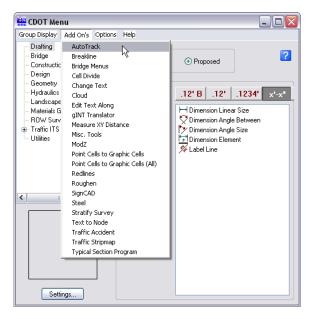
Using AutoTrack



This document guides you through the use of the AutoTrack software. AutoTrack is used to determine the space required to maneuver vehicles.

Opening AutoTrack

1. From the CDOT Menu, select Add On's > Launch AutoTrack.



2. Depending on the skill level setting for AutoTrack, up to three AutoTrack menus will appear. On the MicroStation Menu bar, the **Applications** pull-down can be used to access the AutoTrack commands. An AutoTrack toolbar will also displayed. If the skill level is set to **Novice**, the **Welcome to AutoTrack** wizard is displayed.

t Element Settings Tools Utilities Workspace Applications Wind	ow <u>H</u> elp <u>A</u> xiom	
	Introduction Show Toolbar	
S View 1 - Top Welcome to AutoTrack	Settings System Settings Drawing Settings	
All these buttons are available on the AutoTrack toolbar Default vehicle(click button to change) B-109D - Tumpike Double Semi-Trailer/Trailer	Drawing Explorer Properties Current Model Report Wizard	
Drawing Settings (click button to change)	<u>Vi</u> ew	
Forward design speed 65 mph	⊻ehicle Library	_
Reverse design speed 2.5 mph 1 Master Unit represents 1 ft	AutoDrive Arc <u>A</u> utoDrive Bearing <u>Manual Drive</u> Eollow	
To be guided through AutoTrack click this button	<u>S</u> cript Park a Vehicle ⊻ertical Clearance	-
Driving To start driving click this button	Path Place Outline Animate Insert Profile Insert Turn Graph	
Do not show this dialog in future at startup Close	Generate Turn Template	_
	Parking Tools	
	Utilities •	_
	Help • AutoTrack Video Tutorial Tutor	
AutoTrack		×
🖌 🏈 💷 🎮 🏫 💽 🗖 🛲 🕻 🏷 🖿	‱∎₀ ₽₀ 🚰 /< /"	`■⊟⊱√⊆ ₽ ? №⇒

Setting up AutoTrack

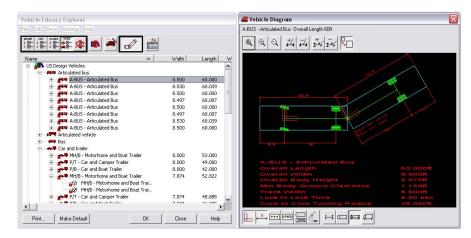
There are a number of settings that control the behavior of AutoTrack. These settings include: Vehicle size, Units of measure, Scale, Tracking Point, Model, Speed, and Dynamics.

Selecting a Vehicle

1. **<D>** the AutoTrack Explore Library button from the toolbar to display the Vehicle Library Explorer.



 The vehicles in the library can be sorted by Group, Category, Classification, or Type. They can also be left unsorted. <D> one of the five buttons to choose a sorting method. <D> the Vehicle Diagram button to display a picture and data of highlighted vehicle.



 To select a vehicle, highlight the name from the list box on the left, and <D> OK. The Vehicle Library Explorer and Vehicle Diagram dialog boxes will be dismissed.

Vehicle Library Explorer		
File Edit Drive Settings Help		
Name 🔺	Width	Length W
🖃 🚽 📶 US Design Vehicles		~
Articulated bus		
A-BUS - Articulated Bus	8.500	60.000
A-BUS - Articulated Bus Tractor		
A-BUS - Articulated Bus Trailer 1		=
🕂 🚰 A-BUS - Articulated Bus	8.530	60.039
🕂 🚰 A-BUS - Articulated Bus	8.500	60.000
🕂 🚰 A-BUS - Articulated Bus	8.497	60.007
🗈 🚰 A-BUS - Articulated Bus	8.500	60.000
🗈 📲 A-BUS - Articulated Bus	8.497	60.007
😥 🚰 A-BUS - Articulated Bus	8.530	60.039
🕂 🚰 A-BUS - Articulated Bus	8.500	60.000
Articulated vehicle		
😟 🛲 Bus		
😑 🚓 🖛 Car and trailer		
🗄 🕋 🛲 MH/B - Motorhome and Boat Trailer	8.000	53.000
🕂 🚙 P/T - Car and Camper Trailer	8.000	49.000
🗄 🕋 🛹 P/B - Car and Boat Trailer	8.000	42.000
😑 🕋 MH/B - Motorhome and Boat Trailer	7.874	52.822
🔒 🔂 MH/B - Motorhome and Boat Trai		~
		•
Print Make Default OK	Close	Help

Drawing Settings

The remaining settings mentioned above are controlled through the AutoTrack Drawing Settings dialog box.

1. <D> the AutoTrack Drawing Settings button from the toolbar to display the Drawing Settings dialog box.



The first tab on the Drawing Settings dialog box is the Units tab. There are two areas on this tab. Vehicle Editing Units settings control the units governing a vehicles performance as well as the graphic elements displayed in MicroStation. Reporting Units determines the units use for AutoTrack generated reports. The settings used should reflect those shown in the diagram below.

