FP-1300 Configuration Utility Help references this help file. Do NOT change the name of this help file in the future.



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Measurement & Automation Explorer Help for DeviceNet

For NI-DNET 1.6

January 2007, 371121C-01

NI-DNET is the software for application development for National Instruments hardware for DeviceNet. This help file describes the NI-DNET software features within National Instruments Measurement & Automation Explorer (MAX). The NI-DNET features within MAX enable you to:

- Verify the installation of your NI DeviceNet hardware
- Configure software properties for each DeviceNet port
- Interact with your DeviceNet network using various tools

For more information about this help file, refer to the following topics:

<u>Using Help</u>

Important Information

Technical Support and Professional Services

To comment on National Instruments documentation, refer to the <u>National</u> <u>Instruments Web site</u>.

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Using Help

Conventions Navigating Help Searching Help Printing Help File Topics

Conventions

This help file uses the following formatting and typographical conventions:

- < > Angle brackets that contain numbers separated by an ellipsis represent a range of values associated with a bit or signal name—for example, AO <0..3>.
- [] Square brackets enclose optional items—for example, [response].
- The » symbol leads you through nested menu items and dialog box options to a final action. The sequence File»Page Setup»Options directs you to pull down the File menu, select the Page Setup item, and select Options from the last dialog box.
 - This icon denotes a note, which alerts you to important information.
- **bold** Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.
- green Underlined text in this color denotes a link to a help topic, help file, or Web address.
- *italic* Italic text denotes variables, emphasis, cross references, or an introduction to a key concept. Italic text also denotes text that is a placeholder for a word or value that you must supply.
- monospace Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.

Navigating Help (Windows Only)

To navigate this help file, use the **Contents**, **Index**, and **Search** tabs to the left of this window or use the following toolbar buttons located above the tabs:

- **Hide**—Hides the navigation pane from view.
- Locate—Locates the currently displayed topic in the Contents tab, allowing you to view related topics.
- **Back**—Displays the previously viewed topic.
- **Forward**—Displays the topic you viewed before clicking the **Back** button.
- **Options**—Displays a list of commands and viewing options for the help file.

Searching Help (Windows Only)

Use the **Search** tab to the left of this window to locate content in this help file. If you want to search for words in a certain order, such as "related documentation," add quotation marks around the search words as shown in the example. Searching for terms on the **Search** tab allows you to quickly locate specific information and information in topics that are not included on the **Contents** tab.

Wildcards

You also can search using asterisk (*) or question mark (?) wildcards. Use the asterisk wildcard to return topics that contain a certain string. For example, a search for "prog*" lists topics that contain the words "program," "programmatically," "progress," and so on.

Use the question mark wildcard as a substitute for a single character in a search term. For example, "?ext" lists topics that contain the words "next," "text," and so on.



Note Wildcard searching will not work on Simplified Chinese, Traditional Chinese, Japanese, and Korean systems.

Nested Expressions

Use nested expressions to combine searches to further refine a search. You can use Boolean expressions and wildcards in a nested expression. For example, "example AND (program OR VI)" lists topics that contain "example program" or "example VI." You cannot nest expressions more than five levels.

Boolean Expressions

Click the **•** button to add Boolean expressions to a search. The following Boolean operators are available:

- **AND** (default)—Returns topics that contain both search terms. You do not need to specify this operator unless you are using nested expressions.
- **OR**—Returns topics that contain either the first or second term.
- **NOT**—Returns topics that contain the first term without the second term.
- **NEAR**—Returns topics that contain both terms within eight words of each other.

Search Options

Use the following checkboxes on the **Search** tab to customize a search:

- Search previous results—Narrows the results from a search that returned too many topics. You must remove the checkmark from this checkbox to search all topics.
- Match similar words—Broadens a search to return topics that contain words similar to the search terms. For example, a search for "program" lists topics that include the words "programs," "programming," and so on.
- Search titles only—Searches only in the titles of topics.

Printing Help File Topics (Windows Only)

Complete the following steps to print an entire book from the **Contents** tab:

- 1. Right-click the book.
- 2. Select **Print** from the shortcut menu to display the **Print Topics** dialog box.
- 3. Select the **Print the selected heading and all subtopics** option.
 - Note Select Print the selected topic if you want to print the single topic you have selected in the **Contents** tab.
- 4. Click the **OK** button.

Printing PDF Documents

This help file may contain links to PDF documents. To print PDF documents, click the print button located on the Adobe Acrobat Viewer toolbar.

CAN Cards

Windows System

National Instruments hardware for the Controller Area Network (CAN) is used by both NI-CAN and NI-DNET (DeviceNet) software.

CAN cards are displayed under **Devices and Interfaces** in MAX. All cards are installed automatically and are displayed when MAX refreshes its configuration. You can refresh MAX by pressing <F5>.

Windows automatically assigns the resources (interrupt number and memory range) for the cards.

Testing CAN Cards

To verify installation of your CAN hardware, right-click on the CAN card, then select **Self-test**. If the self test passes, the card icon shows a checkmark. If the self test fails, the card icon shows a ? mark, and the **Test Status** in the right pane describes the problem.

It is also possible to test all CAN cards in the system at once by selecting **Tools»NI-DNET»Test All Local Cards** in the main menu.

Troubleshooting Self Test Failures

The following sections explain common error messages generated by the Self Test.

Application In Use

This error occurs if you are running an application that is using the CAN card. The self test aborts to avoid adversely affecting your application. Before running the self test, exit all applications that use NI-CAN or NI-DNET. If you are using LabVIEW, you may need to exit LabVIEW to unload the driver.

Memory Resource Conflict

This error occurs if the memory resource assigned to a CAN card conflicts with the memory resources being used by other devices in the system. Resource conflicts typically occur when your system contains legacy boards that use resources not properly reserved with the Device Manager. If a resource conflict exists, write down the memory resource that caused the conflict and refer to the documentation for your Windows operating system for instructions on how to use the Device Manager to reserve memory resources for legacy boards. After the conflict has been resolved, run the Self Test again.

Interrupt Resource Conflict

This error occurs if the interrupt resource assigned to a CAN card conflicts with the interrupt resources being used by other devices in the system. Resource conflicts typically occur when your system contains legacy boards that use resources not properly reserved with the Device Manager. If a resource conflict exists, write down the interrupt resource that caused the conflict and refer to the documentation for your Windows operating system for instructions on how to use the Device Manager to reserve interrupt resources for legacy boards. After the conflict has been resolved, run the Self Test again.

