neoVI ION

Multi-Protocol Vehicle Network Interface

User's Guide

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1 Introduction and Overview

1.1 Introduction

Thank you for purchasing Intrepid Control System's neoVI ION, multi-network vehicle network interface with wireless data logging capability. The ION is Intrepid's fourth-generation Data Logging tool, providing access to multiple channels of CAN/CAN FD, LIN and other vehicle networks with a wireless data access. The ION has its main use case with Data logging and remote reconfiguring to log different data sets. Along with this functionality the neoVI ION can also be used to monitor and transmit on networks, to create custom simulations for network analysis and troubleshooting, remote ECU Flashing, etc.

The ION provides numerous additional features to the very successful neoVI FIRE 2, including more CAN /CAN FD channels, greater performance, larger script space, It also inherits neoVI FIRE 2's features including support for CAN FD, Automotive Ethernet and DoIP, individual multi-color network activity LEDs, USB device hosting, and much more.

Combined with the Wireless neoVI, Intrepid Control System's server solution, logged data is made available remotely. Wireless neoVI's wide features are helpful for Fleet Management and remotely reconfiguring the logger based on the data needed at that stage of development cycle. It can provide upto 16 different types of data collections with signals of your selections also based on their respective trigger conditions. This gives access for multiple teams to gather data from a single ride.

The neoVI ION contains an additional slot for a VNET of your choice if additional Vehicle interface networks like CAN FD, Flexray, Analog card are required. The different options for the VNETs and the store links are listed in section 2.6. These can be purchased and have installed in the neoVI ION at a later date.

1.2 Package Contents

Your neoVI ION package includes both hardware and software.

Hardware

You should receive the following:

- 1 of OBD Cable
- 1 of neoVI FIRE 2 Ethernet Cable Adapter (HD-26F to DB-25M + DB-9M + RJ-45)
- 1 of FIRE2 VNET Module
- 1 of neoVI ION / neoVI PLASMA 4G GPS Antenna with Adhesive
- 1 of microSD Card and Reader Package - 32 GB
- 1 of USB 2.0 A/B Cable - 2m (6')
- Will contain an additional VNET module based on your purchase choice

Figure 1: neoVI ION in its foam packaging.

Please remove, unwrap and inspect all the contents, an example of which is shown in Figure 2.

If anything is missing or damaged, please contact Intrepid for prompt assistance, using the information in Chapter 8. Detailed instructions for attaching the cables to your hardware are provided later in the document.

Note: While the USB cable in the ION package uses industry standard connectors and pinouts, not all USB cables are the same. To ensure reliable operation, please use the cable included with the ION. If you need to replace the original, be sure not to use one longer than 6' (2 m) or you may experience problems with your hardware. If necessary, contact Intrepid for a replacement.

Figure 2: neoVI ION Package Contents. Starting top center with the ION itself and going clockwise: µDB-9 to DB-9 conversion cable; USB cable; microSD card reader; ION Ethernet Cable Adapter; neoVI-OBD-1 cable. The software/driver CD can be found in the center. Note that the OBD cable you receive may differ from the one shown here.

Software

In the ION package you will find a software/driver CD containing:

- A copy of Intrepid's Vehicle Spy vehicle network software.
- Drivers for the neoVI ION.
- An API install kit containing the neoVI Explorer utility for configuring the device.
- Documentation materials.

Intrepid's Vehicle Spy (often abbreviated as *VSpy*) is the "Swiss army knife" of automotive networking tools. In addition to wireless data logging It allows you to easily monitor and transmit on vehicle networks, and includes capabilities for ECU simulation, data acquisition, scripting, diagnostics, data analysis and much more.

If you have purchased VSpy, these features will be available to you immediately. However if you have not purchased VSPY, you will receive a Trial version and have an option to purchase it later based on your requirements.

Wireless neoVI (often abbreviated as *WIVI*) server will be installed in your location or rented server from Intrepid Control Systems based on your choice at the time of purchase. You can access WIVI from any browser to configure your neoVI ION or access the logged data.

DataSPY can be used to analyze the data collected on the server. This analysis can then be shared with other members of your team.

1.3 Operational Overview

The neoVI ION is a compact but powerful hardware tool for working with vehicle networks. Its operation can broadly be broken down into three categories: Data acquisition and logging; network interfacing; and simulation and scripting.

Data Acquisition and Standalone Logging

The ION enables the acquisition of data from networks with precise control over collection parameters. It is designed to operate in standalone mode, running independently within a vehicle. You can write custom scripts that run in real time for logging data to the included SD card. This data is then uploaded to WIVI server where you can access it for downloading or further analysis. You can update the custom scripts remotely through WIVI based on changes in your requirements.

Vehicle Network Interfacing

One function of the neoVI ION is to act as an interface between vehicle networks and a standard PC. Using the provided cables, you can connect the neoVI ION to either a bench test setup or an actual vehicle and monitor live network activity. All channels are captured simultaneously and are hardware time-stamped with great accuracy. Data is transferred by the neoVI ION from attached networks over a USB connection, where it can be viewed in software such as Vehicle Spy.

Simulation and Scripting

The neoVI ION not only allows you to receive data from vehicle networks, but also to transmit on them. Using Vehicle Spy or other software you can define transmit messages with custom data and send them manually or on a schedule of your choosing. You can also write intelligent scripts that implement arbitrary logic and compile them into *CoreMinis* that run within the device itself. This functionality allows you to create specialized test scenarios, and to simulate ECUs and gateways. It is also possible to reflash ECUs using data from the ION's SD card.

1.4 Summary of Key Features

With the neoVI ION, we've fit a lot of power and functionality into a tough little package. To give you an idea of how much you can do with the ION, here's a summary of the device's most important design, construction, operational and performance features.

Construction, Controls and Cabling

- Compact design: 7.4" x 4.5" x 1.6" (19 x 12 x 4 cm).
- Light weight: less than 1.31lb (0.595 KG).
- Solid anodized aluminum case.
- Thick rubber end boots for shock protection.
- Ruggedized metal connectors.
- Cable interfaces on sides for easier connections.
- Multiple cable options for vehicle networks, including Ethernet, DoIP and OBD-II.
- Ability to control LEDs in custom scripts.

Specifications for the ION. Link is given below.

https://cdn.intrepidcs.net/brochures/icsusa/neoVI_Ion.pdf

Networks / Inputs

• 6-12a Dual Wire CAN (all baud rates supported)

• 1-2a Single Wire CAN (also referred to as GMLAN)

• 1-2a Low Speed Fault Tolerant (LSFT) CAN

• 5-10a,b LIN / K Line / KW2K / ISO 9141

• 3-6a,c Low range analog inputs (FIRE VNET):

  - 0-3.3V range
  - 12 bit single ended analog inputs with +/-5% error
  - 1K Samples per second

• 2-4a,c Low range digital inputs/outputs (FIRE VNET):

  - 0-3.3V range
  - Digital I/O (5V tolerant)

a - One VNET included; up to 2 supported for 2x network interfaces

b - Uses K-Line transceiver (simultaneous K-Line and LIN for one network not supported)

c - Analog input pins are shared with 4 digital input pins

Device Specifications

- Voltage input: 4.5-40V
- Temperature range: -40°C to +85°C
- Dimensions: 1.52" × 4.38" × 7.30" (3.88 × 11.12 × 18.67 cm)
- Number of expansion slots: 1
- LEDs (user programmable): 8 red
- Android user microSD card
- SD card: 1
- High-speed USB 2.0
- DAQ Ethernet
- 4G modem
- GPS support: 5 Hz

Protocol Support:

- OBD
- J1939: Includes J1939 DBC, BAM, RTS/CTS
- GMLAN:
  - Services include $22, $23, $AA, $A9, $2C
  - DBC, A2L (ASAP2 File) and ODX, and PID file support
- UDS (ISO14229):
  - Services include $19, $22, $23, $2A, $2C
  - DBC, A2L (ASAP2 File), GDX, MDX, ODX support
- CCP: Includes A2L (ASAP2 file) and ROB support
- XCP: Includes A2L (ASAP2 file) and ROB support

1.5 Hardware and Software Requirements

Only a small amount of hardware is required to use the neoVI ION:

- A vehicle network, either within an actual vehicle or in a test bench environment.
- A DC power supply capable of providing 4.5V to 40V of DC power, with a nominal current of 250 mA at 12V. In case of vehicle connection, the power is taken from the CAR Batteries with access from the OBD port near the driver. Your network setup must include wiring capable of providing this power on pin 25 of a female DB-25 connector that connects to a ION cable; see Chapter 7 for pinout details.
- A PC with an open standard USB 2.0 (or higher) port. You can use a USB hub, but we recommend that this be a powered hub to ensure that sufficient power is provided.

Additional hardware may be required for some uses of the device:

- Interfacing to a BroadR-Reach (100BASE-T1) Automotive Ethernet network requires an Intrepid RAD-Moon or similar media converter device.
- Additional cables may be needed, depending on the nature of the network to which the neoVI ION is being connected.

Intrepid's Vehicle Spy Professional is recommended for use with the ION and provides everything you need to set up your hardware and use all of its capabilities. The setup program for VSpy will also install the necessary drivers for your ION. If you do not have a VSpy license, you can use the Vehicle Spy version provided to you for, configuring the neoVI Ion for logging data and the driver setup. All of this software can be found on the disc that comes with the ION, or if necessary, can be downloaded from the Intrepid web site at http://www.intrepidcs.com. Installation instructions can be found in Chapter 3.

Please refer to the Vehicle Spy documentation for its more specific PC hardware and operating system requirements and recommendations. Note, however, that Vehicle Spy will run on most modern Windows-based PCs.

2 A Tour of neoVI ION Hardware

Let's now take a short tour of the neoVI ION's hardware. We'll examine the device from all sides, showing its external components and explaining what each does. This will help you become more familiar with the unit so you can more easily set up, configure and use it.

> **Warning:** The neoVI ION is a complex device that does not contain any user-serviceable parts. Do not attempt to open the case of the neoVI ION unless specifically instructed to do so by an Intrepid Control Systems technician, or you risk possible injury or damage to the unit.

2.1 Case and Overall Design

The neoVI ION is enclosed in a sturdy black-anodized metal case. The device has been designed and tested for in-vehicle use, and is operational in a temperature range from -40°C to +85°C. An overall view of the neoVI ION can be seen in Figure 3.

Connectors and ports are often a point of failure with hardware devices. To ensure that the neoVI ION provides you with years of reliable service, Intrepid has ruggedized the physical interfaces on the device by using reinforced metal connectors.

To further protect the device against bumps and drops, it has blue-colored rubber bumpers on both ends. These bumpers are removable, but there is no need to do this under normal circumstances, and we recommend that you leave them in place.

Figure 3: Overview of the neoVI ION.

The bottom of the neoVI ION contains useful reference information, including the device serial number, pinouts of its HD-26 and µDB-9 connectors, and Intrepid's contact information (Figure 4). Pinouts for all ION connectors and cables can be found in Chapter 7.

Figure 4: neoVI ION Bottom View.

2.2 Side 1 Interfaces and Connectors

The Side 1 of the neoVI ION contains four components: 2 HD-26 connectors and a set of Cellular and GPS antennas(Figure 5).

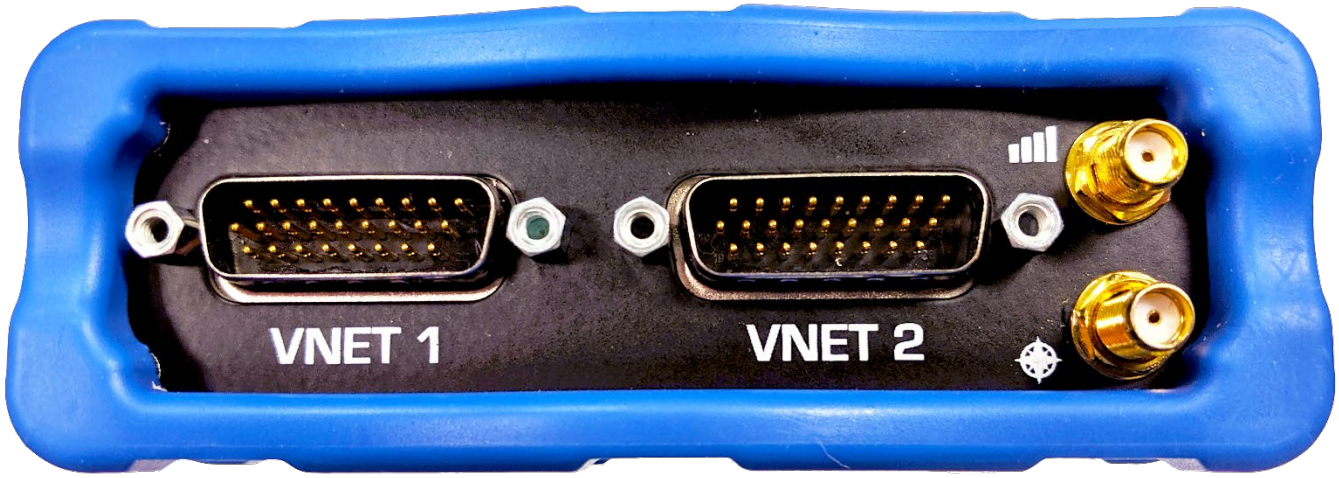


Figure 5: neoVI ION Side 1 View.

HD-26 Network Interface Connectors

These connectors are named VNET 1 and VNET 2. To connect to the neoVI ION, the network interface cable should be connected to VNET 2 enabling CAN, LIN and Ethernet messages to be passed between the network and the ION. This connector also provides primary power to the device. Your additional VNET (from section 2.6) can be accessed from VNET 1. This male, high-density, 26-pin D-subminiature connector is the primary means by which the neoVI ION interfaces with vehicle networks.

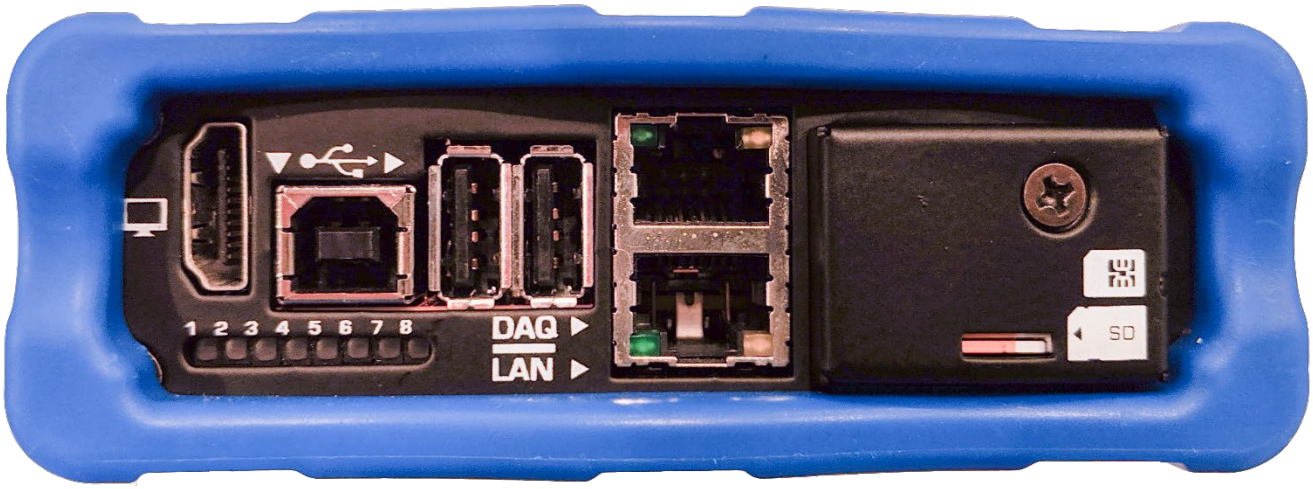
Cellular and GPS antenna

You will receive a Cellular and GPS antenna with your neoVI ION. Connect the antenna as shown in the picture below.

Add a picture of the antenna connected.

2.3 Side 2 Interfaces and Connectors

This side of the neoVI ION contains most of its connectors, ports and slots (Figure 6).



Picture of the side 2 with connectors

Figure 6: neoVI ION Side 2 View.

HDMI Port

Add gifs highlighting the connector.

You can connect a monitor to the ION using the HDMI port. This connection gives access to android screen for making the settings like the WiFi connection and the Wireless neoVI APK download.

USB "B" Connector

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This is the "square" connector for USB devices that use detachable cables. (The "USB A/B cable" will connect the USB "B" side to the neoVI ION and USB "A".)

LED Pattern

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These LEDs have default meanings but can be configured to indicate customized signals.

LED1 and LED 2 combine for the connection indications. The pattern indications are as follows.

LED1 is FIRE1 (FIRE Red)

LED2 is FIRE2 (FIRE Green)

https://cdn.intrepidcs.net/support/neoVIHardware/neoFIREHWSettings.htm

LED2 is FIRE3 - Uploading (CM)

LED4 is FIRE4 - Triggered (CM)

LED5 is WiFI (always off for now)

LED6 is GPS (Green on lock, off when searching)

LED7 is Cell/Modem/Sim (currently just turns on when Modem powers up).

LED8 is Android/USB status

IF USB IS PLUGGED IN

Bright Solid - USB inserted and driver loaded

Bright Blinking - USB inserted and driver not loaded.

IF USB is NOT plugged in

Off - Andriod is off.

Dim Slow Blink(1sec) - Android is not running, booting

Dim Fast Blink - Android is running and WN is not licensed

Blinking between Dim and Bright - Android is running, WN licensed
no APK, or APK <=> VNET broken

Dim Solid - Everything is OK, APK<=>VNET is ok,
HID<=>ANdroid is ok, we are licensed

USB "A" Connectors

Add gifs highlighting the connector.

These connectors can be used for connecting

1. Mouse and a keyboard for the android screen.
2. neoVI MIC for triggers
3. WiFi dongle

DAQ and LAN ports (RJ 45 Connectors)

Add gifs highlighting the connector.

The DAQ port is for the Data Acquisition and designed for accessing Video over IP. This makes neoVI ION capable of logging Video data from upto 8 cameras.

The LAN port is for providing access for Internet, connecting with VSPY over LAN.

Covered slot

This slot holds the SD card that stores data logged or captured by the neoVI ION and the SIM card for cellular connection. It is protected by a metal cover that prevents accidental ejection of the card and protects the slot from dirt and debris.

USB mini Connector

Add gifs highlighting the connector.

Small USB port (USB Mini) is for ICS manufacturing and debugging purposes.

SD Card Slot

Add gifs highlighting the connector.

Standard size slot for SD cards supporting up to 128 GB each for logging data. The SD cards only fit in one way. To extract the card, push in and it will pop out.

SIM Card

Add gifs highlighting the connector.

Slot for a small card that identifies the device on a cellular network. To insert the SIM card, the non-notched side goes in first with the contacts facing down towards the SD card slot. The card does not click.

2.4 Standard Cables and Cable Options

As mentioned in Section 1.2, the ION ships with several standard cables, as well as one of five optional OBD cables that was selected when the device was ordered. We'll now illustrate these cables and describe each one's use. Connector pinouts and cable signal tables for this hardware can be found in Chapter 7 (except for the USB cable, which is industry standard).

USB "A/B" Cable

This is a standard cable is used to connect PCs or other hosts to USB devices that do not have integrated cables (Figure 9). The detachable cable makes the ION easier to transport than would be the case if it were built in, and allows the cable to be easily replaced if it is ever damaged.

Figure 9: USB "A/B" Cable.

ION Ethernet Cable Adapter

This special cable "breaks out" the HD-26 connector on the left side of the neoVI ION to three connectors that are used to communicate with vehicle networks. The cable is illustrated in Figure 12, while the network interface connectors are described further below.

Figure 12: ION Ethernet Cable Adapter. This cable allows the ION to connect to vehicle networks and receive its primary power input.

DB-25 Connector

This is the main vehicle network interface connector, carrying CAN, LIN and Ethernet messages, as well as providing power to the ION from the network (Figure 13). As we'll see later in the manual, it is also used to connect an additional cable for OBD applications.

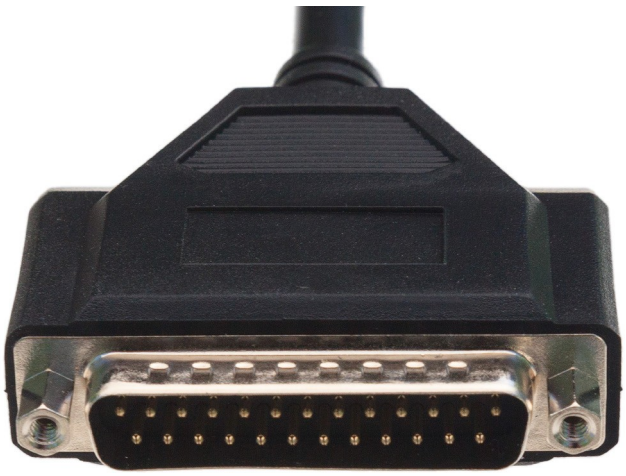


Figure 13: DB-25 Connector. This connector carries main network traffic and primary DC power to the ION.

DB-9 Connector

This connector carries 4 LIN channels for LIN applications (Figure 14).

Figure 14: DB-9 Connector. This industry-standard connector carries LIN traffic.

RJ-45 Connector

This female RJ-45 socket is used to attach a standard Ethernet cable for Automotive Ethernet and DoIP applications (Figure 15).

Figure 15: RJ-45 Socket.

OBD Cables

The ION comes with your choice of one of five OBD cables, which are used to interface the device to a vehicle or bench OBD port. Four of these cables attach to the DB-25 connector on the ION Ethernet Cable Adapter (Figure 13), while the fifth actually takes the place of that cable, connecting directly to the ION.

See Section 3.3 for Connection diagrams that show how to connect all of these cables to the ION and your network or bench.

neoVI-OBD-1 Cable

This cable, which has a red OBD-II connector, is used primarily for General Motors vehicles. It can be seen in Figure 16.

Figure 16: neoVI-OBD-1 Cable.

neoVI-OBD-MULTI Cable

This cable has a standard black OBD-II connector and is suitable for use with the vehicles of most OEMs. It is pictured in Figure 17.

Figure 17: neoVI-OBD-MULTI Cable.

neoVI-OBD-MULTI Right Angle Cable

This is the same as the neoVI-OBD-MULTI cable but terminates with a right-angled OBD II connector for vehicles where this is required. A picture of the cable is shown in Figure 18.

Figure 18: neoVI-OBD-MULTI Right Angle Cable.

neoVI FIRE/RED J1939 Cable

This cable terminates in a round 9-pin Deutsch connector for use in commercial vehicles (Figure 19).

Figure 19: neoVI FIRE/RED J1939 Cable.

ION OBD Cable with DoIP Support

This special cable attaches to the ION's HD-26 connector in place of the regular ION Ethernet Cable Adapter. It contains DB-25, DB-9 and OBD-II connectors wired for DoIP use, and is illustrated in Figure 20.

Figure 20: ION OBD Cable with DoIP Support.

3 Hardware and Software Setup

In this chapter we will explain the steps necessary to set up your neoVI ION to work with a vehicle network. This will include explaining how to install the required software and drivers, connect cables between the ION and the network, and link the unit to a PC.

Note that because vehicle and test bench setups will vary. You may need to alter these instructions to suit your needs.

3.1 Vehicle Spy and Driver Installation and Setup

It is possible to install your hardware and software in either order. However, the neoVI ION requires special drivers to function properly, which are installed automatically by the included software setup programs. If you connect the hardware before the drivers are installed, it will not work correctly. For this reason, we recommend installing the software first.

As mentioned earlier, a full licensed version of Vehicle Spy is recommended in order to allow you to get the most from your neoVI ION. If you purchase Vehicle Spy, its installer will be included on the software disc that comes with the device; if not, a more limited trial version will be provided instead.

Installing Vehicle Spy (Professional or Trial)

The installation process is very similar for both the full and trial versions, though there may be some slight differences between the figures in this document and what you see on your screen. Vehicle Spy 3 uses an automated installer, which will do most of the work for you. Simply follow the instructions below to set up the program on your computer.

1. **Load the Software and Documentation Disc:** Put the disc that came with your neoVI ION into the optical drive of your computer. A few seconds later, the ICS software installation menu should appear on your computer screen, as shown in Figure 21.

> **Note:** On some computers this window may not appear automatically. If this occurs, start Windows Explorer, navigate to the disc's letter under *Computer*, and then double-click the file *icsAutoPlay.exe* to open the menu.

Figure 21: neoVI ION Software Install Dialog Box.

From this menu you can start installing Vehicle Spy 3, install the API support files, and access videos, documentation and online support materials.

2. **Start Vehicle Spy 3 Installation:** Click *Vehicle Spy 3 Install*.
3. **Select Language:** Select your preferred language, and then click OK to proceed. (For the remainder of these directions, we will assume that English has been used.)

The Vehicle Spy 3 setup wizard will now start, displaying a welcome screen as shown in Figure 22 (though the exact version number is likely to differ from the one seen here).

Figure 22: Vehicle Spy 3 Setup Wizard Welcome Screen.

4. **Start Vehicle Spy 3 Setup Wizard:** Click Next > to start the setup wizard.
5. **Review and Accept License Agreement:** Review the license agreement, and assuming its terms are acceptable, select *I accept the agreement*, then click Next > (Figure 23).

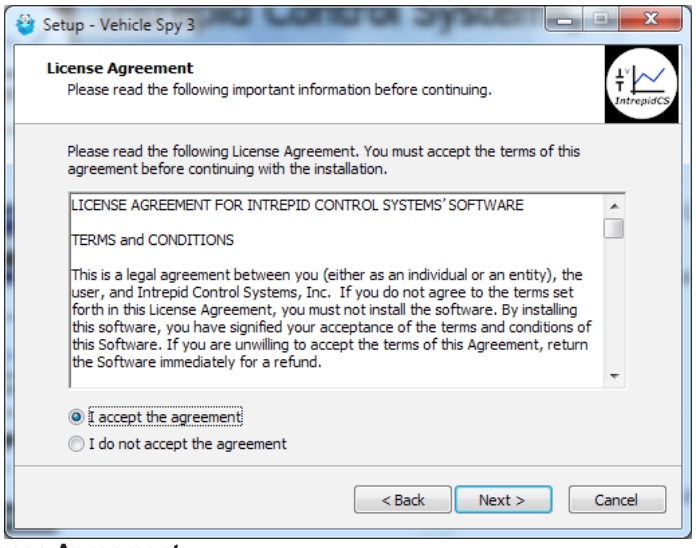


Figure 23: Vehicle Spy 3 License Agreement.

6. **Select Installation Type:** We are doing a new installation so simply click Next > to continue.
7. **Select Destination Location:** Choose where you want to install Vehicle Spy 3 (Figure 24). We normally recommend using the default location. Click Next >.

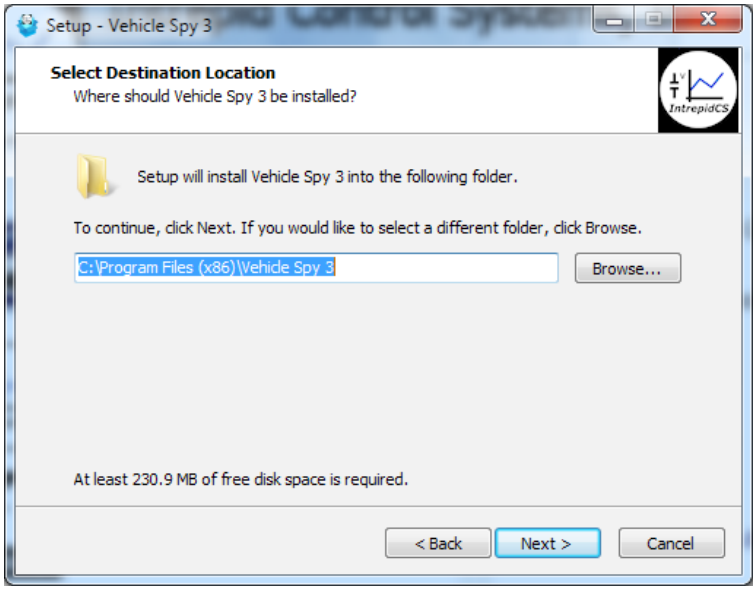


Figure 24: Choosing the Destination Location.

8. **Select Data Directory Location:** Next, choose where you want Vehicle Spy 3 to store its data files. We recommend sticking with the provided default, *C:\IntrepidCS\Vehicle Spy 3* (Figure 25). Click Next > to continue.

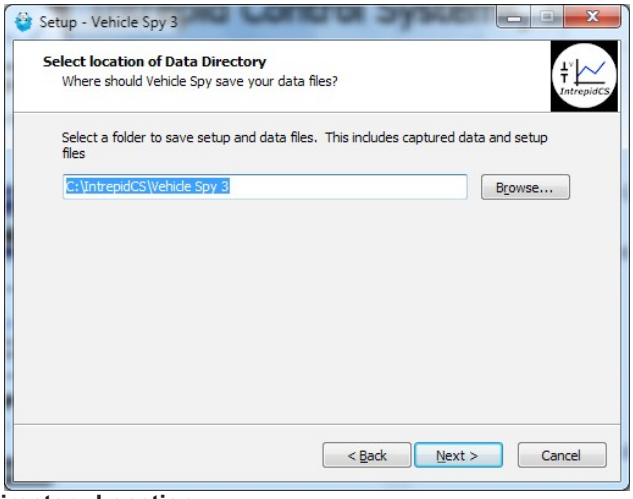


Figure 25: Selecting the Data Directory Location.