Distance Angles		✓ Speed ✓ Time	seconds	• •
Reporting Ur	iits			
Distance	feet	 Speed 	mph	•
Angles	degrees	▼ Time	seconds	•

3. Select the Scale tab. There are two areas on this tab that can be modified; Scale and Driving Convention. The Angles area is controlled through MicroStation and is for informational purposes only. The Scale settings should reflect the Master Units in MicroStation (typically 1 Feet). The Driving Convention area tells the program where the driver sits in the vehicle. In the U.S., Vehicles are left hand drive.

awing Settings	
Units Scale Levels Tracking	Point Model Speed Dynamics Reports
Scale (N.B. [Default scale is taken from the drawing on this platform)—
1 Master Unit represents	1 feet 💌
🔽 Auto check scale against win	dow size
✓ Prompt for scale (and other dr	awing settings) on first use
Angles (these values are read from	m your CAD system settings)
Mangles measured clockwise	
WCB of preferred angular datum	90 deg
Driving convention	
Vehicles are left hand drive	
C Vehicles are right hand drive	
	Street Million Street

Note: There are two check boxes in the **Scale** settings area. The **Auto check scale against window size** will warn the user if the MicroStation window is zoomed out too far to accurately place the driving path. The **Prompt for scale (and other drawing settings) on first use** displays the **Drawing Settings** dialog box (with the Scale tab showing) the first time a path is being defined. The **Drawing Settings** dialog box will not display for subsequent paths. These can be turned on or off depending on your preference.

4. Select the Tracking Point tab. These settings define what part of the vehicle will follow the defined path. There are two areas on this tab; Forwards and Reverse. Forwards controls the tracking point when the vehicle is moving forward and Reverse controls the tracking point when the vehicle is backing up. Use the drop-down list to select the desired tracking point. Frontmost axle and Pilot / Driver are most commonly used for Forwards and Reverse.

Forwards Tracking point (first unit)	Frontmost axle Front of body Frontmost axle Effective front axle Frontmost wheel Front coupling Rear of body Rearmost axle Effective rear axle Rearmost wheel	
☐ Offset to the right	Pilot / Driver Pilot / Driver Wheel cut-in point Wheel cut-out point Body cut-out point User defined point	

There are also two check boxes in the **Forwards** and **Reverse** areas. These checkboxes are labeled **Offset to the left** and **Offset to the right**. These are used to move the tracking point to the left or right of the selected location on the vehicle. To use an offset, indicate the offset side, then key in a value in the field to the right of the checkbox.

	ng Point Model Speed Dynamics Re	eports
Forwards		
Tracking point (first unit)	Left 🔄 Frontmost axle	-
Gffset to the left	- 4 ft	
Gifset to the rig	at 0 0	
	K	
Reverse		
Tracking point (last unit)	Left 🔄 Rear of body	•
C Offset to the left	0 ft	
- Office the state		
C Offset to the right	nt o tr	

5. Select the Model tab. This tab contains four areas; Calculation / Storage interval, Limit Steering, Limit articulation, and Severity of overturns. The settings default to those applied to the vehicle.

In the **Calculation / Storage interval** area, the **Nominal interval** sets how often data is collected as the vehicle runs along the path. A smaller number collects more data but takes longer to process. A larger number collects less data and is faster but less accurate. Values between 0.083 and 4.92 can be used. To change the interval, type a new value in the field, overwriting the current setting.

nits Scale Levels Tracking Point	Model 9	Speed D	ynamics Repo	its
Calculation / Storage interval Nominal interval	0.82	ft		
Limit steering				
Limit steering to percentage	80	%		
Limit steering to angle	30	deg		
Limit steering to radius	32.808	ft	Inner Whee	-
Limit articulation				
Limit articulation to percentage	80	%		
Limit articulation to angle	45	deg		
Severity of overturns				
Maximum overturn angle	45	deg		
		2		

Limit Steering and *Limit articulation* change the vehicle's performance. Steering determines turning radius of the tractor. Under *Limit Steering*:

- Limit steering to percentage reduces the steering angle to percentage indicated.
- Limit steering to angle- sets a maximum steering angle.
- Limit steering to radius- sets a minimum radius the vehicle can turn in. With this a drop-down list is provided with options that can be used to indicate from where on the vehicle the radius is measured.

Jnits Scale Levels Tracking Poin - Calculation / Storage interval	it Model 9	ipeed D	lynamics Reports	
Nominal interval	0.82	ft		
Limit steering				
Limit steering to percentage	80	%		
Limit steering to angle	30	deg		
Limit steering to radius	32.808	ft	Inner Wheel	•
Limit articulation			Inner Wheel Outer Wheel	
Limit articulation to percentage	80	%	Centerline Inner Body	
🔽 Limit articulation to angle	45	deg	Outer Body	_
Severity of overturns				
Maximum overturn angle	45	deg		

Articulation is the angle of the trailer in relation to the tractor. Under *Limit articulation*:

- Limit articulation to percentage reduces the articulation angle to percentage indicated.
- Limit steering to angle- sets a maximum articulation angle.

Jnits Scale Levels Tracking Point	Model S	peed [)ynamics Repo	orts
Calculation / Storage interval	0.82	ft		
Limit steering				
Limit steering to percentage	80	%		
Limit steering to angle	30	deg		
Limit steering to radius	32.808	ft	Inner Whe	el 💌
Limit articulation				
Limit articulation to percentage	80	%		
🔽 Limit articulation to angle	45	deg		
Severity of overturns				
Maximum overturn angle	45	deg		

Overturn is when a vehicle swings out in the opposite direction or continues forward some distance before making a turn. The *Severity of overturns* area is used to define the amount of overturn to be used.