NI-CAN Software Problem Encountered

This error occurs if the Self Test detects that it is unable to communicate correctly with the CAN hardware using the installed NI-CAN or NI-DNET software. If you get this error, shut down your computer, restart it, and run

the Self Test again.

If the error continues after restart, uninstall NI-CAN and NI-DNET, and then reinstall.

NI-CAN Hardware Problem Encountered

This error occurs if the Self Test detects a defect in the CAN hardware. If you get this error, write down the numeric code shown with the error, and contact National Instruments.

Configuring CAN Ports

The physical ports of each CAN card are listed under the card's name. To configure software properties for each port, right-click on the port and select **Properties**.

For more information on configuration, refer to <u>Port Properties Dialog</u> <u>Box</u>.

For more information on changing the representation of a CAN card in MAX between NI-CAN and NI-DNET, refer to <u>Protocol Dialog Box</u>.

LabVIEW Real-Time (RT) System

To test and configure CAN cards on a LabVIEW RT system, use the RT Hardware Configuration Utility in **Tools»NI-DNET»RT Hardware Configuration**. The card and port configuration in this utility is similar to **Devices and Interfaces** under Windows. For more information, refer to <u>LabVIEW RT Configuration</u>.

LabVIEW Real-Time (RT) Configuration

LabVIEW RT combines easy-to-use LabVIEW programming with the power of real-time systems. When you use a National Instruments PXI controller as a LabVIEW RT system, you can install a PXI CAN card and use the NI-CAN and NI-DNET APIs to develop real-time applications. For example, you can simulate the behavior of a control algorithm within a CAN device, using data from received CAN messages to generate outgoing CAN messages with deterministic response times.

Hardware Configuration

After you have installed your PXI CAN cards and downloaded the NI-CAN and NI-DNET software to your LabVIEW RT system, you need to verify the installation and assign interface names to CAN ports. In the MAX **Tools** menu, select **NI-DNET**»**RT Hardware Configuration**.

The RT Hardware Configuration tool begins with a dialog that requests your PXI system IP address. Enter the IP address from your original **Remote Systems** configuration, which is the same IP address that you use within LabVIEW. After a connection has been established successfully, subsequent execution of the RT Hardware Configuration tool uses the same IP address. If you need to change the IP address to a different PXI system, select **Server Address** from the **Network** menu.

Within the RT Hardware Configuration tool, if you do not see the installed PXI CAN cards, select **Refresh** from the **View** menu. To perform a self-test for all PXI CAN cards, select **Test All** from the **Test** menu. The status for each card's self-test is displayed in the same manner as the **MAX Devices and Interfaces** branch on your local Windows system.

To assign an interface name to each CAN port, right-click the port and select **Properties**. The resulting properties dialog is the same as the <u>Port</u> <u>Properties Dialog Box</u> on your local Windows system.

MAX Report Generation

Use the <u>MAX Report Wizard</u> to generate a report of the NI-DNET hardware and software configuration of the system. The report includes the following information.

- Hardware Information, including serial number and board type
- **Port Properties**, including interface name, location, baud rate, and interface MAC ID
- Software Version Information

The MAX Report Wizard supports both local and remote systems, but for remote systems the MAX report does not contain the **Hardware Information** or the **Port Properties**.

Port Properties Dialog Box

Use this dialog box to configure the properties for a port.

Interface

In the **Properties** dialog, you assign an interface name to the port, such as DNET0 or DNET1. The interface name identifies the physical port within NI-DNET functions.

Interfaces previously assigned to other physical ports are marked with an asterisk in the list box. If you select an interface used by another port, the other port is reassigned to the first unused interface.

Baud Rate

The baud rate in this dialog is the default value for <u>NI-DNET Configurator</u> and <u>NI-DNET Analyzer</u>.

Use the **Baud Rate** drop-down list to select from a list of commonly used baud rates.

Interface MAC ID

The interface MAC ID in this dialog is the default value for <u>NI-DNET</u> <u>Configurator</u>.

Use the **MAC ID** drop-down list to select from a list of MAC IDs.

Protocol Dialog Box

National Instruments hardware for Controller Area Network (CAN) is used by both NI-CAN and NI-DNET (DeviceNet) software.

You can view each CAN card in MAX with either DeviceNet or CAN features. To change the view of a CAN card in MAX, right-click the card and select **Protocol**. In this dialog, you can select either DeviceNet for NI-DNET, or CAN for NI-CAN.

Use of NI-DNET is restricted to port 1 (top port) of Series 1 CAN cards. The **Protocol** selection is not available for Series 2 CAN cards. When a 2-port Series 1 CAN card is selected as the DeviceNet protocol, only the top port is enabled. For more information on hardware in CAN kits and DeviceNet kits, refer to Chapter 2, *DeviceNet Hardware Overview*, in the *NI-DNET User Manual*.

When you right-click a port in MAX and select **Properties**, the resulting **Interface** selection uses the syntax **CAN***x* or **DNET***x* based on your protocol selection. Regardless of which protocol is selected, the number *x* is the only relevant identifier with respect to NI-CAN and NI-DNET functions. For example, if you select **DNET0** as an interface in MAX, you can run an NI-DNET application that uses **DNET0**, then you can run an NI-CAN application that uses **CAN0**. Both applications refer to the same port and can run at different times, but not simultaneously.

Introduction to NI-DNET Configurator

NI-DNET Configurator is a powerful DeviceNet configuration tool with Electronic Data Sheet (EDS) support. It replaces the previous SimpleWho utility.

NI-DNET Configurator can search a DeviceNet network to find information about connected devices, load the related EDS files automatically, read and write the device parameters, and change a device MAC ID. The configurator also helps you develop DeviceNet applications by providing device information.

For more information, refer to the following sections:

- **Getting Started**—To become familiar with NI-DNET Configurator, complete the short getting started tutorial. To develop a DeviceNet application right away, refer to <u>6. Develop DeviceNet Applications</u>.
- NI-DNET Configurator Environment—Refer to this section for descriptions of the windows, menus, and toolbar.
- Using NI-DNET Configurator—Refer to this section to perform a specific task such as refreshing the device list.
- **FAQ**—Refer to this section for answers to frequently asked questions.

