

DeviceNet Analysis

with

frontline[®] NetDecoder[™]

User Manual

TELEDYNE LECROY

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Contents

Chapter 1 Introduction	1
1.1 Computer Minimum System Requirements	1
1.2 Frontline NetDecoder Software	1
Chapter 2 DeviceNet Analysis Using Molex SST-DN4-USB Interface Module	3
2.1 Software and Driver installation	3
2.2 Hardware Setup	3
2.3 SST Interface Card Setup to Capture DeviceNet Data	3
2.3.1 Adding SST-DN4-USB Card Alias	4
2.3.2 NetDecoder DeviceNet Capture Settings	7
Chapter 3 DeviceNet Using Rockwell Automation 1784-U2DN	11
3.1 DeviceNet Hardware Settings	11
3.2 START and STOP Triggers for the 1784-U2DN Interface	12
3.2.1 Adding Simple Start/Stop Triggers	13
3.2.2 Adding Compound Start/Stop Triggers	15
3.2.3 Editing a Trigger	16
3.2.4 Delete a Trigger	17
3.2.5 Selecting a Trigger for Capturing	17
Contacting Technical Support	18

Chapter 1 Introduction

This manual contains hardware and software setup information for using the Frontline NetDecoder to analyze DeviceNet networks.

This manual contains the following setup instructions:

- DeviceNet using the Molex SST-DN4-USB interface card.
- DeviceNet using the Rockwell Automation 1784-U2DN

1.1 Computer Minimum System Requirements

Frontline supports the following computer systems configurations:

- Operating System: Windows 7/8/10
- USB Port: USB 2.0 High-Speed or or later

The Frontline software must operate on a computer with the following minimum characteristics.

- Processor: Core i5 processor at 2.7 GHz
- RAM: 1 GB minimum, 2 GB recommended
- Free Hard Disk Space on C: drive: 20 GB

1.2 Frontline NetDecoder Software

The Frontline NetDecoder software must be installed on the host computer. The software can be downloaded from <http://fte.com/products/NetDecoder-download.aspx>.

Note: The NetDecoder software installation requires a Frontline CC-Link ComProbe, RS-422/485 ComProbe, RS-232 ComProbe II, or Ethernet ComProbe hardware.

Chapter 2 DeviceNet Analysis Using Molex SST-DN4-USB Interface Module

This section contains hardware setup instructions for the Molex SST-DN4-USB.

1. Configuring the Molex SST-DN4-USB module.

Note: This step must be completed before starting to capture DeviceNet or other CAN-based networks.

2. Setup instructions for using the NetDecoder to capture DeviceNet traffic.

2.1 Software and Driver installation

Download the Molex software and driver from <http://www.molex.com/molex/mysst/searchBrad.action?partnumber=SST-DN4-USB>. Download version 13.10 or higher.

Follow the manufacturer's instructions to install the software and drivers.

2.2 Hardware Setup

1. Connect the Molex SST-DN4-USB module to the USB TypeB connector on the module's cable.

Note: The DeviceNet software should be installed prior to connecting the interface module on the computer.

2. Connect the other end of the USB cable to a High-Speed USB 2.0 Type A port on the host computer.
3. Connect the Molex SST-DN4-USB module to a DeviceNet or CAN network.

2.3 SST Interface Card Setup to Capture DeviceNet Data

To capture DeviceNet data using the Frontline NetDecoder, the DeviceNet I/O must be configured followed by setting DeviceNet capture filters.

Note: You must complete [Software and Driver installation on page 3](#) before starting this procedure.

2.3.1 Adding SST-DN4-USB Card Alias

Card aliases are used by an application to access Molex DeviceNet scanner modules. Each DeviceNet channel that exists in a system must be assigned a unique name.

1. From the Window **Start, SST, DeviceNet Software Suite, DeviceNet Remote Diagnostics.**
2. Click on the **Config** tab.