9. **Select Start Menu Folder:** Choose where you want your Windows shortcuts for Vehicle Spy 3 to reside. Again, the defaults are generally fine here, though you can change them if you wish. Click Next > to proceed.
10. **Select Additional Tasks:** The one option here is to create a desktop icon for Vehicle Spy 3, which is selected by default. Uncheck the box if you do not wish to have this icon created, then click Next >.

You have now provided all of the information the wizard needs to install Vehicle Spy 3. Your selected options will be displayed in a review box, as shown in Figure 26.

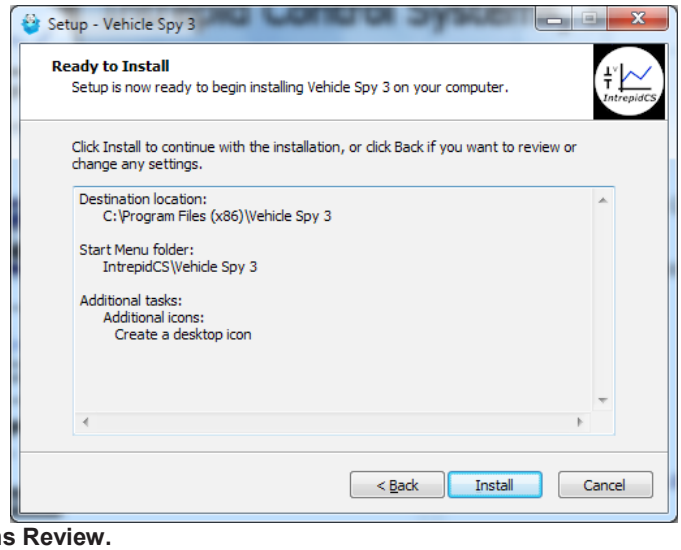


Figure 26: Installation Options Review.

11. **Review Installation Options and Begin Installation:** Ensure that the options you have chosen are correct, and then click Install.

The wizard will now begin installing Vehicle Spy 3. A window will appear showing you the progress of the installation (Figure 27).

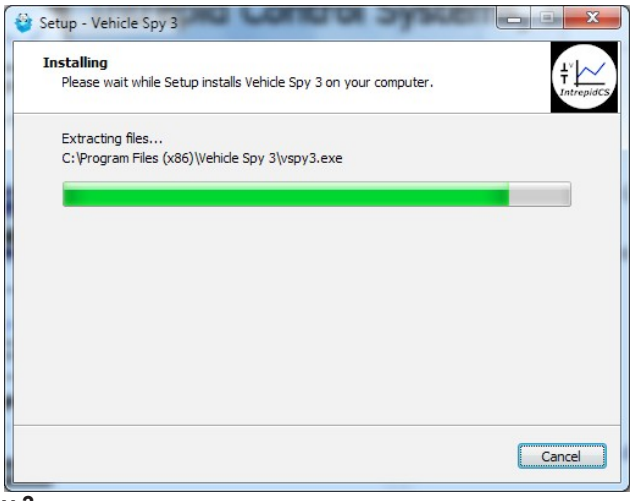


Figure 27: Installing Vehicle Spy 3.

After completing installation of the software itself, the wizard will automatically install various drivers required by Vehicle Spy 3 and the neoVI ION. The first install will be guided by the VCP Driver Installer.

12. **Install VCP Drivers:** Click Next > to begin installing the first set of drivers. This will usually take only a few seconds, and when completed, a message will appear like the one in Figure 28. Click Finish to complete this initial driver installation process.

Figure 28: VCP Driver Installation Complete.

Next, support files for Microsoft Visual C++ 2010 and 2005 will be installed, if they are not already on the computer. This happens automatically, and you may briefly see a dialog box like the one in Figure 29. Many systems already have these files, however; if that is the case, a message may appear telling you that they are already present; just hit OK to continue.

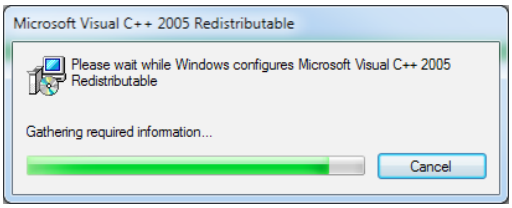


Figure 29: Installing Support Files for Microsoft Visual C++ 2005.

The WinPcap installer will start next. This is a special support program that allows Ethernet traffic on a PC to be captured and displayed by Vehicle Spy 3. You will see a window similar to the one shown in Figure 30.

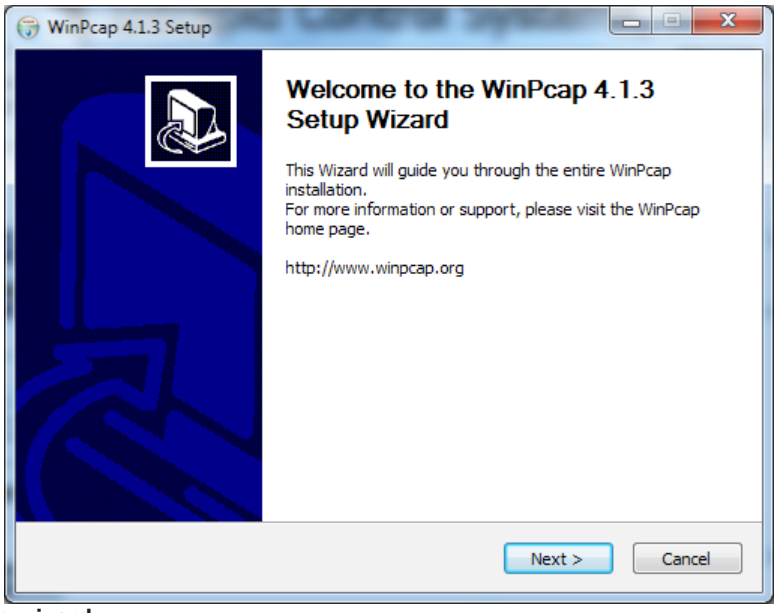


Figure 30: WinPcap setup wizard.

13. **Install WinPcap:** Click Next > to start the installation process. Review the WinPcap license agreement and click I Agree if you are willing to abide by its terms. Leave the box on the next screen checked so that WinPcap starts automatically, and click Install. After a few seconds a message will appear saying that the installation is complete; click Finish to exit this installer.

The setup wizard will now install SMSC LAN9500 device drivers. This only takes a few seconds and requires no user intervention; you may see a dialog box on the screen like the one in Figure 31.

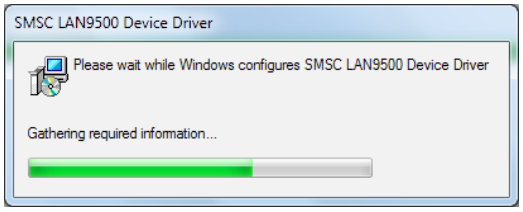


Figure 31: SMSC LAN9500 device driver installation.

Another ICS driver installer dialog box will now appear, similar to the first one.

14. **Install ICS Port Drivers:** Click Next > to begin installing the ICS port drivers.

At this point you may receive a prompt from Windows like the one shown in Figure 32. Please click Install to authorize driver installation.

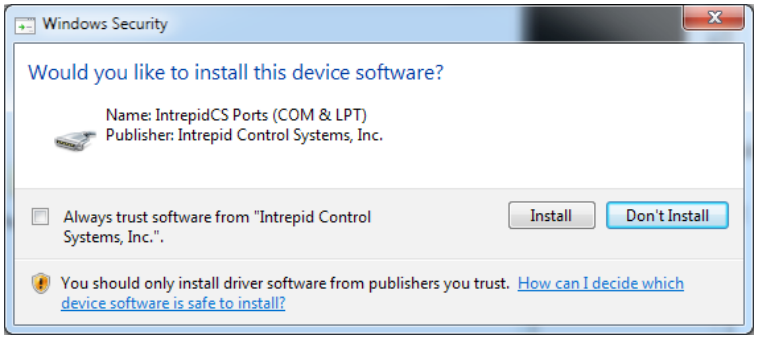


Figure 32: Windows Security Dialog Box.

Once installation begins, it will take only a few moments, and when completed, a message will appear like the one in Figure 33.

15. **Complete Port Driver Installation:** Click Finish to exit this part of the install.

Figure 33: Port Driver Installation Complete.

You will now see a window similar to Figure 34, indicating that the setup process is complete.

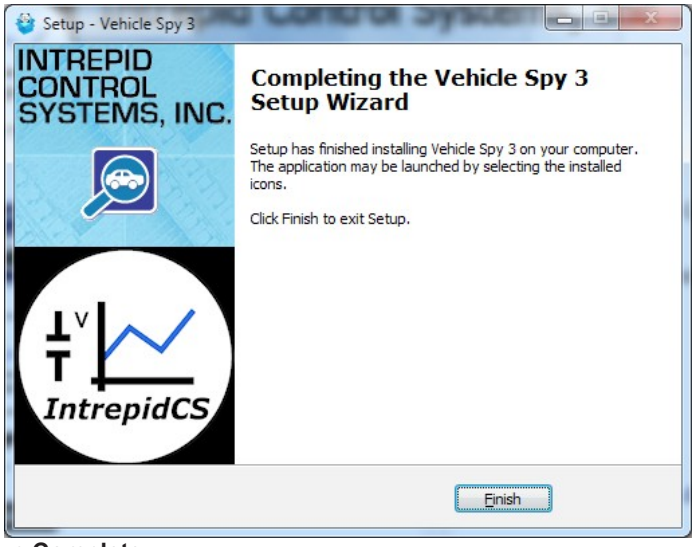


Figure 34: Vehicle Spy 3 Setup Complete.

16. **Exit the Setup Wizard:** Click Finish.

Congratulations, you're done!

3.2 Driver and API Support File Installation and Setup

If you plan to use the neoVI ION without Vehicle Spy 3, you will need to install drivers and support files to allow the hardware to be accessed via its API. Please follow the steps below. All of these files are installed automatically with Vehicle Spy 3, so if you followed the instructions in Section 3.1, you can skip the directions here.

1. **Load the Software and Documentation Disc:** Insert the disc that came with your neoVI ION into the optical drive of your computer. A few seconds later, the ICS software installation menu should automatically appear on your computer screen, as shown in Figure 35.

> **Note:** On some computers this window may not appear automatically. If this occurs, start Windows Explorer, navigate to the disc's letter under *Computer*, and then double-click the file *icsAutoPlay.exe* to open the menu.

Figure 35: neoVI ION Software Install Dialog Box.

2. **Start Support File Installation:** Click *RP1210 J2534 Intrepid API Install*.
3. **Select Language:** Select your preferred language, and then click OK to proceed. (We will assume that English has been used.)

The setup wizard for the ICS API and driver kit will now start, displaying a welcome screen as shown in Figure 36. (The version number you see may be different from the one shown here.)

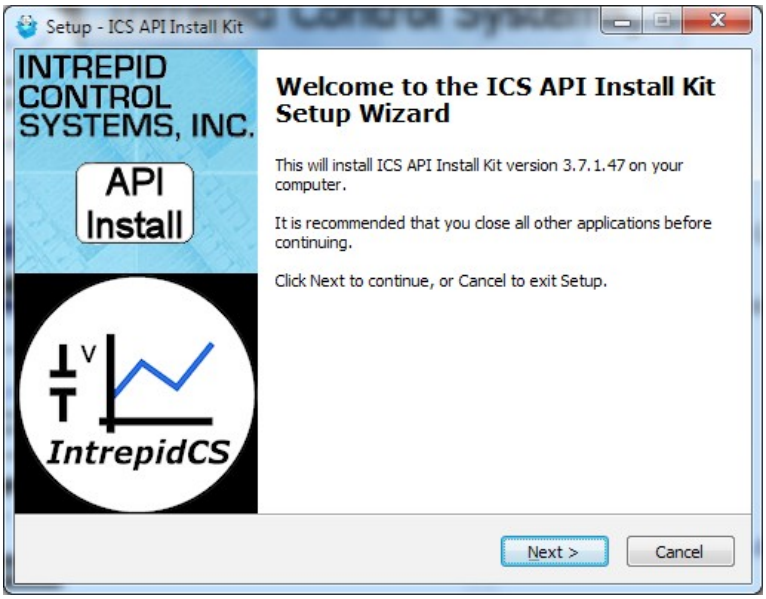


Figure 36: API and Driver Setup Wizard Welcome Screen.

4. **Start API and Driver Setup Wizard:** Click Next > to start the setup wizard.
5. **Review and Accept License Agreement:** Review the license agreement, and assuming its terms are acceptable, select *I accept the agreement*, then click Next > (Figure 37).

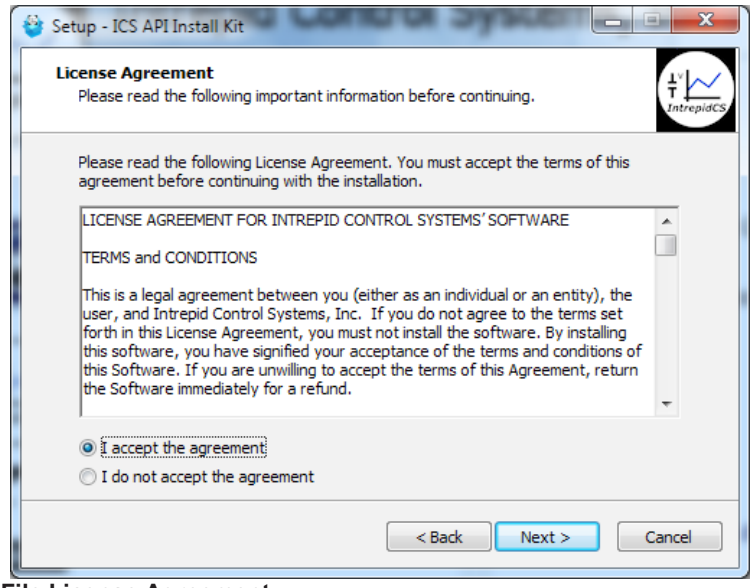


Figure 37: API and Driver File License Agreement.

6. **Select Installation Type:** We are doing a new installation so simply click Next > to continue.
7. **Select Destination Location:** Choose where you want to install Vehicle Spy 3 (Figure 38). We normally recommend keeping the default location. Click Next >.

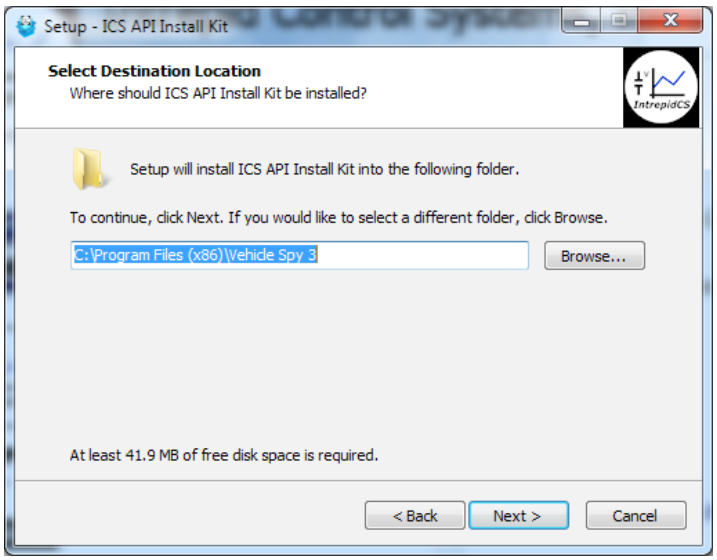


Figure 38: Choosing the API Kit Destination Location.

You have now provided all of the information the wizard needs, and it will display a summary as shown in Figure 39.

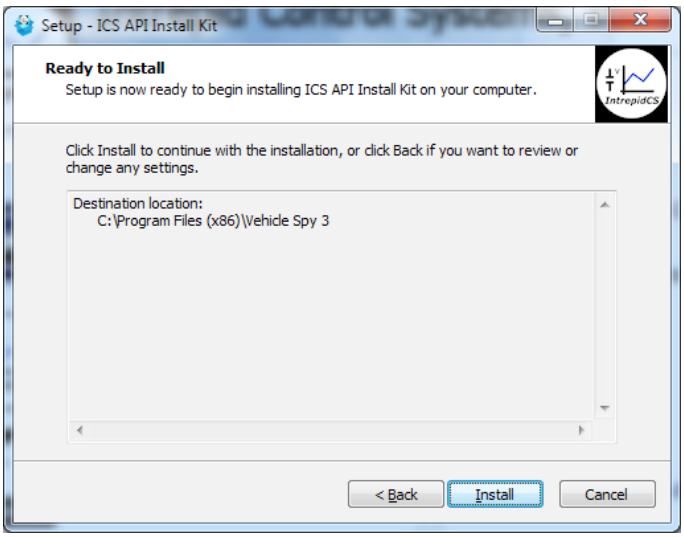


Figure 39: API Installation Options Review.

8. **Review Installation Options and Begin Installation:** Ensure that the options you have chosen are correct, and then click Install.

The wizard will now begin installing Vehicle Spy 3. A window will appear showing you the progress of the installation (Figure 40).

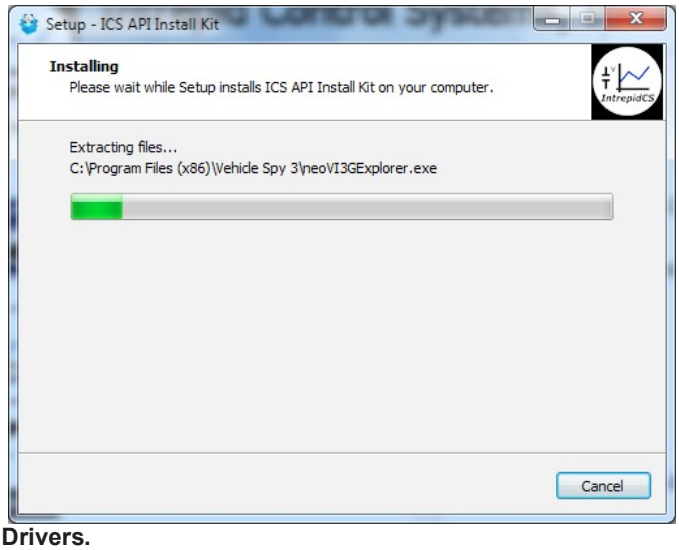


Figure 40: Installing API and Drivers.

After completing the basic setup, the wizard will automatically install various drivers required by the neoVI ION. The first install will be done by the VCP Driver Installer.

9. **Install VCP Drivers:** Click Next > to begin installing the first set of drivers. When completed, a message will appear like the one in Figure 41. Click Finish.

Figure 41: VCP Driver Installation Complete.

Next, support files for Microsoft Visual C++ 2010 and 2005 will be automatically installed, if they are not already on the computer. You may briefly see a dialog box like the one in Figure 42. If a prompt appears saying the files are already installed, hit OK to continue.

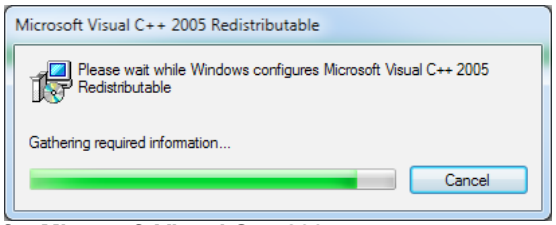


Figure 42: Installing Support Files for Microsoft Visual C++ 2005.

Another ICS driver installer dialog box will appear now.

10. **Install ICS Port Drivers:** Click Next > to begin installing the ICS port drivers.

If you see a Windows dialog like the one in Figure 43, click Install to authorize installation.

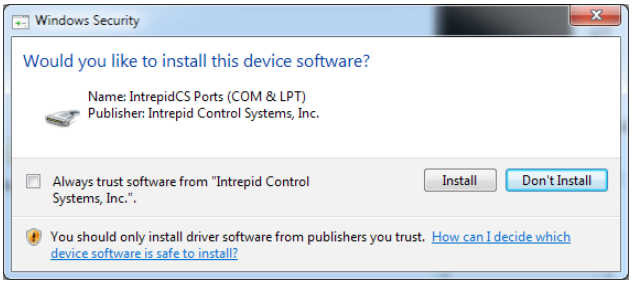


Figure 43: Windows Security Dialog Box.

Once installation begins, it will take only a few seconds, and when completed, a message will appear like the one in Figure 44.

11. **Complete Port Driver Installation:** Click Finish to exit this part of the install.

Figure 44: Port Driver Installation Complete.

You will now see a dialog box like the one shown in Figure 45, indicating that the setup process is complete.

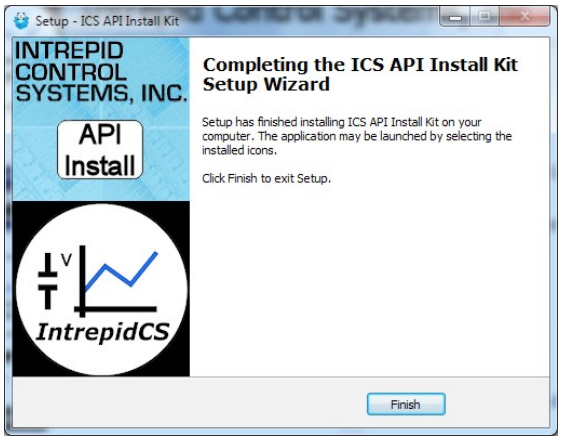


Figure 45: Vehicle Spy 3 Setup Complete.

12. **Exit the Setup Wizard:** Click Finish.

Congratulations, you're done!

3.3 Hardware Connection Diagrams

Connection diagrams show you at a glance how to physically connect your neoVI ION to vehicle networks and your PC. Below you will find first a Connection diagram for using the ION without an OBD cable, and then five additional ones showing the connections for each of the OBD cable options discussed in Section 2.5.

Four of the OBD cables—the neoVI-OBD-1, neoVI-OBD-MULTI, neoVI-OBD-MULTI Right Angle, and neoVI FIRE/RED J1939—are connected to the DB-25 of the ION Ethernet Cable Adapter and then attach to an OBD port on a vehicle or network test bench. The fifth, the ION OBD Cable with DoIP Support, replaces the ION Ethernet Cable Adapter.

Basic Hardware Connection Diagram

Figure 46 shows the basic hardware configuration of the neoVI ION, with the USB cable connecting the device to the PC, and the ION Ethernet Cable Adapter and µDB-9 to DB-9 cables linking it to vehicle networks.

Figure 46: Basic ION Hardware Connection Diagram. This diagram shows basic connections with no OBD cable.

OBD Hardware Connection Diagram - neoVI-OBD-1 Cable

In Figure 47 you can see the basic hardware setup from Figure 46 but with the addition of the neoVI-OBD-1 cable.

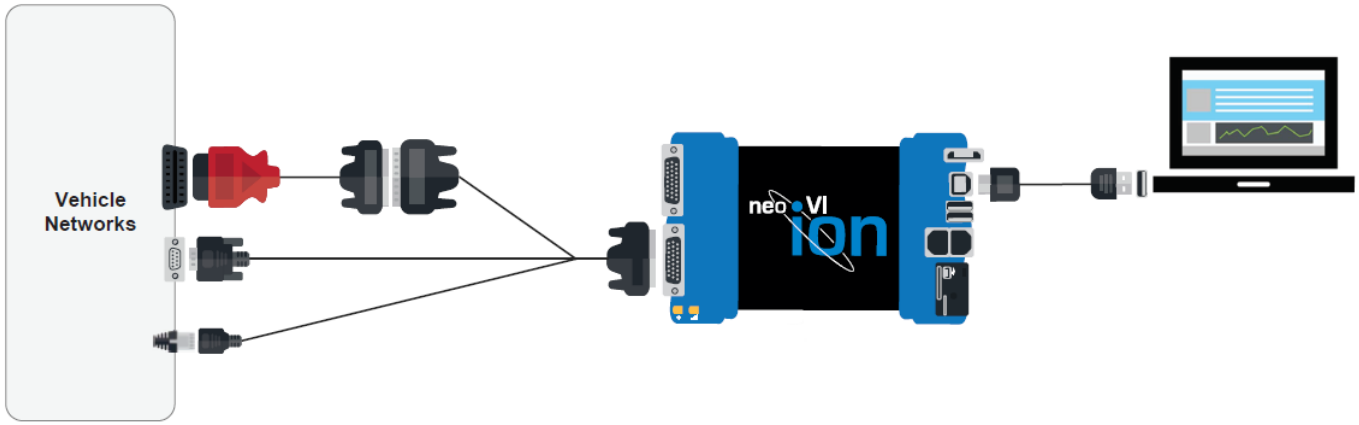


Figure 47: ION Hardware Connection Diagram with neoVI-OBD-1 Cable.

OBD Hardware Connection Diagram - neoVI-OBD-MULTI Cable

Figure 48 shows the hardware setup using the neoVI-OBD-MULTI cable.

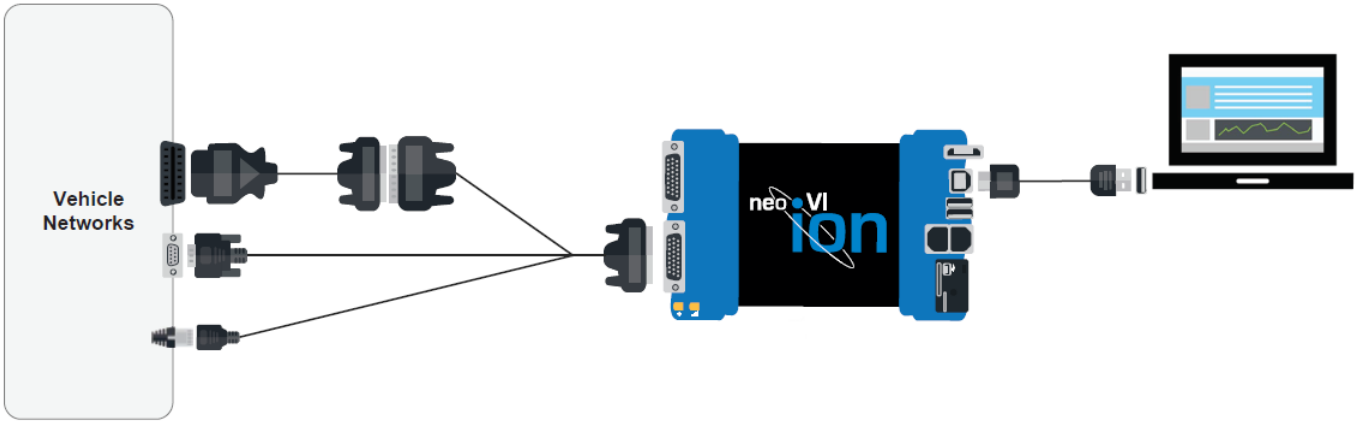


Figure 48: ION Hardware Connection Diagram with neoVI-OBD-MULTI Cable.

OBD Hardware Connection Diagram - neoVI-OBD-MULTI Right Angle Cable

The hardware setup for the neoVI-OBD-MULTI Right Angle cable is the same as that of the neoVI-OBD-MULTI, except the OBD connector is at a right angle to the cable for use where this is convenient (Figure 49).

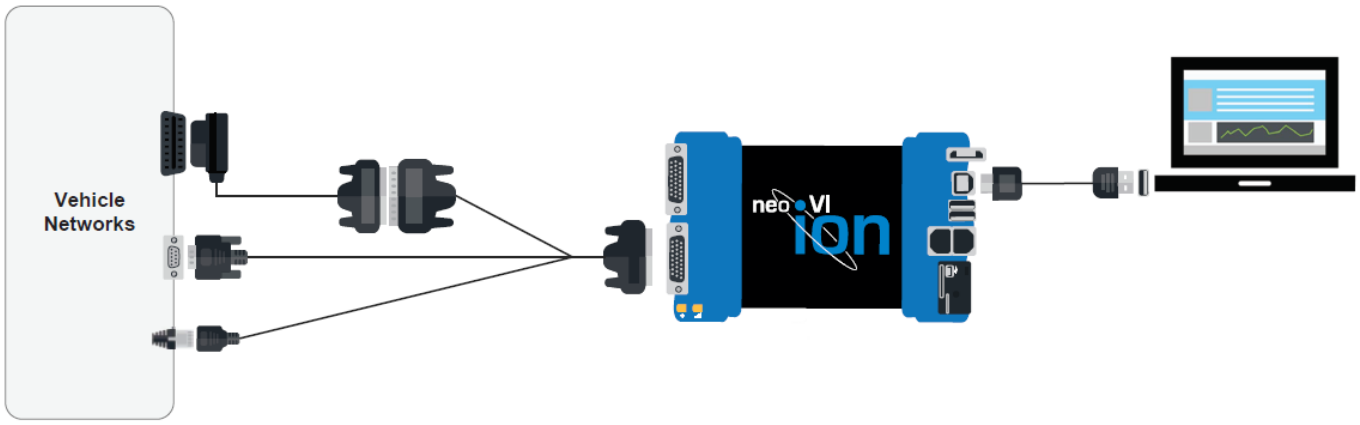


Figure 49: ION Hardware Connection Diagram with neoVI-OBD-MULTI Right Angle Cable.

