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FRONTLINE TEST SYSTEM™

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DEVICENET ANALYSIS USING  
NETDECODER™

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## 1 Introduction

**Welcome** to the Frontline Test System (FTS) DeviceNet Analysis using NetDecoder™ Setup Guide. This supplemental guide contains hardware and software setup information for using the NetDecoder software application to analyze DeviceNet networks.

This guide contains the following setup instructions:

- DeviceNet using SST Woodhead's interface cards
- DeviceNet using Rockwell Automation's 1784-U2DN

## 2 DeviceNet using SST Woodhead's interface cards

NetDecoder's CAN and DeviceNet analyzers work with SST's PCI interface cards (DN3-PCI) as well as the PCMCIA interface cards (DN3-PCM). This section contains hardware setup instructions for SST's interface cards. The instructions are the same for both the PCI and the PCMCIA interface cards. This section contains the following:

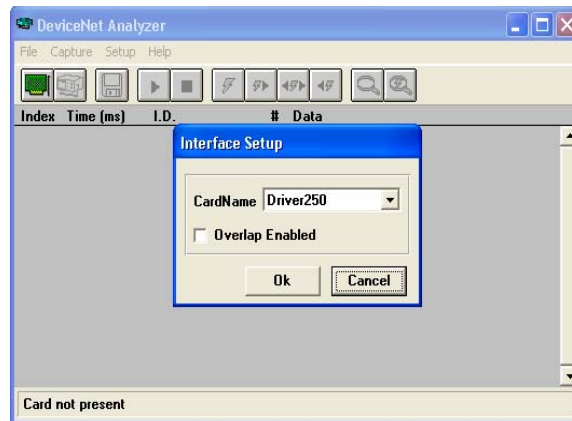
- Installing the SST Woodhead DeviceNet Card  
This procedure must be completed before starting the setup for DeviceNet or other CAN-based networks.
- Setup Instructions for using the SST card for capturing DeviceNet data

### 2.1 Installing the SST Woodhead DeviceNet Card

**Note: Install the DeviceNet card driver by following the SST Woodhead installation instructions.**

The installation software on the CD is for Windows NT 4.0 with SP4, XP Pro, 2000 Pro, 2000 Server and Server 2003. We have also successfully installed the cards under XP Home Edition. If you need drivers for other operating systems, they can be downloaded from the SST Woodhead web site at <http://www.woodhead.com>.

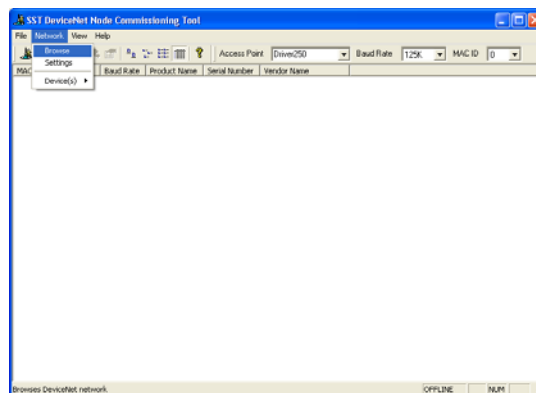
1. Insert the SST DeviceNet software CD first, before inserting the card. The CD should auto run and display the main menu. If it does not, browse the CD and double-click on setup.exe.
2. Select Product Menu from the main menu.
3. Select your card type from the Product Menu screen.
4. Choose DeviceNet DNP Products Install 2.0 for NT/XP/2000/Server from the top drop-down list and click Next. Follow the installation instructions.
5. If you do not have an operational network: Go to Start | Programs | SST | DeviceNet DNP and select the DeviceNet Analyzer program.



**Figure 1 - Interface Setup**

Select the appropriate card name from the drop list. Once selected, you will notice that the health LED on the dongle will turn green and the comm. LED will reflect the communications status of the DeviceNet Network.

**If you have an operational network:** Go to Start | Programs | SST | DeviceNet DNP and select the DeviceNet Commissioning Tool. Select the appropriate module from the Access Point drop list. If the module is functioning, the software will allow you to browse the network for devices. Notice that the bottom of the window will state the status of the card and network.



**Figure 2 DeviceNet Commissioning Tool**

SST's DeviceNet interface cards can be used to capture DeviceNet data as well as other CAN-based, non-DeviceNet network protocols. If you are interested in capturing other CAN-based network data, then proceed to Section 2.2 for further setup instructions. If you are interested in only pure DeviceNet data capture, then proceed to Section 2.3 for further setup instructions.