1. Launch NI-DNET Configurator

Complete the following steps to launch NI-DNET Configurator:

- 1. Launch Measurement & Automation Explorer (MAX).
- 2. In MAX, select your CAN card under **My System»Devices and Interfaces**.
- 3. Change the protocol to DeviceNet by right-clicking the CAN card and selecting **Protocol**. (Refer to <u>Protocol Dialog Box</u> for more information.)
- 4. Set the DeviceNet interface properties by right-clicking the port and selecting **Properties**. (Refer to <u>Port Properties Dialog Box</u> for more information.)
- 5. Launch the configurator by right-clicking the port and selecting **Configurator**.
- 6. After launch, the configurator searches all devices on the network automatically. A message box tells you to add your device EDS files. Click **OK**. (Refer to <u>What is EDS?</u> for more information.)
- 7. A message box asks you whether to upload or download. Click **Upload**. (Refer to <u>Refresh the Device List</u> for more information.)

2. Add the EDS Files

Complete the following steps to add EDS files:

- 1. Launch EDS Manager by selecting **Tools**»EDS Manager.
- 2. Click Add an EDS file, select the EDS file, and click OK.

DS Manager		
Sorted by	Manufacturer 💌 🕥	6 8 0
	ton Electrical cro Mo Electronics, Inc. ockwell Automation/Allen-Bradley	

- 3. Repeat the previous step to add multiple EDS files.
- 4. Close EDS Manager.
- 5. Select **Network»Refresh the Device List** to apply the newly added EDS files.
- 6. A message box asks you whether to upload or download. Click **Upload**.

Refer to <u>What is EDS?</u> and <u>Manage EDS Files</u> for more information.

3. Browse the Devices

You now can browse the device information.

In the DeviceNet Network window, you can see the device list. Each node is a device; the root node is the interface device. For example, in [03] PRMxx, [03] is the device MAC ID and PRMxx is the device product name.

DeviceN	let Network
E 📷 [00]	DNETO
1	[01] D251-8000
0	[03] PRMxx
- I	[30] Series 9000(Strobe)-Diffuse w/micr

Select a device in the DeviceNet Network window, and you can see the device information in the Device Information window.

- The **General** tab shows the device basic information and related EDS file information.
- The **Parameters** tab shows the parameter list. Select a parameter, and its description is shown in **Parameter Information**.
- The **I/O Data** tab shows the device supported I/O connection. Select an I/O connection, and its description is shown in **I/O Information**.

0	General	Parameters 1/0 Data	
	Device Ir	nformation:	
	Item		
	Name		
	Vendor		

Refer to <u>Configurator Main Window</u> and <u>Device Information Window</u> for more information.

4. Read/Write the Parameters

Complete the following steps to read or write a parameter:

- 1. Click the **Parameters** tab in the Device Information window.
- 2. Double-click the parameter. A **View/Edit Parameter Value** dialog appears.
- 3. Change the parameter value and click **Edit**.
- 4. Repeat the previous two steps to change other parameters.
- 5. Select **Device Download to Device** to download the changed parameter value to the device.
- 6. To upload all device parameters, select **Device»Upload from Device**.

Refer to <u>View/Edit a Parameter Value</u>, <u>Device Information Window</u>, <u>Upload from Device</u>, and <u>Download to Device</u> for more information.

5. Change MAC ID

A MAC ID is a device address that ranges from 0 to 63. You may need to change a device MAC ID to resolve a MAC ID conflict.

Complete the following steps to change a device MAC ID:

- 1. Right-click the device in the DeviceNet Network window and select **Change MAC ID**.
- 2. Enter the new MAC ID and click **OK**.

Refer to <u>Change MAC ID</u> for more information.

6. Develop DeviceNet Applications

NI-DNET Configurator can help you develop DeviceNet applications in LabVIEW, LabWindows/CVI, C, or Basic.

The two typical DeviceNet applications are accessing a device parameter and accessing device I/O data, described in the following tables.

Accessing a Device Parameter

Purpose	Function(s) or VI(s)	Comment
Configure and open an Explicit Messaging object to access parameters.	ncOpenDnetExplMsg (Open DeviceNet Explicit Messaging)	Needs the device MAC ID, which is in the DeviceNet Network window.
Read or write a parameter.	ncGetDnetAttribute (Get DeviceNet Attribute) and ncSetDnetAttribute (Set DeviceNet Attribute)	Needs the parameter class ID, instance ID, attribute ID, and size, which are in the Parameters tab of the Device Information window.
Decode or encode a parameter.	ncConvertFromDnetRead (Convert From DeviceNet Read) and ncConvertForDnetWrite (Convert For DeviceNet Write)	Needs the parameter data type, which is in the Parameters tab of the Device Information window.

Refer to the **Get Identity Attributes** example for more information.

Accessing Device I/O Data

Purpose	Function(s) or VI(s)	Comment
Configure and open an I/O object to access I/O data.	ncOpenDnetIO (Open DeviceNet I/O)	Needs the device MAC ID, I/O connection type, and input/output length. The MAC ID is in the DeviceNet Network window. The I/O connection type and input/output length are in the I/O Data tab of the Device Information window.
Read input data or write output data.	ncReadDnetIO (Read DeviceNet I/O) and ncWriteDnetIO (Write DeviceNet I/O)	Needs the input/output length, which is in the I/O Data tab of the Device Information window.
Decode the input data or encode the output data.	ncConvertFromDnetRead (Convert From DeviceNet Read) and ncConvertForDnetWrite (Convert For DeviceNet Write).	You can get the decode/encode hint in I/O Data»I/O Information in the Device Information window.

Refer to the **Single Device** example for more information.

Refer to <u>Configurator Main Window</u>, <u>Device Information Window</u>, *NI-DNET User Manual*, and *NI-DNET Programmer Reference Manual* for more information.