OBD Hardware Connection Diagram - neoVI FIRE/RED J1939 Cable

Figure 50 shows the setup when using the neoVI FIRE/RED J1939 cable for OBD.

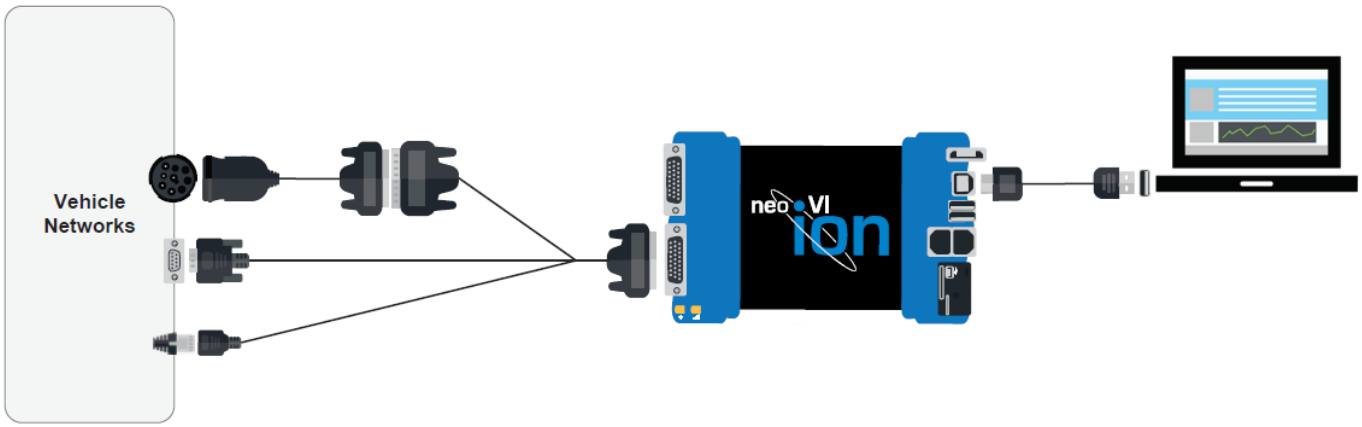


Figure 50: ION Hardware Connection Diagram with neoVI FIRE/RED J1939 Cable.

OBD Hardware Connection Diagram - ION OBD Cable with DoIP Support

The special ION OBD Cable with DoIP Support replaces the ION Ethernet Cable Adapter as shown in Figure 51.

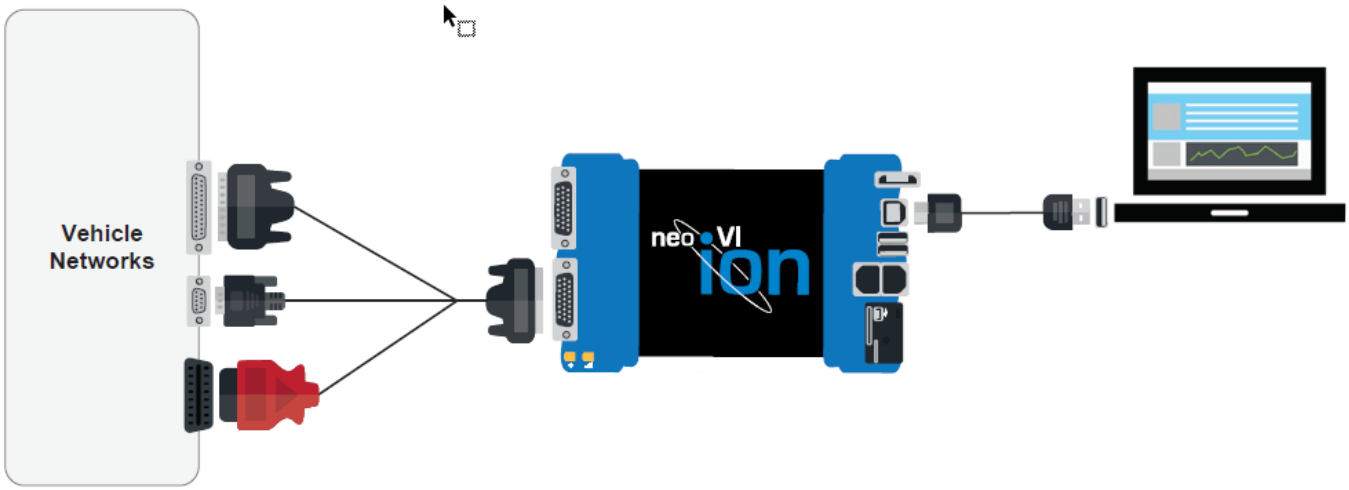


Figure 51: ION Hardware Connection Diagram with ION OBD Cable with DoIP Support.

3.4 Vehicle Network and Power Connections

Two connectors on the ION are used to attach it to vehicle networks. The HD-26 connector on the left side of the device provides primary power input to the neoVI ION and also carries most of the network channels. This is also where your OBD cable is attached, either directly or indirectly.

The connection steps are listed in a specific order chosen to make the process intuitive, and to prioritize the power connection so you can verify quickly that the ION is operational.

However, the steps can be performed in any order you find convenient.

HD-26 and OBD Cable Connections to ION

The connections made here will depend on which OBD cable, if any, you are using with the ION.

If you are using no OBD cable, or any OBD cable other than the ION OBD Cable with DoIP Support:

1. **Attach ION Ethernet Cable Adapter to HD-26 Connector:** Attach the HD-26 female connector on the network interface cable to the HD-26 male connector on the neoVI

ION(VNET 2 slot). Tighten the thumbscrews so the cable remains securely attached (Figure 52).

Figure 52: Connecting the HD-26 Cable Connector to the neoVI ION.

2. **Attach OBD Cable to DB-25 Connector on ION Ethernet Cable Adapter(OBD Use Only):** Connect the female DB-25 connector of your neoVI-OBD-1, neoVI-OBD-MULTI, neoVI-OBD-MULTI Right Angle or neoVI FIRE/RED J1939 cable to the male DB-25 of the ION Ethernet Cable Adapter (Figure 53).

Figure 53: Attaching the DB-25 Connector of an OBD Cable to the DB-25 on the ION Ethernet Cable Adapter.

3. **Attach DB-25, DB-9, RJ-45, J1939 and/or OBD-II Connectors to Vehicle Network:** Attach the connectors from the ION Ethernet Cable Adapter and your OBD cable (if using) to their mating halves on your network, then secure them in place.

As soon as you connect the device supplying power to the cable attached to the neoVI ION, the device should boot up. You will recognize this by green LEDs beginning to flash in a quick and regular pattern on both the side of the device next to the HD-26 connection, and in the upper left corner of the top membrane interface. If the LEDs do not start flashing, please see Chapter 8 for assistance.

3.5 PC Connection

Now we will connect the ION to the PC. This can be done either directly to a USB 2.0 (or higher) port on the computer, or indirectly through a USB hub.

The neoVI ION can draw up to the USB standard maximum of 500 mA through its USB connection. All computers should be able to supply this amount of current, however, unpowered USB hubs may not be able to do so, especially if they have multiple devices

connected to them. If you experience difficulties with the ION when using an unpowered hub port, but the device works when connected directly to a PC USB slot, you probably need to use the PC slot or a powered hub.

1. **Attach USB "B" Connector to ION:** Insert the square "B" connector on the supplied USB cable into the matching receptacle on the right side of the ION (Figure 55).

Figure 55: Connecting the USB Cable to the neoVI ION.

2. **Attach USB "A" Connector to PC or USB Hub:** Attach the standard rectangular USB connector to your PC or USB hub.

Upon making the USB connection, you may notice messages within Windows informing you that drivers are being installed. These were in fact actually installed when you ran Vehicle Spy or the API installation utility, but are configured the first time the device is attached. If you see error messages associated with drivers at this point, please contact Intrepid for assistance.

4 Device Configuration

Your neoVI ION ships from the factory ready to use with its default settings. However, its operation can also be customized to your exact needs by adjusting dozens of parameters that control its internal hardware and firmware. In this chapter, we'll show you how to manage and fine-tune your neoVI ION, including enabling and disabling networks, adjusting baud rates, turning on or off specific features, and much more.

4.1 Starting and Using neoVI Explorer

The *neoVI Explorer* utility allows you to connect to, manage and configure all of your Intrepid Control Systems hardware, including the neoVI ION. It is supplied both as an integrated feature of Vehicle Spy, and as a standalone program.

This section will describe general features and the basics of using neoVI Explorer, so you will understand the utility well when we get into settings specific to the ION.

Starting neoVI Explorer from within Vehicle Spy

There are several ways to open neoVI Explorer from within VSpy. These are probably the two easiest, since they are accessible at all times:

- **Menu Item:** Click the *Setup* menu and then select *Hardware*.
- **Hardware Setup Button:** Click the button located in the main Vehicle Spy toolbar just under its menu (Figure 56).

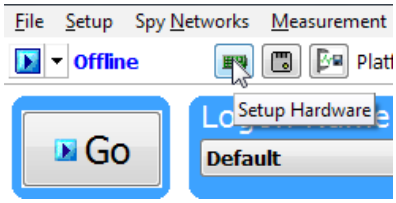


Figure 56: Starting neoVI Explorer from within Vehicle Spy.

Note that you cannot start neoVI Explorer when Vehicle Spy is online (even if in simulation mode). If you attempt to do so, VSpy will prompt you to either go offline and launch neoVI Explorer, or remain online and return to Vehicle Spy.

Starting neoVI Explorer as a Standalone Program (with Vehicle Spy Installed)

If you want to work with your neoVI ION without opening Vehicle Spy, you can launch neoVI Explorer directly. Open the Start Menu, navigate to the *IntrepidCS* folder, then under the *Vehicle Spy 3* subfolder, select *neoVI Explorer* (Figure 57).

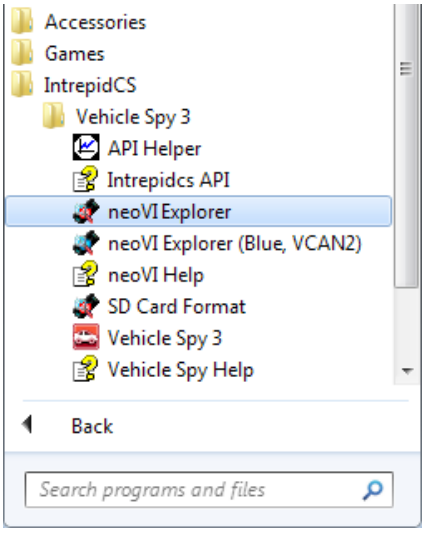


Figure 57: Starting neoVI Explorer Directly with Vehicle Spy 3 Installed.

Starting neoVI Explorer as a Standalone Program (API Kit Installed)

If you installed the API kit and support files instead of Vehicle Spy, you can run neoVI Explorer from the Start Menu using the same basic process as described above. The only difference is the name of the subfolder, so you will navigate to the *IntrepidCS* folder, then open the *ICS API Install Kit* subfolder, and finally select *neoVI Explorer* (Figure 58).

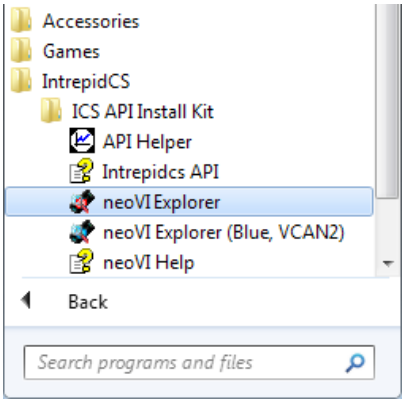


Figure 58: Starting neoVI Explorer as a Standalone Program from the API Kit.

Connecting to the ION

When neoVI Explorer loads, it will start up with the first hardware device it can find selected in the menu pane on the left. You should see your neoVI ION listed here, along with its serial number. If you don't see the ION, but do see other Intrepid devices, be sure to scroll down to look for it. If it is still not visible, either its drivers have not been installed correctly or it is not powered properly; please refer to Chapter 7 for assistance.

To manage your ION, click on its entry in the navigation pane (if it is not already highlighted) and then press the *Connect* button. After successfully connecting to the device, you will see

a "thumbs up" icon next to the device's name, and checkmarks will appear next to currently-enabled networks in the explorer area on the left. You should also see a message in the message box on the right saying neoVI ION CYxxxx settings have been read. This tells you that neoVI Explorer has loaded the current settings from the ION. The information in the upper right-hand part of the window is device-specific and described in Section 4.2. The screen as a whole should appear similar to that shown in Figure 59 (but note that the version number shown at the bottom may be different).

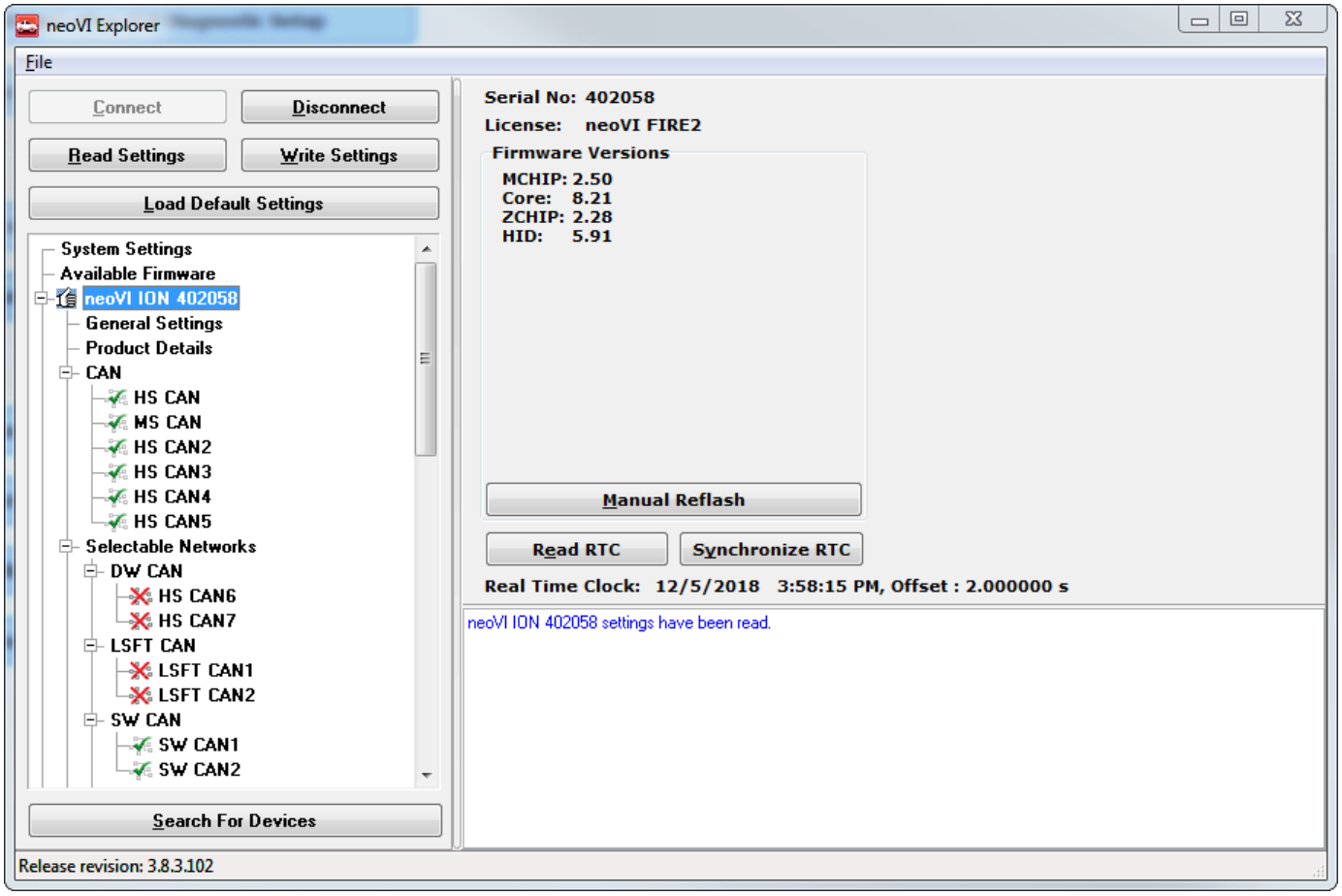


Figure 59: Typical neoVI Explorer Window After Initial Connection to the neoVI ION.

Note: It is possible to click on various parameter groups at any time, but they will not show valid data until you connect to the device. Remember also to connect to the device before making changes, or those alterations will be erased when you do connect and the settings in the hardware are loaded.

Writing and Reloading Settings

To avoid potential problems, neoVI Explorer will not save any changes to device parameters until you instruct it to do so. This is done by pressing the *Write Settings* button, which will update the parameters within the firmware in your ION. If you make changes you do not want to keep, pressing the *Read Settings* button will reload the settings stored in the device, wiping out any modifications made in neoVI Explorer that had not yet been saved.

Reloading Device Defaults

To return all settings to factory defaults, press the *Load Defaults* button. This is convenient if many changes have been made and written to the firmware in the past, and you want to start over with a clean slate.

Note that pressing this button actually writes the defaults to the device first, and then reloads them automatically, so you do not need to also press *Write Settings*. You will see messages in the message area telling you that defaults have been sent to the device and then read from it.

Disconnecting from the ION

Press the *Disconnect* button to tell neoVI Explorer that you are done working with the neoVI ION. This step is optional, because neoVI Explorer will disconnect from any connected devices when you exit the program.

Searching for Devices

If you attach new hardware to your PC after starting neoVI Explorer, press the '*Search For Devices'* button at the bottom left of the dialog box to prompt the program to scan for new hardware you can manage.

Exiting neoVI Explorer

Like any Windows program, you can close neoVI Explorer by clicking the "X" in the top right corner or pressing the Alt+F4 key combination.

4.2 System Settings and Firmware Updates

The top two entries in the explorer window on the left side of neoVI Explorer contain system-wide settings that apply to all hardware devices, and information related to firmware updates.

System Settings

Click here, and in the right-hand pane you will see four settings that you can enable or disable (Figure 60):

- **Enable Server:** Turns on the neoVI Server feature, a background program that allows your hardware to be used by multiple applications at the same time.
- **Enable Low Latency:** This is an advanced setting for applications where fast response is needed after transmission.
- **Enable Slave VNET Settings:** This setting is used for the ION VNet module used with a neoVI Plasma or Ion, and can be ignored for the neoVI ION.
- **Enable Auto Update:** When enabled, both neoVI Explorer and Vehicle Spy will automatically update firmware. If this box is not checked, firmware must be updated manually. (See below for details.)

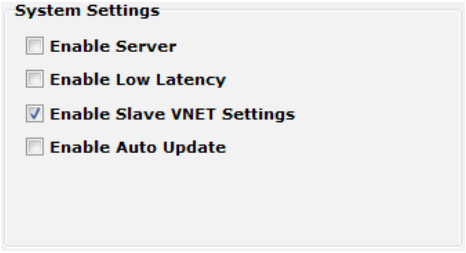


Figure 60: neoVI Explorer System Settings Pane

Available Firmware

This is an informational page that shows which firmware versions are available in this version of neoVI Explorer for various Intrepid products. Some devices have multiple firmware programs that control different aspects of their operation; in the case of the ION, these are called *MCHIP, Core, HID* and *ZCHIP*.

You normally won't need to look in this area, because as we'll see in Section 4.3, neoVI Explorer shows you the current and available firmware versions for your ION when you connect to it.

Updating Firmware

New versions of firmware are created regularly by Intrepid's engineers to implement new features and correct problems that have been identified.

If you have *Enable Auto Update* on—which is the default and is recommended—then you don't really need to worry about firmware updates. Each time you connect to your neoVI ION in neoVI Explorer or go online with it in Vehicle Spy, the firmware will be checked, and if a newer version is available, the device will immediately be updated. You will see dialog boxes on the screen showing you the progress of this operation, which takes approximately 60 seconds; an example is shown in Figure 61.

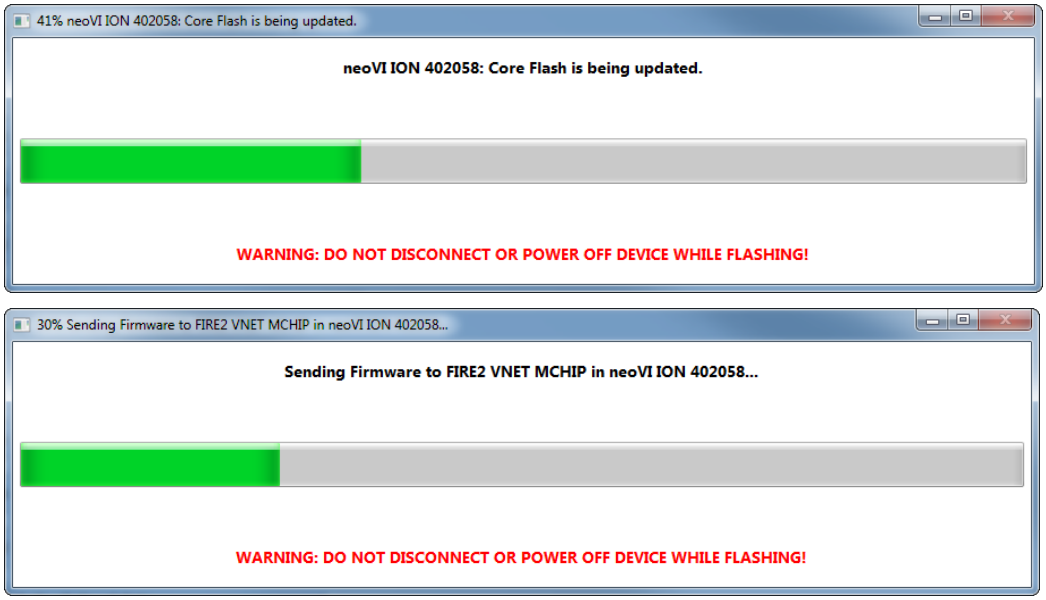


Figure 61: Firmware Download Message Box.

If you do not have automatic updates enabled, you control when your firmware is updated. When new firmware is available, you will be notified on the initial connection screen, as shown in Figure 62. Simply press the *Manual Reflash* button to update the firmware. Again, you will see messages as both the CCHIP and MCHIP firmware programs are sent to the device,

and a message will appear in the message box on the right to tell you that the process has completed.

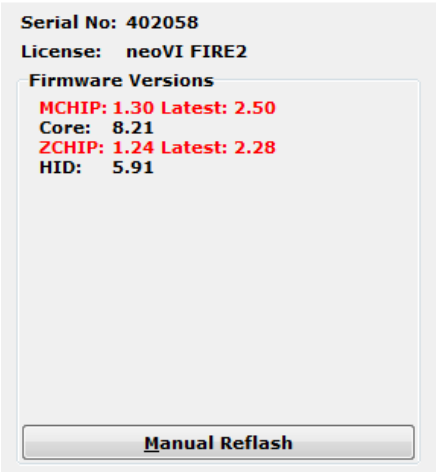


Figure 62: neoVI Explorer Firmware Message Box and Manual Reflash Button.

Note that while firmware updates are in progress, the device will be in bootloader mode, indicated by a "three times LED2 and one LED1" LED flash sequence. This will stop when the update is complete. Also, even if only one of the firmware components has a new version, both will be updated to ensure internal consistency in the ION.

4.3 General Settings and Product Details

These two areas of the neoVI ION's parameter setup provide information about the device and allow you to perform a few basic maintenance tasks.

General Settings

After connecting to the device you will see basic information about it in the right-hand pane of the window (Figure 63):

- The device's serial number.
- The firmware versions currently in the device, and an indication if new firmware is available.
- A message showing that the hardware license for the device was recognized.
- A current readout of the ION's real-time clock.

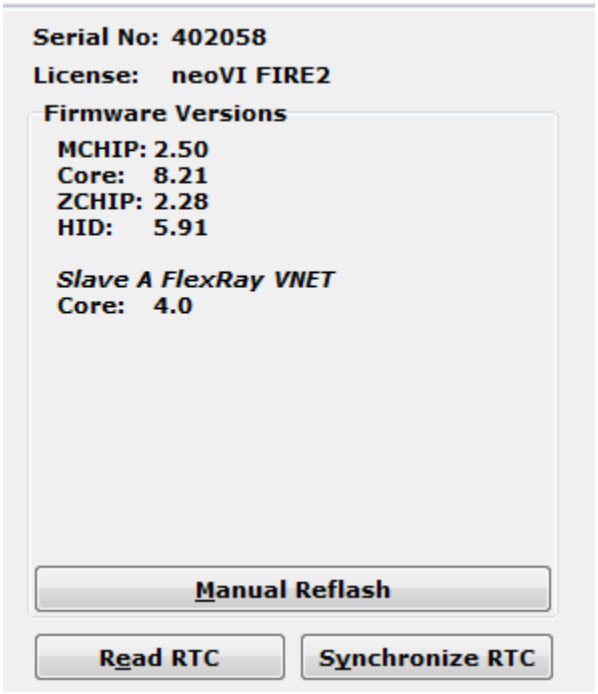


Figure 63: neoVI Explorer neoVI ION General Settings

This information can be displayed again at any time by clicking the ION's name in the explorer navigation window, or the *General Settings* entry immediately below it.

The versions of the MCHIP and CCHIP firmware for the ION will each be shown in black if they match the firmware versions within neoVI Explorer. If they do not, the current version and the newest available version will be shown in red to help you notice that an update is available, as seen in Figure 62. Section 4.2 provides more information on firmware updates.

There are four buttons on this screen. Two of them, *Load Defaults* and *Manual Reflash*, were described in Section 4.2. The *Read RTC* button will reload the device's internal time clock, while *Synchronize RTC* will set the device's clock to the same value as that of the PC.

Product Details

This is an informational area that provides technical data on the ION's hardware and internal setup. You will generally only need this if requested by Intrepid in order to facilitate support or troubleshooting. You can use the *Copy To Clipboard* button to copy all of the information to the Windows Clipboard, so you can then paste it into an email or file.

4.4 Standard CAN Networks (HS CAN 1-5 and MS CAN)

This area of neoVI Explorer is used to enable, disable and configure the six standard dual wire CAN networks in the ION: High Speed CAN channels 1 to 5 (HS CAN and HS CAN2-5) and the Medium Speed CAN channel (MS CAN). Each channel has an entry under the "CAN" group (which cannot be clicked itself). The current status of each channel is shown next to

its name; a green checkmark indicates that the channel is enabled, while a red X means it is disabled. Figure 64 shows an example of the CAN channels area, with MS CAN and HS CAN4 currently disabled, and the other channels enabled.

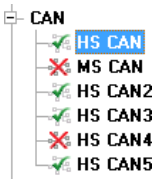


Figure 64: neoVI Explorer CAN Group.

All six of these channels have the same parameters, which can be configured using the controls in the right-hand pane; the default settings are shown in Figure 65.

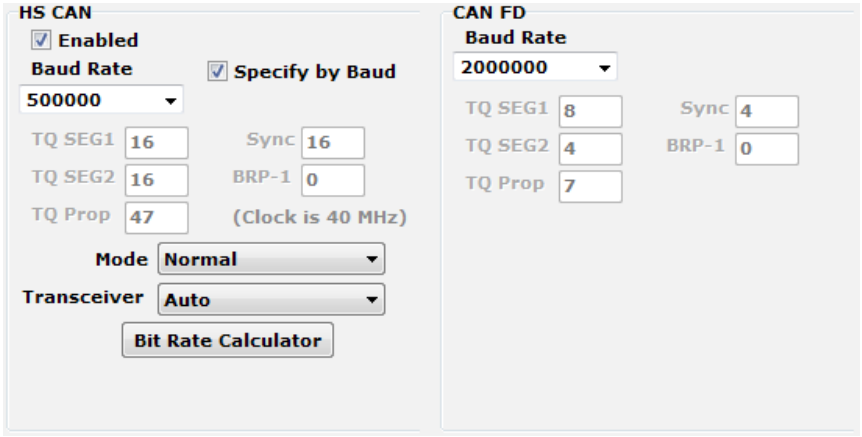


Figure 65: neoVI Explorer Standard CAN Parameters with Default Settings.

Enabled

Place a checkmark in this box to enable the channel or clear the checkmark to disable it. When disabled, all the other parameter controls are disabled (grayed out).

Specify by Baud

This is a master control that determines whether the operation of the channel is controlled by a numeric baud rate or is calculated from lower-level timing parameters. When checked, the *Baud Rate* and *CAN FD Baud Rate* drop-down boxes are enabled and the various *TQ*, *Sync* and *BRP-1* entries are disabled. When unchecked, this is reversed.

Specifying by baud rate is the default and is recommended except for advanced users with special requirements.

Baud Rate

When *Specify by Baud* is selected, choose a baud rate for the channel from the drop-down box below. The default value is 500000.

