



## Route Plans

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The Route Plan drop-down list on the menu bar allows you to configure Cisco CallManager route plans using route patterns, route filters, route lists, and route groups.

This section contains descriptions of the following route plan concepts:

- Understanding Route Plans, page 5-1
- Understanding Route Pattern Wildcards and Special Characters, page 5-7
- Understanding Closest-Match Routing, page 5-11
- Understanding Discard Digits Instructions, page 5-12

## Understanding Route Plans

The Cisco CallManager uses the route plan to route both internal calls and external (Public Switched Telephone Network [PSTN]) calls.

Route patterns, route filters, route lists, and route groups provide flexibility in network design. Route patterns work in conjunction with route filters to direct calls to specific devices and to include or exclude specific digit patterns. (Use route patterns to include and exclude digit patterns. Use route filters primarily to include digit patterns.) Route lists control the selection order of the route groups. Route groups set the selection order of the gateway devices.

Route patterns can be assigned to gateways, or to route lists and route groups.

**Note**

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After adding or changing route pattern information, you must reset the gateway for the new or updated information to be recognized.

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Route groups determine the order of preference for gateway and port usage. Route groups allow overflows from busy or failed devices to alternate devices.

Route lists determine the order of preference for route group usage. If a route list is configured, at least one route group must be configured. One or more route lists can point to one or more route groups.

Route filters allow or restrict access to routing patterns. Tags are the core component of route filters. A tag applies a name to a portion of the dialed digits. For example, the North American Numbering Plan (NANP) number 972-555-1234 contains the LOCAL-AREA-CODE (972), OFFICE-CODE (555), and SUBSCRIBER (1234) tags.

**Note**

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The NANP is the numbering plan for the PSTN in the United States and its territories, Canada, Bermuda, and many Caribbean nations. It includes any number that can be dialed and is recognized in North America.

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Route patterns represent all valid digit strings. When you assign a directory number to a Cisco IP Phone, you are assigning it a route pattern (the directory number is the route pattern). Cisco Access Analog Trunk Gateways, Cisco Access Digital Trunk Gateways, Cisco MGCP gateways, and H.323-compliant gateways also use route patterns. Cisco gateways can route ranges of numbers with complex restrictions and manipulate directory numbers before the Cisco CallManager passes them on to an adjacent system. The adjacent system can be a central office (CO), a private branch exchange (PBX), or a gateway on another Cisco CallManager system.

A route pattern can be assigned directly to a Cisco Access Gateway, or it can be assigned to a route list for more flexibility. For example, in Figure 5-1 Cisco Access Digital Gateway 1 is designated as the first-choice for routing outgoing calls to the PSTN.

**Tips**

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If a gateway does not have a route pattern, it cannot place calls to the PSTN or to a PBX. To assign a route pattern to an individual port on a gateway, you must assign a route list and a route group to that port.

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Figure 5-1 shows the effects of using route patterns with Cisco Access Digital Gateways. In this example, the route pattern is assigned to a route list, and that route list is associated with a single route group. The route group supports a list of devices that are selected based on availability. If all ports on the first-choice gateway are busy or out of service, the call is routed to the second-choice gateway.