NI-DNET Configurator Main Window

The NI-DNET Configurator main window is shown below.

jile <u>V</u> iew <u>N</u> etwork <u>D</u> evice <u>T</u> ools <u>H</u> e	lp	(1)
19 19 14 14 14 15	0	2
DeviceNet Network	General Parame	eters [1/0 Data] (5)
□ ■ [00] DNET0 □ [01] D251-8000 ■ [03] PDMyy	Device Information:	
[[30] Series 9000(Strobe)-Diffu	Item	Value
(4)	Name Vendor	Series 9000(Strobe)-Diffuse w/micro [8] Allen-Bradley [1]
	Туре	Photoelectric Sensor [6]
	Catalog	42GNP-9000-QD
	Version	1.006
	Serial Number	UX50082046
	EDS Information:	
	Item	Value
	Path Name	C:\Program Files\National Instruments\N
	Date	11-22-94 11:00:00
	File Revision	1.000
teady (3)		NUM

The window consists of five parts:

Index	Name	Description
1	Menus	Refer to Menus.
2	Toolbar	Refer to Toolbar.
3	Status Bar	The status bar.
4	DeviceNet Network Window	Lists all the DeviceNet devices. Each node is a device; the root node is the interface device. For example, in [03] $PRMxx$, [03] is the device MAC ID and $PRMxx$ is the device product name.
5	Device Information Window	Shows the device general information, parameter list, and I/O connection information. Refer to <u>Device Information Window</u> for more information.
Device Information Window

The Device Information window consists of three tabs: **General**, **Parameters**, and **I/O Data**.

General

The **General** tab shows the device basic information and related EDS file information.

- **Device Information**—Shows the device identity information, catalog number, version number, and serial number. **Name** contains the product name and product code. **Vendor** contains the vendor name and vendor ID. **Type** contains the device type name and type code.
- **EDS Information**—Shows the related EDS file information. (NULL) is shown if you do not add the device EDS file.

Parameters

The **Parameters** tab shows the parameter list and parameter description. The tab is empty if you do not add the device EDS file.

- **Category**—You can show all parameters by selecting **[All Parameters]** or a subset of parameters in a category by selecting the related category.
- **Parameters**—The parameter list. You can view or edit the details of a specific parameter value by double-clicking it.

Parameter List Columns				
Index	Name	Description		
1	#	The parameter index defined in the EDS file.		
2	Flag	The parameter flags. \mathbf{R} means the parameter is		
		read-only. S means the parameter supports		
		scaling.		
3	Parameter	The parameter name.		
4	Value	The parameter value.		
5	Unit	The parameter unit.		
6	Туре	The parameter data type.		
7	Size	The parameter size.		
8	Class ID	Use the three IDs to identify the parameter in		
9	Instance	the device. You need the IDs when you call		
	ID	ncGetDnetAttribute() and Get DeviceNet		
10	Attribute	Attribute.vi		
	ID			

• **Parameter Information**—The selected parameter information including the description, value range, enumeration meaning list, and engineering value calculation formula.

I/O Data

- **Supported I/O**—Shows the device-supported I/O connection.
- **I/O Information**—The selected I/O connection information including the description and Number of Significant Bits. For example, Number of Significant Bits = 2 means that bit 0 and bit 1 are valid bits. This parameter is empty if you do not add the device EDS file.

Supported I/O List Columns						
Index	Name	Description				
1	ІО Туре	The I/O connection type, such as Strobe and Poll.				
2	Input	The input name and its size.				
3	Output	The output name and its size.				

Refer to <u>Configurator Main Window</u> for more information.

Menus

The NI-DNET Configurator main window includes the following menus:

- File Menu Exit—Quit the application.
- View Menu
 Toolbar—Show or hide the toolbar.
 Status Bar—Show or hide the status bar.
- Network Menu

Refresh the Device List—Search all connected devices.

Upload from Network—Upload all device parameters.

Download to Network—Download all device parameters.

Device Menu

Upload from Device—Upload device parameters.

Download to Device—Download device parameters.

Change MAC ID—Change the device MAC ID.

Open EDS File—Open the device EDS file.

Tools Menu

EDS Manager—Launch EDS Manager to add or delete EDS files.

• Help Menu

NI-DNET Configurator Help—Launch the help file. You can also press <F1> to access the help file.

About NI-DNET Configurator—Launch the about dialog.

Toolbar

The NI-DNET Configurator main window toolbar includes the following buttons:

- Network Buttons
 - **Refresh the Device List**—Search all connected devices.
 - Upload from Network—Upload all device parameters.
 - Download to Network—Download all device parameters.
- Device Buttons
 - Upload from Device—Upload device parameters.
 - **Download to Device**—Download device parameters.
 - **Change MAC ID**—Change the device MAC ID.
 - ¹¹⁹ **Open EDS File**—Open the device EDS file.
- Tool Buttons
 - EDS Manager—Launch EDS Manager to add or delete EDS files.
- Help Buttons
 - NI-DNET Configurator Help—Launch the help file. You can also press <F1> to access the help file.

Refresh the Device List

If you connect a new device to the network or disconnect a device from the network, complete the following steps to refresh the device list:

- 1. Select Network»Refresh the Device List.
- 2. After refreshing successfully, a message box asks you whether to upload or download. Select one of the following options:
 - Click **Upload** to upload all device settings from the network. Refer to <u>Upload from Network</u> for more information.
 - Click **Download** to download all device settings to the network. Refer to <u>Download to Network</u> for more information.
 - Click **Cancel** to cancel.

Upload from Network

You can upload all device settings from the network by selecting **Network**»**Upload from Network**.

Refer to <u>Upload from Device</u> for more information.

Download to Network

You can download device settings to the network by selecting **Network**»**Download to Network**.

Refer to <u>Download to Device</u> for more information.

View/Edit a Parameter Value

Complete the following steps to view or edit a device parameter:

- 1. Click the **Parameters** tab in the <u>Device Information window</u>.
- 2. Double-click the parameter. A **View/Edit Parameter Value** dialog appears.
- 3. To edit the parameter value, change the value (refer to the following table) and click **Edit**.

To view the parameter value details but not edit them, click **Cancel** to close the dialog.

Category	Related Data Type(s)	Comment
Boolean	BOOL	Click the True or False radio button.
		If the parameter supports enumeration, refer to Enumeration.
Integer	SINT, INT, DINT, LINT, USINT, UINT, UDINT,	Change the value in the edit control. You can change the radix to view or edit the value in decimal or hex.
	ULINT	If the parameter supports enumeration, refer to <i>Enumeration</i> . If the parameter supports scaling, refer to <i>Scaling</i> .
Float	REAL, LREAL	Change the value in the edit control.
Bit-String	BYTE, WORD, DWORD, LWORD	A list of check boxes show the bit values. Set a bit by checking the related check box. Clear a bit by unchecking the related check box.
Visible String	STRING, SHORT_STRING	Change the value in the edit control.
Enumeration	N/A	Select the enumeration value in the combo box.
Scaling	N/A	Change the engineering value in the edit control. Refer to <u>What</u> <u>is Scaling?</u> for more information.