• Maximum overturn angle- sets the maximum angle of the vehicle's wheels off of the intended path if no overturn were used.

Jnits Scale Levels Tracking Point	Model S	beed L)ynamics Repo	rts
- Calculation / Storage interval Nominal interval	0.82	ft		
Limit steering				
Limit steering to percentage	80	%		
Limit steering to angle	30	deg		
I Limit steering to radius	32.808	ft	Inner Whee	el 💌
Limit articulation				
✓ Limit articulation to percentage	80	%		
✓ Limit articulation to angle	45	deg		
Severity of overturns				
Maximum overturn angle	45	deg		

6. Select the **Speed** tab. This tab contains three areas: *Design Speed*, *Limit forward turn rate(transition curve)*, and *Limit reverse turn rate(transition curve)*.

The **Design Speed** is the speed used to calculate the path of the vehicle. The design speed can be set differently for forward and reverse.

- Forward design speed- The key in field is used to set the value for the forward design speed. The drop down menu is used to set the unit for the design speed
- **Reverse design speed** The key in field is used to set the value for the reverse design speed. The drop down menu is used to set the unit for the design speed.

Forward design speed	5	km/h	•
Reverse design speed	2.5	mph	+
 Based upon lock to lock dis Based upon a circular tange 		feet	<u> </u>
Limit reverse turn rate (transi	tion curve)		
 Based upon lock to lock tim Based upon lock to lock dis 	· · · · · · · · · · · · · · · · · · ·	feet	Ŧ

The *Limit forward turn rate(transition curve)* models the time and distance traveled forward whilst turning the steering wheel. This is done so that the wheels do not go from straight ahead to fully turned in an instant. There are three options for the forward turn rate:

- Design speed Forward design speed	5	km/h	•	
Reverse design speed	2.5	mph	•	
Based upon lock to lock distant Based upon a circular tangentia		feet	Ŧ	
 Limit reverse turn rate (transition Based upon lock to lock time (d) 	l curve) lefined in vehic			
G Based upon lock to lock distant	ce 2.5	feet	<u>~</u>	

• **Based upon lock to lock time (defined in vehicle)**- Each vehicle profile has a Lock to Lock time. This is the amount of time it takes to

turn the wheel from a full turn in one direction to a full turn in the other direction. The vehicle's path is calculated using the design speed (above) and the lock to lock time of the vehicle.

- Based upon lock to lock distance- This option specifies a set distance traveled for the lock to lock time. This option does not use the design speed in the path calculations.
- **Based upon a circular tangential arc** This option forces the steering point of the vehicle to follow a perfectly circular path around the curve. This method does not use design speed or lock to lock time. This is the method used by AASHTO.

The *Limit reverse turn rate(transition curve)* works like the forward turn rate, except in reverse. There are only two options for limiting the reverse turn rate; Based upon lock to lock time (defined in vehicle) and Based upon lock to lock distance. The above descriptions apply to these options as well.

Design speed				
Forward design speed	5	km/h	-	
Reverse design speed	2.5	mph	-	
C Based upon a circular tangenti				
 Limit reverse turn rate (transition Based upon lock to lock time (or 		.)		
C Based upon lock to lock distan	ce 2.5	feet	Ŧ	

- 7. Select the *Dynamics* tab. This tab is used to apply conditional factors such as Friction or Superelevation to calculate the minimum turn radius.
 - Toggle on *Limit turning for dynamic effects (weight related)* to use the information on this tab.
 - **Recommendations From** is used to determine the source data for the calculations. The illustration below lists the various options.

rawing Settings					
Units Scale Levels	Tracking Point Model Speed Dynamics Reports				
Limit turning for dyna	mic effects (weight related)				
Recommendations from	AASHTO Handbook 2004				
Design Context	AASHTO Handbook 1990 AASHTO Handbook 1994				
Friction factor (f)	AASHTO Handbook 2001 AASHTO Handbook 2004				
Super-elevation (e)	Custom Settings TAC Handbook 1999				

If *Custom Settings* is selected, the fields on the left side of the dialog box are activated for user input.

Recommendations from	Custom Settings	•
Design Context	N/A	
Friction factor (f)	0 or 🔽 Use table value of	0
Super-elevation (e)	or 🔽 Use max table value of	0
Min. applicable speed	or 🔽 Use table value of	0 km/
Minimum turn radius (R)	or 🔽 Use calculated value of	0 ft
Recommended values b	ased upon current forward design speed (V) of	50 km/
Radius to the center of	the steered axle	0 ft
(N.B. Recomme	nded and calculated values change with design sp	eed)

From top to bottom, the fields are: Friction factor (f), Super-elevation (e), Min. applicable speed, and Minimum turn radius.

A separate toggle determines if the **Minimum turn radius** field is available for user entry. If the **Use calculated value of** option is toggled on, the **Minimum turn radius** field is disabled and the minimum turn radius will be calculated based on the data entered above.

Min. applicable speed 0 or 🗹 Use table value of	0 km/h			
Minimum turn radius (R) 0 or 🔽 Use calculated value of	0 ft			
Recommended values based upon current forward design speed (V) of 50 km/h				

If one of the AASHTO or TAC Handbooks is selected, the fields on the left will be disabled and the calculations will be made with data from the specified handbook. Toggles are provided to turn on or off: Friction factor (f), Super-elevation (e), Min. applicable speed, and Minimum turn radius.