**Figure 5-1** Route Plan Summary Diagram for Cisco Access Digital Gateways

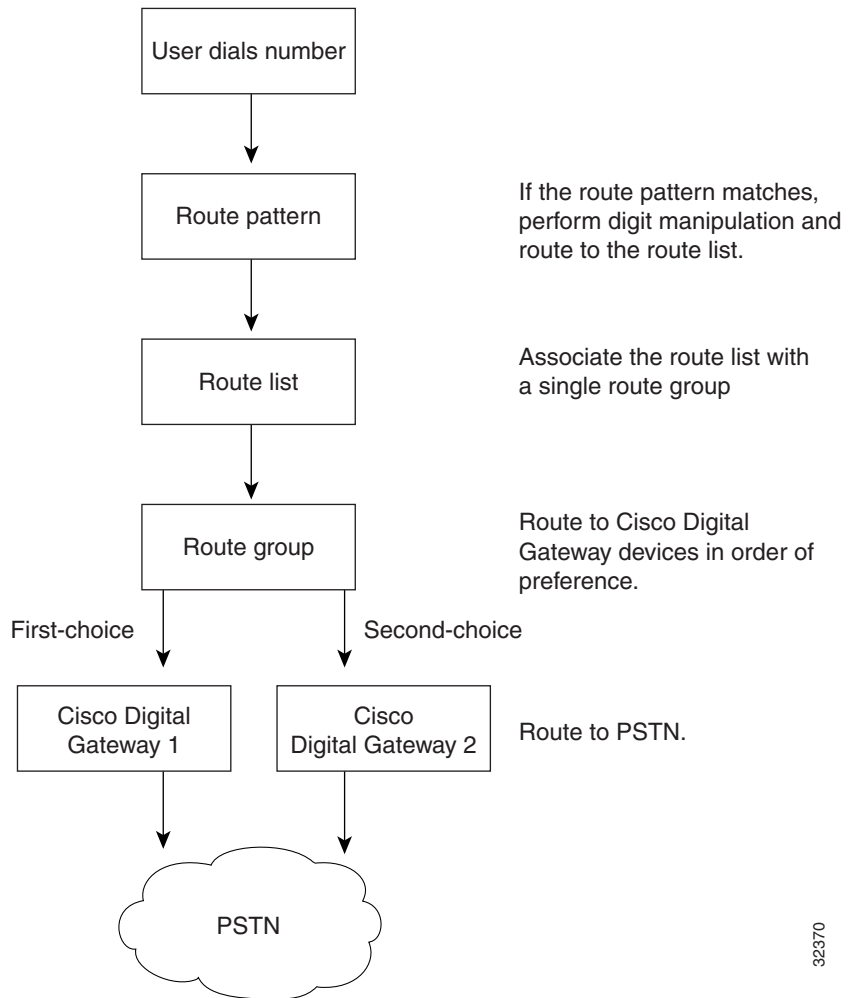
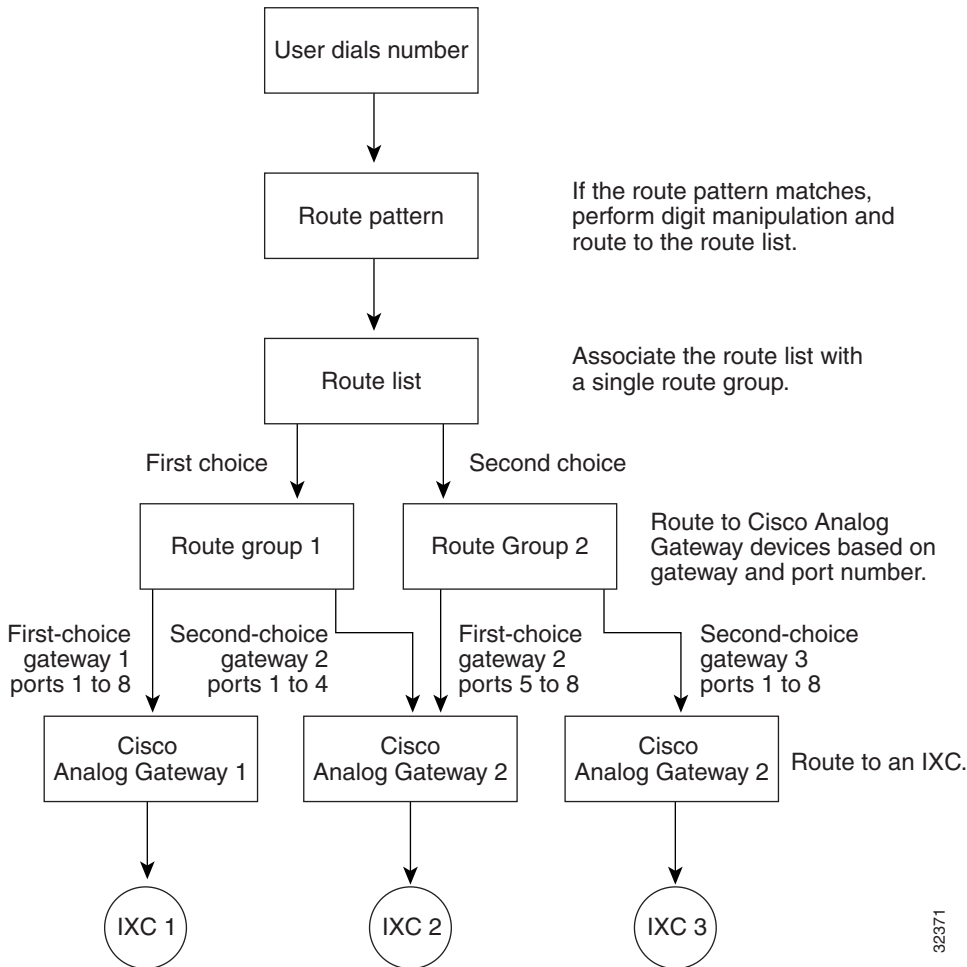