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Note Editing a parameter value does not automatically change it in the device. You must download the values to take effect. Refer to <u>Download to Device</u> and <u>Download to Network</u> for more information.

Upload from Device

You can upload device settings by selecting **Device»Upload from Device**.

NI-DNET Configurator uploads all parameters from the device.

Refer to <u>Upload from Network</u> for more information.

Download to Device

You can download device settings by selecting **Device**»**Download to Device**.

NI-DNET Configurator downloads all modified parameters to the device.

Refer to <u>View/Edit a Parameter Value</u> and <u>Download to Network</u> for more information.

Change MAC ID

A device Media Access Control Identifier (MAC ID) represents the device address on the DeviceNet network. The MAC ID range is 0 to 63. If multiple devices use the same MAC ID, only one device can work properly. To resolve a MAC ID conflict, you must change the device MAC ID.

Complete the following steps to change the MAC ID:

- 1. Select Device»Change MAC ID.
- 2. Enter the new MAC ID and click **OK**. After you change the MAC ID, the configurator uploads all parameters from the device.



Note Some devices do not support changing the MAC ID via software. In this case, you must change the MAC ID via a hardware switch. Refer to the device manual for more information.

Open EDS File

You can open a device EDS file by selecting **Device**»Open EDS File.



Note Do not change the EDS file. Use EDS Manager to replace an EDS file with a newer version.

Manage EDS Files

You can launch EDS Manager to add or delete EDS files by selecting **Tools»EDS Manager**.

Show EDS Files

EDS Manager shows all added EDS files. You can view them in two ways:

- 1. **Sorted by Manufacturer**—The EDS files are sorted by manufacturer -> category -> product -> revision.
- 2. **Sorted by Category**—The EDS files are sorted by category -> manufacturer -> product -> revision.

Add EDS Files

In EDS Manager, complete the following steps to add EDS files:

- 1. Click Add an EDS file to add a single EDS file. Click Add a directory of EDS files to add all EDS files under a directory.
- 2. Select the file or directory and click **OK**.
- 3. After validating the added EDS files, a dialog shows the results. If the result is **Succeed**, EDS Manager successfully added the EDS file.

If the result is **Fail**, EDS Manager rejected the EDS file. You can see the failure reason in the **Comment** column.

Delete EDS Files

In EDS Manager, complete the following steps to delete EDS files:

- 1. Select the EDS files to delete. You can select all EDS files by clicking **Select All**. You can unselect all EDS files by clicking **Clear All**.
- 2. Click Delete the selected EDS files.



Note If you add or delete EDS files in EDS Manager, the changes do not take effect until you apply them by selecting **Network**»**Refresh the Device List**.

What is EDS?

An Electronic Data Sheet (EDS) is a text file defined by the DeviceNet specification. An EDS file provides all information necessary to access and alter a device's configurable parameters.

You can use a DeviceNet configuration tool such as NI-DNET Configurator to configure devices with EDS files.

You can get a device EDS file from the device manufacturer or the <u>ODVA</u> <u>official Web site</u>.

If you add EDS files, you can find valuable device information in NI-DNET Configurator to develop DeviceNet applications.

Refer to <u>Device Information Window</u>, <u>Manage EDS Files</u>, and <u>Develop</u> <u>DeviceNet Applications</u> for more information.

What is Scaling?

If the EDS file defines the scaling factors for a parameter, NI-DNET Configurator represents actual UINT and INT parameter values in other formats. The parameter raw value is the *actual value*, and the new form is the *engineering value*.

Use the following formula to tell the engineering value from the actual value:

 $EngValue = \frac{(ActualValue + Offset) * Mult * Base}{Div * 10^{Precision}}$

If a parameter supports scaling:

- The parameter flag is S.
- You can see the formula in the parameter information.
- You can edit the parameter value in the engineering form.

Refer to <u>Device Information Window</u> and <u>View/Edit a Parameter Value</u> for more information.

Introduction to NI-DNET Analyzer

NI-DNET Analyzer monitors the DeviceNet network and interprets the captured CAN messages according to the DeviceNet protocol.

The analyzer is useful for troubleshooting and analyzing DeviceNet networks and systems. You can see the messages together with their parameters. The CAN message timestamp resolution is 100 μ s. You can display certain types of messages using powerful filters and find options. You can also get the message statistics.

For more information about NI-DNET Analyzer, refer to the following sections:

- **NI-DNET Analyzer Environment**—Refer to this section for a description of the environment layout and an introduction to the windows, menus, and toolbar.
- Using NI-DNET Analyzer—Refer to this section to perform a specific task such as configuring filter settings.
- **FAQ**—Refer to this section for answers to frequently asked questions.

NI-DNET Analyzer Main Window

The NI-DNET Analyzer main window is shown below.



The window consists of six parts:

Index	Name	Description
1	Title	
2	Menus	Refer to Menus.
3	Toolbar	Refer to <u>Toolbar</u> .
4	Packet List Window	Refer to Packet List Window.
5	Detailed Decoding Results Window	Refer to Detailed Decoding Results Window.
6	Status Bar	Refer to <u>Status Bar</u> .

Packet List Window

The Packet List window lists all viewable packets. The window includes the following fields:

- Raw Data
 - **Time Stamp**—The time stamp of captured packets.
 - Arb. ID—Arbitration ID, from 0 to 0x7EF.
 - **Data (Hex)**—Data field of the DeviceNet packet with a length of 0 to 8 bytes.
- Brief Decoding Results
 - **Group**—Group ID, from 1 to 4.
 - **Msg. ID**—Message ID, from 0 to 15, or 0x2C, 0x2D, 0x2E, 0x2F.
 - **Src. MAC**—Source MAC ID, from 0 to 63. The analyzer uses to indicate that the source MAC ID is not available.
 - Dest. MAC—Destination MAC ID, from 0 to 63. The analyzer uses to indicate that the Destination MAC ID is not available.
 - Description—Abbreviated description of the captured packet (for example, Dup Req (NF) stands for Duplicate MAC ID Check Request Message).