## 2.2 Setup Instructions for using the SST Interface Card for capturing DeviceNet data

You must complete the procedure above titled *Installing the SST Woodhead DeviceNet Card* before starting this procedure. The DeviceNet setup instructions for the SST interface cards consists of the following:

- Device Setup
- DeviceNet Capture Filters.

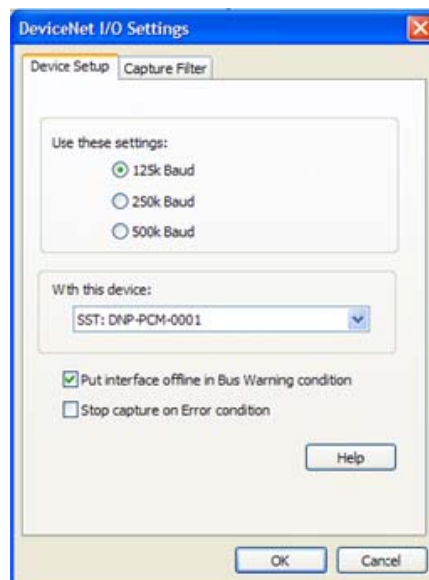
### 2.2.1 DeviceNet I/O Settings

#### 2.2.1.1.1 DEVICE SETUP

You must setup your card before NetDecoder can use it. This is done from the I/O Settings window.

To setup the DeviceNet card:

1. Start NetDecoder. Choose NetDecoder from Start | Programs | Frontline NetDecoder [version#] | Frontline NetDecoder. Then from the Choose Protocol to Analyze dialog, expand the Open DeviceNet Vendor Association folder, select the DeviceNet using SST card icon, and click the Run button. Then choose I/O Settings from the Options menu on the Control window.
2. There are two tabs: Device Setup and Capture Filter. Choose Device Setup.
3. Select the baud rate of the target network (see 3).
4. Select a capture device from the list of available devices found on your machine in the With this device box.

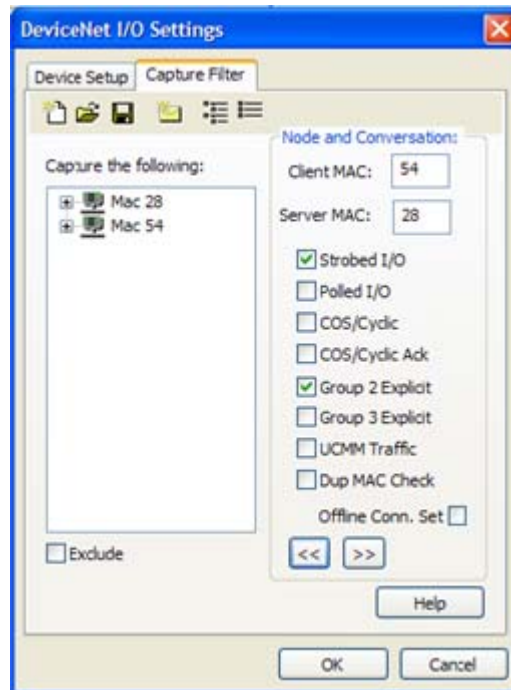


**Figure 3 Device Setup Tab**

## 2.2.2 DeviceNet Capture Filters







### To access the capture filters:

1. Start NetDecoder. Choose NetDecoder from Start | Programs | Frontline NetDecoder [version#] | Frontline NetDecoder. Then from the *Choose Protocol to Analyze* dialog, expand the *Open DeviceNet Vendor Association* folder, select the *DeviceNet using SST card* icon, and click the *Run* button. Then choose *Hardware Settings* from the *Options* menu on the Control window.
2. There are two tabs: Device Setup and Capture Filter. Choose *Capture Filter* (See 4 below).



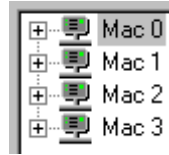
**Figure 4 Capture Filter Tab**

## 2.2.3 Toolbar Buttons

-  Clears the current filter settings
-  Loads a filter from disk
-  Saves the current filter to disk
-  Opens the Add Message dialog (information on this dialog is at the end of this document)
-  Expands all nodes in the filter display
-  Collapses all nodes in the filter display

### 2.2.3.1 Creating a Filter

The Filter Panel on the left displays the messages that will be captured (or excluded) by the current filter.