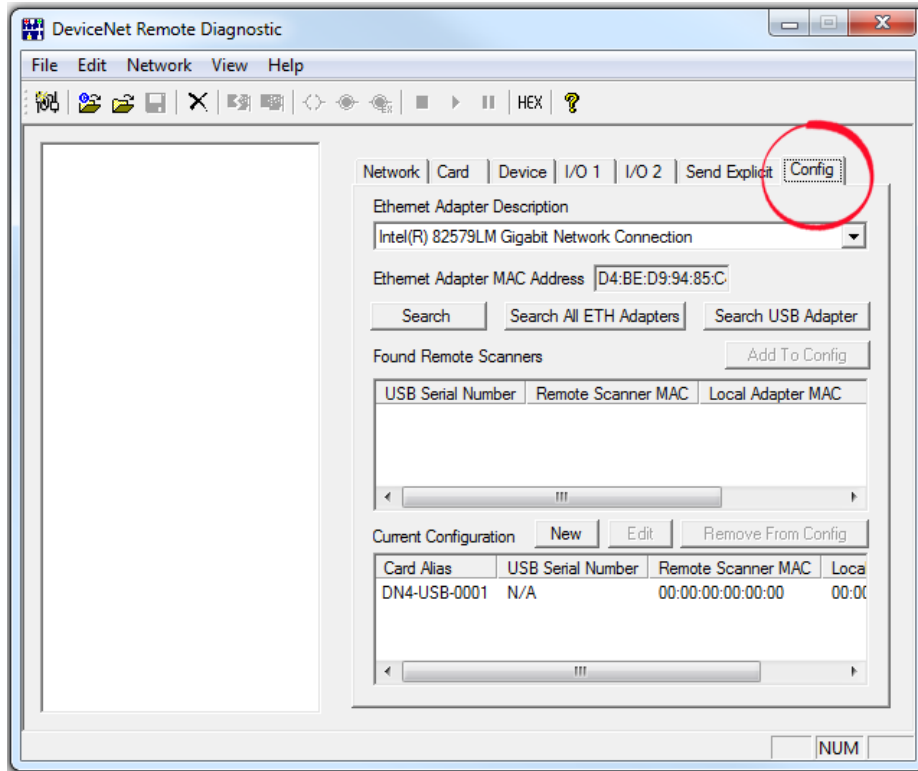


Figure 2.1 - DeviceNet Remote Diagnostics Config Tab.