Figure 5-2 shows the effects of using route patterns with Cisco Access Analog Gateways. In this example, the route pattern is assigned to a route list, and that route list is associated with two route groups. Route group 1 is associated with ports 1 through 8 on gateway 1, which route all calls to interexchange carrier 1 (IXC 1). Route group 1 is also associated with ports 1 through 4 on gateway 2. Route group 2 is associated with ports 5 through 8 on gateway 2 and all ports on gateway 3.

Each route group supports a list of devices that are selected based on availability. For route group 1, if ports 1 through 8 on the first-choice gateway are busy or out of service, calls are routed to ports 1 through 4 on the second-choice gateway. If all routes in route group 1 are unavailable, calls are routed to route group 2. For route group 2, if ports 5 through 8 on the first-choice gateway are busy or out of service, calls are routed to ports 1 through 8 on the second-choice gateway. If no ports on any gateway in either route group are available, the call is routed to an all trunks busy tone.

Figure 5-2 Route Plan Summary Diagram for Cisco Access Analog Gateways



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**Related Procedures**

- Adding a Route Filter, page 20-5
- Adding a Route Group, page 21-2
- Adding a Route Pattern, page 23-3
- Adding a Route List, page 22-5



**Table 5-1 Wildcards and Special Characters (continued)**

Character	Description	Examples
?	The question mark (?) wildcard matches zero or more occurrences of the preceding digit or wildcard value.	The route pattern 91X? routes or blocks all numbers in the range 910 through 9199999999999999999999.  This expression is functionally equivalent to the 91! route pattern.
+	The plus sign (+) wildcard matches one or more occurrences of the preceding digit or wildcard value.	The route pattern 91X+ routes or blocks all numbers in the range 9100 through 9199999999999999999999.
[ ]	The square bracket ([ ]) characters are used to enclose a range of values.	The route pattern 813510[012345] routes or blocks all numbers in the range 8135100 through 8135105.
-	The hyphen (-) character is used, with the square brackets, to denote a range of values.	The route pattern 813510[0-5] routes or blocks all numbers in the range 8135100 through 8135105.
^	The circumflex (^) character is used, with the square brackets, to negate a range of values.  Only one ^ character is allowed in each route pattern.	The route pattern 813510[^1-5] routes or blocks all numbers in the range 8135106 through 8135109.