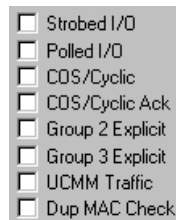


**Figure 5 Filter Panel**

1. To create a filter, first choose which nodes to include in the filter in the Client MAC and Server MAC boxes.
  - **Client MAC** - When non-blank, messages associated with the client side of a conversation are added for this MAC ID. When blank, no client side messages are added.
  - **Server MAC** - When non-blank, messages associated with the server side of a conversation are added for this MAC ID. When blank, no server side messages are added.

For example, to filter on all server side messages from MAC ID 3, leave the Client MAC blank and put "3" in the Server Side box.

2. Choose the messages to filter on by checking the boxes. When blank, all messages associated with the specified client and server MAC IDs are added to the filter. Enabling one or more checkboxes limits the messages added to specific connection types only.



**Figure 6 Connection Types**

### 2.2.4 Offline Conn. Set

Enabling this checkbox adds the Group 4 Offline Connection Set messages to the filter.



**Figure 7 Offline Conn. Set**

1. Check the Exclude box to cause all messages **except** those listed in the filter panel to be captured.
2. Add the messages to the filter.

## 2.2.5 Add Conversation



Adds the messages associated with the Node and Conversation to the filter. Pressing <enter> in either of the client or server MAC fields also does this.

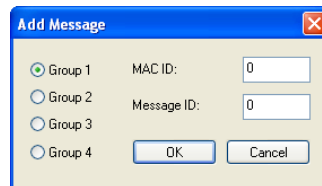
## 2.2.6 Remove Selection



Removes the selected message or group of messages from the filter. Pressing <delete> while navigating in the filter panel also does this.

### 2.2.6.1.1 ADD MESSAGE DIALOG

The Add Message dialog appears when you click the Add Message button on the toolbar of the Capture Filter tab. This dialog is used to add messages to a DeviceNet Capture Filter that are not covered by the standard connection types.



**Figure 8 Add Message Dialog**

- **Group** - Selects the Group to which the message is added.
- **MAC ID** - Selects the MAC ID for which the message is added. This field is disabled for Group 4 messages.
- **Message ID** - Selects the Message ID to be added. The range is restricted according to the selected Group.

### 3 DeviceNet using Rockwell Automation's 1784-U2DN

NetDecoder also supports Rockwell Automation's 1784-U2DN DeviceNet interface. The 1784-U2DN interfaces to the PC 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 can 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 Hardware Settings dialog by selecting **Hardware Settings** from the **Options** menu on the NetDecoder Control window.

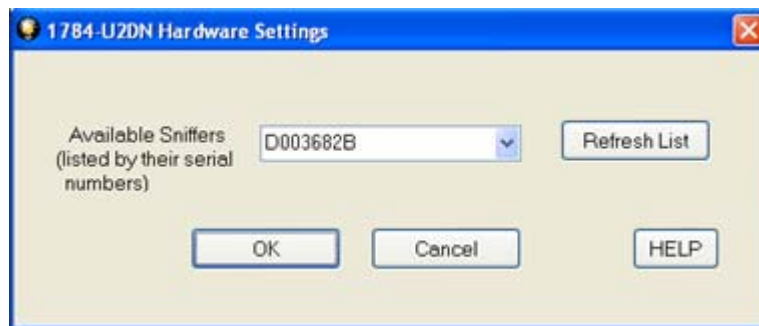


Figure 9 - 1784-U2DN Hardware Settings

FTS automatically scans and identifies all the 1784-U2DN devices plugged into the PC. These devices, identified by their Serial Numbers, are displayed in the drop-down list of Available Sniffers.

1. Select a device from the drop-down list
2. Select OK.

Selecting Cancel overrides all the selections and returns the user to the Control Window.

**Note:** You can select Refresh List to update the list of 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
- KnowledgeBase Tech Note: <http://www.rockwellautomation.com/knowledgebase/> , ID 53280.

## 3.2 START and STOP Triggers for the 1784-U2DN interface

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NetDecoder allows you to define START and STOP Triggers while using the 1784-U2DN interface card. The triggers can be accessed through the “Options→ I/O Settings” menu item.