CAN Timing Settings

When *Specify by Baud* is deselected, the operation of the CAN channel is based on these five settings: *TQ SEG1*, *TQ SEG2*, *TQ Prop*, *Sync*, *BRP-1*. These settings are for advanced users and normally should be left at their default values.

CAN FD Baud Rate

When *Specify by Baud* is selected, choose a baud rate for the data phase of CAN FD messages. The default value is 2000000.

CAN FD Timing Settings

When *Specify by Baud* is deselected, use these settings (*TQ SEG1*, *TQ SEG2*, *TQ Prop*, *Sync*, *BRP-1*) for the data phase of CAN FD messages. These parameters are for advanced users and normally should be left at their default values.

Mode

The operating mode of the channel; choose from one of these four options:

- **Normal:** Normal operation (default).
- **Disable:** Channel is disabled.
- **Listen Only:** This channel only receives messages, with no transmissions, and also no error frames generated nor acknowledgments sent.

Transceiver

The operating mode of the CAN transceiver:

- **Auto:** The transceiver is automatically controlled by the CAN logic for the channel (default).
- **Enabled:** The transceiver is always enabled.
- **Disabled:** The transceiver is disabled.

Bit Rate Calculator

Press this button to launch the Intrepid Bit Timing Calculator.

4.5 Selectable CAN Networks

The 7th and 8th of the ION's CAN channels are user-selectable: they can be set as additional High Speed (dual wire) CAN channels (HS CAN6 and HS CAN7), as Low Speed Fault Tolerant CAN channels (LSFT CAN and LSFT CAN 2), or as Single Wire CAN channels (SW CAN and SW CAN 2). Both channels must be set to the same mode (so you cannot have HS CAN6 and SW CAN at the same time, for example). The selectable CAN channel group in neoVI Explorer can be seen in Figure 66.

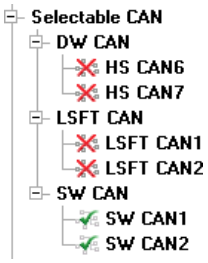


Figure 66: neoVI Explorer Selectable CAN Group.

Selectable CAN Mode

The master control for these channels can be found by clicking on *Selectable CAN*. On the right side you will find a drop-down box; choose *DWCAN*, *LSFTCAN* or *SWCAN* depending on which CAN variant you want for these two channels (Figure 67). SWCAN is the default.

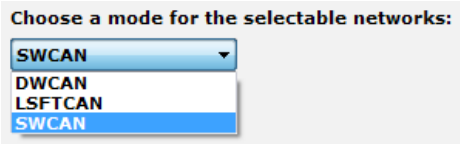


Figure 67: neoVI Explorer Selectable CAN Mode Control

Based on your selection, neoVI Explorer will automatically enable the corresponding two channels in this group and disable the other four. You can manually override the enabled channels if, for example, you only want one of the two. You cannot, however, override the disabled channels, as they are physically disconnected within the device when your selection is made. (If you listen closely after changing the selection here and clicking *Write Settings*, you may even hear a relay click as the change is made in the hardware.)

DW CAN (HS CAN 6 / HS CAN 7)

When *DWCAN* is selected, two additional High Speed CAN channels are turned on. Their parameters are identical to the six standard CAN channels described in Section 4.4, and are configured in the same way.

LSFT CAN (LSFT CAN / LSFT CAN 2)

When *LSFTCAN* is selected these two channels are enabled. They have the same basic settings as the standard CAN channels (Figure 68), except that there are no CAN FD settings (since CAN FD is not supported on LSFT CAN). The default baud rate for LSFT CAN channels is 125000.

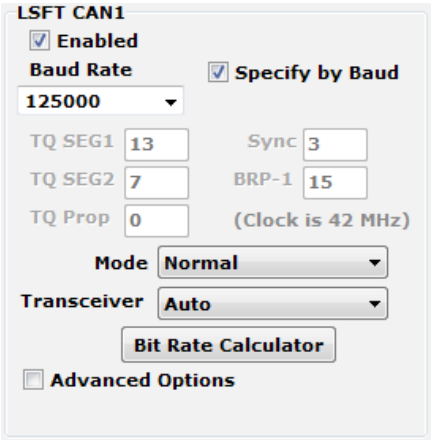


Figure 68: neoVI Explorer LSFT CAN Parameters with Default Settings

SW CAN (SW CAN / SW CAN 2)

With *SWCAN* chosen under *Selectable CAN*, the Single Wire CAN channels are enabled. These have the same settings as the standard CAN channels, with the following changes (Figure 69):

- No CAN FD section (CAN FD is not supported on these channels).
- The *Transceiver* drop-down box has additional options: *High Voltage* and *High Speed*.
- The *High Speed Auto Switch* option tells the channel to switch to high speed mode upon receipt of a specific message.
- The default baud rate is 33333.

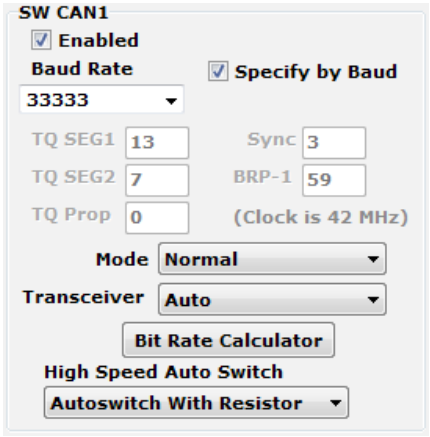


Figure 69: neoVI Explorer SW CAN Parameters with Default Settings.

4.6 LIN Networks (LIN1 to LIN4)

This section of the ION explorer tree allows you to enable, disable and configure its four LIN channels, LIN1 to LIN4. Each channel has an entry under the "LIN" group (Figure 70). As with the CAN channels, a green checkmark indicates that a particular channel is enabled, while a red X means it is disabled.

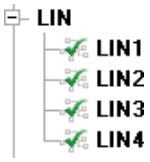


Figure 70: neoVI Explorer LIN Group.

All of these channels have the same parameters, which can be seen in Figure 71. In this image we have selected the *Advanced Options* checkbox to display its options (described below).

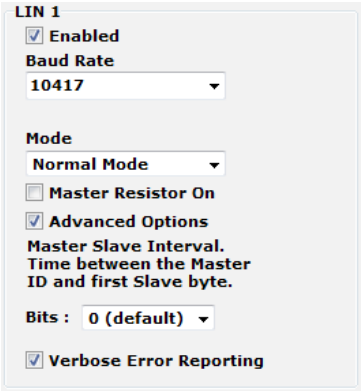


Figure 71: neoVI Explorer LIN Parameters, with Default Settings and Advanced Options Displayed.

Enabled

Place a checkmark in this box to enable the channel or clear the checkmark to disable it. When disabled, all the other parameter controls are disabled (grayed out).

Baud Rate

Select a baud rate for the channel; the default is 10417.

Mode

This option is currently not used and should be left at the default of "Normal Mode".

Master Resistor On

Enable this option for the neoVI ION to act as the master on the specified LIN bus.

Advanced Options

Click this checkbox to reveal two additional options:

- **Master Slave Interval:** The time between the master ID and the first slave byte, in bits (default 0).
- **Verbose Error Reporting:** When checked, break errors and other error messages from the LIN driver are displayed.

4.7 Other Parameters

In addition to the network-specific parameters described above, there are a number of additional option sets that you can use to tailor the operation of your ION (Figure 74).

Figure 74: neoVI Explorer Additional Parameter Groups.

ISO 15765-2

This page contains one setting: *IFS Shift Register* (Figure 75). Changing this from its default value of 0 causes time to be added to the Inner Frame Spacing of USDT frames transmitted by CoreMini scripts running in the ION. The number entered is multiplied by 6.4 µs to determine the time offset. The allowed range is -1563 to 1563.

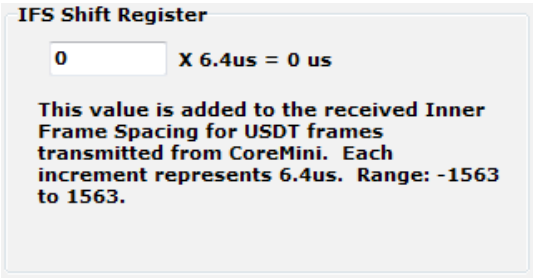


Figure 75: neoVI Explorer IFS Shift Register Parameter for ISO 15765-2.

Text API

These parameters control the operation of the textAPI that can be used to operate the neoVI ION using third party software. Please contact Intrepid if you require assistance with using the API.

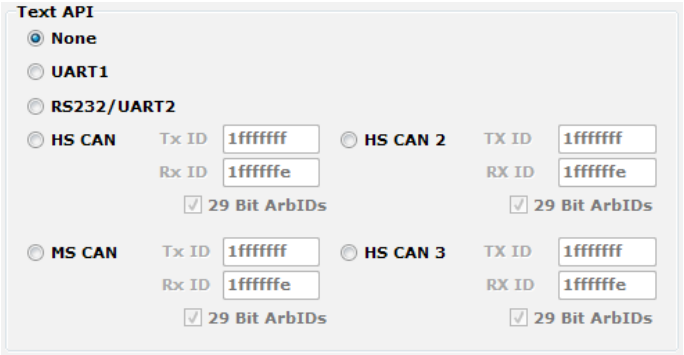


Figure 76: neoVI Explorer Text API Parameters.

Network Enables

This area provides more options for controlling the enabling and disabling of individual networks within the ION (Figure 77). The main display contains a scrollable list with checkboxes that can be set or unset to enable or disable each network. These are equivalent to the Enable checkboxes found in the parameter areas for the corresponding networks.

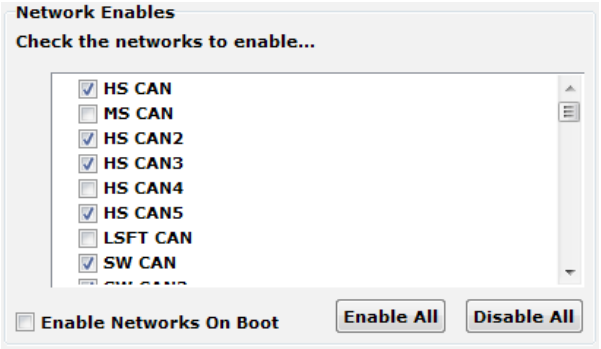


Figure 77: neoVI Explorer Network Enable/Disable Parameters.

Enable Networks on Boot

Normally, the neoVI ION will not acknowledge messages on a network unless it is online with that network or running a CoreMini script. When this option is enabled, the device always acknowledges frames on all enabled networks.

Enable All

Enables all networks. Note that this may include enabling networks that are mutually exclusive (such as SW CAN and LSFT CAN). If you use this option, be sure to disable networks that should be off, so the device remains in a valid configuration.

Disable All

Disables all networks.

Performance Tests / USB Performance

Under *Performance Tests* is a single area called *USB Performance*. Here you will find a test to check the performance of the ION's USB connection (Figure 78). When *Enable Performance Blast Test* is checked, the ION sends high-speed traffic over the USB connection to the PC.

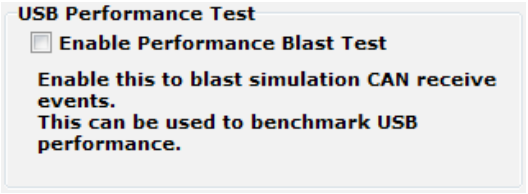


Figure 78: neoVI Explorer USB Performance Test.

4.8 Insert SIM card in neoVI ION

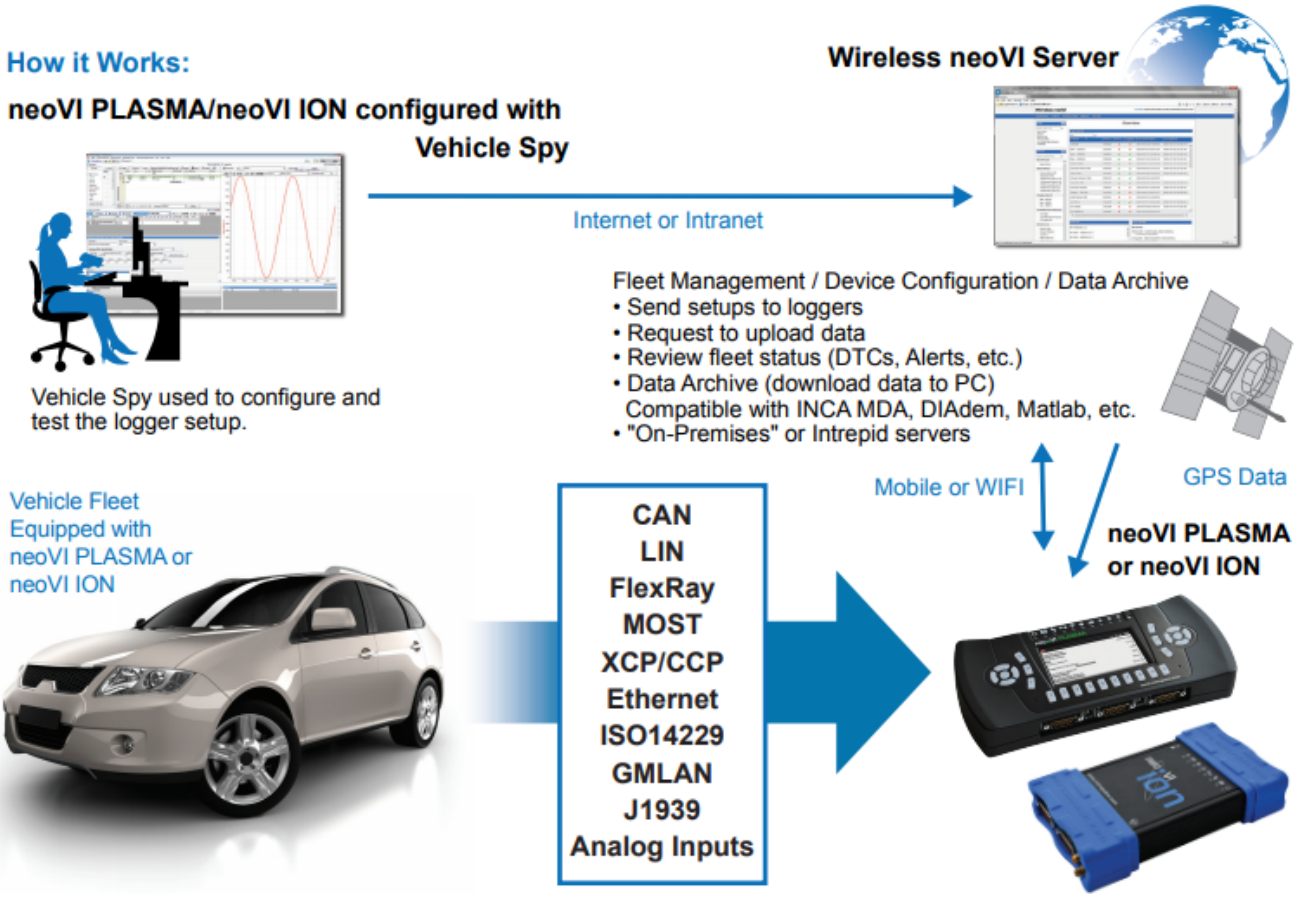
Slot for a small card that identifies the device on a cellular network. To insert the SIM card, the non-notched side goes in first with the contacts facing down towards the SD card slot. Push the card in with gentle taps to avoid damaging the pins. The card does not click.

Insert a picture for ION with SIM Card inserted.

5 Wireless neoVI Connection

Wireless neoVI (often abbreviated as *WIVI*)is the website and server software package that manages automatic and manual remote download, control, and monitoring of data. Its carefully designed user interface makes interacting with your logger fleet straightforward and intuitive.

https://www.intrepidcs.com/products/software/wireless-neovi/



5.1 Connecting to neoVI ION

The initial step to configure your logger is to connect to WIVI. Settings for ION can be accessed by the following ways.

VNC client in VSpy

VNC client gives access to the android in the ION. Figures below will direct you to connect to ION.

- Make sure your neoVI ION is powered and USB is plugged into your Laptop.
- You have already installed VSpy on your laptop as directed in section 3.1.

- Once you launch VSPY you should see the neoVI ION detected on the Logon Screen at the bottom as shown in Fig. 65

Fig. 65 neoVI ION detected in VSPY as displayed on the Logon Screen

- Follow steps in the Fig. to connect to VNC

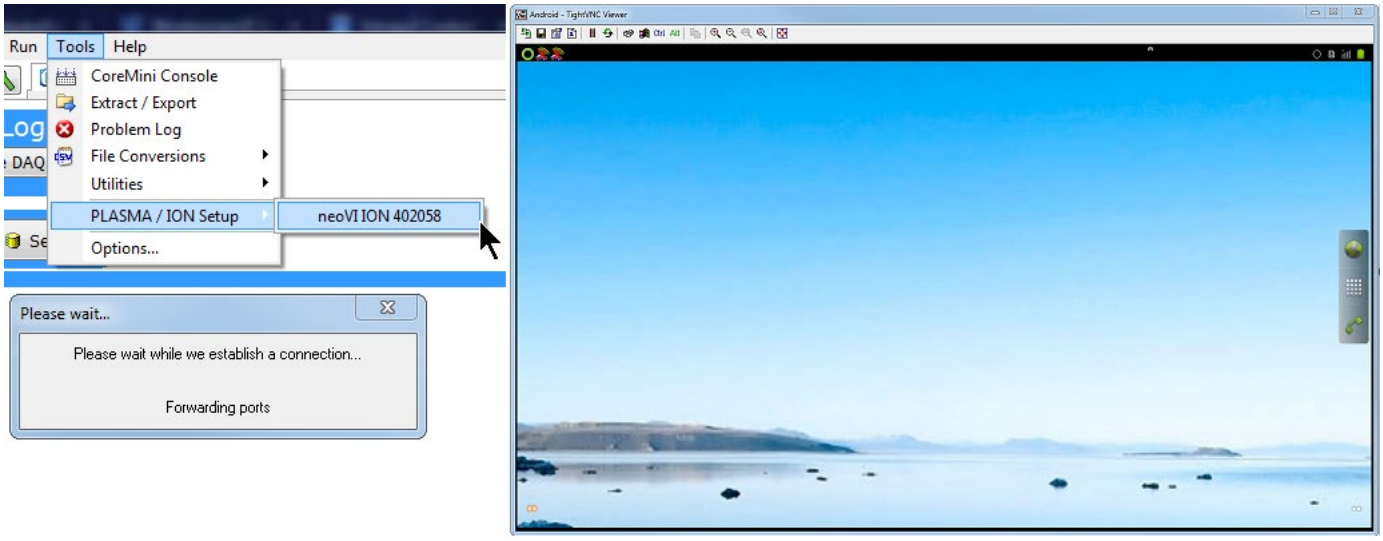


Fig. 66 Steps for connecting to neoVI ION via VNC viewer

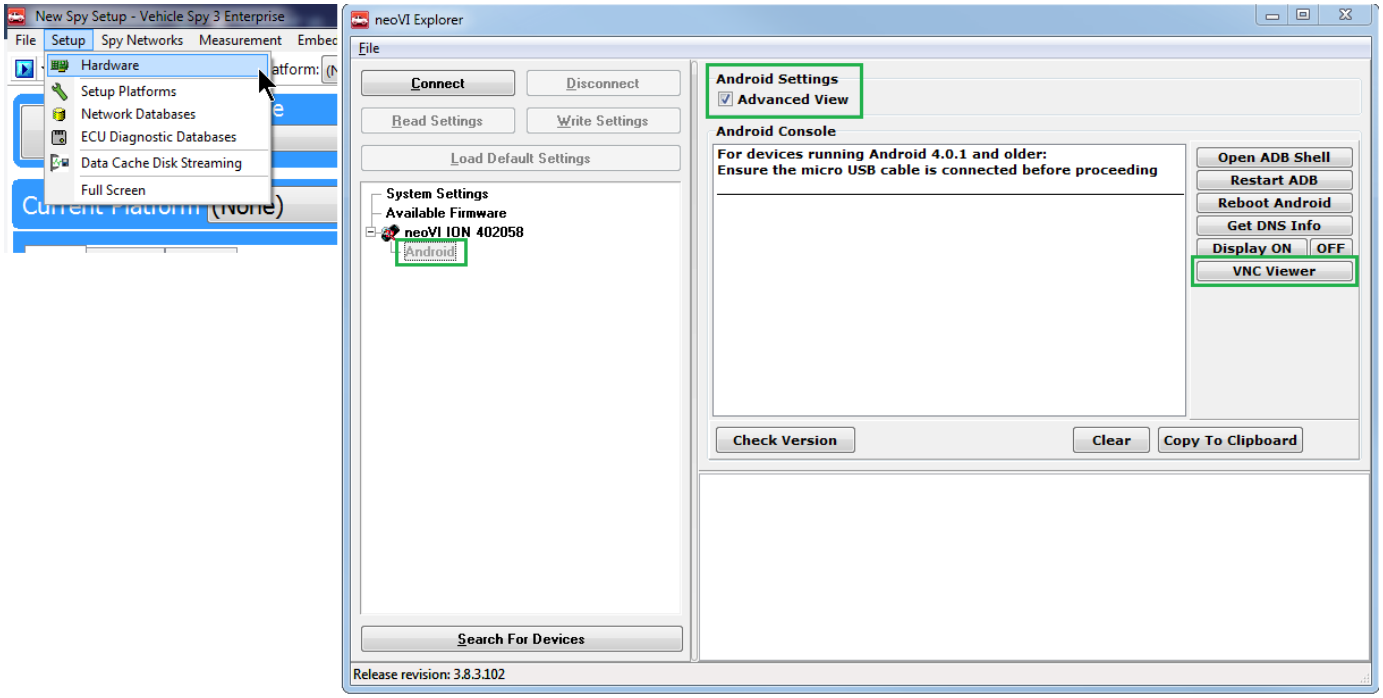
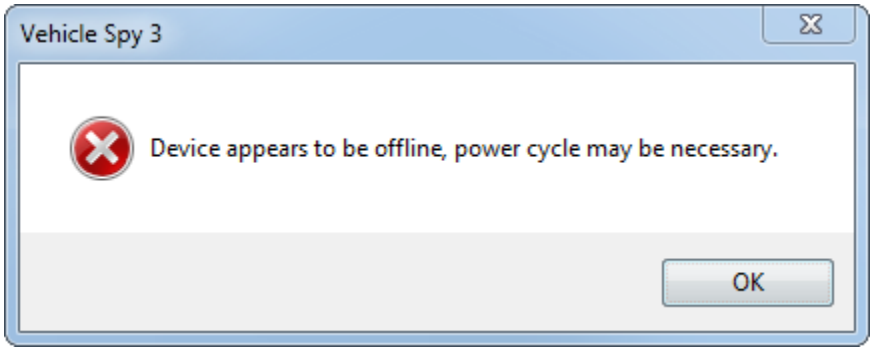


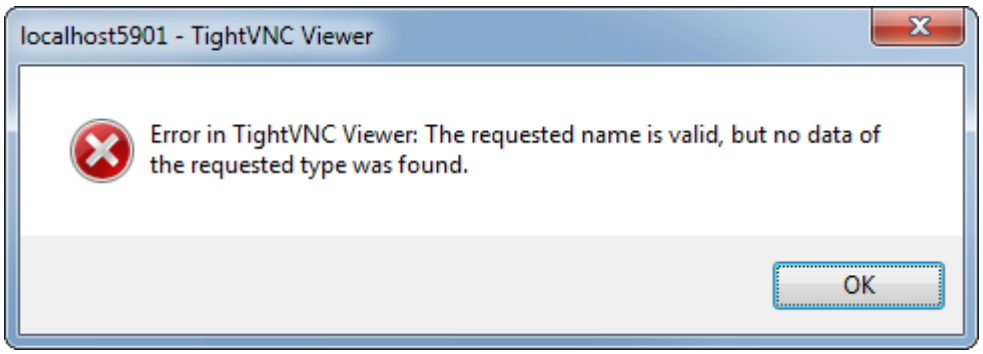
Fig. 67 Alternate way to establish the VNC connection to the neoVI ION

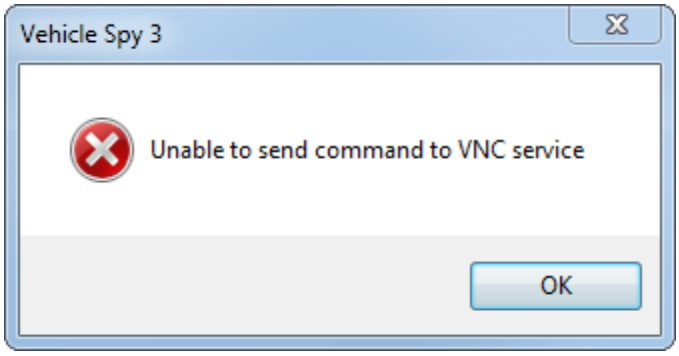
- Further settings are in section 5.3

Unable to connect to VNC

If the VNC connection fails and you can follow the actions mentioned in the error windows.

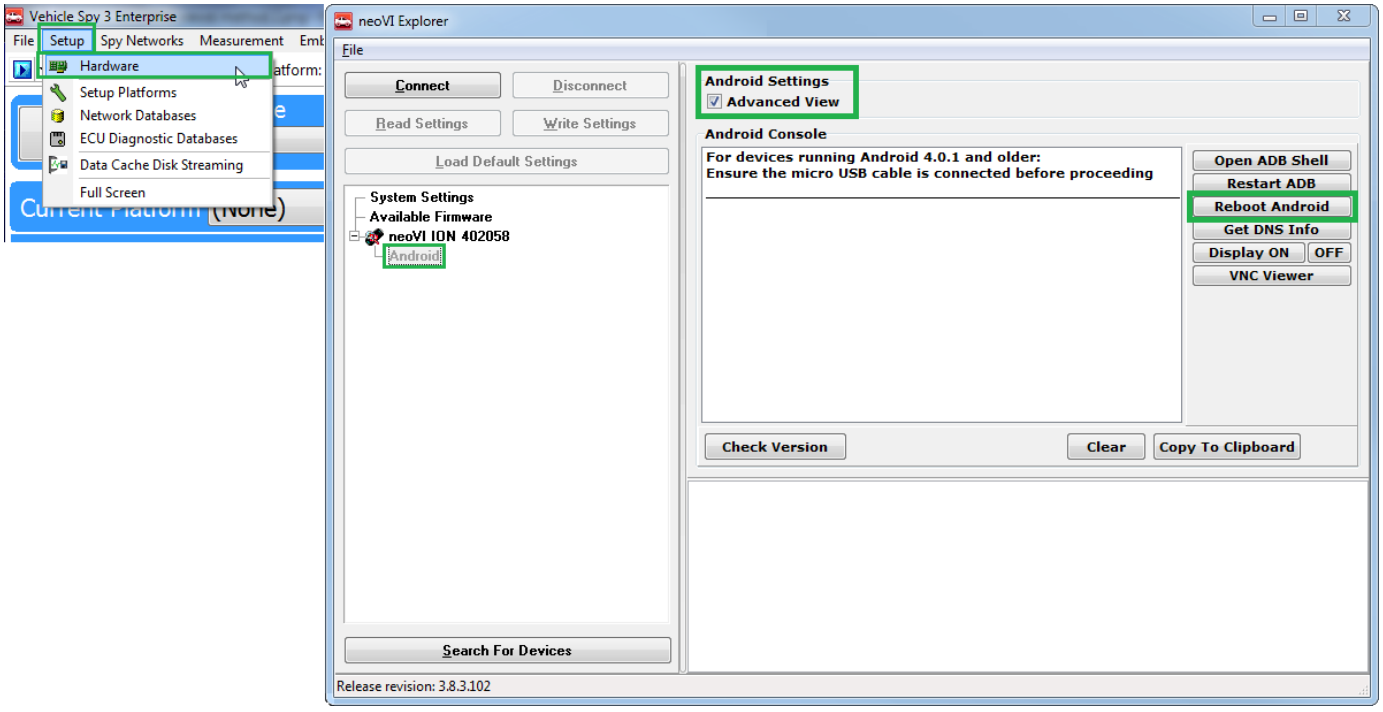




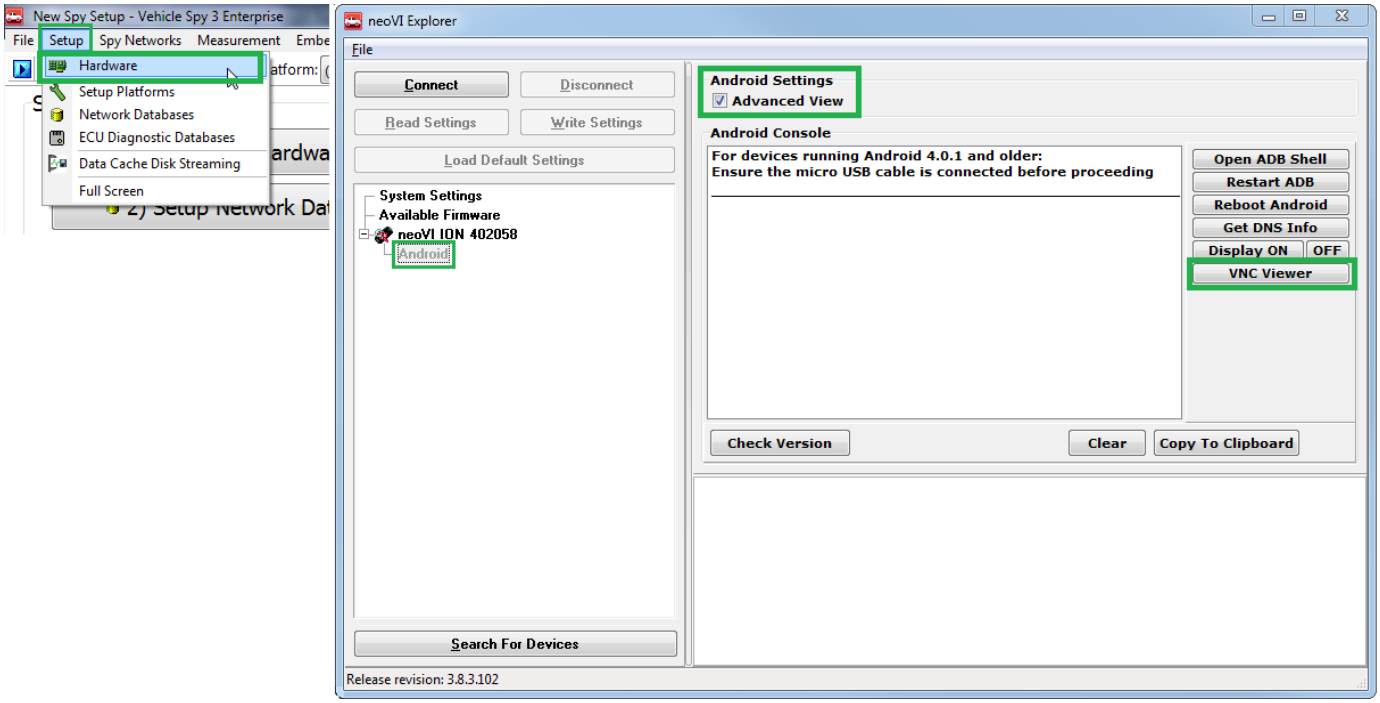


In case of the Unable to connect, Rebooting Android for neoVI ION will help.