Refer to <u>DeviceNet Message Descriptions</u> for the relationship between the abbreviated descriptions and their full descriptions.

Refer to <u>View Decoding Results</u> for the details of related operations.

Detailed Decoding Results Window

The Detailed Decoding Results window displays detailed decoding results of a selected packet. This window displays the following information:

Raw Data

- Arbitration ID
- Data(Hex)

Refer to Packet List Window for more information.

- IDs
- Group ID
- Message ID
- Source MAC ID
- Destination MAC ID

Refer to Packet List Window for more information.

- Details
 - **Description**—The full description of the captured packet.

The analyzer shows a more meaningful description instead of the abbreviated keywords in the Packet List window.

Refer to <u>DeviceNet Message Descriptions</u> for all packet descriptions.

- Fragmented
 - **Yes**—A fragmented message.
 - **No**—A nonfragmented message.
 - N/A—Fragmented information is not available.
- Parameters—Type-specific information.

For example, the type-specific information of a duplicate MAC ID check message includes **Physical Port Number**, **Vendor ID**, and **Serial Number**.

Refer to <u>View Decoding Results</u> for the details of related operations.

Menus

The NI-DNET Analyzer main window includes the following menus:

• File Menu

New—Create a new document.

Open...—Open an existing document.

Save As...—Save the active document with a new name.

Exit—Quit the application.

• Edit Menu

Find Packet...—Find specified packets.

Clear All—Clear the current document.

View Menu

Toolbar—Show or hide the toolbar.

Status Bar—Show or hide the status bar.

Statistics Information—Show statistics information.

Capture Menu

Start Capture—Start capture.

Stop Capture—Stop capture.

Settings Menu

Network Settings...-Configure network settings.

Display Settings...—Configure display settings.

Filter Settings...-Configure filter settings.

• Help Menu

NI-DNET Analyzer Help—Launch the help file. About NI-DNET Analyzer—Launch the about dialog.

Toolbar

The NI-DNET Analyzer main window toolbar includes the following buttons:

- New—Close the current document and create a new empty document.
- **Open...**—Open an existing log file.
- **Save As...**—Save the current document to a specified file.
- Sind Packet...—Find specified packets.
- X Clear All—Clear the current document.
- Start Capture—Start capture.
- **Stop Capture**—Stop capture.
- Network Settings...—Configure network settings.
- **Isplay Settings...**—Configure display settings.
- **Filter Settings...**—Configure filter settings.
- **M** Statistics Information—Show statistics information.
- WI-DNET Analyzer Help—Launch the help file.

Status Bar

You can see the current network settings in the status bar. Refer to <u>Configure Network Settings</u> for the network setting details.

Launch and Exit NI-DNET Analyzer

Launch NI-DNET Analyzer

Complete the following steps to launch NI-DNET Analyzer:

- 1. Launch Measurement & Automation Explorer (MAX).
- 2. In MAX, select your CAN card under **My System»Devices and Interfaces**.
- 3. Right-click the CAN card and select **Protocol** to change the protocol to DeviceNet. (Refer to <u>Protocol Dialog Box</u> for more information.)
- 4. Right-click the port and select **Properties** to set the DeviceNet interface properties. (Refer to <u>Port Properties Dialog Box</u> for more information.)
- 5. Right-click the port and select **Analyzer** to launch the analyzer.
- 6. The analyzer prompts you to select **Monitor the Network** or **Open an Existing Log File**.

If you select **Monitor the Network**, the analyzer starts capture automatically.

If you select **Open an Existing Log File**, you can specify a .dcap file to load previously captured data.

Exit NI-DNET Analyzer

Select File»Exit to close the analyzer.



Note When the analyzer exits, the current display and filter settings are saved automatically. They are loaded automatically the next time you launch the analyzer.

Start and Stop Capture

Start Capture

Complete the following steps to start capture:

- 1. (Optional) Configure the related settings, including: <u>Network</u> <u>Settings</u>, <u>Filter Settings</u>, and <u>Display Settings</u>.
- 2. Select Capture»Start Capture to start capture.

Stop Capture

Select Capture»Stop Capture to stop capture.

View Decoding Results

Brief Decoding Results

You can see brief decoding results in the Packet List window, including:

- Group ID
- Message ID
- Source MAC ID
- Destination MAC ID
- Abbreviated description of captured packet

Detailed Decoding Results

Complete the following steps to view detailed decoding results:

- 1. If the analyzer is capturing, stop capture. Refer to <u>Start and Stop</u> <u>Capture</u> for details.
- 2. Click an item in the <u>Packet List window</u> to see the detailed decoding results of the selected packet in the <u>Detailed Decoding</u> <u>Results window</u>.

Save and Open a Log File

Save

Complete the following steps to save the current document:

- 1. If the analyzer is capturing, stop capture. Refer to <u>Start and Stop</u> <u>Capture</u> for details.
- 2. Select **File**»**Save As...** to save the current document.

Open a Log File

Complete the following steps to open an existing log file:

- 1. If the analyzer is capturing, stop capture. Refer to <u>Start and Stop</u> <u>Capture</u> for details.
- 2. Select **File»Open...** to specify a log file to open.

Find a Packet

The analyzer can search a specific packet and highlight it in the <u>Packet</u> <u>List window</u>.

Complete the following steps to find a specific packet:

- 1. If the analyzer is capturing, stop capture. Refer to <u>Start and Stop</u> <u>Capture</u> for details.
- 2. Select Edit»Find Packet....
- 3. Change the following find parameters as needed:
 - Find by Message Type—Select Message Type in the Category combo box and specify a message type in the Find What combo box.
 - Find by Group ID—Select Group ID in the Category combo box and specify a group ID in the Find What combo box.
 - Find by Message ID—Select Message ID in the Category combo box and specify a message ID in the Find What combo box.
 - Find by Source MAC ID—Select Source MAC ID in the Category combo box and specify a source MAC ID in the Find What combo box.
 - Find by Destination MAC ID—Select Destination MAC ID in the Category combo box and specify a destination MAC ID in the Find What combo box.
 - Find by Arbitration ID—Select Arbitration ID in the Category combo box and enter a value between 0 and 0x7EF in the Find What combo box.
- 4. Click Find Next.
View Statistics Information

Complete the following steps to view the network traffic statistics information:

- 1. If the analyzer is capturing, stop capture. Refer to <u>Start and Stop</u> <u>Capture</u> for details.
- 2. Select **View**»**Statistics Information...** to open the statistics information dialog.
- 3. Select an item from the **Category** combo box to view the corresponding statistics information:
 - General Information
 - **Packet Count**—The total number of captured packets.
 - **Packets Count per Millisecond**—The number of captured packets per millisecond.
 - Average Data Length in Bytes—The average number of bytes in the data field.
 - Packet Count for Each Device
 - **Sent**—The number of packets sent by each device in the total capture time.
 - **Received**—The number of packets received by each device in the total capture time.