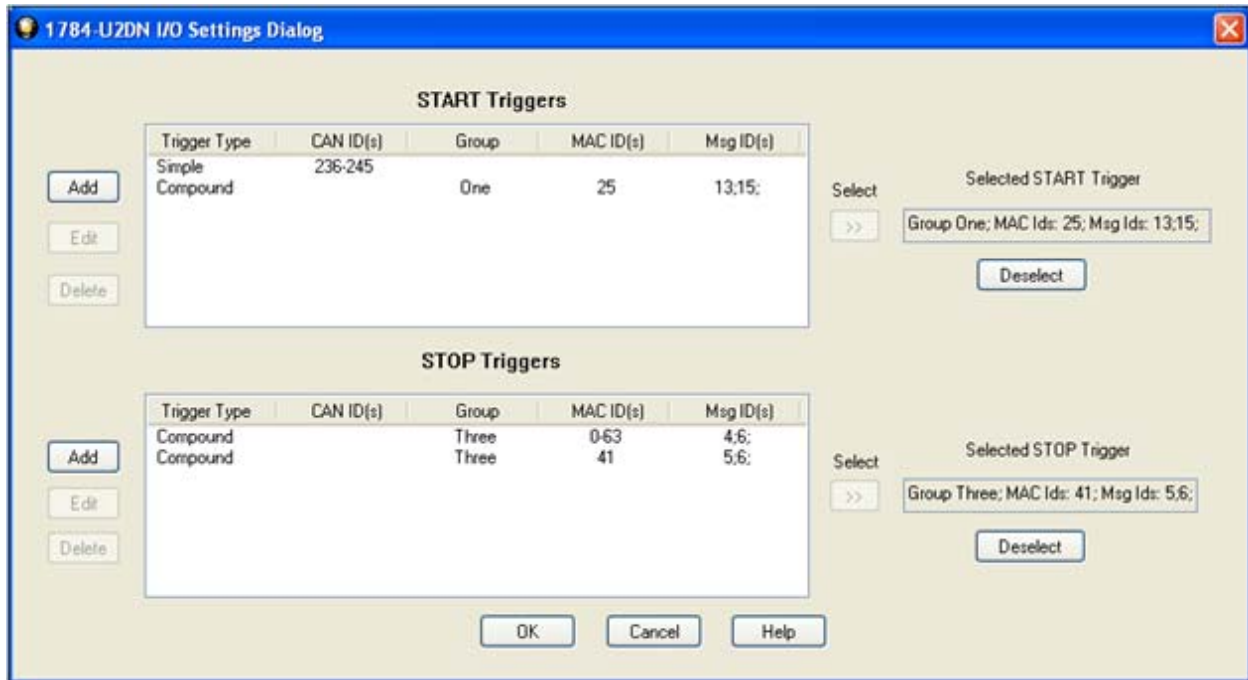
The DeviceNet1784-U2DN I/O Settings provides the user options for setting START and STOP triggers. The user can define the START and STOP triggers according to the contents of the Controller Area Network (CAN) Identifier field in the DeviceNet frame. The CAN ID of a DeviceNet frame consists of three 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 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 and STOP triggers. The triggers are displayed in the list control boxes shown on the I/O Settings Dialog. Though multiple triggers can be created and saved, only a single set of START and STOP triggers can be selected at a time.



**Figure 10 - 1784-U2DN I/O Settings Dialog**

- 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.
- 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.

### 3.2.1 Adding Simple Start/Stop Triggers

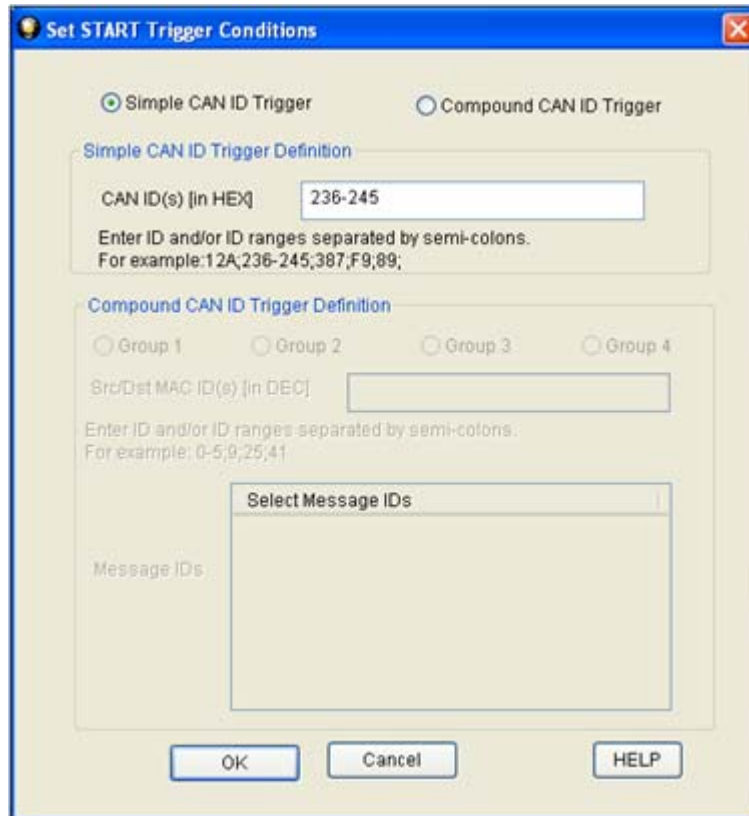
The user can add a new set of START or STOP triggers by clicking on the “Add” button to the right of the list control boxes. On clicking the “Add” button, the Set Start/Stop Trigger Conditions dialog appears. The process for creating a Start Trigger or a Stop Trigger is exactly the same.