Limit turning for dyna Recommendations from	-		-			
Design Context	AASHTO Handbook 2004					
Friction factor (f)			-	Use table value of	0.2	
Super-elevation (e)	0	01	-	Use max table value of	0.08	
Min. applicable speed	0	oi l	-	Use table value of	24.1401	km/h
Minimum turn radius (R)	0	oi l	•	Use calculated value of	241.338	ft
Recommended values b	ased upon	cure	ent	forward design speed (V) of	50	km/h
Radius offset from outer	most whee	el (e.g	9. ti	o outer lane marking) by 👱	0	ft
Radius offset from outer	most whee	el (e.g	g, ti	o outer lane marking) by 👱	0	ft
(N.B. Recommen	nded and (calcu	lati	ed values change with desig	n speed)	

The drop down menu at the bottom of the dialog box is used to specify what part of the vehicle will follow the radius specified. There are three options; *Radius* offset from outermost wheel (e.g. to outer lane marking) by, *Radius to the* center of the steered axle, and *Radius offset from innermost wheel* (e.g. to inner lane marking) by.

- Radius to the center of the steered axle- This places the center of the vehicle on the calculated radius.
- Radius offset from outermost wheel by- This option puts the radius on the outside lane marking. When selected, the ft field becomes active. Use this field to specify a distance from the lane marking for the radius.
- Radius offset from innermost wheel by- This option puts the radius on the inside lane marking. Use the ft field to specify a distance from the lane marking for the radius.

Recommendations from AASHTO Handbook 2004					-	
Design Context Rural h/w, urban f/w & h/spd streets, (3-27, e=0.08)(US)						
Friction factor (f)	0	or	~	Use table value of	0.2	
Super-elevation (e)	0	or	~	Use max table value of	0.08	
Min. applicable speed	0	or I	~	Use table value of	24.1401	km/h
Minimum turn radius (R)	0	or I	•	Use calculated value of	241.338	ft
Recommended values l	based upon	curre	ent	forward design speed (V) of	50	km/ł
Radius offset from out	ermost whee	el (e.g	g. ti	o outer lane marking) by 💌	0	ft
Radius offset from oute Radius to the center of				o outer lane marking) by		- 28

Creating a Path

Once the desired settings have been made, a path can be created for the vehicle to use. The two options described are **AutoDrive** and **Follow**. **AutoDrive** creates the path dynamically, based on user input. **Follow** uses an element displayed in the dgn file to create the path. The first two examples below will illustrate the AutoDrive and Follow options. The third example will use both AutoDrive and Follow to create a single path.

In the first example, the vehicle will travel up the northbound road around the curve to the intersection. It will then make a right turn onto the cross street. The maneuver around the curve will use standard AutoDrive, with <D> mouse clicks determining the radius and direction of the path. At the intersection the *Turn onto bearing* option will be used. Here the turning radius is based on the design speed and the degree of turn.

1

Creating a Path with AutoDrive

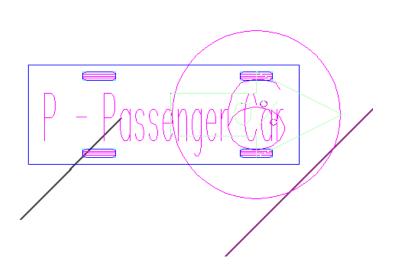
There are two icons on the AutoTrack toolbar that can be used to start AutoDrive; AutoTrack AutoDrive and AutoTrack AutoDrive Bearing. Both display the same dialog box, the only difference is in the toggle settings in the AutoDrive dialog box.

- 1. Zoom in on the area where the path is to begin.
- 2. Select one of the two AutoTrack AutoDrive icons.

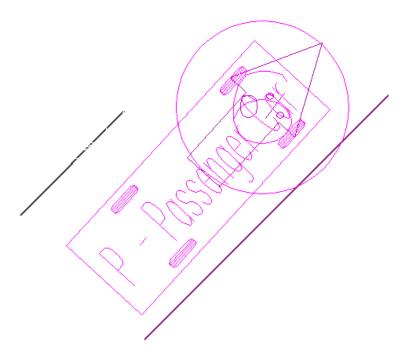
AutoTrack	
≠ ⊆ ⊂ ≲ 🖓 🖾 🖓 🖉	⌀⋌ۅᢆᡛᡰᢛᡐᡖᡌᢛ᠙ᡏᢙᢅ/ᠭᠺ᠓᠊᠊᠊᠊᠋ᡜ᠋ᢓᠲᠵ᠘᠌᠌᠌᠌ᢓ
AutoTrack AutoDrive	AutoTrack AutoDrive Bearing

A cell of the vehicle is attached to the cursor.

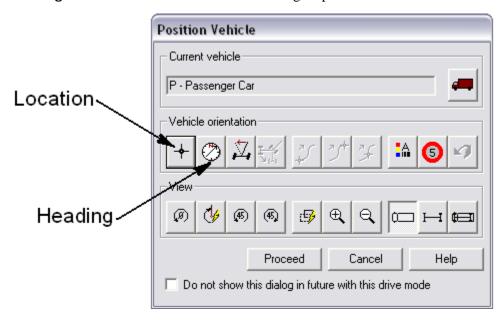
3. Move the cursor to the desired start point and *<*D*>* to identify the vehicle's starting location.