The snapshot below will guide you through the settings. Once the Android Reboot is requested, Wait for 2 mins before requesting a VNC connection.



The Android will take a couple of mins to boot up. You can retry the VNC connection once the android is booted.



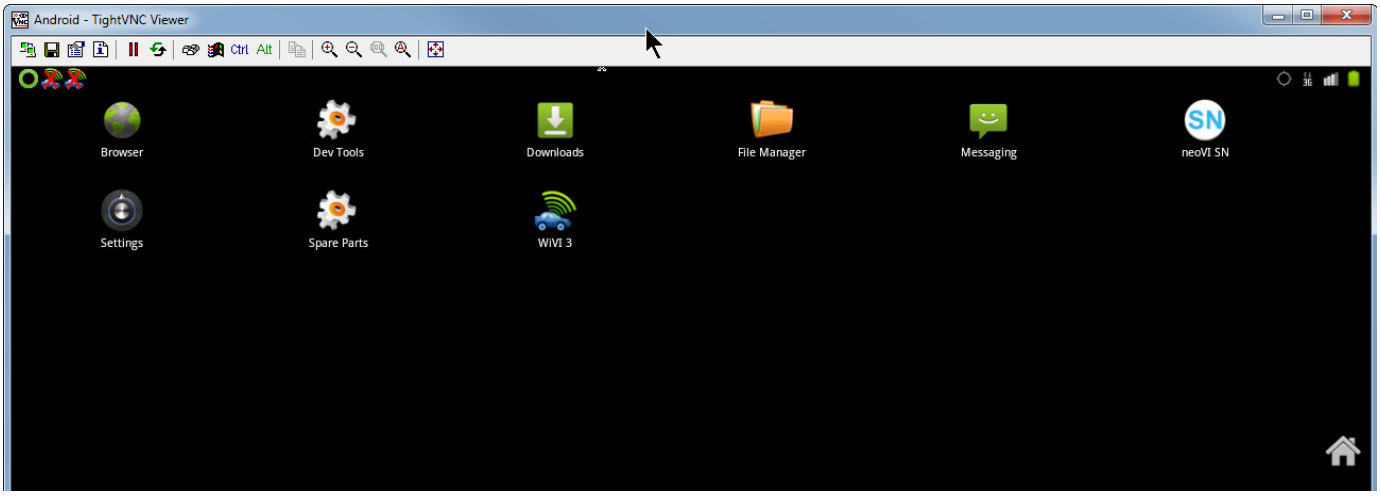
Monitor with HDMI, Keyboard and Mouse

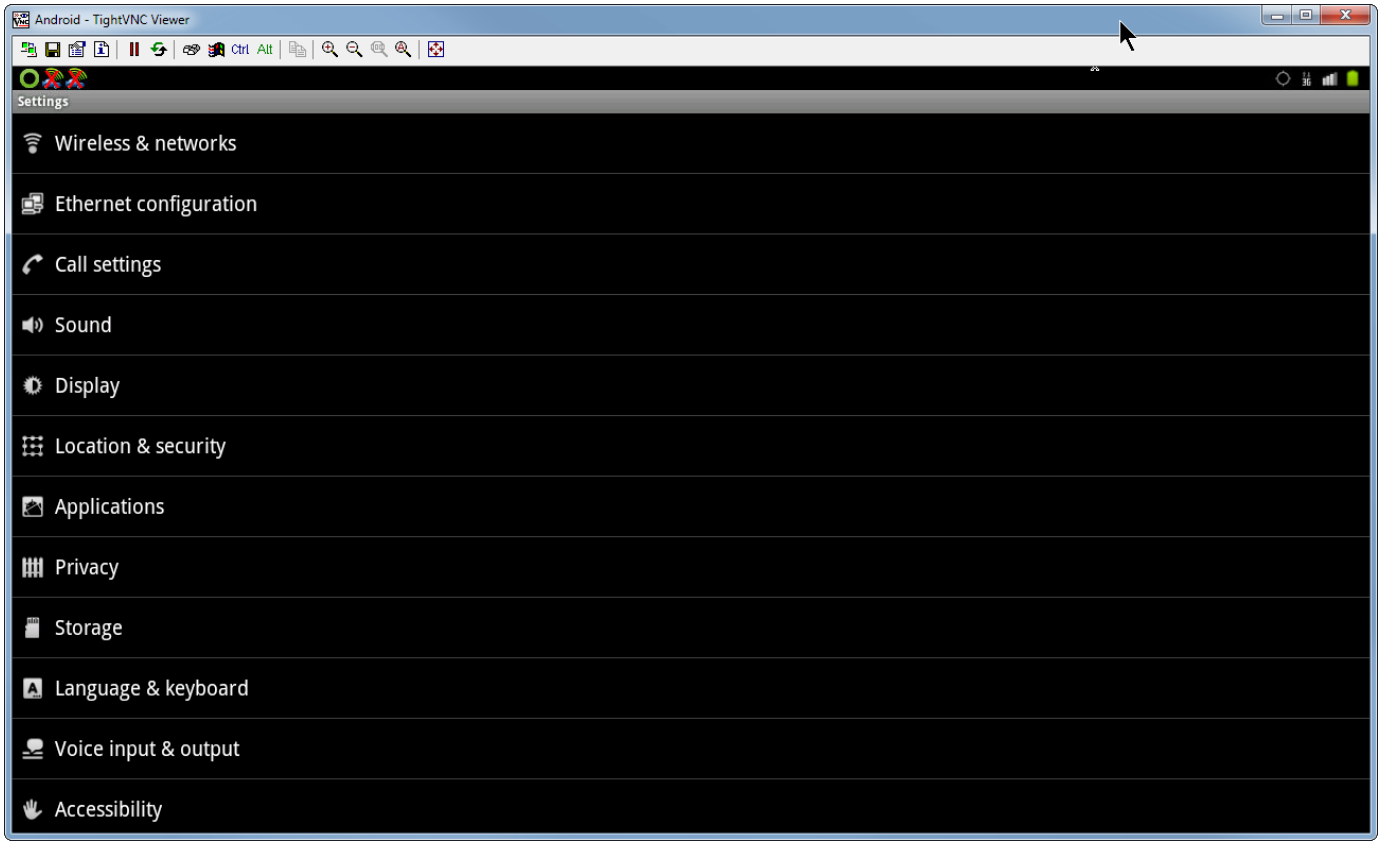
You can connect to the ION with a monitor via its HDMI port. Connect a keyboard and a mouse to the USB A port of your neoVI ION. Figures below will direct you to connect to ION.

Insert a picture with neoVI ION connected to monitor, keyboard and mouse

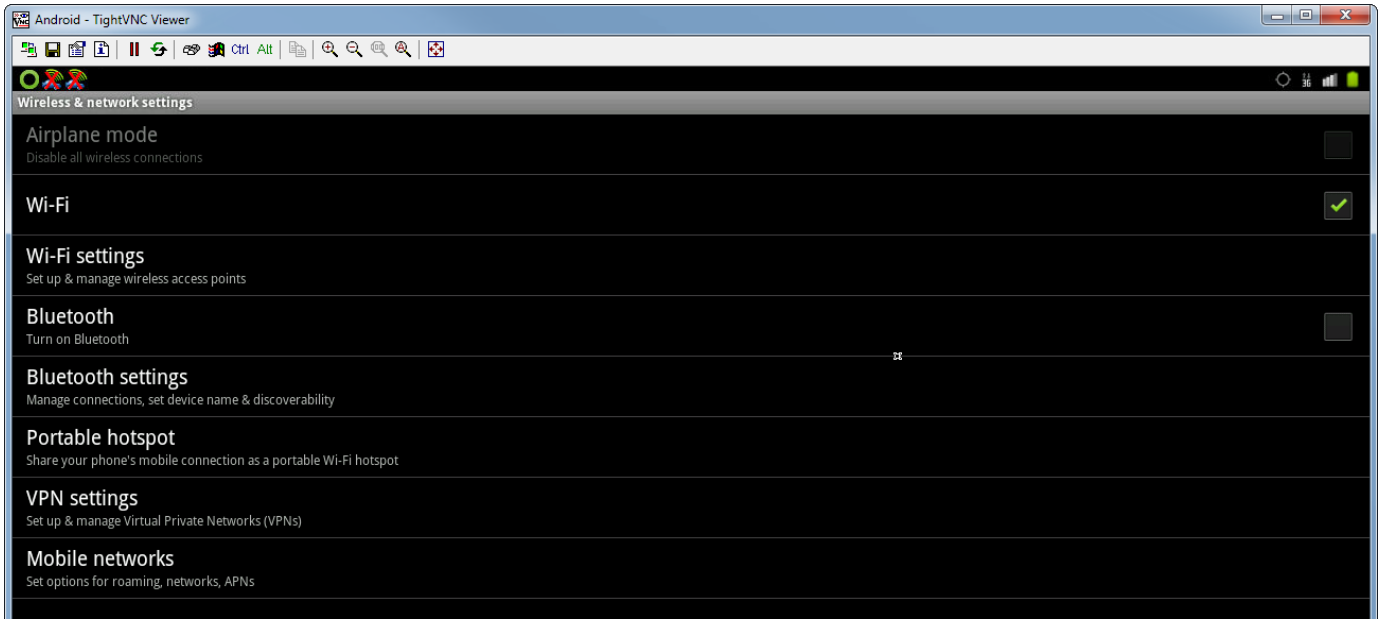
5.2 Check 3G/4G Data and WiFi settings:

Main Menu → Settings → Wireless & Networks → Mobile Networks / WiFI settings:

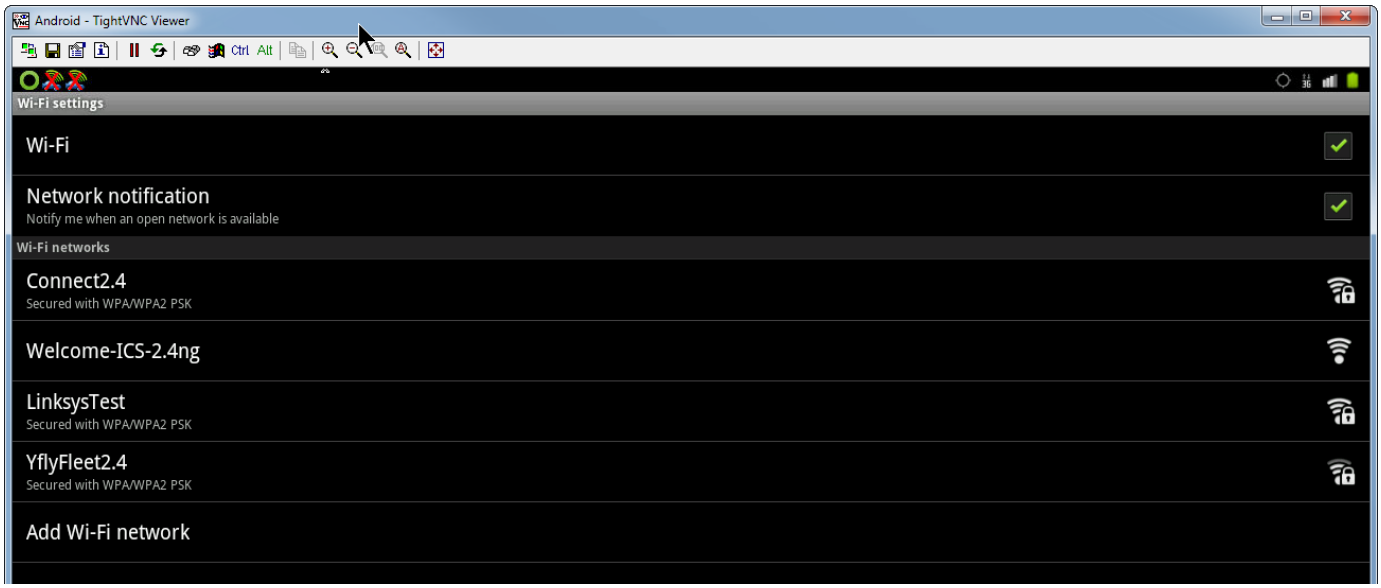




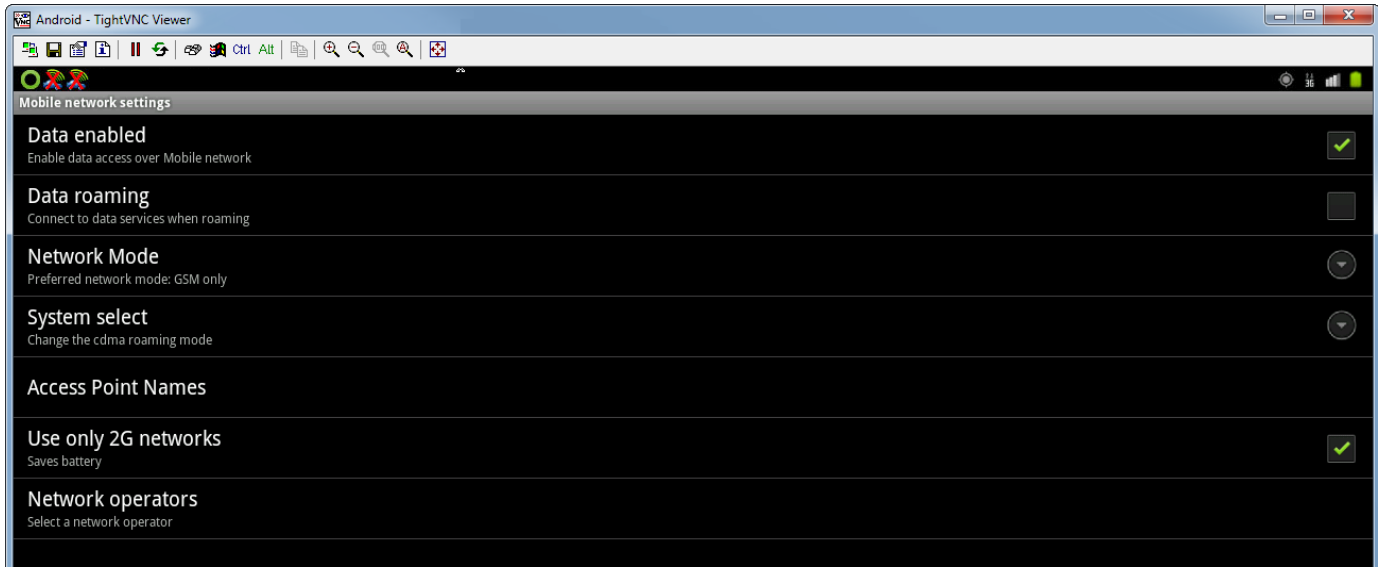
Wireless and Networks



WiFi Settings:



Mobile networks



5.3 Configuring the APK

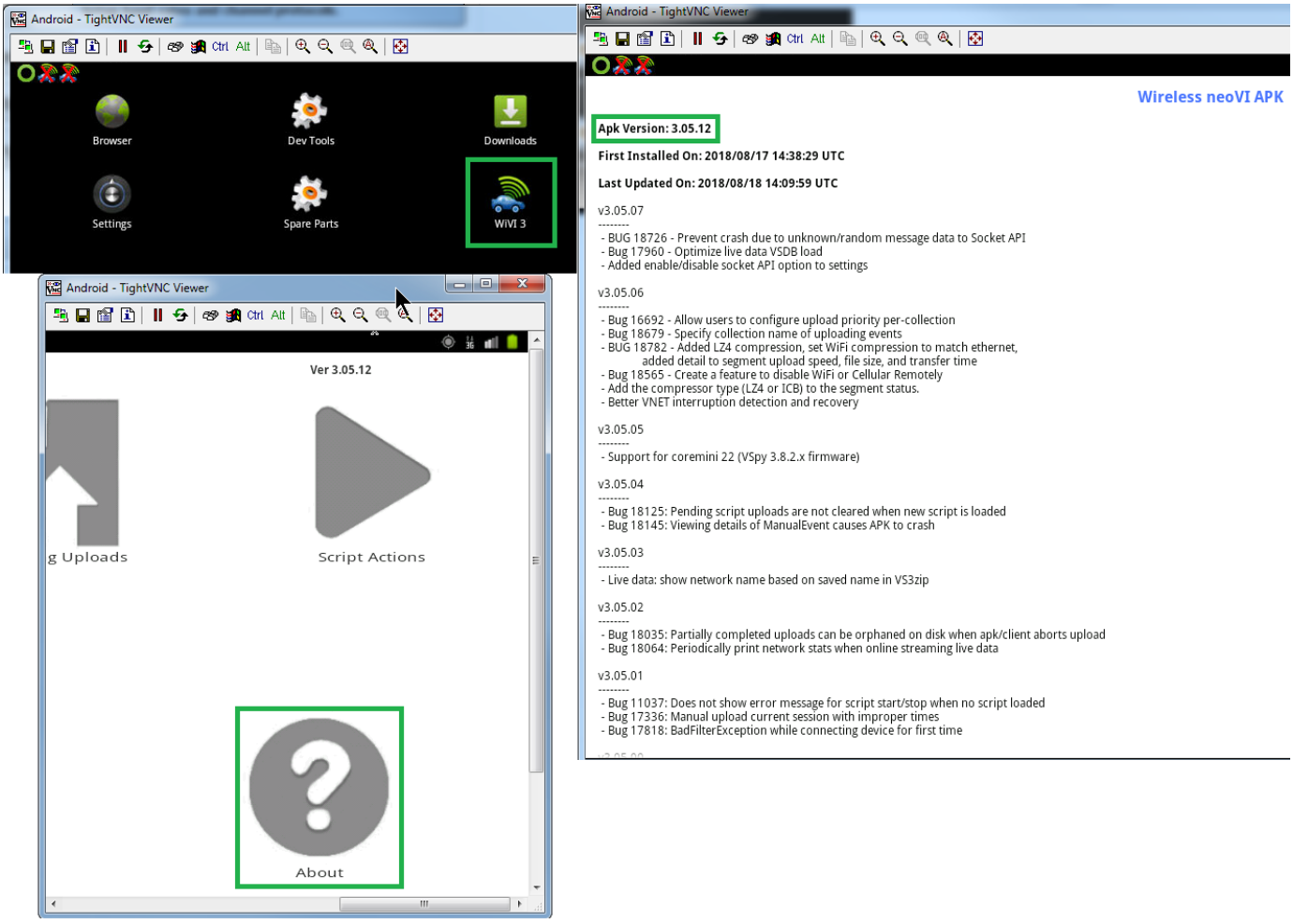
Section 5.1 will give access to the android in the neoVI ION. Once the VNC connection is established, following steps will set up the ION connection with Wireless neoVI.

Checking APK version

The existing APK version can be obtained from the path:

Main Menu → WiVI 3 → About

This section gives detailed history of the APK installations.



Update to the Latest APK

The APK on the neoVI ION can be updated over the ADB connection using a PC with VSPY installed or remotely through WiVI server.

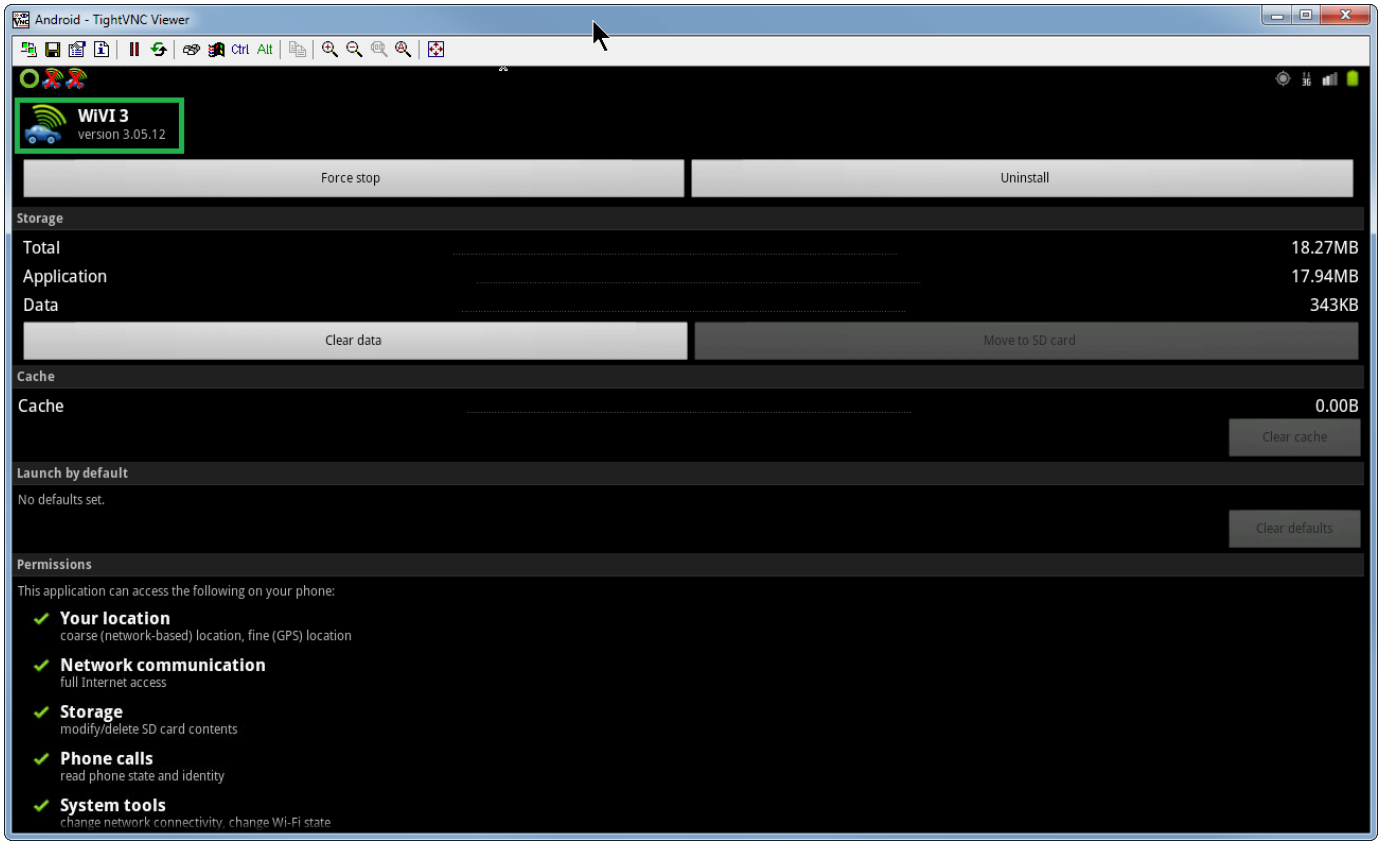
Update APK over ADB

Uninstall existing APK

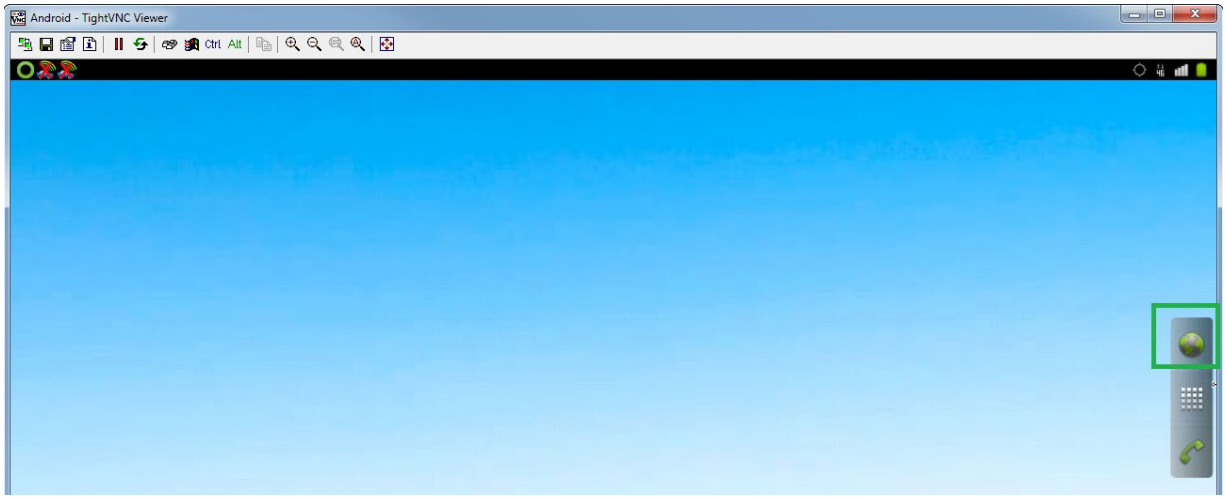
Keyboard

If installing from the PC, it is recommended to uninstall the existing version from neoVI ION.