3. Click on the **Search USB Adapter** button to locate the connected USB scanner.

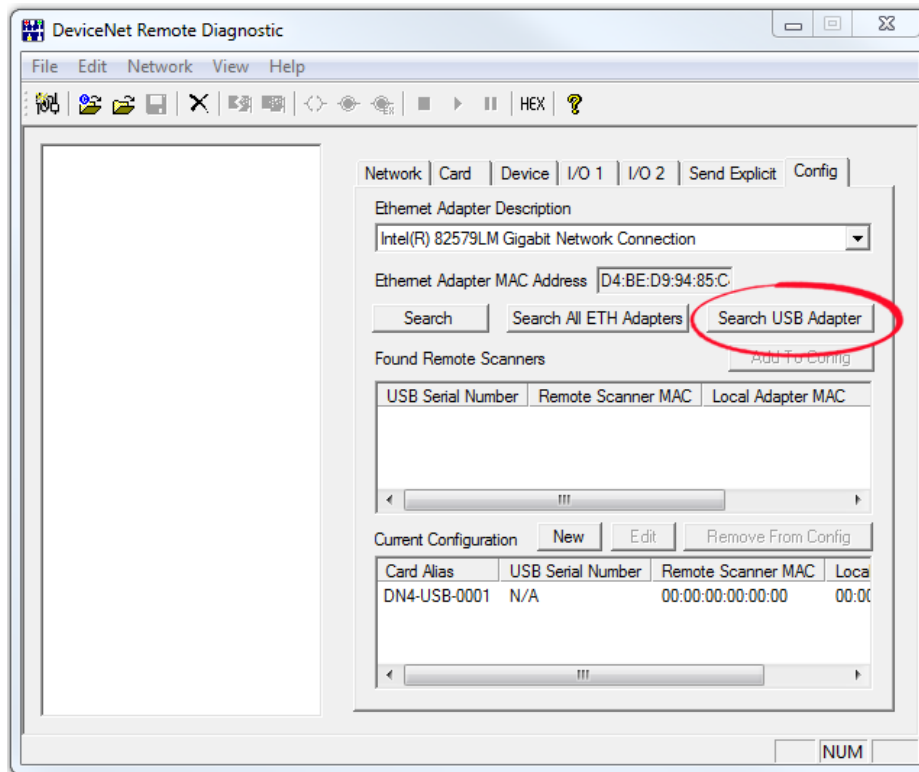


Figure 2.2 - DeviceNet Remote Diagnostics Search USB Adapter

4. In the **Found Remote Scanners** list click on the USB device, and click on the **Add to Config** button.

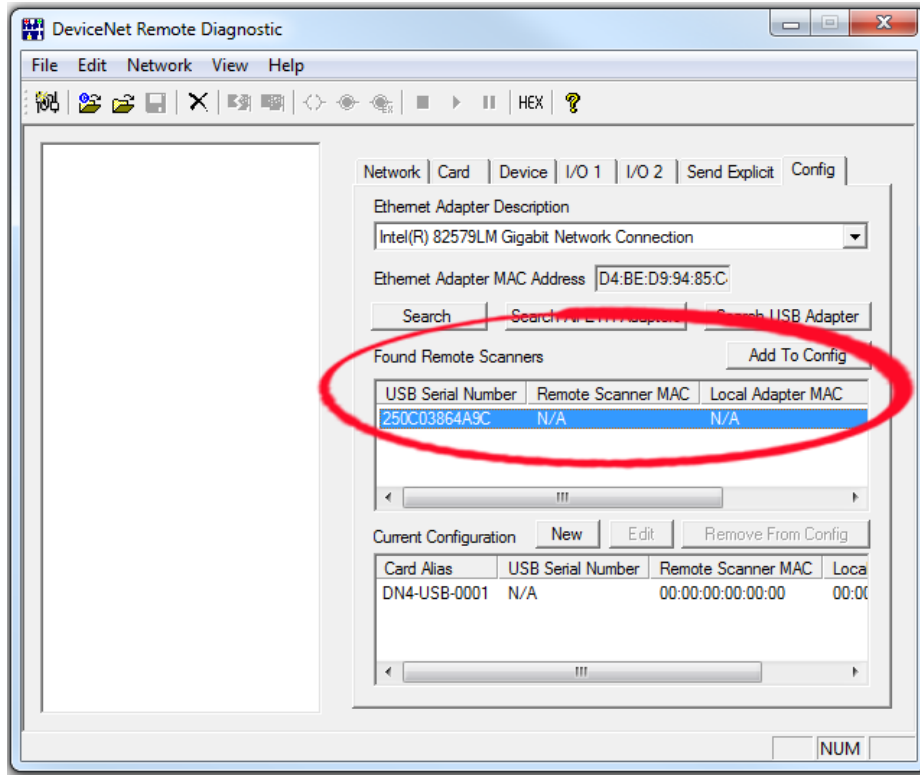


Figure 2.3 - DeviceNet Remote Diagnostics Add to Config

- 5. The **ADD USB Remote Scanner Serial** dialog opens. In the **Card Alias** enter an alias for the connected USB scanner. The alias can be any name. In this example, this is the second DN4-USB to be configured.

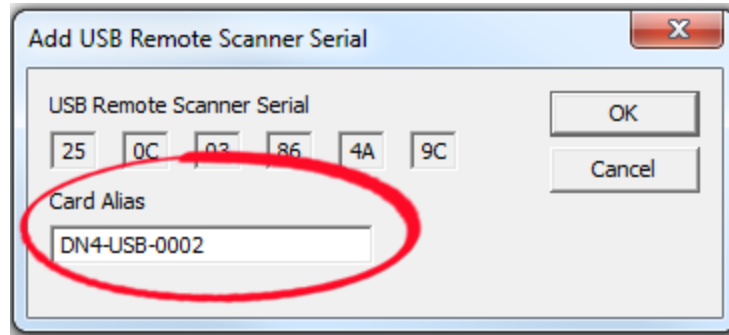


Figure 2.4 - DeviceNet Remote Diagnostics Set Alias

Click the **OK** button when finished and the USB device is added to the **Current Configuration** list.

The SSTDN4-USB is now installed on your computer or system and is ready to be used.

2.3.2 NetDecoder DeviceNet Capture Settings

1. If the **DeviceNet I/O Settings** dialog is already open proceed to step 2, otherwise, from the Windows **Start** select **All Programs, Frontline NetDecoder <version#>, Frontline NetDecoder**.

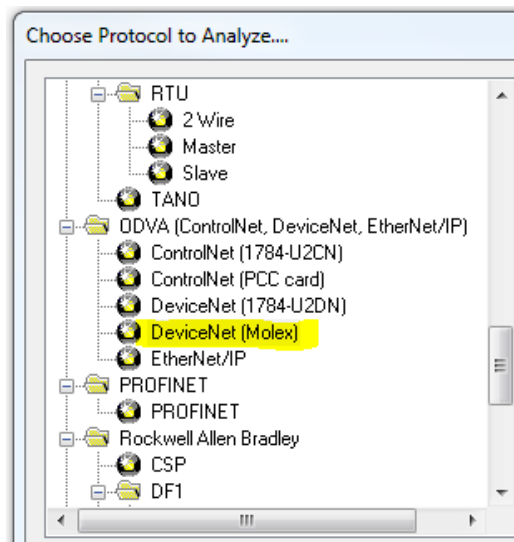


Figure 2.5 - Choose the DeviceNet (Molex) Protocol

- a. In the **Choose Protocol to Analyze**, select **ODVA (ControlNet, DeviceNet, EtherNet/IP)**.
 - b. Select **DeviceNet (Molex)** and then click the **Run** button.
 - c. Then choose **Hardware Settings** from the **Options** menu on the **Control** window.
2. Then choose **Hardware Settings** from the **Options** menu on the **Control** window.