**Table 5-1 Wildcards and Special Characters (continued)**

Character	Description	Examples
.	<p>The dot (.) character is used as a delimiter to separate the Cisco CallManager access code from the directory number.</p> <p>This special character can be used, with the discard digits instructions, to strip off the Cisco CallManager access code before sending the number to an adjacent system.</p> <p>Only one . character is allowed in each route pattern.</p>	The route pattern 9.@ identifies the initial 9 as the Cisco CallManager access code in an NANP call.
*	<p>The asterisk (*) character is generally used to identify feature activation and deactivation codes.</p> <p>The *character must be the first character in the route pattern.</p>	The route pattern *72 routes or blocks feature activation and deactivation codes. The * character identifies this as a special two-digit number.
#	<p>The octothorpe (#) character is generally used to identify the end of the dialing sequence.</p> <p>The #character must be the last character in the pattern.</p>	The route pattern 901181910555# routes or blocks an international number dialed from within the NANP. The # character after the last 5 identifies this as the last digit in the sequence.

Table 5-2 lists Cisco CallManager Administration fields that require route patterns and shows the valid entries for each field.

**Table 5-2 Field Entries**

<b>Field</b>	<b>Valid entries</b>
Call Park Number/Range	[ ^ 0 1 2 3 4 5 6 7 8 9 - ] X * #
Calling Party Transform Mask	0 1 2 3 4 5 6 7 8 9 X * #
Called Party Transform Mask	0 1 2 3 4 5 6 7 8 9 X * #
Caller ID DN (Gateways)	0 1 2 3 4 5 6 7 8 9 X * #
Directory Number	[ ^ 0 1 2 3 4 5 6 7 8 9 - ] + ? ! X * # +
Directory Number (Call Pickup Group)	0 1 2 3 4 5 6 7 8 9
External Phone Number Mask	0 1 2 3 4 5 6 7 8 9 X * #
Forward All	0 1 2 3 4 5 6 7 8 9 * #
Forward Busy	0 1 2 3 4 5 6 7 8 9 * #
Forward No Answer	0 1 2 3 4 5 6 7 8 9 * #
Meet-Me Conference number	[ ^ 0 1 2 3 4 5 6 7 8 9 - ] + ? ! X * # +
Prefix Digits	0 1 2 3 4 5 6 7 8 9 * #
Prefix DN (Gateways)	0 1 2 3 4 5 6 7 8 9 * #
Route Filter tag values	[ ^ 0 1 2 3 4 5 6 7 8 9 - ] X * #
Route Pattern	[ ^ 0 1 2 3 4 5 6 7 8 9 - ] + ? ! X * # + . @
Translation Pattern	[ ^ 0 1 2 3 4 5 6 7 8 9 - ] + ? ! X * # + . @

# Understanding Closest-Match Routing

Closest-match routing is the process of matching the narrowest range of numbers in any pattern. When the Cisco CallManager encounters a configuration in which a dialed number matches multiple route patterns, it uses closest-match routing to determine which route pattern matches the number most closely. When two configured route patterns match exactly the same number of addresses, the Cisco CallManager arbitrarily chooses one. The following paragraphs explain why such exact matches are an unusual occurrence.

It is possible to configure several route patterns that match a single number. For instance, the number 8912 matches all of the following route patterns: 8912, 89XX, and 8XXX.

In this example, the route pattern 8912 matches exactly one address. The route pattern 89XX matches 8912 plus 99 other addresses, and the route pattern 8XXX matches 8912 plus 999 other addresses.

If the user dials 8913, the call routes differently. Using the preceding example, this address matches only the routing patterns 89XX and 8XXX. Since 89XX matches a narrower range of addresses than 8XXX, the Cisco CallManager delivers the call to the device assigned the routing pattern 89XX.

Using the @ wildcard character in a route pattern requires additional consideration.

The number 92578912 matches both of the following route patterns: 9.@ and 9.XXXXXXX. Even though both of these route patterns seem to equally match the address, the 9.@ route pattern actually provides the closest match. The @ wildcard character encompasses many different route patterns, and one of those route patterns is [2-9]XXXXXX. Since the number 2578912 more closely matches [2-9]XXXXXX than it does XXXXXXXX, the 9.@ route pattern provides the closest match for routing.