Main Menu → Settings → Applications → Manage Applications → WiVI 3



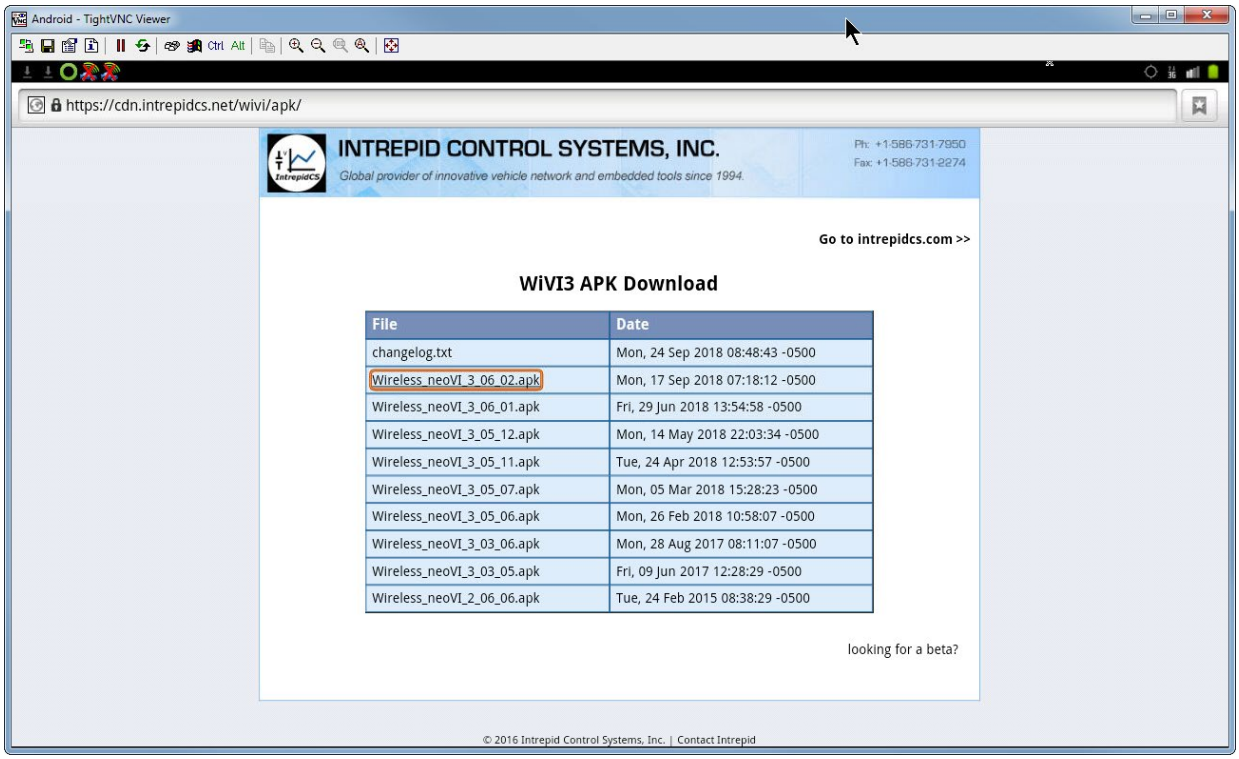
Download latest APK:



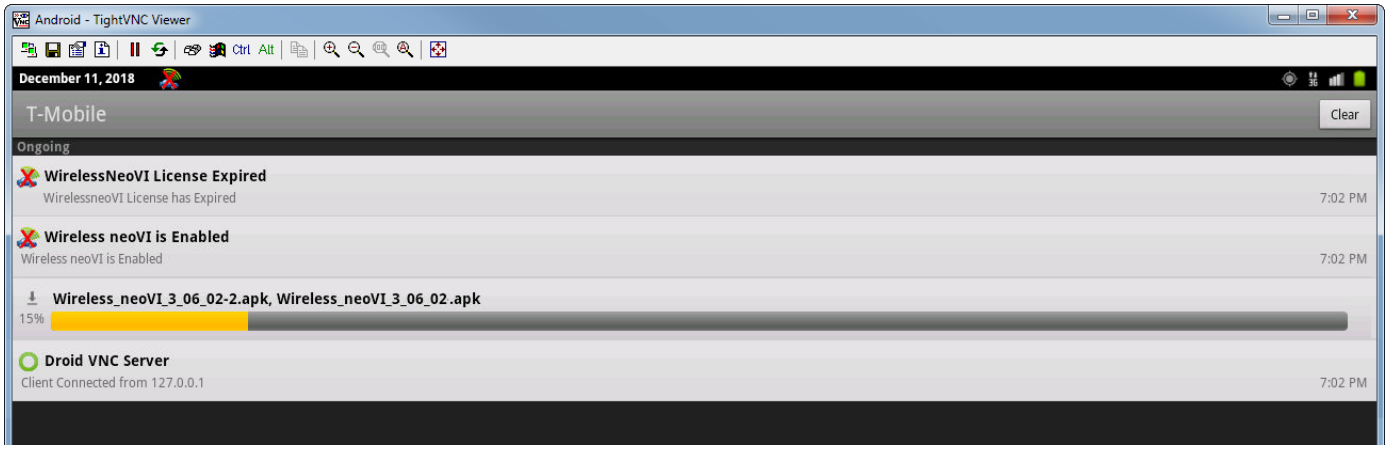
Enter the url: https://cdn.intrepidcs.net/wivi/apk

You will see the page with all available APK installs as shown below.

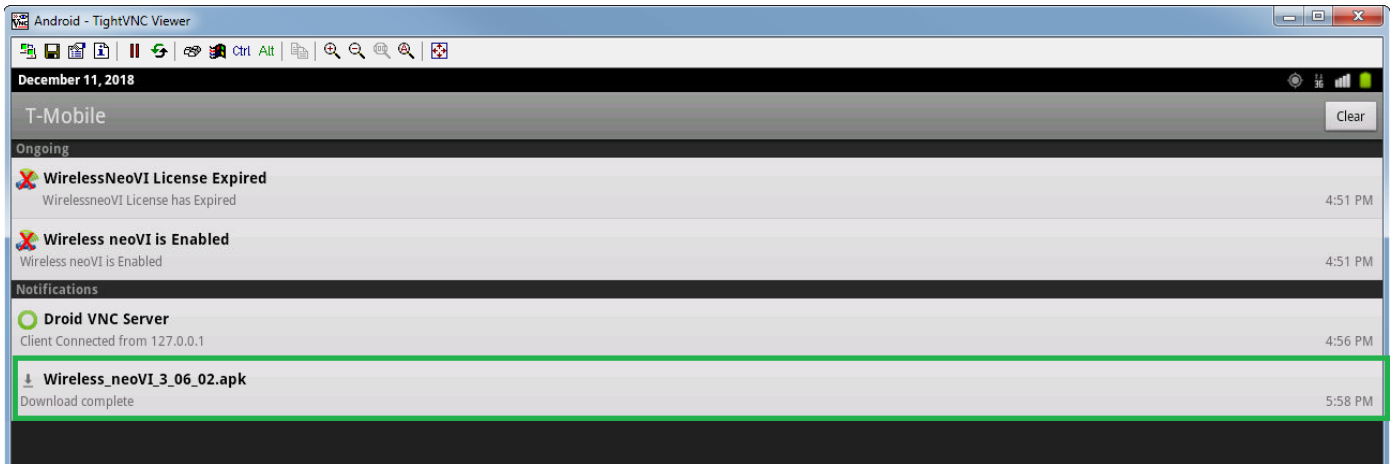
Click on the required APK install to be downloaded.

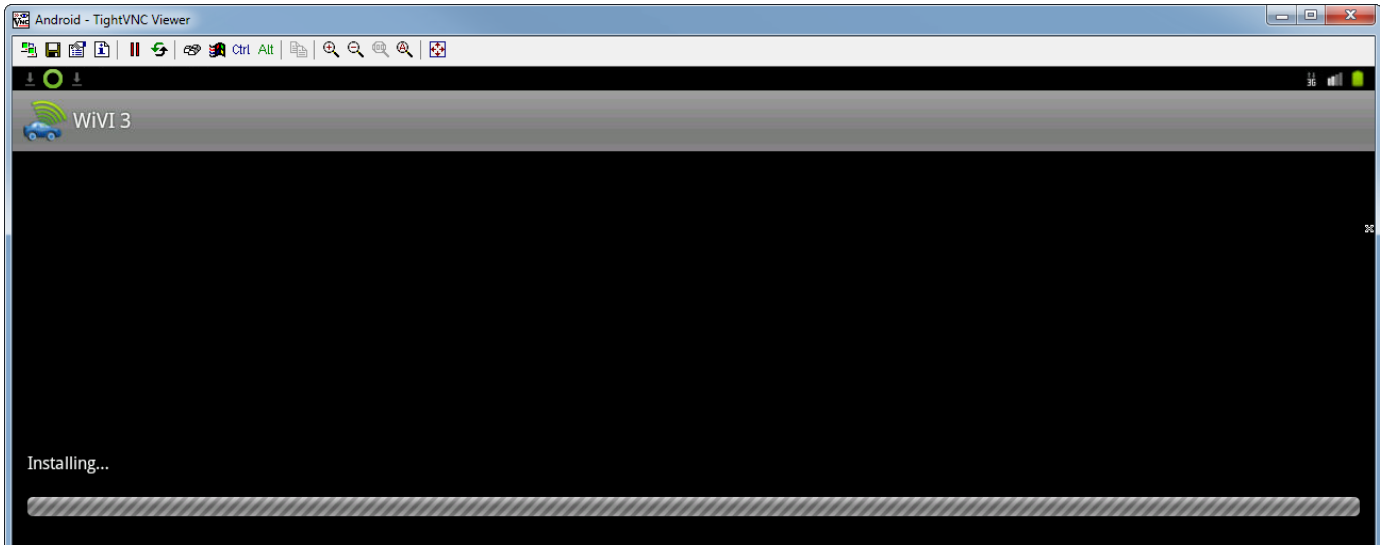


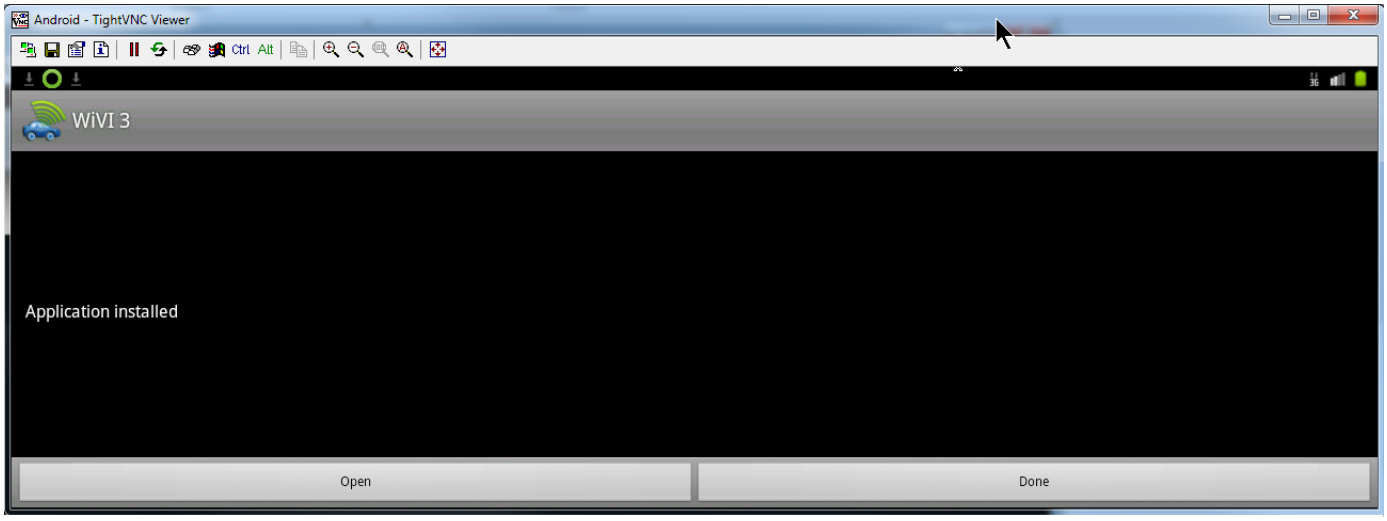
This will start the APK Install download



Once the download is complete, you can install the APK by clicking on the link in the notifications section or from the downloads directory.







Update APK over WiVI

With this option you can update the APK version remotely. Once the APK file is uploaded to the server for the specific 'Device', it will download to the neoVI ION and auto install.

NeoVI ION needs to be connected to WiVI for this process.

Download latest APK:

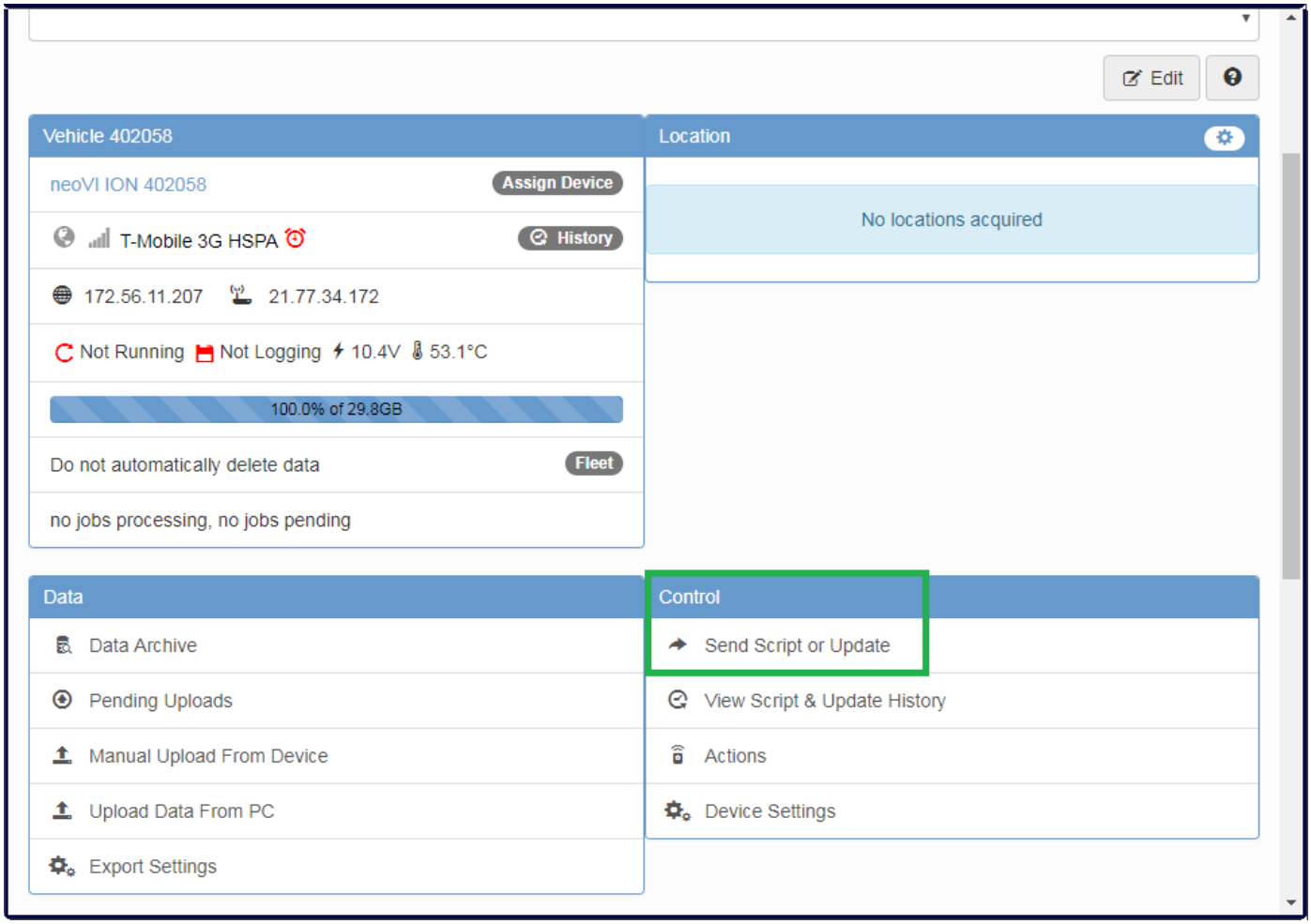
URL for downloading the APK Install: https://cdn.intrepidcs.net/wivi/apk

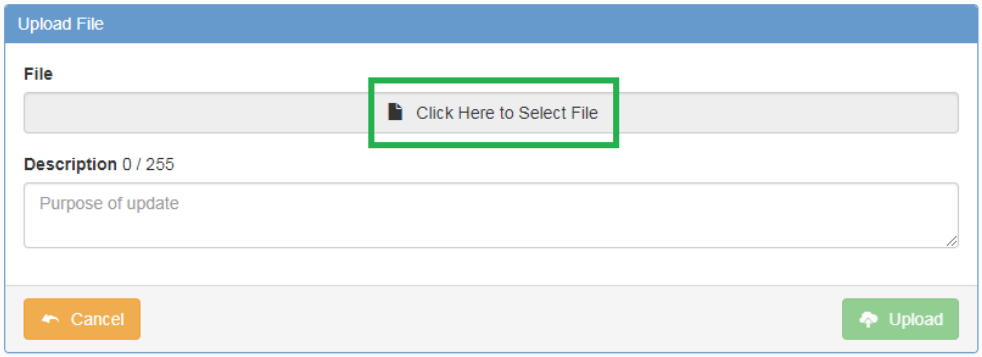
Download the file for the APK Install.

Once the download is complete, Login to the WiVI server to connect to neoVI ION.

The left side of the window will give you a selection of devices on the server. Select the Vehicle/Device to update the APK.

Right side of the Window will give vehicle information with option 'Send Script or Update' option. Click on this option to access file upload window.

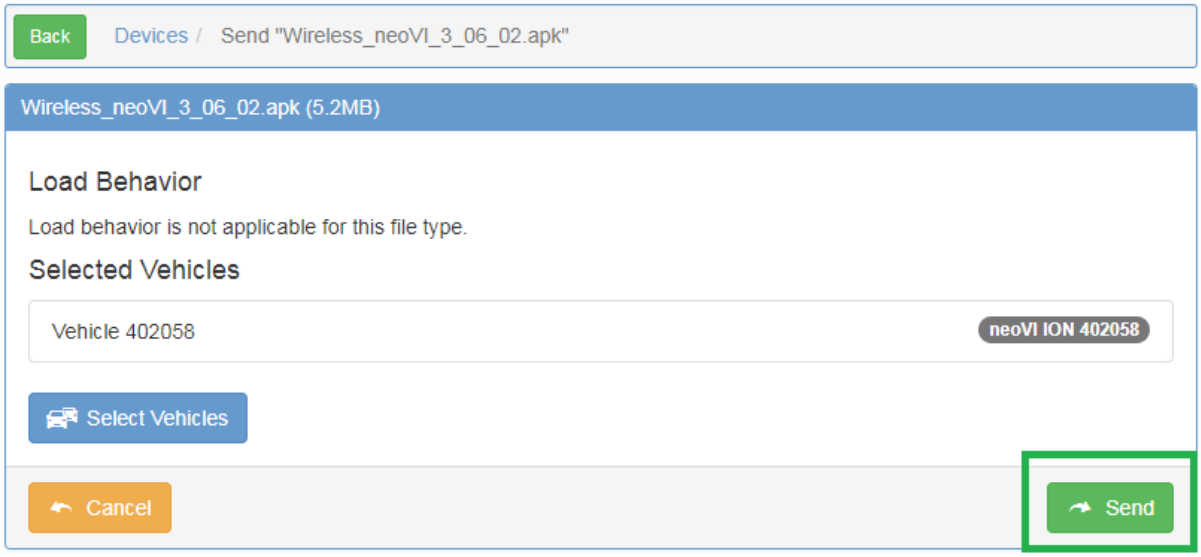




Uploading the APK file to the server

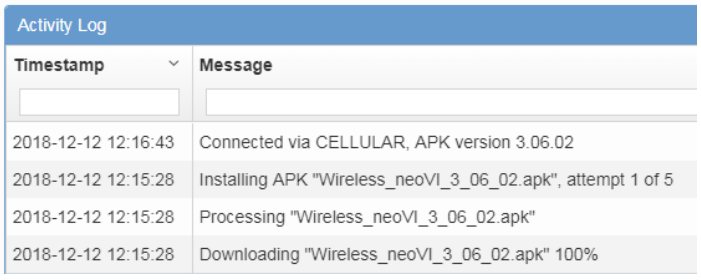
Send the APK file to neoVI ION

The APK file will be downloaded to neoVI ION. Once the download is complete, the APK file will auto install and reboot the device to connect back to the server.



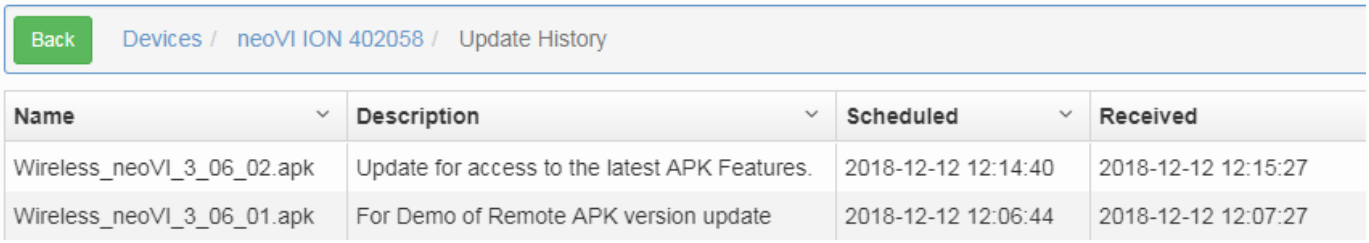
The 'Activity logs' on the Main Vehicle page will give the progress updates of the APK installation on the neoVI ION.

This process will take approximately 2-5 mins to complete.



Update History:

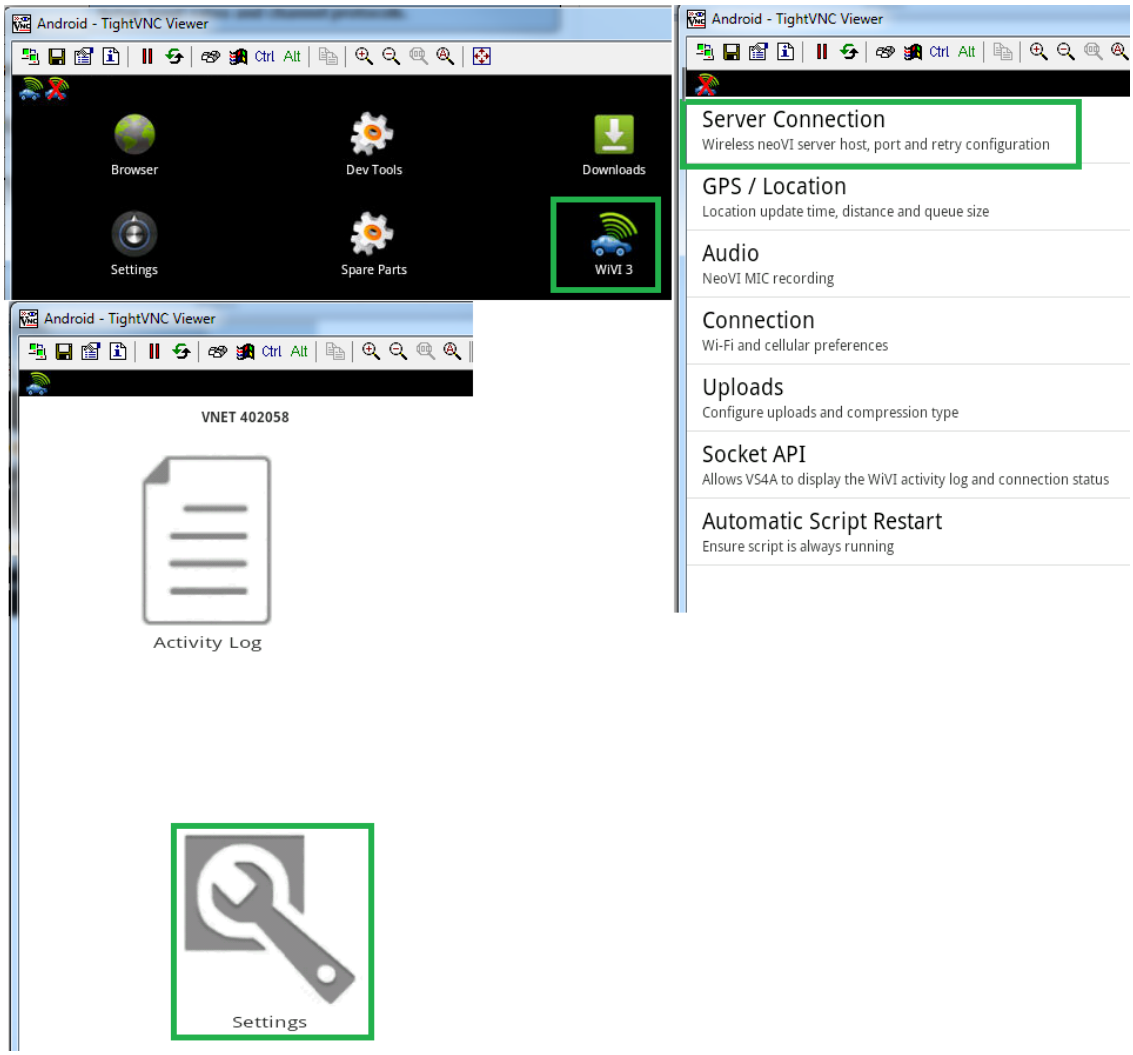
The Main Vehicle page has option for Update History.

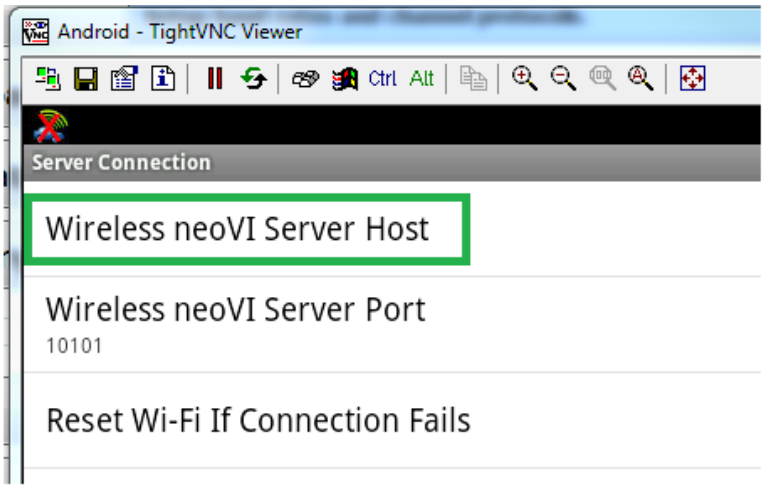


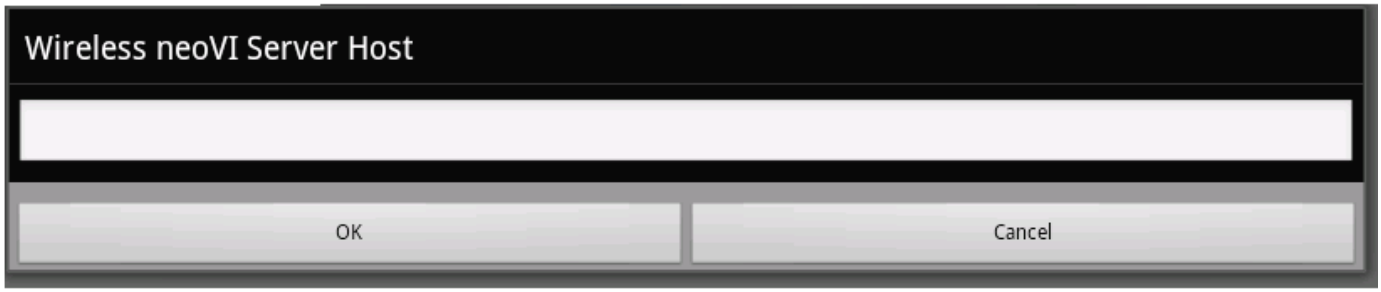
Setting Server address

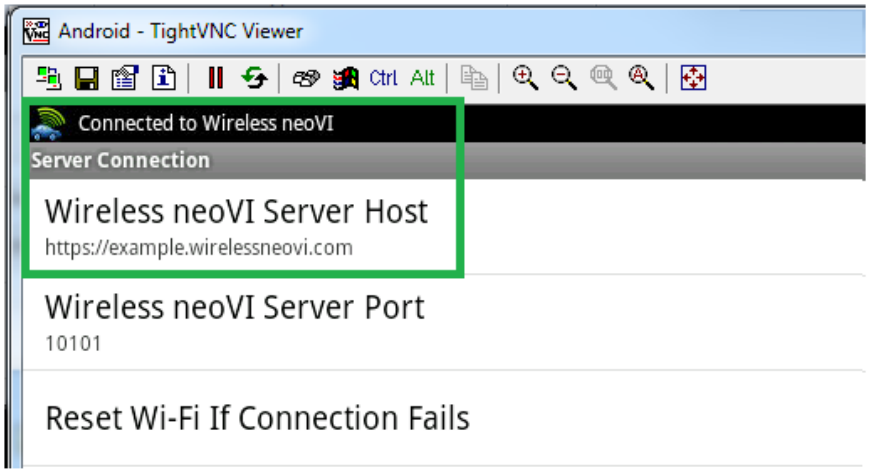
To connect to the server, you have to enter the server address and Port as shown in the procedure below.