• Packet Count for Each Message Type

The number of packets of each message type in the total capture time.

4. Click OK.

Configure Network Settings

Complete the following steps to configure the network settings:

- 1. If the analyzer is capturing, stop capture. Refer to <u>Start and Stop</u> <u>Capture</u> for details.
- 2. Select **Settings»Network Settings...** to open the network settings dialog.
- 3. Select the interface name of your National Instruments interface, which could be:
 - Physical interfaces, from CAN0 to CAN63.
 - Virtual interfacesi, CAN256 or CAN257.

Refer to <u>What is Virtual Interface?</u> for details.

- 4. Select the baud rate your DeviceNet network uses. The DeviceNet specification allows either 125000, 250000, or 500000 bps.
- 5. Click **OK**.

Note The analyzer uses the interface name and baud rate assigned in MAX as default network settings.

Configure Filter Settings

You can use the filter to select desired packets to be captured or displayed.

Complete the following steps to configure the filter settings:

- 1. If the analyzer is capturing, stop capture. Refer to <u>Start and Stop</u> <u>Capture</u> for details.
- 2. Select **Settings»Filter Settings...** to open the filter settings dialog.
- 3. Click **Enable** or **Disable** to enable or disable the filter.
- 4. If the filter is enabled, check the corresponding check boxes on each filter page to select your desired packets.
- 5. Click OK.

Note If the filter is enabled during capture, the analyzer discards all packets that do not match the filter. After capture, you can change filter settings to view more desired packets. However, all original captured packets are still retained in the current document.

Configure Display Settings

Complete the following steps to configure the display settings:

- 1. If the analyzer is capturing, stop capture. Refer to <u>Start and Stop</u> <u>Capture</u> for details.
- 2. Select **Settings»Display Settings...** to open the display settings dialog.
- 3. Configure the display settings, including:
 - **Update Rate**—A rate at which the UI updates (in milliseconds).

You can select a value from an enumerated list, including **1000 ms**, **2000 ms**, and **5000 ms**, where **1000 ms** is the default value.

- **Time Stamp Format**—Time stamp of captured packets listed in the Packet List window, either absolute or relative format.
 - **Absolute**—In local system time format. An example is shown below.

Format	14:27	':13.257	'.3		
Value	14	27	13	257	3
	Hour	Minute	Second	Millisecond	100*N
Description	This time :	oacket i zone).	s capture	ed in 14:27:1	3.257.

- **Relative**—In seconds since the first packet captured. An example is shown below.

Format(Unit : Second)	285.2345
Description	This packet is captured 285.2345 seconds after the first packet was captured.

4. Click OK.

Create a New Document

Close the current document and create a new empty document. The analyzer clears the contents in the Packet List and Detailed Decoding Results windows.

Complete the following steps to create a new empty document:

- 1. If the analyzer is capturing, stop capture. Refer to <u>Start and Stop</u> <u>Capture</u> for details.
- 2. Select File»New.

Clear the Current Document

Clear the current document contents. The analyzer clears the contents in the Packet List and Detailed Decoding Results windows.

Complete the following steps to clear the current document:

- 1. If the analyzer is capturing, stop capture. Refer to <u>Start and Stop</u> <u>Capture</u> for details.
- 2. Select Edit»Clear All.

What is Virtual Interface?

NI-CAN provides a virtual CAN card with two interfaces, *CAN256* and *CAN257*. A virtual bus connects the two virtual interfaces. When you write CAN frames to one virtual interface, the other virtual interface receives those frames. This feature allows you to read and write CAN data in the same manner as two actual CAN interfaces connected by an actual CAN cable.

What is Message Body Format?

The request messages transmitted over an explicit messaging connection should conform to the specific format. The following table shows the format of a nonfragmented explicit request.

7	6	5	4	3	2	1	0
Frag[0]	XID	MAC ID					
			Clas	s ID			
			Instan	ce ID			
	Service Data (Optional)						

Message body format specifies that the Class ID and Instance ID are 8 or 16-bit integers. The following table describes the message body format values.

Value	Meanings
DeviceNet(8/8)	Class ID = 8 bit integer. Instance ID = 8 bit integer.
DeviceNet(8/16)	Class ID = 8 bit integer. Instance ID = 16 bit integer.
DeviceNet(16/16)	Class ID = 16 bit integer. Instance ID = 16 bit integer.
DeviceNet(16/8)	Class ID = 16 bit integer. Instance ID = 8 bit integer.