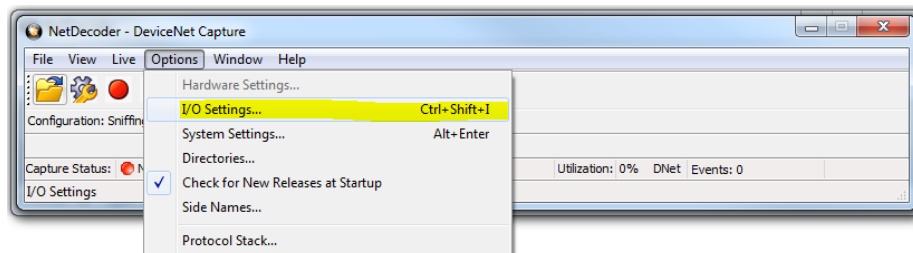


Figure 2.6 - Device Net Capture Control Window

3. In the **DeviceNet I/O Settings** dialog, select the **Capture Filter** tab.

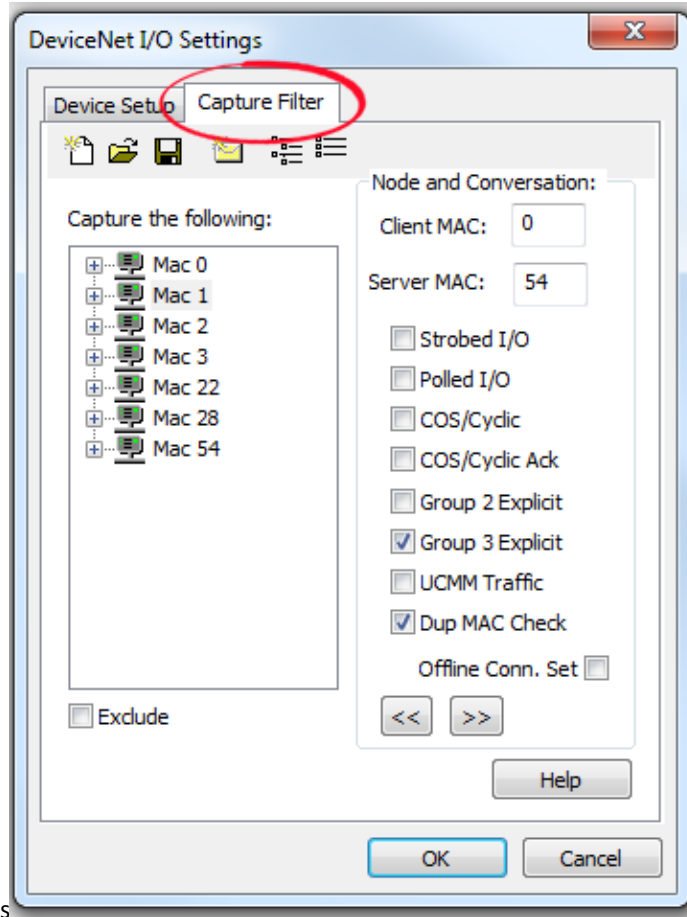


Figure 2.7 - NetDecoder DeviceNet I/O Settings Capture Filter Tab

- Filters are defined as the combination of a node identifier and the messages to include with that node. Filters are created in the Node and Conversation: section of the Capture Filter Tab. In this section the nodes are defined in the Client MAC and Server MAC and the messages for those nodes is set in the check boxes.

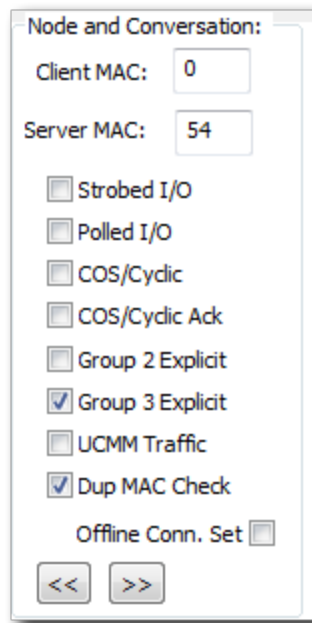


Figure 2.8 - DeviceNet I/O Settings Node and Conversation Section

Client MAC - When a number is added to this box, messages associated with the client side of the conversation are added for this MAC ID. In [Figure 2.8 above](#), node 0 is selected for the **Client MAC**. If the node box is empty **Client MAC** is not included in the filter.




Server MAC - When a number is added to this box, messages associated with the server side of the conversation are added for this MAC ID. In [Figure 2.8 above](#), node 54 is selected for the **Server MAC**. If the node box is empty **Server MAC** is not included in the filter.


Messages to include in the conversation are listed below the **Client** and **Server MACs**. The group of messages can have two states.


- **All boxes unchecked:** All messages are included in the node conversation.
- **Some boxes checked:** Only the checked messages are included in the node conversation.

If the **Offline Conn. Set** is checked Group 4 messages are included in the filter but there is no associated MAC.