Server connection Setting



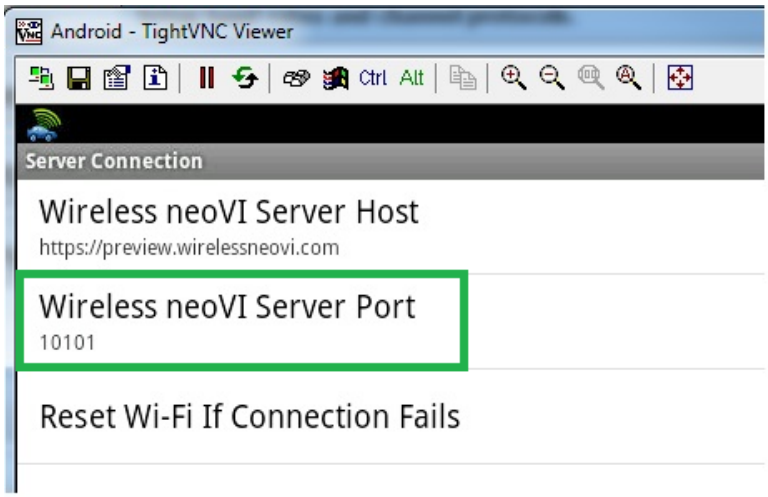


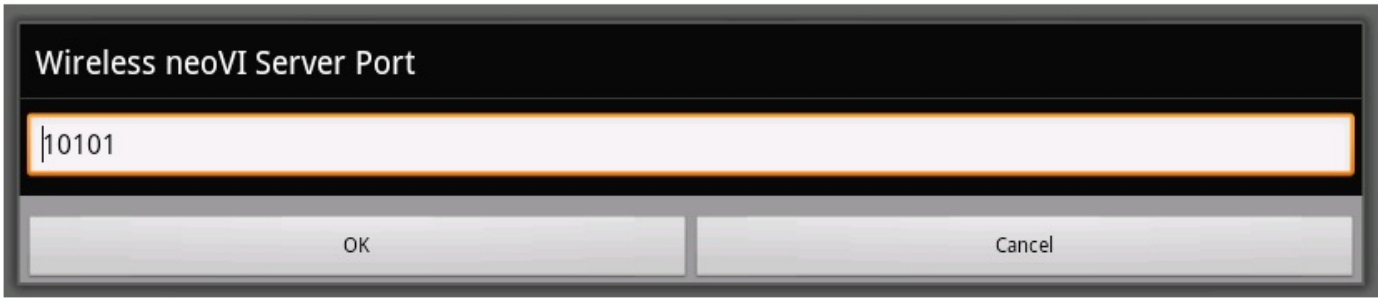




Wireless neoVI Server Port

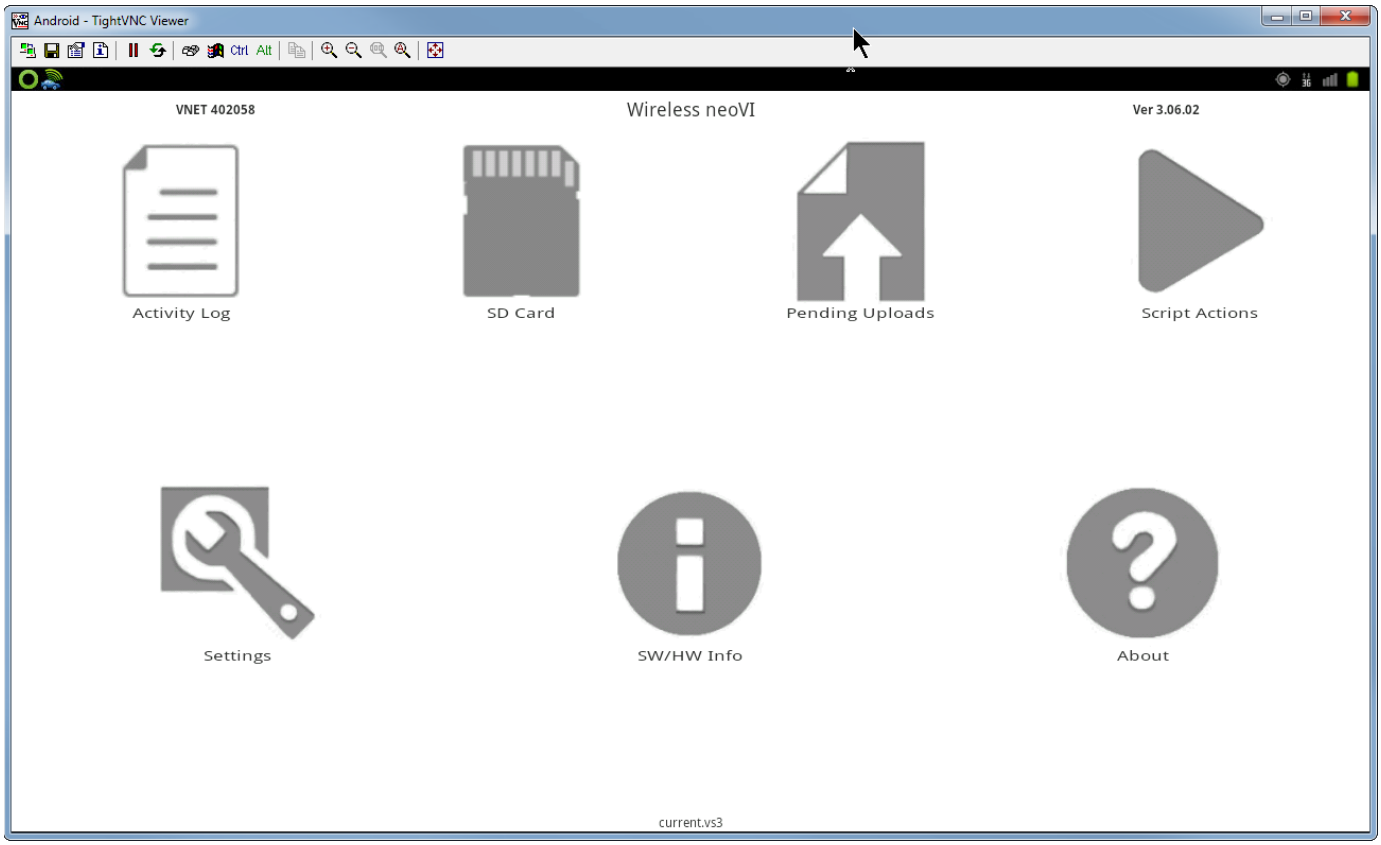
This port should by default be '10101'. Make sure that this setting is not changed. In some cases, a different port number can be used based on the port settings on WIVI.





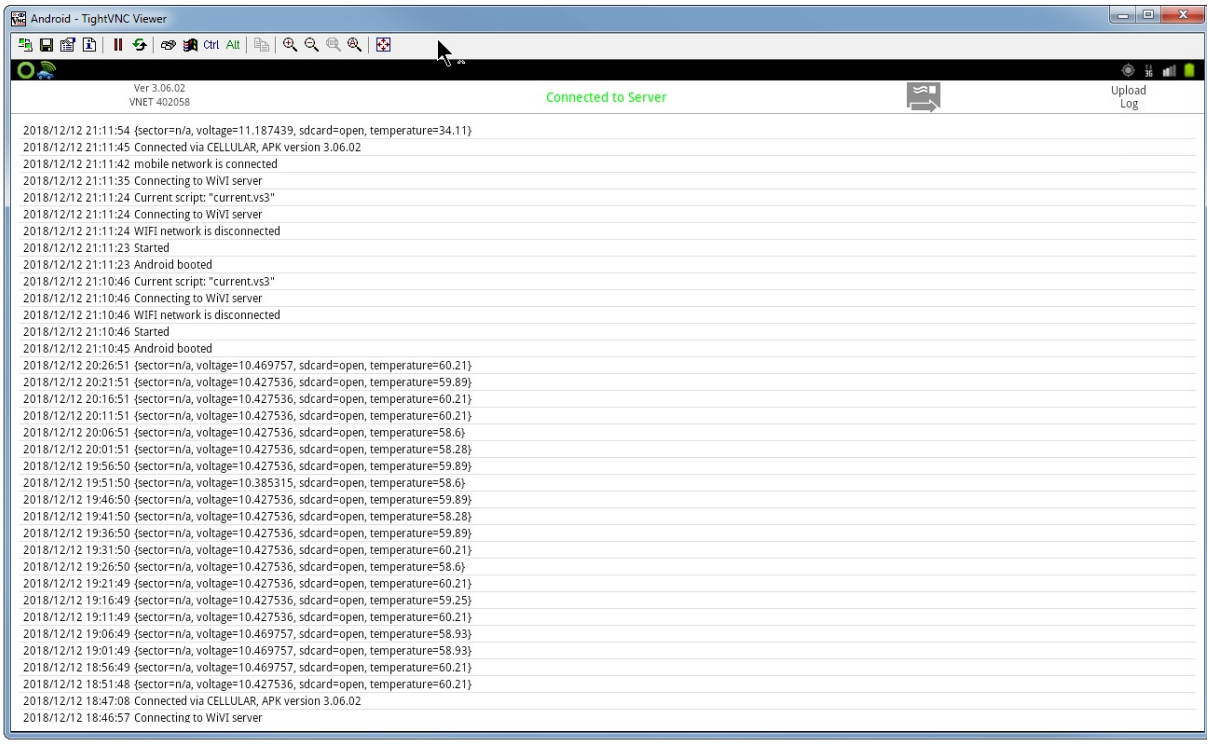
Other APK options

The APK provides other options for information like the Activity logs, SD Card status, Script actions, Settings and SW/HW info.



Activity Logs

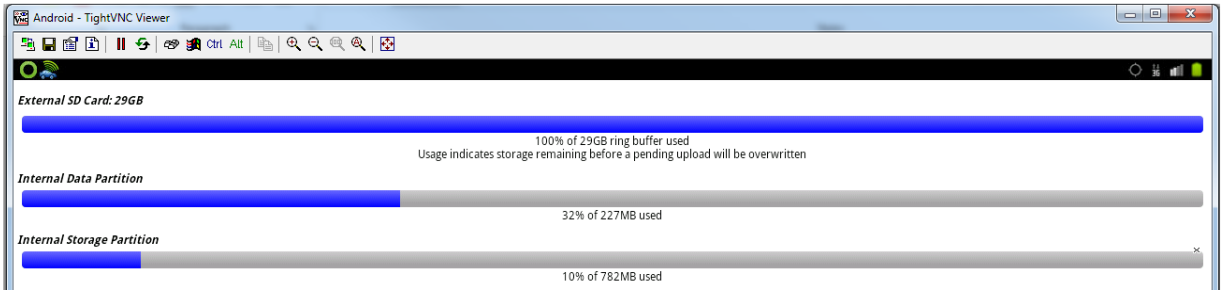
This option gives all activity logs of the neoVI IONs and WiVI server interaction, including Data uploads, APK updates, Server connected.

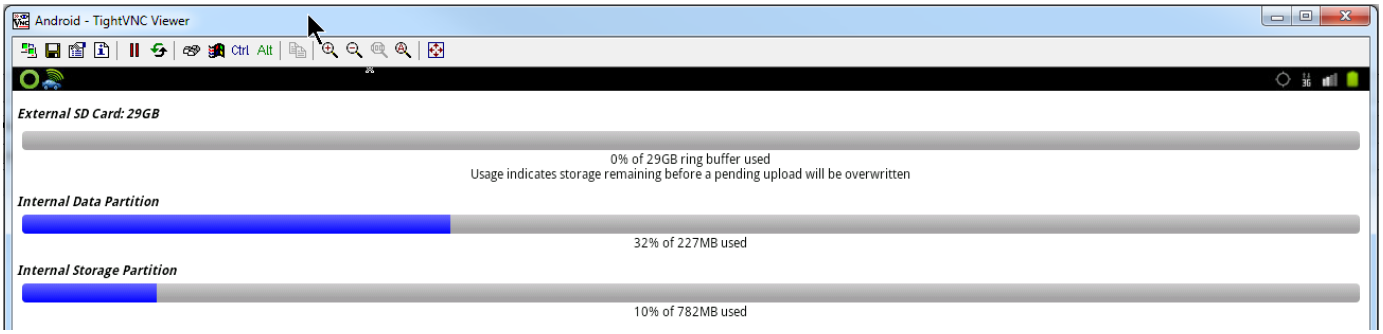


SD Card:

This option gives information of the Memory usage of the neoVI ION.

The SD card usage shows the percentage of remaining memory

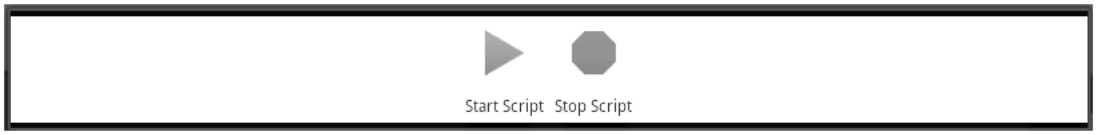




Script Actions:

Start and Stop script running in the neoVI ION. You can access these commands while the neoVI ION is running the script.

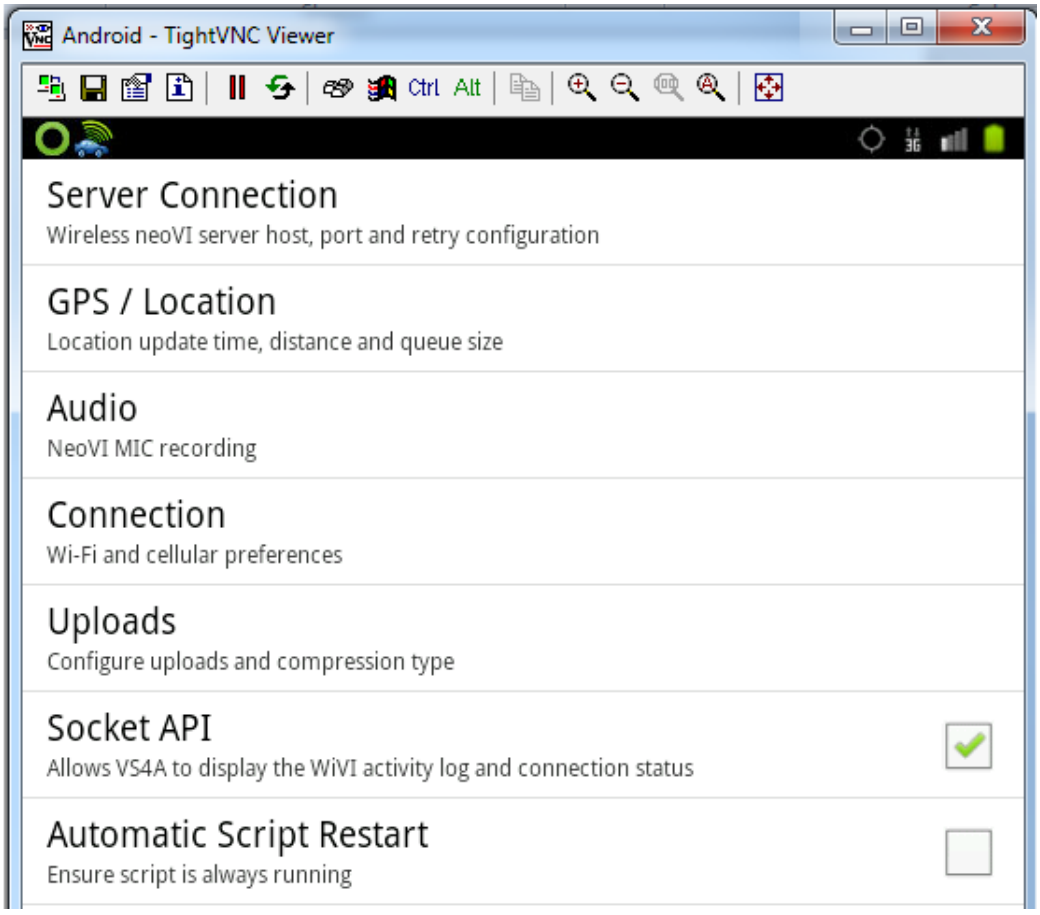
Script Actions



Settings:

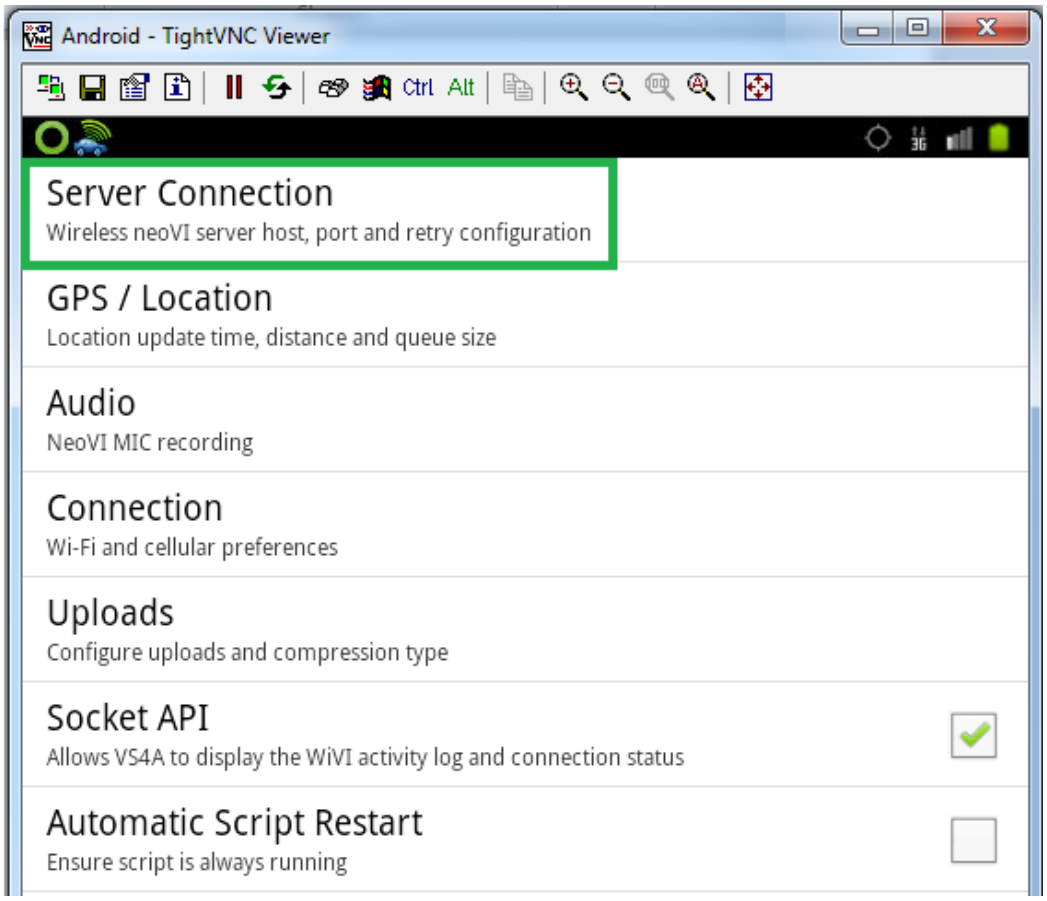
This option contains different APK and device settings. The settings are explained below.

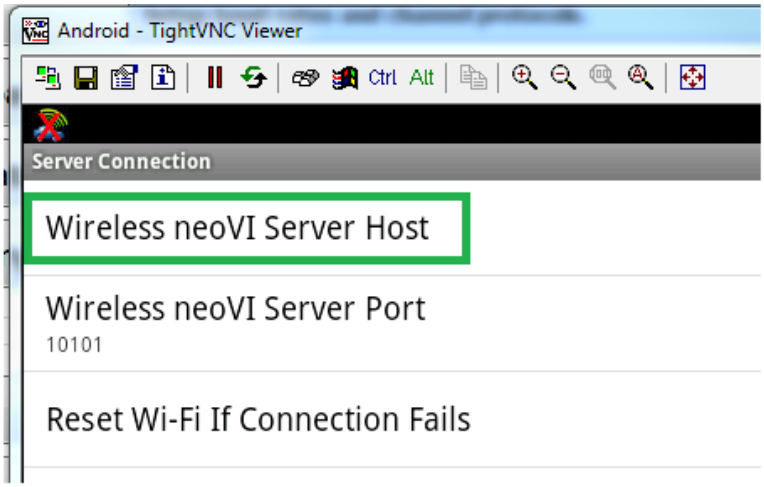
Settings

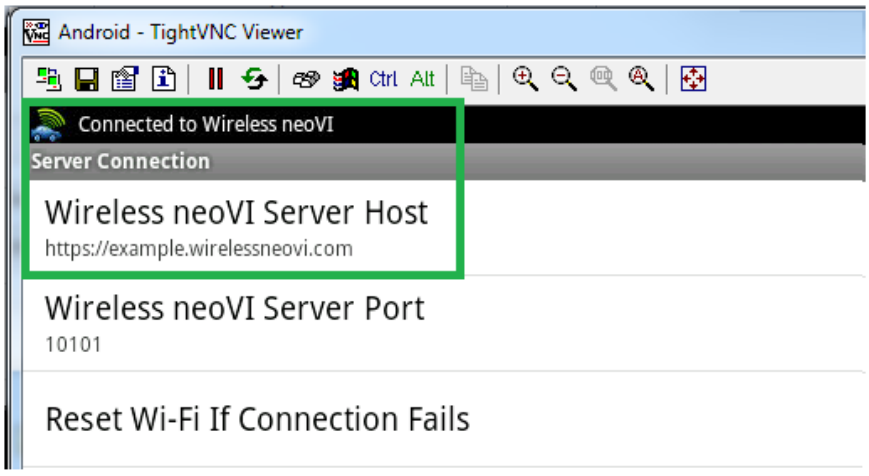


Server Connection:

Use this setting to add the server address to establish a connection with the server.





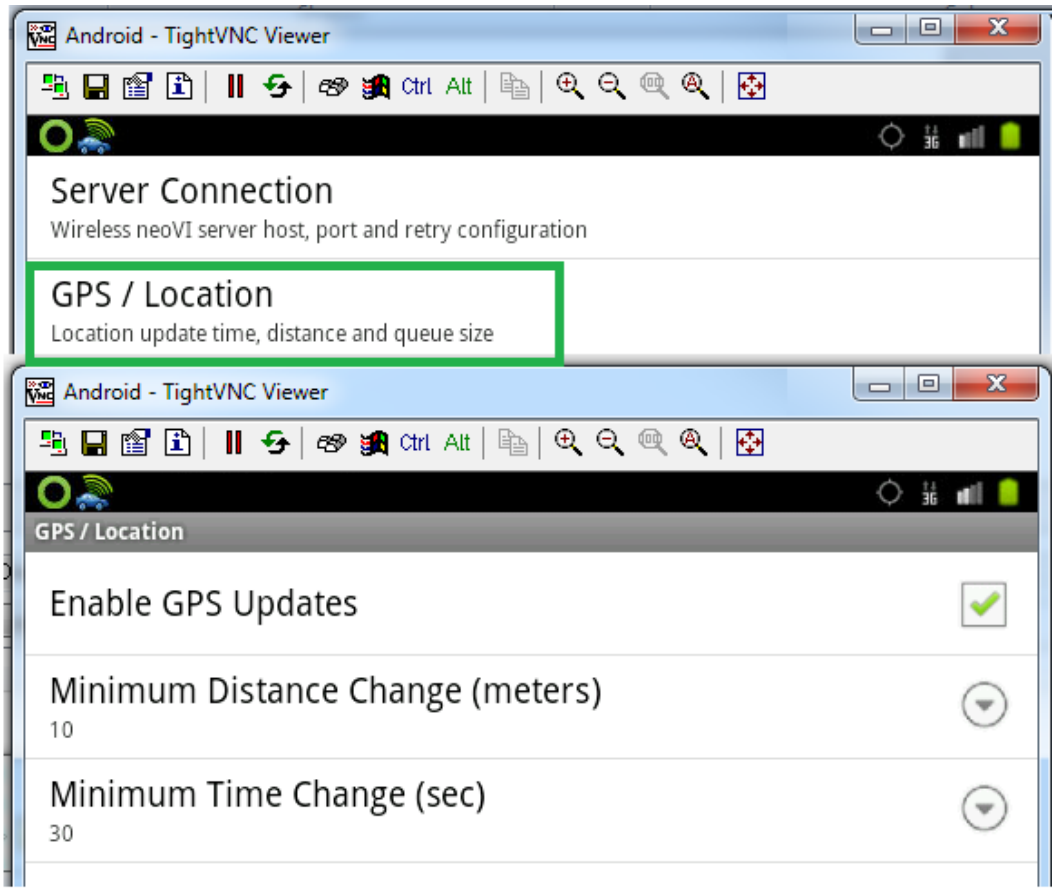


GPS / Location:

These options allow you to get GPS Updates for the device's location.

You can also set the update rate according to the location change or based on the time.

Make sure that the GPS antenna is connected to the neoVI ION to get the GPS updates.

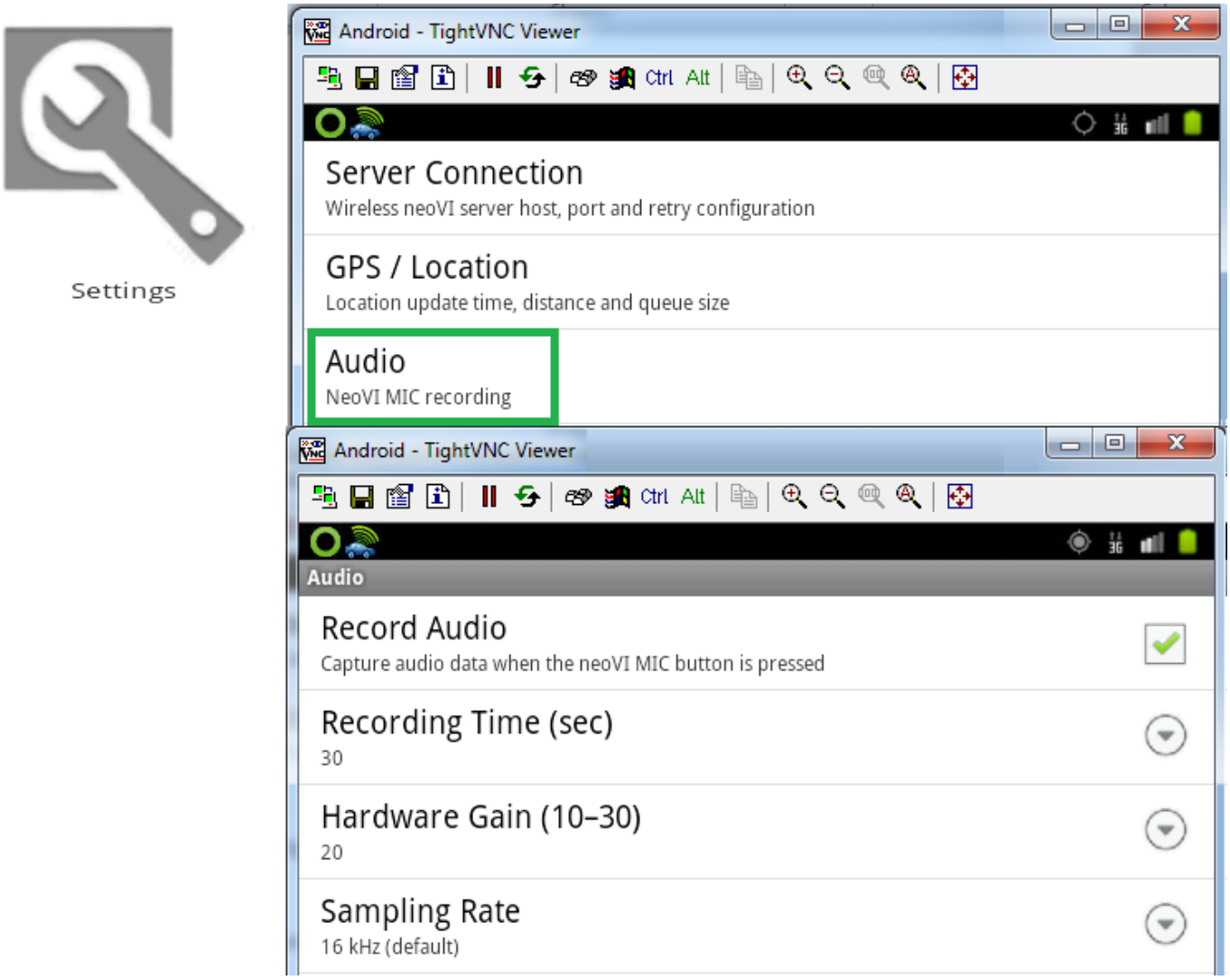


Audio:

neoVI MIC 2 can be used as a USB Trigger, GPS and microphone pendant accessory for neoVI ION

https://store.intrepidcs.com/neoVI-MIC-2-p/neovi-mic-2.htm

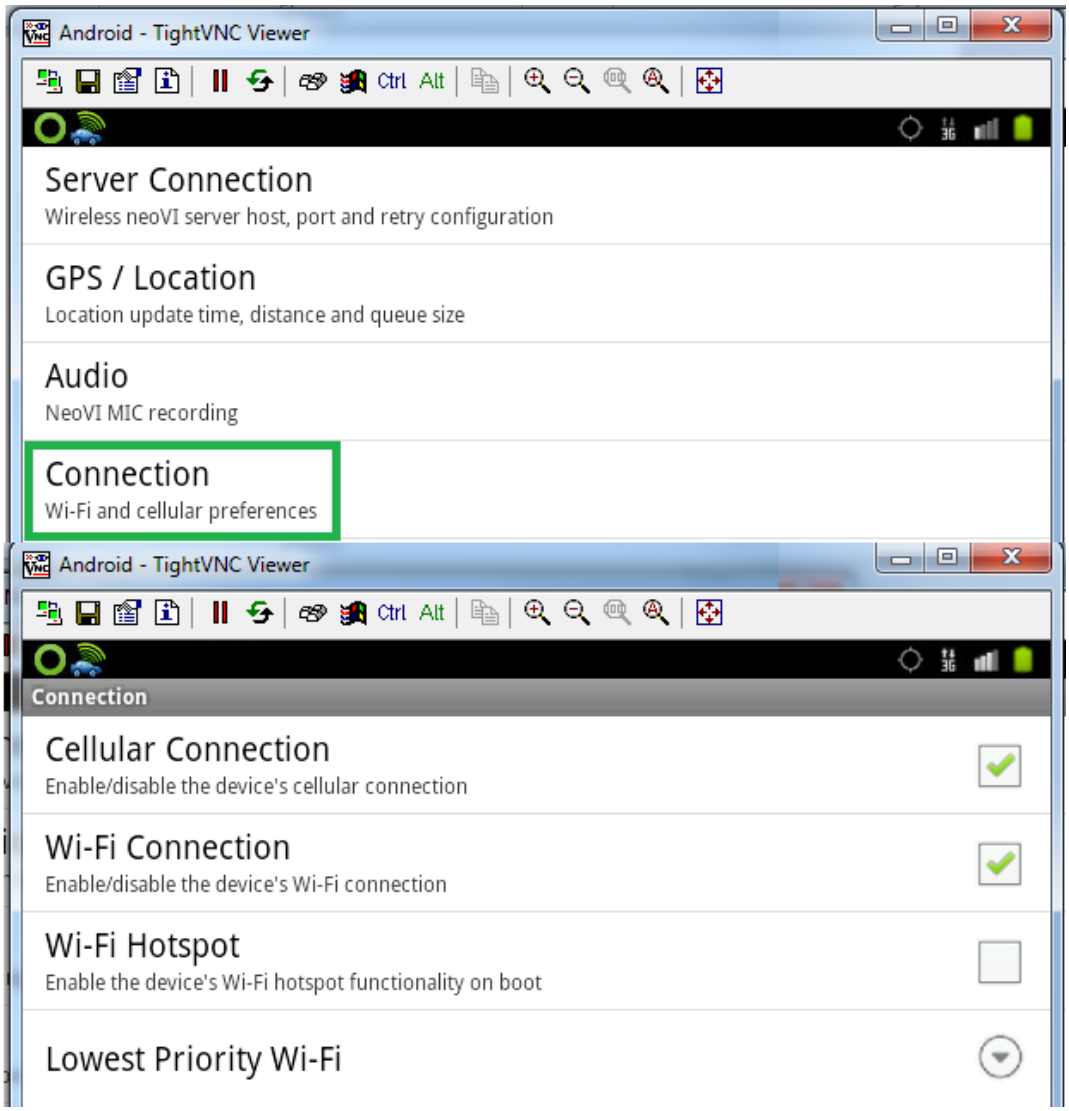
Insert a picture with neoVI MIC 2 connected to neoVI ION



The options allow you to enable recording and settings for length of the recording. It also gives the settings for Gain and sampling rates for the recording to adjust its quality.