# Understanding Discard Digits Instructions

A discard digits instruction (DDI) removes a portion of the dialed digit string before passing the number on to the adjacent system. Portions of the digit string must be removed, for example, when an external access code is needed to route the call to the PSTN, but that access code is not expected by the PSTN switch.

Table 5-3 lists DDIs and describes the effects of applying each DDI to a dialed number.

**Table 5-3 Discard Digits Instructions**

DDI	Effect	Example
10-10-Dialing	This DDI removes: <ul style="list-style-type: none"> <li>IXC access code</li> </ul>	Route pattern: 9.@ Dialed digit string: 910102889728135000 After applying DDI: 99728135000
10-10-Dialing Trailing-#	This DDI removes: <ul style="list-style-type: none"> <li>IXC access code</li> <li>end-of-dialing character</li> </ul>	Route pattern: 9.@ Dialed digit string: 910102889728135000# After applying DDI: 99728135000
11/10D->7D	This DDI removes: <ul style="list-style-type: none"> <li>long distance direct dialing code</li> <li>long distance operator assisted dialing code</li> <li>IXC access code</li> <li>area code</li> <li>local area code</li> </ul> This DDI creates a 7-digit local number from an 11- or 10-digit dialed number.	Route pattern: 9.@ Dialed digit string: 919728135000 or 99728135000 After applying DDI: 98135000

**Table 5-3 Discard Digits Instructions (continued)**

DDI	Effect	Example
11/10D->7D Trailing-#	This DDI removes: <ul style="list-style-type: none"> <li>• long distance direct dialing code</li> <li>• long distance operator assisted dialing code</li> <li>• IXC access code</li> <li>• area code</li> <li>• local area code</li> <li>• end-of-dialing character</li> </ul> This DDI creates a 7-digit local number from an 11- or 10-digit dialed number	Route pattern: 9.@  Dialed digit string: 919728135000# or 99728135000#  After applying DDI: 98135000
11D->10D	This DDI removes: <ul style="list-style-type: none"> <li>• long distance direct dialing code</li> <li>• long distance operator assisted dialing code</li> <li>• IXC access code</li> </ul>	Route pattern: 9.@  Dialed digit string: 919728135000  After applying DDI: 99728135000
11D->10D Trailing-#	This DDI removes: <ul style="list-style-type: none"> <li>• long distance direct dialing code</li> <li>• long distance operator assisted dialing code</li> <li>• end-of-dialing character</li> <li>• IXC access code</li> </ul>	Route pattern: 9.@  Dialed digit string: 919728135000#  After applying DDI: 99728135000

**Table 5-3 Discard Digits Instructions (continued)**

<b>DDI</b>	<b>Effect</b>	<b>Example</b>
Intl TollBypass	This DDI removes: <ul style="list-style-type: none"> <li>• international access code</li> <li>• international direct dialing code</li> <li>• international operator assisted dialing code</li> </ul>	Route pattern: 9.@ Dialed digit string: 901181910555 After applying DDI: 981910555
Intl TollBypass Trailing-#	This DDI removes: <ul style="list-style-type: none"> <li>• international access code</li> <li>• international direct dialing code</li> <li>• international operator assisted dialing code</li> <li>• end-of-dialing character</li> </ul>	Route pattern: 9.@ Dialed digit string: 901181910555# After applying DDI: 981910555
NoDigits	This DDI removes no digits.	Route pattern: 9.@ Dialed digit string: 919728135000 After applying DDI: 919728135000
NoDigits Trailing-#	This DDI removes: <ul style="list-style-type: none"> <li>• end-of-dialing character</li> </ul>	Route pattern: 9.@ Dialed digit string: 919728135000# After applying DDI: 919728135000