To add, delete, or change a filter:

- **Add:** To add the node and conversation filter selection to the DeviceNet I/O Settings click on the  button.
- **Delete:** To delete or remove the node and conversation filter from the DeviceNet I/O Settings click on the  button, or click on the node in the **Capture the following:** pane and click on the  button.
- **Change:** Delete the filter, then change the node and conversation settings, and add the new filter.







To exclude certain messages from the conversation (a NOT function), set the note and conversation as described in previous steps, and check the **Exclude** box, then click the  button.

- Once the node and conversation filters are set, click on the **Save filter** icon  in the toolbar. A Windows **Save As** dialog opens. Set a filter file name and location and click **Save**. Click on the **Capture Filter OK** button. Refer to [Capture Filter Toolbar](#) below.

The NetDecoder is now ready to capture and analyze network data using the SST-DN4-USB scanner.

2.3.2.1 Capture Filter Toolbar

Toolbar Icons

Icon	Description
	Clears the current filter settings
	Loads a filter from disk
	Saves the current filter to disk
	Opens the Add Message dialog
	Expands all nodes in the filter display
	Collapses all nodes in the filter display

Chapter 3 DeviceNet Using Rockwell Automation 1784-U2DN

NetDecoder also supports Rockwell Automation's 1784-U2DN DeviceNet interface. The 1784-U2DN interfaces to the host computer through a USB port. You can analyze your DeviceNet network using the 1784-U2DN interface.

Refer to Rockwell Automation's documentation for installing the 1784-U2DN. The instructions may be downloaded from Rockwell Automation's online document library. There are no additional installation instructions for using the 1784-U2DN as the sniffer interface.

3.1 DeviceNet Hardware Settings

The Hardware Settings dialog allows you to select a device to sniff/scan. You access the **1784-U2DN Hardware Settings** dialog by selecting **Hardware Settings** from the **Options** menu on the NetDecoder Control window.

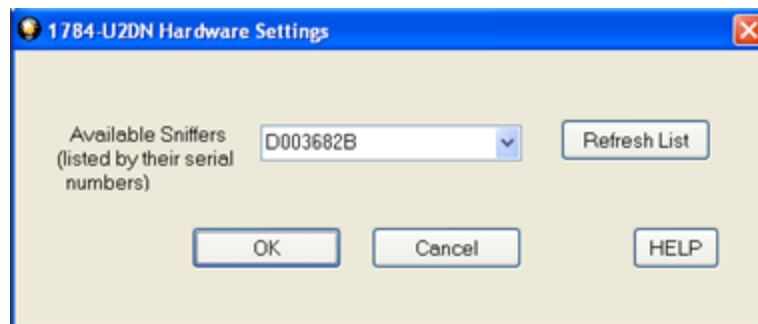


Figure 3.1 - 1784-U2DN Hardware Settings

Frontline NetDecoder software automatically scans and identifies all the 1784-U2DN devices plugged into the host computer. These devices, identified by their serial numbers, are displayed in the drop-down list of **Available Sniffers**.

1. Select a device from the **Available Sniffers** drop-down list.
2. Click the **OK** button.

Clicking the **Cancel** button overrides all the selections and returns the user to the **Control** window.

Click on the **Refresh List** button to update the list of connected devices.

For additional information about the 1784-U2DN device, please refer to the documentation from Rockwell Automation (RA). The relevant RA document numbers are:

- Publication: 1784-IN046
- MM (PN): PN-25191
- DIR: 10000017341/PUB
- Knowledge Base Tech Note: <http://www.rockwellautomation.com/knowledgebase/> , ID 53280.

3.2 START and STOP Triggers for the 1784-U2DN Interface

NetDecoder allows you to define **START** and **STOP Triggers** while using the 1784-U2DN interface module. The triggers can be accessed through the **NetDecoder Control** window **Options** menu **I/O Settings**.

The user defines the **START** and **STOP Triggers** according to the contents of the Controller Area Network (CAN) Identifier field in the DeviceNet frame. The CAN ID of a DeviceNet frame consists of three parts: the Group Number, the MAC ID and the Message ID.

- A **START Trigger** is defined as the event that starts data capture. The capture engine ignores all DeviceNet frames prior to the enabling of the specified START trigger. All subsequent frames are captured until either a user-defined **STOP Trigger** fires or the user manually stops data capture.
- A **STOP Trigger** is defined as the event that stops data capture. The capture engine stops capturing all frames after the specified **STOP Trigger** event is enabled.

The **START** or **STOP Trigger** is enabled when an incoming DeviceNet frame has a CAN ID value equal to the value in the Simple or Compound trigger. If user has defined multiple CAN IDs, then the condition is met if the CAN ID of the incoming frame matches any one of the defined IDs. If the user enters a blank field in the trigger dialog, then that implies that the trigger condition is met on any value of CAN ID.