DeviceNet Message Descriptions

Explicit Message

Abbreviated Description	Full Description
EM GetAttrAll Req(NF)	Explicit Request Message—Get All Attributes
EM GetAttrAll Rsp(NF)	Explicit Response Message—Get All Attributes
EM SetAttrAll Req(NF)	Explicit Request Message—Set All Attributes
EM SetAttrAll Rsp(NF)	Explicit Response Message—Set All Attributes
EM Reset Req(NF)	Explicit Request Message—Reset
EM Reset Rsp(NF)	Explicit Response Message—Reset
EM Start Req(NF)	Explicit Request Message—Start
EM Start Rsp(NF)	Explicit Response Message—Start
EM Stop Req(NF)	Explicit Request Message—Stop
EM Stop Rsp(NF)	Explicit Response Message—Stop
EM Create Req(NF)	Explicit Request Message—Create
EM Create Rsp(NF)	Explicit Response Message—Create
EM Delete Req(NF)	Explicit Request Message—Delete
EM Delete Rsp(NF)	Explicit Response Message—Delete
EM Apply_Attr Req(NF)	Explicit Request Message—Apply Attribute
EM Apply_Attr Rsp(NF)	Explicit Response Message—Apply Attribute
EM GetAtSingle Req(NF)	Explicit Request Message—Get Single Attribute
EM GetAtSingle Rsp(NF)	Explicit Response Message—Get Single Attribute
EM SetAtSingle Req(NF)	Explicit Request Message—Set Single Attribute
EM SetAtSingle Rsp(NF)	Explicit Response Message—Set Single Attribute
EM FndNxObjIn Req(NF)	Explicit Request Message—Find Next Object Instance
EM FndNxObjIn Rsp(NF)	Explicit Response Message—Find Next Object Instance
EM Error Rsp(NF)	Explicit Response Message—Error
EM Restore Req(NF)	Explicit Request Message—Restore
EM Restore Rsp(NF)	Explicit Response Message—Restore
EM Save Req(NF)	Explicit Request Message—Save
EM Save Rsp(NF)	Explicit Response Message—Save
EM NOP Req(NF)	Explicit Request Message—No Operations
EM NOP Rsp(NF)	Explicit Response Message—No Operations
EM GetMember Req(NF)	Explicit Request Message—Get Member
EM GetMember Rsp(NF)	Explicit Response Message—Get Member
EM SetMember Req(NF)	Explicit Request Message—Set Member
EM SetMember Rsp(NF)	Explicit Response Message—Set Member
EM InsertMmbr Req(NF)	Explicit Request Message—Insert Member
EM InsertMmbr Rsp(NF)	Explicit Response Message—Insert Member

EM RemoveMmbr Req(NF)	Explicit Request Message—Remove Member
EM RemoveMmbr Rsp(NF)	Explicit Response Message—Remove Member
EM Unknown Srv Req(NF)	Explicit Request Message—Unknown Service
EM Unknown Srv Rsp(NF)	Explicit Response Message—Unknown Service

I/O Message

Abbreviated Description	Full Description
Mstr Poll Cmd	Master Poll Command
Mstr COS Msg	Master Change of State Message
Mstr Cyclic Msg	Master Cyclic Message
Mstr COS Ack	Master Change of State Acknowledge Message
Mstr Cyclic Ack	Master Cyclic Acknowledge Message
Mstr Bit-Strobe Cmd	Master Bit-Strobe Command Message
Mstr Poll Cmd/COS Msg	Master Poll Command/Change of State Message
Mstr Poll Cmd/Cyclic Msg	Master Poll Command/Cyclic Message
Slv Poll Rsp	Slave Poll Response
Slv COS Msg	Slave Change of State Message
Slv Cyclic Msg	Slave Cyclic Message
Slv COS Ack	Slave Change of State Acknowledge Message
Slv Cyclic Ack	Slave Cyclic Acknowledge Message
Slv Bit-Strobe Rsp	Slave Bit-Strobe Response Message
Slv Poll Rsp/Cyclic Ack	Slave Poll Response/Cyclic Acknowledge Message
Slv Poll Rsp/COS Ack	Slave Poll Response/Change of State Acknowledge Message

Unknown Message

Abbreviated Description	Full Description
Unknown	Unknown Message

Predefined Message

Abbreviated Description	Full Description
G3 UCMM Open Req(NF)	Group3 Unconnected Message—Open Explicit Messaging Connection Request
G3 UCMM Open Rsp(NF)	Group3 Unconnected Message—Open Explicit Messaging Connection Response
G3 UCMM Close Req(NF)	Group3 Unconnected Message—Close Explicit Messaging Connection Request
G3 UCMM Close Rsp(NF)	Group3 Unconnected Message—Close Explicit Messaging Connection Response
G3 UCMM Error Rsp(NF)	Group3 Unconnected Message—Error Response
G3 UCMM Unknown Srv(NF)	Group3 Unconnected Message—Unknown Service
G2 UCMM Allocate Req(NF)	Group2 Unconnected Message—Allocate Request
G2 UCMM Allocate Rsp(NF)	Group2 Unconnected Message—Allocate Response
G2 UCMM Release Req(NF)	Group2 Unconnected Message—Release Request
G2 UCMM Release Rsp(NF)	Group2 Unconnected Message—Release Response
G2 UCMM Error Rsp(NF)	Group2 Unconnected Message—Error Response
G2 UCMM Unknown Srv(NF)	Group2 Unconnected Message—Unknown Service
Dup Req(NF)	Duplicate MAC ID Check Request Message
Dup Rsp(NF)	Duplicate MAC ID Check Response Message
Heartbeat(NF)	Device Heartbeat Message
ShutDown(NF)	Device Shutdown Message

Offline Message

Abbreviated Description	Full Description
Offline Ownership Req(NF)	Offline Ownership Request Message
Offline Ownership Rsp(NF)	Offline Ownership Response Message
Offline Identify Req(NF)	Offline Identify Communication Faulted Request Message
Offline Identify Rsp(NF)	Offline Identify Communication Faulted Response Message
Offline Who Req(NF)	Offline Who Communication Faulted Request Message
Offline Who Rsp(NF)	Offline Who Communication Faulted Response Message
Offline Change MAC ID Req(NF)	Offline Change MAC ID Communication Faulted Request Message

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Belgium	32 0 2 757 00 20
Brazil	55 11 3262 3599
Canada	800 433 3488
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Czech Republic	420 224 235 774
Denmark	45 45 76 26 00
Finland	385 0 9 725 725 11
France	33 0 1 48 14 24 24
Germany	49 0 89 741 31 30
India	91 80 41190000
Israel	972 0 3 6393737
Italy	39 02 413091
Japan	81 3 5472 2970
Korea	82 02 3451 3400
Lebanon	961 0 1 33 28 28
Malaysia	1800 887710
Mexico	01 800 010 0793
Netherlands	31 0 348 433 466
New Zealand	0800 553 322
Norway	47 0 66 90 76 60
Poland	48 22 3390150
Portugal	351 210 311 210

Russia	7 495 783 68 51
Singapore	1800 226 5886
Slovenia	386 3 425 42 00
South Africa	27 0 11 805 8197
Spain	34 91 640 0085
Sweden	46 0 8 587 895 00
Switzerland	41 56 200 51 51
Taiwan	886 02 2377 2222
Thailand	662 278 6777
Turkey	90 212 279 3031
United Kingdom	44 0 1635 523545
United States (Corporate)	512 683 0100