4. The vehicle cell will pivot around the selected location. Rotate the cell to the desired orientation and *<D>*.



5. The Position Vehicle dialog box will display. If the cell is not located in the exact position it should be, it can relocated at this time. Use the Location icon to change the vehicle's starting position (it will maintain its orientation). Use the Heading icon to rotate the cell while maintaining its position.



Note: The MicroStation view controls are operational during this procedure. Use them as needed to get the proper placement of the vehicle throughout the design of the path.

6. A number of the settings made above can be changed at this point if necessary. Use the following icons:

Select Vehicle- Use to select a different vehicle profile (see steps 9 – 11 above).

Autotrack Model Properties- This is used to change design speed, tracking point, dynamics, etc. (see steps 15 - 18 above).

Properties	
Path Notes Vehi	cle Maneuvers Reports
Path	
Path ID	6
Title	Passenger car NB Right Turn
Path Scale	1 Master Unit represents 1ft
Level Prefix	DRAFT_CD-Violet
Comments	
Status	Fwd: 5.00km/h Min Center Radius: 0.00ft Length: 0.00ft
	Extract Data
Make Default	Reset OK Cancel Help

Path Properties- A Title and Comments can be added to the path using this icon. A user can key in title information and comments at this point (optional). The other tabs are used for informational purposes only.

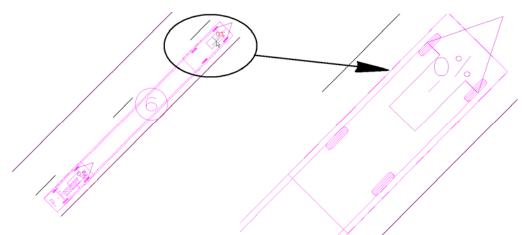
7. Once the cell is in position and any changes have been made to the settings, <D> the **Proceed** icon.

Position Vehicle
Current vehicle
P - Passenger Car
Vehicle orientation
+ 🖉 🏹 🌮 🕉 🖬 🌀 🜌
View
Proceed Cancel Help
Do not show this dialog in future with this drive mode

- 8. The AutoDrive dialog box is displayed. A number of settings (and setting overrides) can be made from this dialog box. The first two will be described here:
 - Minimum Radius This is an override to the setting made on the *Models* tab of the Drawings Settings dialog box (step 16 above). Use the left field to key in the minimum radius. Use the drop down list to select the part of the vehicle that will follow the radius.
 - Clearance Offset This displays a temporary line around the vehicle at the specified distance. It is used to show the additional space needed for the vehicle to avoid curbs and oncoming traffic.

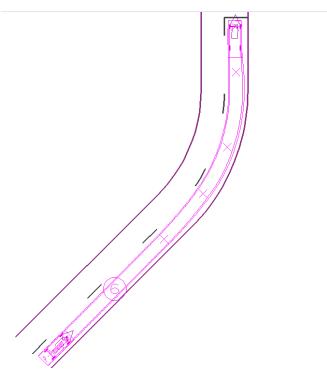
AutoDrive (Dimensions: ft, deg)						
💌 Minimum radius	32.808	Inner Wheel	-			
🔽 Clearance offset	1.640	Inner Wheel Outer Wheel				
Turn onto bearing		Centerline				
Turn through angle	90.00 👻	Inner Body Outer Body				
C Turn onto WCB	0.00 👻	Current	105.75			
C Freehand (turn imme	diately)					
🔲 Side overturn	3.281	N.B. Overturn	IS			
Exit overturn	3.281	only work when traveling				
Max. overturn angle	45	forwards	2			
ا الله الله الله الله الله الله الله ال	>>>	More	Help			

9. Position the cursor at the next position along the path and <D> to accept that location.



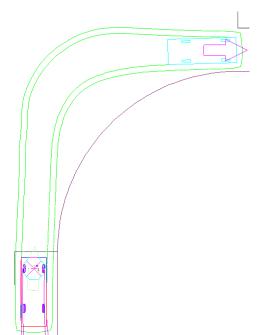
Note: As seen in the detail above, the percent that the wheels are turned is displayed on the cell. Be aware that this text is proportional to the cell and will be difficult to see when zoomed out.

10. Continue to <D> along the path of the vehicle. Each Data point will be indicated by an 'X' on the path.



In the illustration above, the path has been defined around the bend and to the intersection.

At the intersection, a 90 degree right turn is required. This is done using the **Turn onto bearing** option. In addition to this option, the Minimum radius will also be reset. The default minimum radius for the vehicle selected is 32.808 feet while the street return radius is 50 feet. Using the default radius gives an undesirable result as illustrated below:

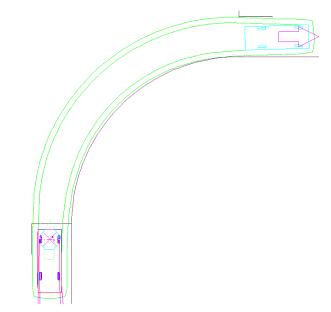


By resetting the *Minimum radius* to that of the street return and relocating the *tracking point to the Inner Wheel* a smoother maneuver can be accomplished. The use of the *Clearance offset* will help keep the vehicle off the curb and out of oncoming traffic.