In the case of a **START Trigger**, the particular frame matching the condition will be the first frame in the capture and all subsequent frames will be captured. In the case of a **STOP Trigger**, the particular frame matching the condition will be the last frame in that capture session.

The user can define and store multiple **START** or **STOP Triggers**. The triggers are displayed in the list control boxes shown in [Figure 3.2 on the facing page](#). Though multiple triggers can be created and saved, only a single set of **START** or **STOP Triggers** can be selected at a time.

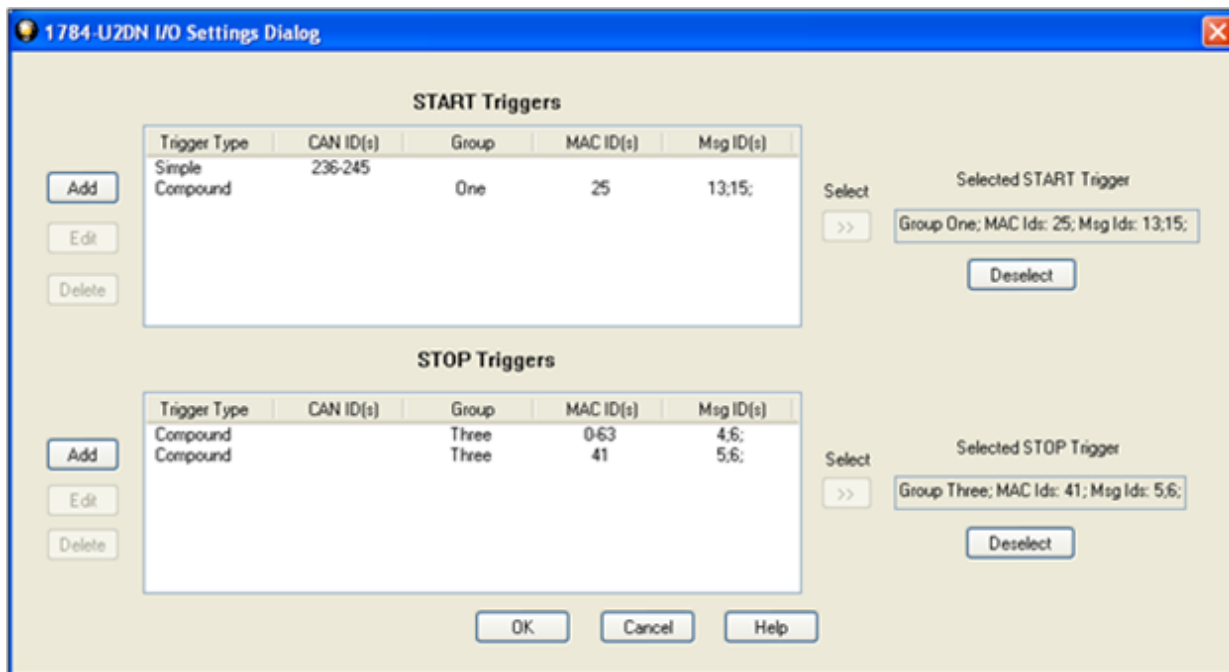


Figure 3.2 - NetDecoder 1784-U2DN I/O Settings

The triggers are saved in a NetDecoder .ini file. The saved triggers appear in the I/O Settings dialog the next time the application is opened.

The I/O Settings option is not available during the middle of a data capture. Only when the data capture is stopped, the user will be able to select the I/O settings menu and bring up the triggers.

3.2.1 Adding Simple Start/Stop Triggers

The user can add a new set of **START** or **STOP Triggers** by clicking on the **Add** button to the right of the triggers control boxes (See [Figure 3.2 above](#)). Clicking the **Add** button opens the **Set Start/Stop Trigger Conditions** dialog. The process for creating a **Start Trigger** or a **Stop Trigger** is identical.