#### To add a **Simple START or STOP Trigger**

1. From the I/O Settings dialog select Add.

The Set START Trigger Conditions dialog appears.

2. Select the Simple Controller Area Network CAN radio button.



**Figure 11 - Set START Trigger Condition**

From this point you can only enter a basic CAN ID. The rules for entering a basic CAN ID are:

- The CAN values are read as **hexadecimal**.
- The values can range from **0x000 to 0x7FF**.
- You can enter a single value: **12**
- You can enter multiple values which must be separated by a semi-colon: **34;12;AB;FC;2**
- You can enter a range of values: **12-28**
- You can enter a combination of individual values and ranges: **12;34;56-7A;1**

3. Enter The CAN ID(s) in the text box.
4. Select OK.

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.

**Note: Selecting Cancel overrides all the selections and returns the user to the I/O Settings Dialog.**

### 3.2.2 Adding a Compound Start/Stop Trigger

The Compound Trigger radio button option provides the user with the ability to define complicated triggers based on the exact values of group numbers, MAC IDs and Message IDs.

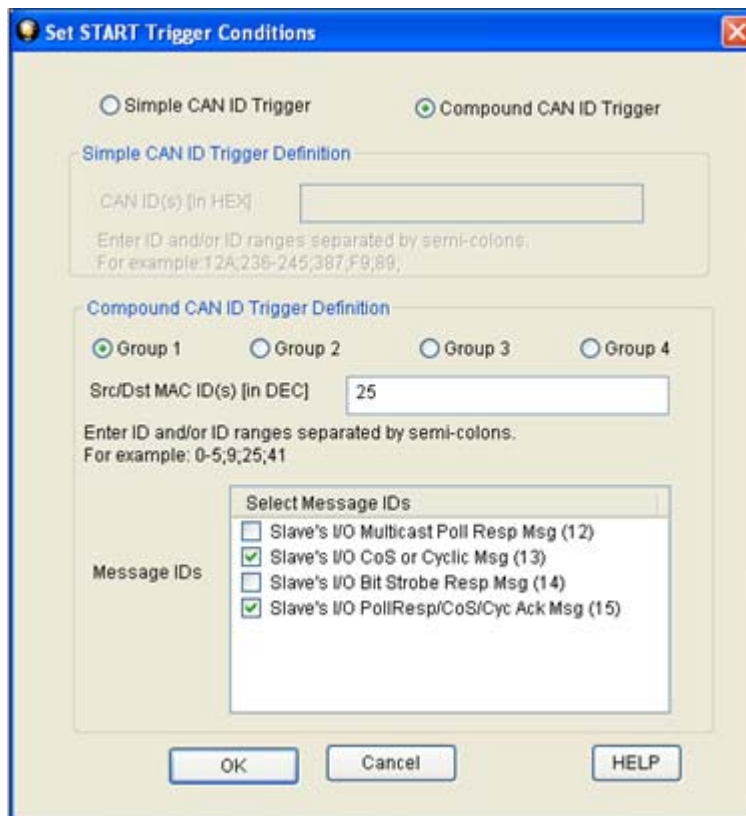
The process for setting a START Trigger or a STOP Trigger is exactly the same.

#### To add a **Compound START** or **STOP Trigger**

1. From the I/O Settings dialog select Add.

The Set START Trigger Conditions dialog appears.