**Table 5-3 Discard Digits Instructions (continued)**

DDI	Effect	Example
PreAt	This DDI removes all digits prior to the NANP portion of the route pattern, including: <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• PBX external access code</li> </ul>	Route pattern: 8.9@ Dialed digit string: 899728135000 After applying DDI: 9728135000
PreAt Trailing-#	This DDI removes all digits prior to the NANP portion of the route pattern, including: <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• PBX external access code</li> <li>• end-of-dialing character</li> </ul>	Route pattern: 8.9@ Dialed digit string: 899728135000 After applying DDI: 9728135000
PreAt 10-10-Dialing	This DDI removes all digits prior to the NANP portion of the route pattern, including: <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• PBX external access code</li> <li>• IXC access code</li> </ul>	Route pattern: 8.9@ Dialed digit string: 8910102889728135000 After applying DDI: 9728135000

**Table 5-3 Discard Digits Instructions (continued)**

DDI	Effect	Example
PreAt 10-10-Dialing Trailing-#	<p>This DDI removes all digits prior to the NANP portion of the route pattern, including:</p> <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• PBX external access code</li> <li>• IXC access code</li> <li>• end-of-dialing character</li> </ul>	<p>Route pattern: 8.9@</p> <p>Dialed digit string: 8910102889728135000#</p> <p>After applying DDI: 9728135000</p>
PreAt 11/10D->7D	<p>This DDI removes all digits prior to the NANP portion of the route pattern, including:</p> <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• PBX external access code</li> <li>• long distance direct dialing code</li> <li>• long distance operator assisted dialing code</li> <li>• IXC access code</li> <li>• area code</li> <li>• local area code</li> </ul> <p>This DDI creates a 7-digit local number from an 11- or 10-digit dialed number.</p>	<p>Route pattern: 8.9@</p> <p>Dialed digit string: 8919728135000 or 899728135000</p> <p>After applying DDI: 8135000</p>

**Table 5-3 Discard Digits Instructions (continued)**

DDI	Effect	Example
PreAt 11/10D->7D Trailing-#	<p>This DDI removes all digits prior to the NANP portion of the route pattern, including:</p> <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• PBX external access code</li> <li>• long distance direct dialing code</li> <li>• long distance operator assisted dialing code</li> <li>• IXC access code</li> <li>• area code</li> <li>• local area code</li> <li>• end-of-dialing character</li> </ul> <p>This DDI creates a 7-digit local number from an 11- or 10-digit dialed number.</p>	<p>Route pattern: 8.9@</p> <p>Dialed digit string: 8919728135000# or 899728135000#</p> <p>After applying DDI: 8135000</p>
PreAt 11D->10D	<p>This DDI removes all digits prior to the NANP portion of the route pattern, including:</p> <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• PBX external access code</li> <li>• long distance direct dialing code</li> <li>• long distance operator assisted dialing code</li> <li>• IXC access code</li> </ul>	<p>Route pattern: 8.9@</p> <p>Dialed digit string: 8919728135000</p> <p>After applying DDI: 9728135000</p>

**Table 5-3 Discard Digits Instructions (continued)**

DDI	Effect	Example
PreAt 11D->10D Trailing-#	This DDI removes all digits prior to the NANP portion of the route pattern, including: <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• PBX external access code</li> <li>• long distance direct dialing code</li> <li>• long distance operator assisted dialing code</li> <li>• IXC access code</li> <li>• end-of-dialing character</li> </ul>	Route pattern: 8.9@  Dialed digit string: 8919728135000#  After applying DDI: 9728135000
PreAt Intl TollBypass	This DDI removes all digits prior to the NANP portion of the route pattern, including: <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• PBX external access code</li> <li>• international access code</li> <li>• international direct dialing code</li> <li>• international operator assisted dialing code</li> </ul>	Route pattern: 8.9@  Dialed digit string: 8901181910555  After applying DDI: 81910555