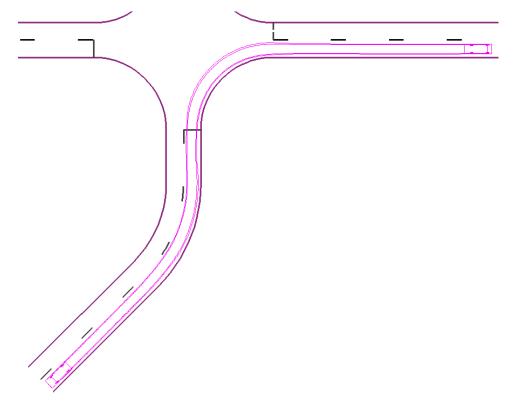
- 11. In the AutoDrive dialog box, toggle on Minimum radius. In the field to the right, key in the new radius (for this example 50 will be used).
- 12. From the drop-down list, select Inner Wheel.
- 13. Toggle on Clearance offset if it is not already on.
- 14. Toggle on Turn onto bearing.
- 15. Toggle on Turn through angle. From the adjacent drop-down list, select 90.

AutoDrive (Dimensions: ft, deg)					
Minimum radius	50	Inner Wheel 🗨			
Clearance offset	1.640				
✓ Turn onto bearing					
 Turn through angle 	90 🔻	Current 64.91			
C Turn onto WCB	0.00 💌	Current 67.26			
C Freehand (turn immed)	ediately)				
🔲 Side overturn	3.281	N.B. Overturns			
🔲 Exit overturn	3.281	only work when traveling			
Max. overturn angle	45	forwards			
₩ 🖗	>>>	More Help			

16. Move the cursor to the center of the lane on the cross-street and <D>. As shown in the illustration below, a much smoother maneuver is achieved with the new settings.

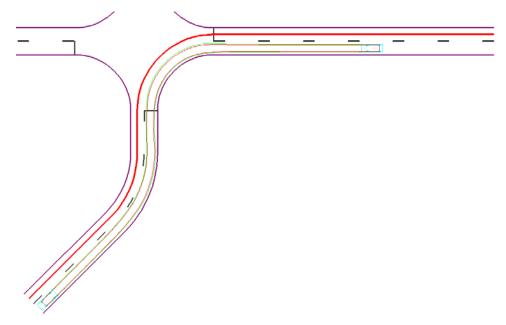


17. Move the cursor further down the road and <D> then <R> to complete the path. The Finished example is shown below:



Creating a Path with Follow

As stated above the **Follow** command uses a graphic element to define the path of a vehicle. When working with contiguous elements, it is best to create a MicroStation *Complex Chain* from these elements. This will speed up the process by reducing the number of times the command must be selected in order to complete the path. In this example, the red line traveling east and making a left turn will be used to define the vehicle's path.



1. From the AutoTrack toolbar, select the Follow icon.

A message window appears asking, "Do you wish to follow using the default vehicle?" <D> Yes to use the default vehicle. If the No is selected, the Vehicle Library Explorer dialog box is displayed and a new vehicle can be selected.

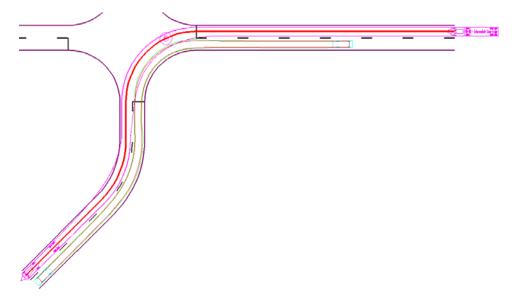
AutoTra	ck	X
?	Do you wish to follow using the default vehicle (P - P.	assenger Car)?
	Yes No	

For this example, the **WB-40** – **Intermediate Semi-Trailer** was selected.

- The prompt in the lower left corner of the MicroStation window reads, "Select Object to Follow". <D> on the element defining the vehicle's path near the beginning. The line will highlight. <D> again in a blank area to accept the element.
- 4. The Settings dialog box is displayed. Make any necessary changes in the settings, then <D> OK.

Direction	Forwards	•	
Position Automatic 💽 (new paths only)			
🗖 Generate an ei	ditable path		
Algorithm		000	
Split line into le		1099 ft	
C Track vertices			
Optimisations —		_	
Ignore vertices	closer than 1.640	1416 ft	
🔽 Follow line as c	closely as possible (by dropp	ping unreachable points)	
The state of the	ng path by removing unnec		

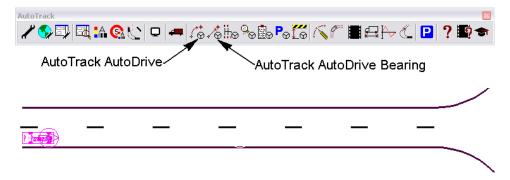
The path will automatically be created along the element as shown in the illustration below:



Creating a Path with AutoDrive and Follow

In this example, the vehicle heading east will make a right turn using the AutoDrive commands. After completing the turn, the Follow command will be used to incorporate the red line into the path.

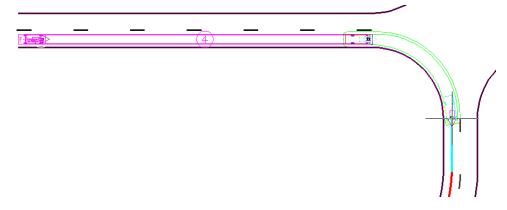
1. Select the **AutoDrive** icon from the AutoTrack toolbar and place the vehicle as described in steps 21 through 25 above.