2. Select the **Compound CAN ID Trigger** radio button.



**Figure 12 - Set START Trigger Conditions**

The **Compound CAN ID Trigger** option allows you to define complicated triggers based on the exact values of group numbers, MAC IDs and Message IDs. There are four groups to choose from. The following figure 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 – 7ff	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 13 CAN ID Groups**

3. Enter a Source/Destination (Src/Dst) MAC ID(s) in the text box.

- The Src/Dst values are entered in decimals
- The values can range from **0 - 63**
- You can enter a single value: **12**
- You can enter multiple values which must be separated by a semi-colon: **34;12;22;34;61**
- You can enter a range of values: **12-28**
- You can enter a combination of individual values and ranges: **12;34;56-59;61**

4. Select a Group radio button.

When you select a radio button for Group 1,2, 3 or 4, a set of Message ID's appear in the Select Message ID's list box. You can select one or more of the Message IDs in each group.

5. Select one or more of the Message IDs using the checkbox
6. Select OK.

**Note: Selecting Cancel overrides all the selections and returns the user to the I/O Settings Dialog.**

The I/O Settings dialog reappears with the Trigger Type, CAN or Msg Id(s), Group Name, and Src/Dst MAC Id(s). Not all columns will have data. For example, Group Four will not have a MAC ID. Also, if you enter a Simple START/STOP Trigger, there will be no Group identifier.

### 3.2.3 Editing a Simple Start/Stop Trigger

When you select a START/STOP Trigger on the I/O Settings 1784-U2DN, it appears in the START/STOP Triggers list control box. Once a trigger is created, you can select it and edit the values that were entered initially.

## To edit a **Simple START/STOP Trigger**

1. From the I/O Settings dialog, double click the specific trigger in the list control box  
**OR**
1. Select the trigger in the list control box and click on the “Edit” button on the right.

The *Set START/STOP Trigger Conditions* dialog appear with the triggers dialog box populated with the stored values.

You can edit the Source/Destination MAC ID's.

2. Make changes to the trigger.
3. When you are finished editing the trigger, select OK.

If all the new changes are valid, the new trigger values are stored in the same position in the list control box. If the values are not valid, you will receive an error message identifying the error.

**Note: Selecting Cancel overrides all the selections and returns the user to the I/O Settings Dialog.**

### 3.2.4 Editing a Complex Start/Stop Trigger

When you create a START/STOP Trigger on the I/O Settings 1784-U2DN, it appears in the START/STOP Triggers list. Once a trigger is created, you can select it and edit the values that were entered initially.

1. From the I/O Settings dialog, double click the specific trigger in the list control box  
**OR**
1. Select the trigger in the list control box and click on the “Edit” button on the right.

The *Set START/STOP Trigger Conditions* dialog appears with the triggers dialog box populated with the stored values.

You can select or deselect a Message ID and/or edit the Source/Destination MAC ID's.

2. Edit the value(s) in the **Source/Destination MAC ID(s)** text box.
3. Select or de-select a message in the ID in the Select Message ID's list
4. When you are finished editing the trigger, select OK.

If all the new changes are valid, the new trigger values are stored in the same position in the list control box.

### 3.2.5 Deleting a Simple START/STOP Trigger

When you enter a START/STOP Trigger on the I/O Settings 1724-U2DN, it appears in the START/STOP Triggers list. Once a trigger is set, you can delete it from the list.

To delete a **Simple START or STOP Trigger**

1. From the *I/O Settings Dialog* select the checkbox for the trigger you want to delete.
2. Select Delete.

The trigger is deleted from the list.

### 3.2.6 Deleting a Complex Start/Stop Trigger

When you select a START/STOP Trigger on the I/O Settings 1784-U2DN, it appears in the START/STOP Triggers list. Once a trigger is set, you can delete it from the list.

To delete a **Complex START/STOP Trigger**

1. From the *I/O Settings Dialog* select the checkbox for the trigger you want to delete.
2. Select Delete.

The trigger is deleted from the list.

## 4 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.

Web: <http://www.fte.com>, click Support

Email: [tech\\_support@fte.com](mailto:tech_support@fte.com)

Also see the User Forum at <http://fte.com/forum>

If you need to talk to a technical support representative, support is available between 9am and 5pm, U.S. Eastern time, Monday through Friday. Technical support is not available on U.S. national holidays.

Phone: +1 (434) 984-4500

Fax: +1 (434) 984-4505

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