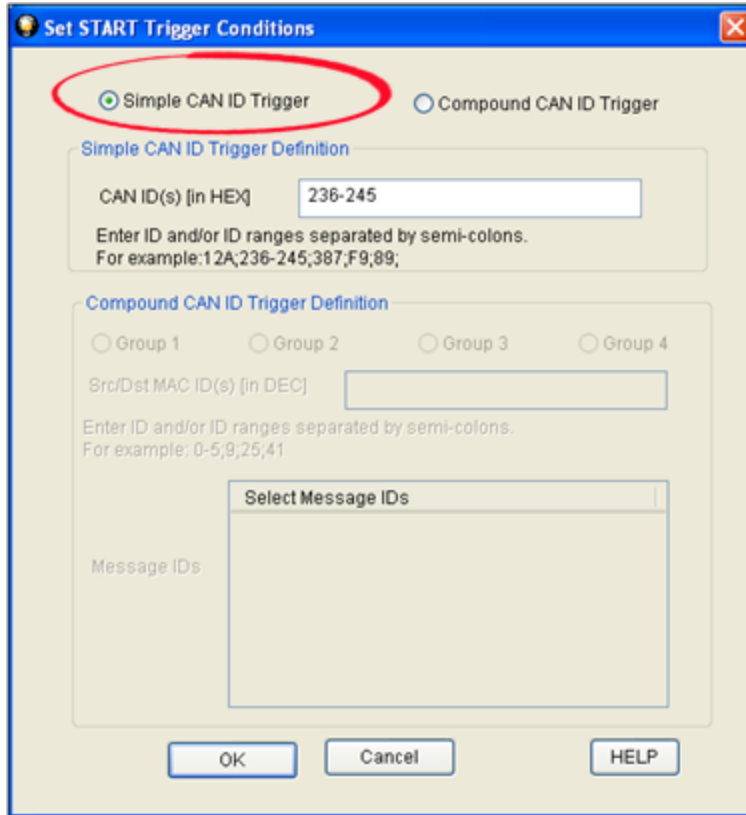


Figure 3.3 - Example: Set START Trigger Conditions

To create a simple start trigger, for example,

1. Select the **Simple CAN ID Trigger** radio button. Only the **Simple CAN ID Trigger Definition** section is active.
2. In the CAN ID(s) field enter CAN IDs formatted using the following rules:
 - All values are hexadecimal.
 - Value range is 0x000 to 0x7FF.
 - Enter a single value, such as 12, or
 - Enter multiple values separated by a semicolon, such as 34;12;AB;fc;;2, or
 - Enter a range of values, such as 12-29, or
 - Enter a combination of individual values and ranges, such as 12;34;56-7a;1.
3. Click the **OK** button when finished.

If all the trigger values are valid, then the values are stored in the list control box on the **I/O Settings** dialog. The last trigger created is shown at the bottom of the list.

Clicking on the **Cancel** button overrides all the CAN IDs and returns the user to the **I/O Settings** dialog.

3.2.2 Adding Compound Start/Stop Triggers

The **Compound CAN ID Trigger** option allows you to define triggers based on the exact values of group numbers, MAC IDs and Message IDs. There are four groups to choose from. [Figure 3.4 below](#), taken from the official DeviceNet specification, shows how the 11 bits of the CAN ID are used by the DeviceNet messaging protocol and the values in the four groups.

IDENTIFIER BITS											HEX RANGE	IDENTITY USAGE		
10	9	8	7	6	5	4	3	2	1	0				
0	Group 1 Message ID			Source MAC ID								000 – 3ff	Message Group 1	
1	0	MAC ID			Group 2 Message ID								400 – 5ff	Message Group 2
1	1	Group 3 Message ID			Source MAC ID								600 – 7bf	Message Group 3
1	1	1	1	1	Group 4 Message ID (0 – 2f)						7c0 – 7ef	Message Group 4		
1	1	1	1	1	1	1	X	X	X	X	7f0 – 7ff	Invalid CAN Identifiers		
10	9	8	7	6	5	4	3	2	1	0				

Figure 3.4 - CAN ID Groups

The process for setting a **START Trigger** or a **STOP Trigger** is identical.

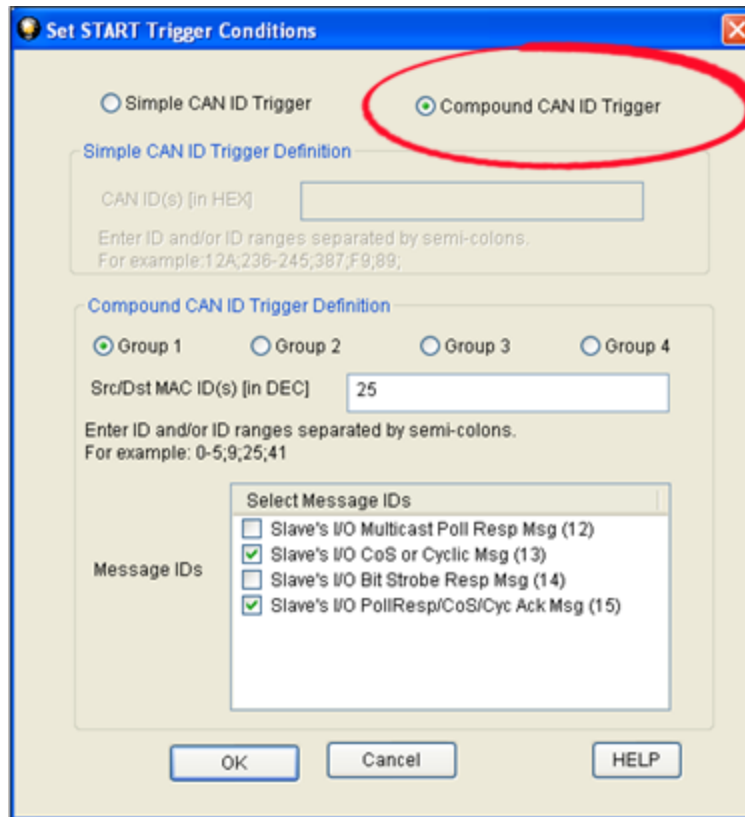


Figure 3.5 - Example, Set Compound Start Trigger Conditions

To set up a compound trigger:

1. Select the **Compound CAN ID Trigger** radio button. **Only the Compound CAN ID Trigger Definition** section is active.
2. In the **Str/Dst ID(s)** field, enter the source destination MAC ID(s) using the following rules.
 - Values are decimal.
 - Value range is from 0 to 63.
 - Enter a single value, such as 12, or
 - Enter multiple values separated by a semi-colon, such as 34;12;22;34;61, or
 - Enter a range of values, such as 12-28, or
 - Enter a combination of individual values and ranges, such as 12;34;56-59;61.
3. Select a radio button for **Group 1, Group 2, Group 3, or Group 4**. The messages associated with the selected group will appear in the **Message IDs** field. Check one or more messages to associate with the trigger. The compound trigger will activate when one of the messages associated with the MAC ID(s) appears on the network, that is the when messageID₁ OR messageID₂ OR messageID₃ OR ...messageID_n occurs.

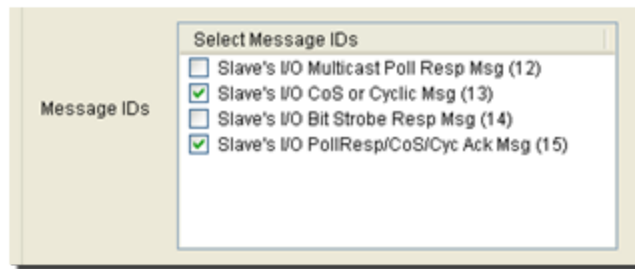


Figure 3.6 - Example: Compound Trigger Group Message Selection

When the compound filter is completed, click on the **OK** button. The **I/O Settings** dialog appears with the **Trigger Type** field = **Compound**, **Group** field = Group Name, and **MAC Id(s)** = Source/Destination settings. Not all columns will have data. For example, **Group** = Four will not have a **MAC ID** field value.

Clicking on the **Cancel** button overrides all the selection and returns the user to the **I/O Settings** dialog.

3.2.3 Editing a Trigger

To edit a simple or compound trigger:

1. From the **1784-U2DN I/O Settings** dialog do one of the following actions:
 - Double-click on the trigger in the trigger list control box.
 - Select the trigger in the list control box and click on the **Edit** button.

The **Set START/STOP Trigger Conditions** dialog opens populated with the selected trigger's stored values.

2. Make changes to the trigger.

3. When changes are complete, click on the **OK** button. If all the changes are valid, the new trigger values are stored in the same position in the **1784-U2DN I/O Settings** dialog trigger list control box. If the values are not valid, an error message appears. Selecting **Cancel** overrides any changes and returns to the **1784-U2DN I/O Settings** dialog and the selected filters appears unchanged.


3.2.4 Delete a Trigger

To delete a simple or compound filter:

1. From the **1784-U2DN I/O Settings** dialog, select the trigger in the list control box and click on the **Delete** button.
2. The trigger is deleted from the list.

3.2.5 Selecting a Trigger for Capturing

Once **START** and **STOP Triggers** are set, select a trigger for use during the network capture. These procedures are identical for both the **START** and **STOP Triggers**.

1. In the **1784-U2DN I/O Settings Dialog** select a trigger in the trigger list by clicking on it.
2. Click on the Select button  on the right of the list box. The selected trigger appears in the **Selected START/STOP Triggers** field. This is the START/STOP trigger that will be use in the next capture session.
3. To empty the **Selected START/STOP Trigger** field, click the **Deselect** button below the field.

Contacting Technical Support

Technical support is available in several ways. The online help system provides answers to many user related questions. Frontline's website has documentation on common problems, as well as software upgrades and utilities to use with our products.

On the Web: <http://fte.com/support/supportrequest.aspx>

Email: tech_support@fte.com

If you need to talk to a technical support representative about your NetDecoder software, support is available between 9 am and 5 pm, U.S. Eastern Time zone, and between 9 am and 5 pm, Pacific Time zone, on Monday through Friday. Technical support is not available on U.S. national holidays.

Phone: +1 (434) 984-4500

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Instructional Videos

Teledyne LeCroy provides a series of videos to assist the user and may answer your questions. These videos can be accessed at fte.com/support/videos.aspx. On this web page use the **Video Filters** sidebar to select instructional videos for your product.