2. Extend the path to the intersection (see steps 26 through 28 above).



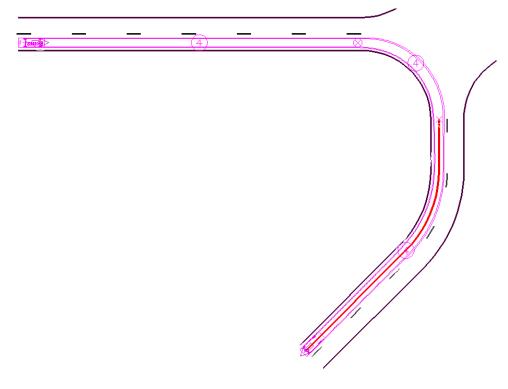
Using the *Turn onto bearing* option (described in steps 29 through 34 above),
 <T> to the end of the line defining the remainder of the path. <D> to accept the location.



4. From the *AutoTrack* toolbar, select the Follow icon.

AutoTrack	
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5. <D> on the line defining the remainder of the path. <D> again to accept the element. Make any desired settings changes (step 39 above) and <D> OK to complete the path.



AutoTrack Reports

An AutoTrack report is the graphic display related to the vehicle path and not textual data. There are four different reports that can be displayed from AutoTrack: Body and Chassis Envelopes, Spaced Vehicle Outlines, Hatched Body Envelope, and Clearance Envelope. All of these reports have six common elements: Body Outline, Chassis Outline, Symbols, Annotation, Profile, and Graph.

Working with AutoTrack Reports

AutoTrack reports are accessed through the path's Properties dialog box.

1. Highlight the path to report on then <D> the AutoTrack Properties icon on the AutoTrack toolbar.

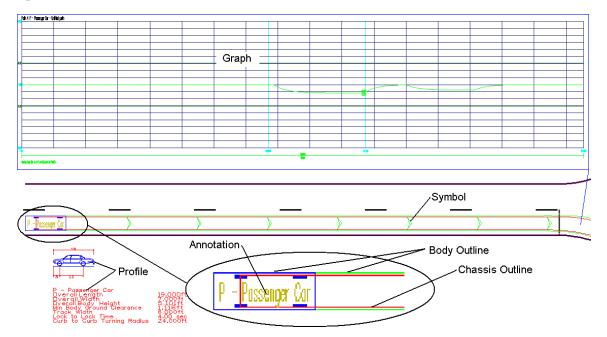


The **Properties** dialog box is displayed.

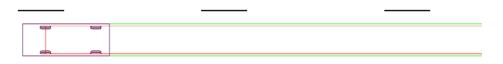
2. From the **Properties** dialog box, select the **Reports** tab.

Properties	
Path Notes Vehicle Maneuvers Reports Available Reports (tick to enable) Construction lines Report 0001 Body and Chassis Envelopes Chassis outline (plan) Chassis outlines Symbols Annotation Profile Graph Report 0003 Spaced Vehicle Outlines Report 0003 Latched Body Envelope Report 0004 Clearance Envelope Report 004 Clearanc	Rename New Edit Duplicate Delete
Make Default Reset OK Cancel	Help

The illustration below identifies each of the six elements that can make up a report.



The illustrations below show the differences in each of the reports. (Note: Graph, Profile, Annotation, and symbol have been turned off in all of the illustrations.)



Body and Chassis Envelope



Spaced Vehicle Outlines



Hatched Body Envelope



Clearance Envelope

3. Toggle on the report type and report elements then **<D> OK**. The **Properties** window is dismissed and the report is displayed.

Properties Path Notes Vehicle Maneuvers Reports Available Reports (tick to enable)	
Constant lines Government Constant of the series Constres Constant of the series	Rename New Edit Duplicate Delete
Make Default Reset OK Cance	el Help

Editing an AutoTrack Path

Existing paths can be modified using the commands on the **AutoTrack Path Edit** toolbar. Each of the commands on this toolbar is explained below.

1. To display the AutoTrack Path Edit toolbar, select the AutoTrack Path Edit icon from the AutoTrack toolbar.



- 2. To begin editing a path, *<D>* to highlight the path.
- 3. Select the desired icon from the AutoTrack Path Edit toolbar.

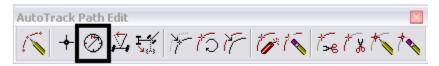


Note: The leftmost icon on this toolbar is not used. The command associated with that icon launches the toolbar, which is already displayed.

4. To move the path by the starting location, select the Initial Vehicle Location icon. When selected the path is attached to the cursor by its starting location.
<D> on the new starting location to move the path. The relationship between points is maintained during this operation and no modification to lengths, radii, or bearing is made.



5. To change the vehicle's starting direction, select the **Initial Vehicle Heading** icon. When selected, the vehicle rotates with the movement of the cursor. The path is modified to attempt to pass through points located on the path. This should only be used for minor corrections in bearing as major alterations will drastically alter the path.



6. By default, the vehicle's wheels are in the straight ahead position when placed. If the path starts in a turn, the angle of the wheels can be adjusted by selecting the Initial Vehicle Steering icon. This changes the angle of the wheels with the movement of the cursor, but leaves the orientation of the vehicle unchanged. Like the Initial Vehicle Heading command, this operation can drastically change the path.



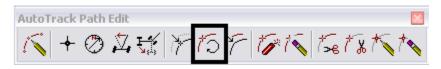
7. The **Initial Vehicle Articulation** is used to change the starting orientation of a trailer to its tractor (or car). This will not greatly affect the path as the tractor maintains it orientation.