**Table 5-3 Discard Digits Instructions (continued)**

<b>DDI</b>	<b>Effect</b>	<b>Example</b>
PreAt Intl TollBypass Trailing-#	<p>This DDI removes all digits prior to the NANP portion of the route pattern, including:</p> <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• PBX external access code</li> <li>• international access code</li> <li>• international direct dialing code</li> <li>• international operator assisted dialing code</li> <li>• end-of-dialing character</li> </ul>	<p>Route pattern: 8.9@</p> <p>Dialed digit string: 8901181910555#</p> <p>After applying DDI: 81910555</p>
PreDot	<p>This DDI removes:</p> <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> </ul>	<p>Route pattern: 8.9@</p> <p>Dialed digit string: 899728135000</p> <p>After applying DDI: 99728135000</p>
PreDot Trailing-#	<p>This DDI removes:</p> <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• end-of-dialing character</li> </ul>	<p>Route pattern: 8.9@</p> <p>Dialed digit string: 899728135000#</p> <p>After applying DDI: 99728135000#</p>
PreDot 10-10-Dialing	<p>This DDI removes:</p> <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• IXC access code</li> </ul>	<p>Route pattern: 8.9@</p> <p>Dialed digit string: 8910102889728135000</p> <p>After applying DDI: 99728135000</p>

**Table 5-3 Discard Digits Instructions (continued)**

DDI	Effect	Example
PreDot 10-10-Dialing Trailing-#	This DDI removes: <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• IXC access code</li> <li>• end-of-dialing character</li> </ul>	Route pattern: 8.9@ Dialed digit string: 8910102889728135000# After applying DDI: 99728135000
PreDot 11/10D->7D	This DDI removes: <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• long distance direct dialing code</li> <li>• long distance operator assisted dialing code</li> <li>• IXC access code</li> <li>• area code</li> <li>• local area code</li> </ul> This DDI creates a 7-digit local number from an 11- or 10-digit dialed number.	Route pattern: 8.9@ Dialed digit string: 8919728135000 or 899728135000 After applying DDI: 98135000

**Table 5-3 Discard Digits Instructions (continued)**

DDI	Effect	Example
PreDot 11/10D->7D Trailing-#	This DDI removes: <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• long distance direct dialing code</li> <li>• long distance operator assisted dialing code</li> <li>• IXC access code</li> <li>• area code</li> <li>• local area code</li> <li>• end-of-dialing character</li> </ul> This DDI creates a 7-digit local number from an 11- or 10-digit dialed number.	Route pattern: 8.9@  Dialed digit string: 8919728135000# or 899728135000#  After applying DDI: 98135000
PreDot 11D->10D	This DDI removes: <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• long distance direct dialing code</li> <li>• long distance operator assisted dialing code</li> <li>• IXC access code</li> </ul>	Route pattern: 8.9@  Dialed digit string: 8919728135000  After applying DDI: 99728135000

**Table 5-3 Discard Digits Instructions (continued)**

<b>DDI</b>	<b>Effect</b>	<b>Example</b>
PreDot 11D->10D Trailing-#	This DDI removes: <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• long distance direct dialing code</li> <li>• long distance operator assisted dialing code</li> <li>• IXC access code</li> <li>• end-of-dialing character</li> </ul>	Route pattern: 8.9@  Dialed digit string: 8919728135000#  After applying DDI: 99728135000
PreDot Intl TollBypass	This DDI removes: <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• international access code</li> <li>• international direct dialing code</li> <li>• international operator assisted dialing code</li> </ul>	Route pattern: 8.9@  Dialed digit string: 8901181910555  After applying DDI: 981910555
PreDot Intl TollBypass Trailing-#	This DDI removes: <ul style="list-style-type: none"> <li>• Cisco CallManager external access code</li> <li>• international access code</li> <li>• international direct dialing code</li> <li>• international operator assisted dialing code</li> <li>• end-of-dialing character</li> </ul>	Route pattern: 8.9@  Dialed digit string: 8901181910555#  After applying DDI: 981910555