8. The **Move Path** command is similar to the **Initial Vehicle Location** command in that it moves the path without changing the relationships of any of the points on the path. The difference is that with this command a base point is located which does not have to be on the path. A second point is then located to specify the distance and direction that the path is moved.



9. Rotate Path is used to spin the entire path about a specified point while maintaining the relationship of all the points within the path.



10. The **Copy Path** command works like the MicroStation copy. The highlighted path is picked up by its origin and a **<D>** indicated the origin of the copy.



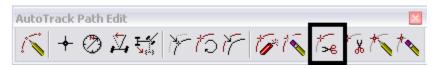
- 11. To delete a path but retain the graphics, use the **Explode Path** command.
 - **Note:** The graphic elements are a cell and the Complex Status will have to be dropped in order to manipulate the individual elements.



12. The Delete Path command deletes the path and its graphics.



13. The Trim Start of Path moves the initial point (and the vehicle cell) along the path. A <D> identifies the new starting point. All information behind the new starting point is removed.



14. The **Trim End of Path** moves the end point (and the vehicle cell) along the path. A <D> identifies the new ending point. All information behind the new end point is removed.



15. The Edit Target Point can be used to move existing points on the path (including the beginning and end points). It can also be used to add additional points to the path. When selected, the cursor moves along the path. To move an existing point, <D> on the point. The point is then attached to the cursor and a second <D> will identify its new location. A <D> on the path, but not on an existing point will add a new point. A second <D> is used to its location as well.



16. **Delete Last Target Point** removes the data from the end of the path back to the next point on the path.



<u>Note:</u> The MicroStation UnDo command can be used to negate the editing done in AutoTrack.

Inserting a Turn Graph

A turn graph can be placed as part of a report when creating or displaying a path. However, when done this way the Graph is placed at a specific location from the paths origin. This may not always be the best location. Using the **Insert Turn Graph** command allows the user to dynamically place the graph.

1. Select the Insert Turn Graph icon from the AutoTrack toolbar.



2. The lower left corner is attached to the cursor. <D> to identify the location of the graph.

AutoTrack Animation

Using the AutoTrack Animation tool the vehicle cells can actually move along their paths.

1. Select the Animate Vehicle icon from the *AutoTrack* toolbar.



The AutoTrack Animation dialog box is displayed.

AutoTrack Animation			
	×16 0.0/122.4	Advanced	Close

- 2. The icons in the lower left corner of the dialog box are the animation controls. From left to right they are:
 - Reset This moves all vehicles to their initial point.
 - Single Step Forward The vehicles are moved along their path one step for each push of the icon.
 - Play The animation runs from beginning to end.
 - Fast Forward This is used to set the speed of the animation.
 - Loop Indefinitely This replays the animation until the play icon is toggled off.
 - **Record** this creates an avi file of the animation.
- 3. The slider bar, across the top of the dialog box, can also be used to move back and forth through the animation.
- 4. **<D>** Advanced button.

AutoTrack Animation				
	x16 0.0/122.4	Advanced	Close	
	X16 0.0/122.4	Advanced		

5. The expanded dialog box shows the currently loaded paths in the animation highlighted in green. To insert additional paths into the animation, <**D**> **Add**.

AutoTrack Anin	nation				
	• •	x32	103.4/122.4	Basic	Close
Animation name	Animation 1				.
		Glob	al Actions		
	Path 5 WB-40	- Interme	diate Semi-Tr	ailer - Semi path	
1	Edit		Add	Remove	

6. The **Path Animation** dialog box is displayed. Use the **Path** drop-down list to select an additional path to add to the animation.

Path Animation Path			_	
Animation Path 5 WB-40 - Intermediate S Animation Path 6 P - Passenger Car - Pas Path 4 P - Passenger Car - Unt	senger car NB Right Turn			
Hidden end distance 0 Start delay (sec) 0 Show vehicle before start Show vehicle after end	< >	Sort New Remove		
		ОК	Cancel	Help

7. **<D> OK** to add the path. Additional paths can be added the same way.

8. The active path is shown with a red box around it. This path can be edited or removed. To edit the path, <D> Edit.

	• •	x32 103.4/122.4	Basic	Close
nimation name	Animation 1			•
		Global Actions		
	Path 5 WB-4	0 - Intermediate Semi-T	railer - Semi path	
	Path 6 P - Pas:	enger Car - Passenger	car NB Right Turn	u l
	Path 4	P - Passenger Car - Un	titled path	

- 9. The *Path Animation* dialog box is displayed again this time relating to the selected path. The following options are available:
 - Hidden start distance The vehicle is started further up the path by the distance entered.
 - Hidden end distance The vehicle stops on the path the distance entered fro the end point.
 - **Start delay (sec)** The vehicle waits the indicated number of seconds before moving. This can be set differently for each path.
 - Show vehicle before start When toggled on the vehicle cell is shown before the play icon is pressed. When off the cell is not displayed until the play icon is pressed.
 - Show vehicle after end This works the same as the Show vehicle before start.

nimation	Intermediate	delays		Show
Hidden start distance 0 Hidden end distance 0 Start delay (sec) 0 Show vehicle before start I∕ Show vehicle after end I∕	Distance	Delay	Sort	 ✓ Chassis outlines ✓ Body outline (plan)
	<		New Remove	Color

10. After all changes to settings are made, use the animation controls described in steps 61 and 62 to view the animation.