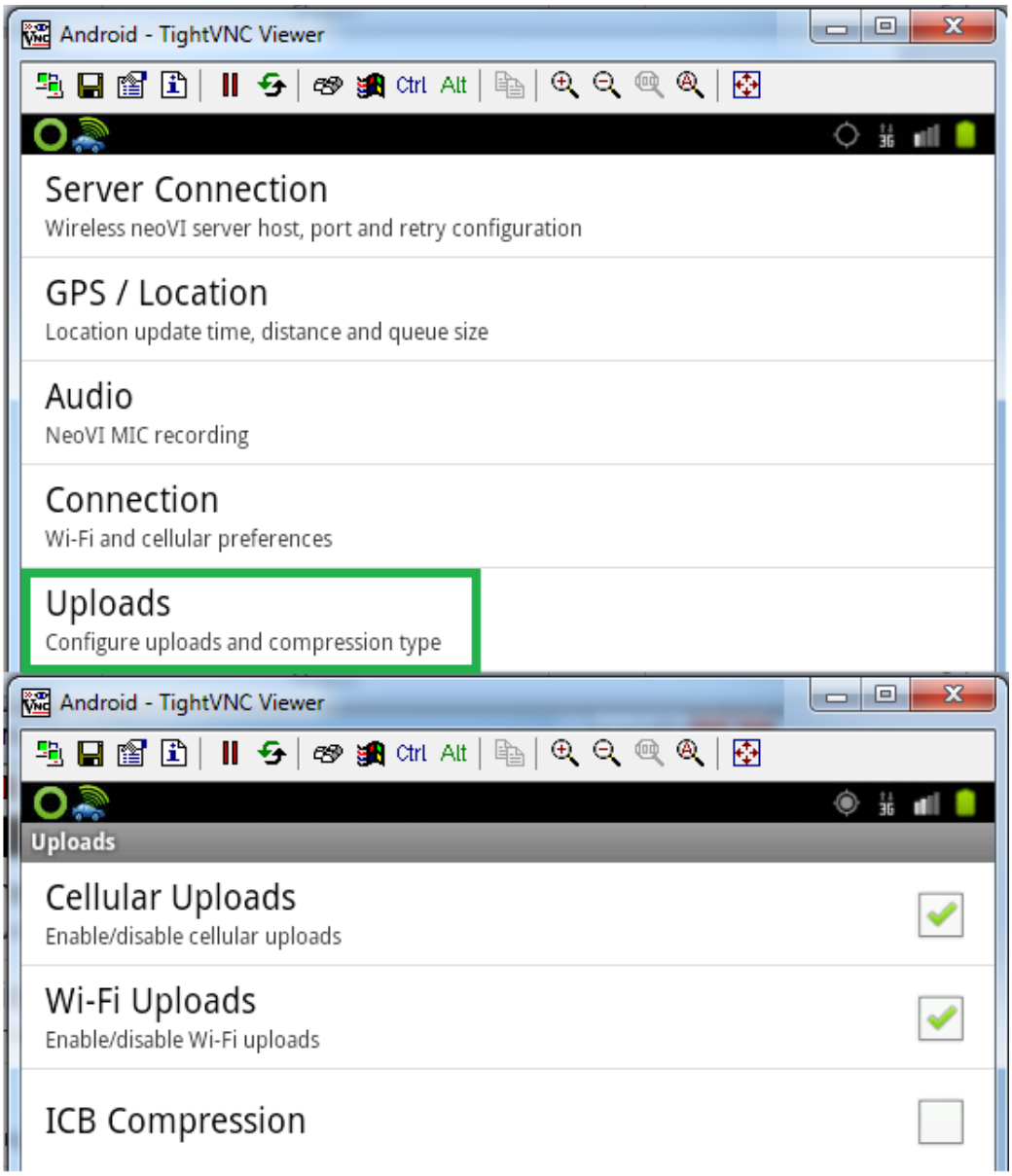
Connection:

These options are for Mobile Data and WiFi Settings. These settings have same effects as the Android settings (Settings → Wireless and Networks.



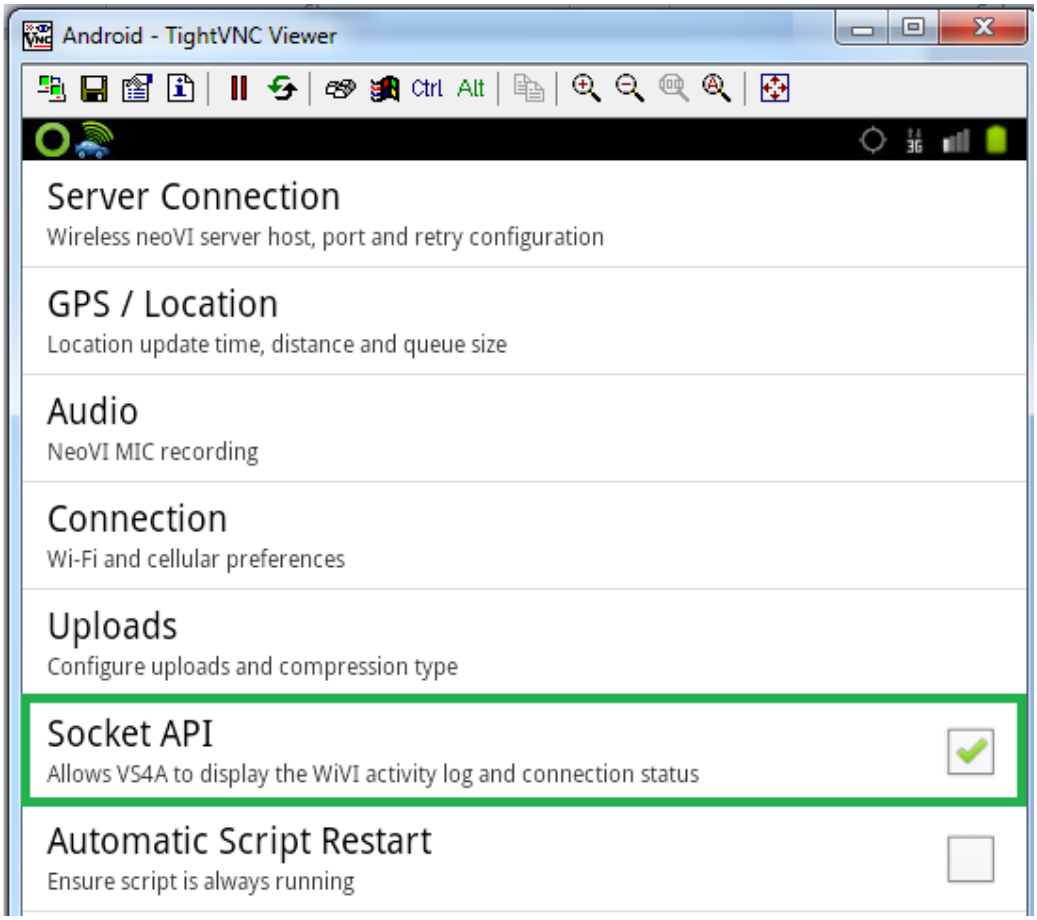
Uploads:

Settings for the uploading the logged files either on Cellular Data or WiFi or both. It also gives options for the compression type of the logged files.



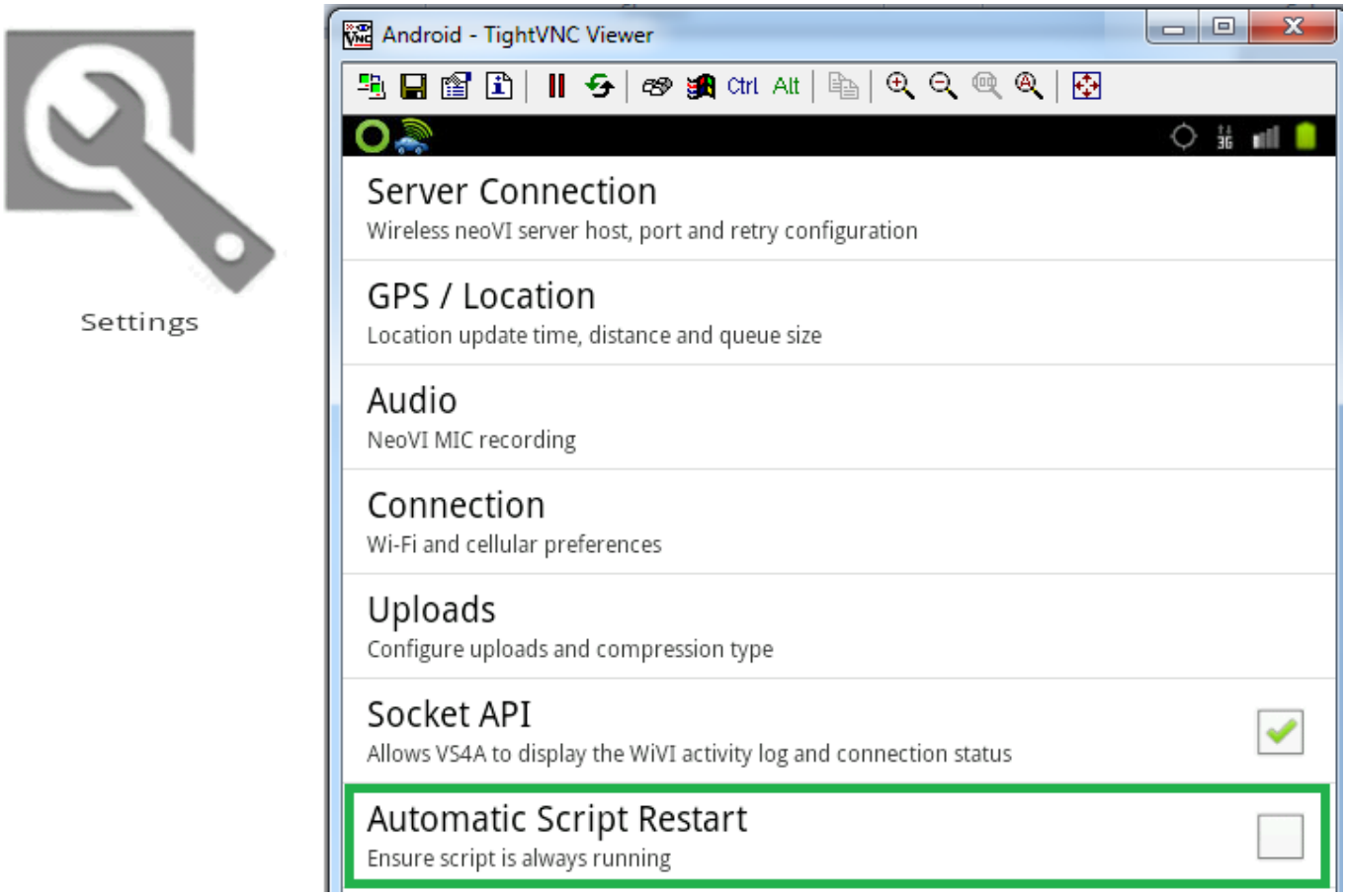
Socket API:

If enabled VS4A (Vehicle Spy for Android)can display WiVI activity logs and connection status.



Automatic Script Restart:

Enable this option if you need to restart the script after a power cycle/ sleep-WakeUp.



5.4 Connecting to neoVI ION (rough draft)

The initial step to configure your logger is to connect to WIVI. Settings for ION can be accessed by the following ways.

VNC client in VSpy

VNC client gives access to the android in the ION. Figures below will direct you to connect to ION.

- Make sure your neoVI ION is powered and USB is plugged into your Laptop.

6 Core Feature Operation

Now that we have completed installing and configuring our hardware and software, we are ready to use the neoVI ION. In this chapter, we show you just some of the many applications of the ION.

Each of the sections contains an example application, and where possible, step-by-step instructions are provided for those who wish to duplicate the results on their own device.

The goal of this chapter is specifically to assist those who are new to Intrepid hardware and software, and so simplified examples are provided. Advanced users may wish to skim or even skip this chapter. Note that some sections of this chapter will be written in future updates of the manual.

The examples use Intrepid's Vehicle Spy 3 Professional, the ideal tool for working with your ION. Due to the complexity of Vehicle Spy, we only describe the basics necessary for the examples; for full details on this powerful software tool, please see the separate Vehicle Spy documentation.

6.1 Data Logging with WIVI

1. **Configure the neoVI ION for the vehicle networks:**

   This is covered in the section 4.

2. **Creating the logger script:**

   -

3. **Uploading the script to the logger from WIVI:**
4. **Monitoring the Data upload:**
5. **Downloading data from WIVI for analysis:**
6. **Select neoVI ION:** On the *Logon Screen*, select the neoVI ION if it does not already have a checkmark next to it. To do so, right-click the device name and choose *Select Hardware* (Figure 79).

6.2 Monitoring Conventional Vehicle Networks

The most basic use of the neoVI ION is to monitor the activity on conventional vehicle networks such as CAN or LIN. Once the device is connected to the network and correctly configured, this is actually very easy to do, assuming you have the right software. In our example we will show how the neoVI ION can monitor CAN traffic on a bench network using Vehicle Spy 3.

Assuming that your network already has CAN messages being transmitted by other devices,

we can monitor that traffic with these simple steps:

1. Launch Vehicle Spy: Start Vehicle Spy by double-clicking its icon or selecting it from the Windows Start Menu.

2. Select neoVI ION: On the *Logon Screen*, select the neoVI ION if it does not already have a checkmark next to it. To do so, right-click the device name and choose *Select Hardware* (Figure 79).

Figure 79: Selecting the neoVI ION from the Logon Screen of Vehicle Spy.

3. **Go Online:** Press the blue arrow button in the top left corner of Vehicle Spy.

The program will go online and automatically switch to *Messages View*, showing you the incoming traffic. An example can be found in Figure 80, which shows CAN messages that are being transmitted to the ION by another network interface tool. By default, identical messages will be grouped together; if you prefer to see the messages in chronological order, press the *Scroll* button located just above the message display.

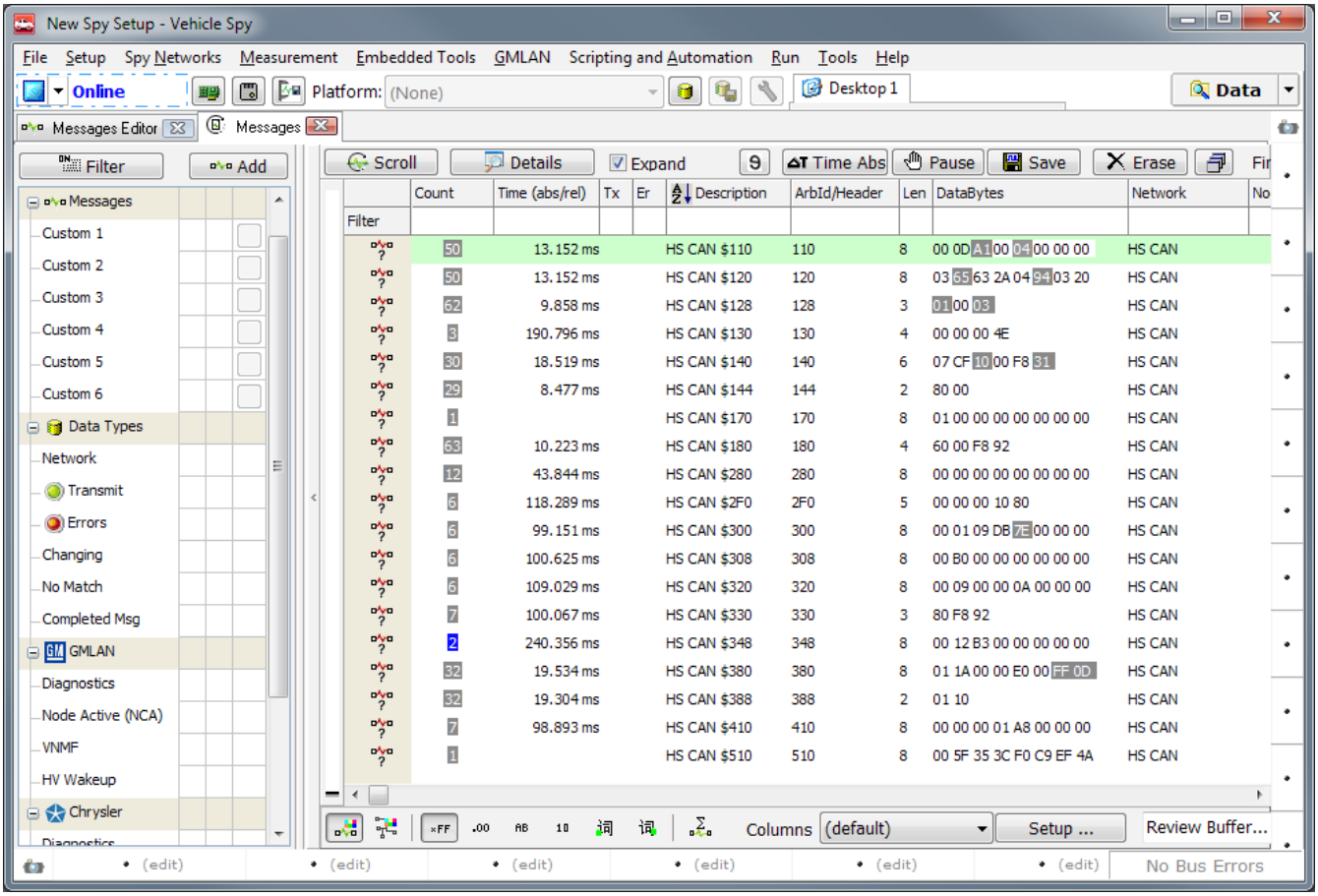


Figure 80: Monitoring Message Traffic in Vehicle Spy Using the neoVI ION.

Notice that the CAN messages are shown in their raw form, with arbitration IDs and data bytes. If you have a database matching the message traffic being monitored, you can load it into a platform and Vehicle Spy will decode the messages and show the signals within each. For details on how to accomplish this, please consult the Vehicle Spy documentation.

6.3 Transmitting on Conventional Vehicle Networks

In addition to monitoring network traffic with the neoVI ION, we can also easily generate and transmit traffic of our own. We'll show how this is done by creating and then transmitting a custom CAN message on the HS CAN channel.

First, make sure the neoVI ION is connected to your vehicle network. Then follow these steps to create and transmit a message:

1. **Launch Vehicle Spy:** Start Vehicle Spy by double-clicking its icon or selecting it from the Windows Start Menu.
2. **Select neoVI ION:** On the *Logon Screen*, select the neoVI ION if it is not already selected: right-click the device name and choose *Select Hardware* (see Figure 79).
3. **Load Messages Editor:** Select *Messages Editor* from the *Spy Networks* menu.
4. **Select Transmit Messages:** Click the *Transmit* button, found in the blue bar.
5. **Create Transmit Message:** To the right of the drop-down box that currently says "HS CAN", click the ✚ button.

Vehicle Spy will generate a new HS CAN transmit message called "Tx Message HS CAN 1", preset with default values. The program window should now appear similar to Figure 81.

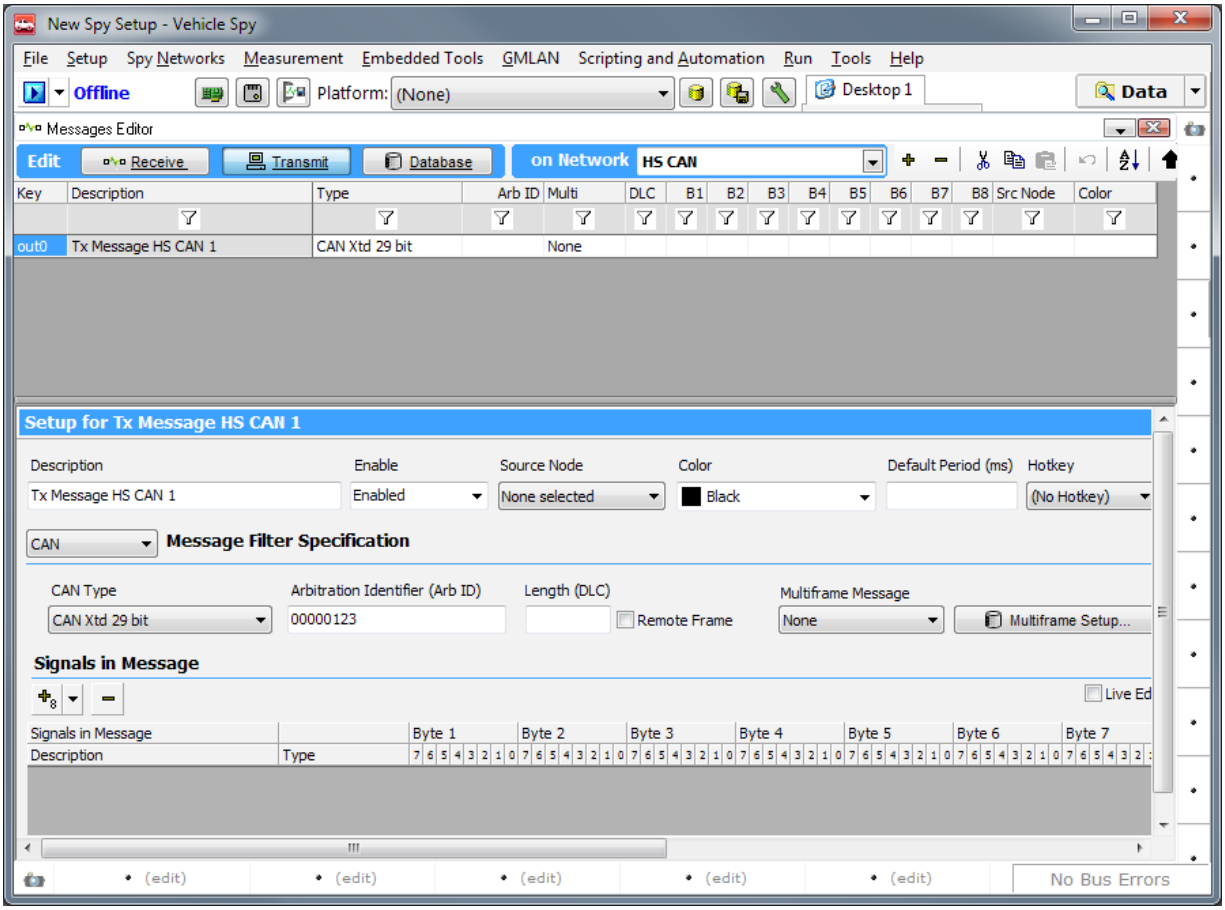


Figure 81: A Default Transmit Message Created in Vehicle Spy.

Next, we will change the default message by assigning an arbitration ID to it, and then adding a signal and renaming it.

6. **Set Message to Arbitration ID 123:** Under the *Arb ID* column for the message, enter the value "123".
7. **Add Message Signal:** In the middle of the screen, find "Signals in Message"; just below this click the button. A signal called "Signal 0" is created.
8. **Rename Message Signal:** Under the *Description* column, double-click "Signal 0" and change the name to "Engine Speed".

With these changes, the message should now appear as seen in Figure 82.

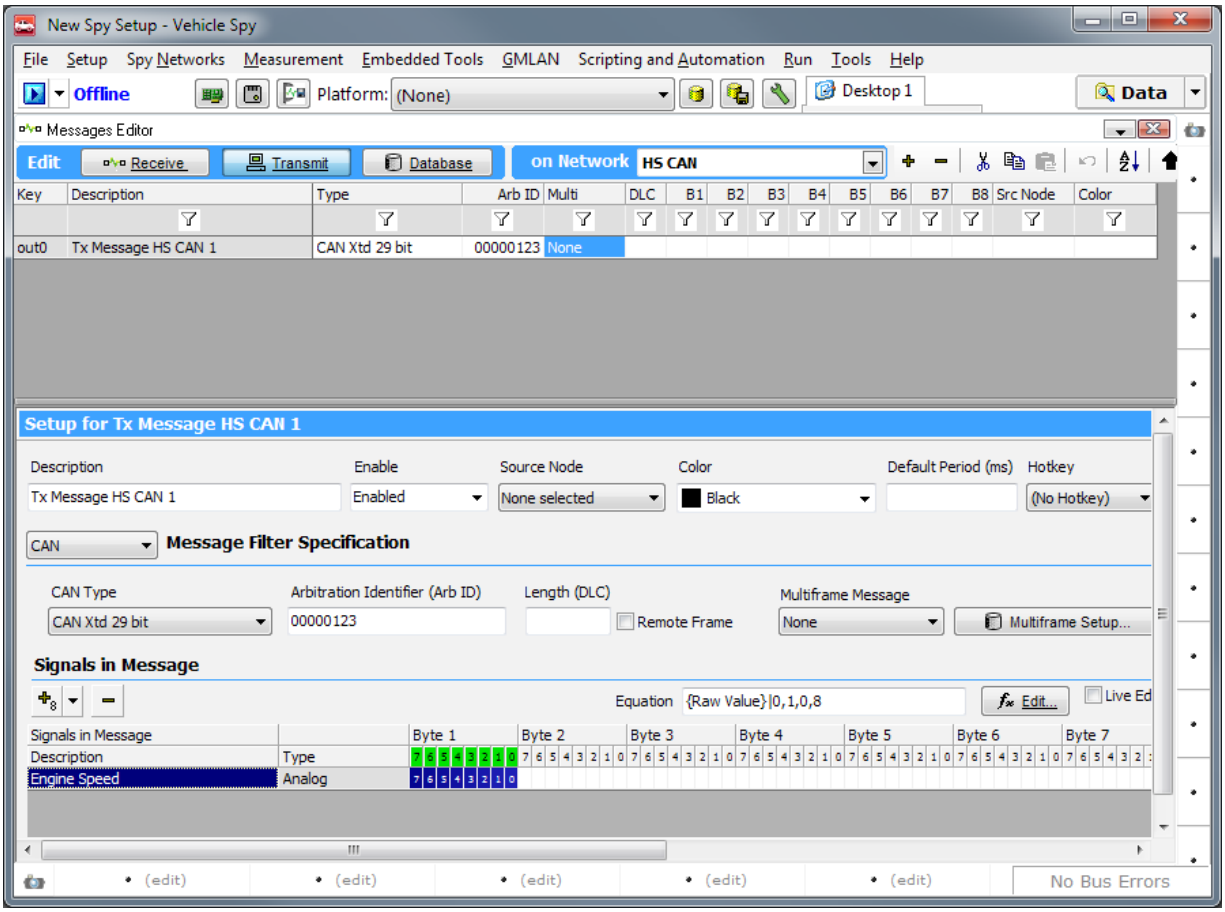


Figure 82: Vehicle Spy Transmit Message with Arb ID and Named Signal.

We'll now use the *Tx Panel* to specify a simple static value to send in that signal, and then instruct Vehicle Spy to transmit the message periodically.

9. **Load Tx Panel:** Select *Tx Panel* from the *Spy Networks* menu.
10. **Select Message:** Click on "HS CAN Message 1" under *Description* on the left side of the screen.
11. **Select Transmission Rate:** The message by default is set to "Periodic" transmissions, but the rate says "None". Double-click in this field, scroll down and choose "0.100".

12. **Set Signal Data Value:** On the right side of the screen, double-click under *Value* for the *Engine Speed* signal, and enter "207". (You may need to first move the vertical divider bar that separates the two halves of the Tx Panel, by clicking on it and dragging it to the left.)

The *Tx Panel* in Vehicle Spy should now appear similar to Figure 83. Our custom message is ready to transmit.

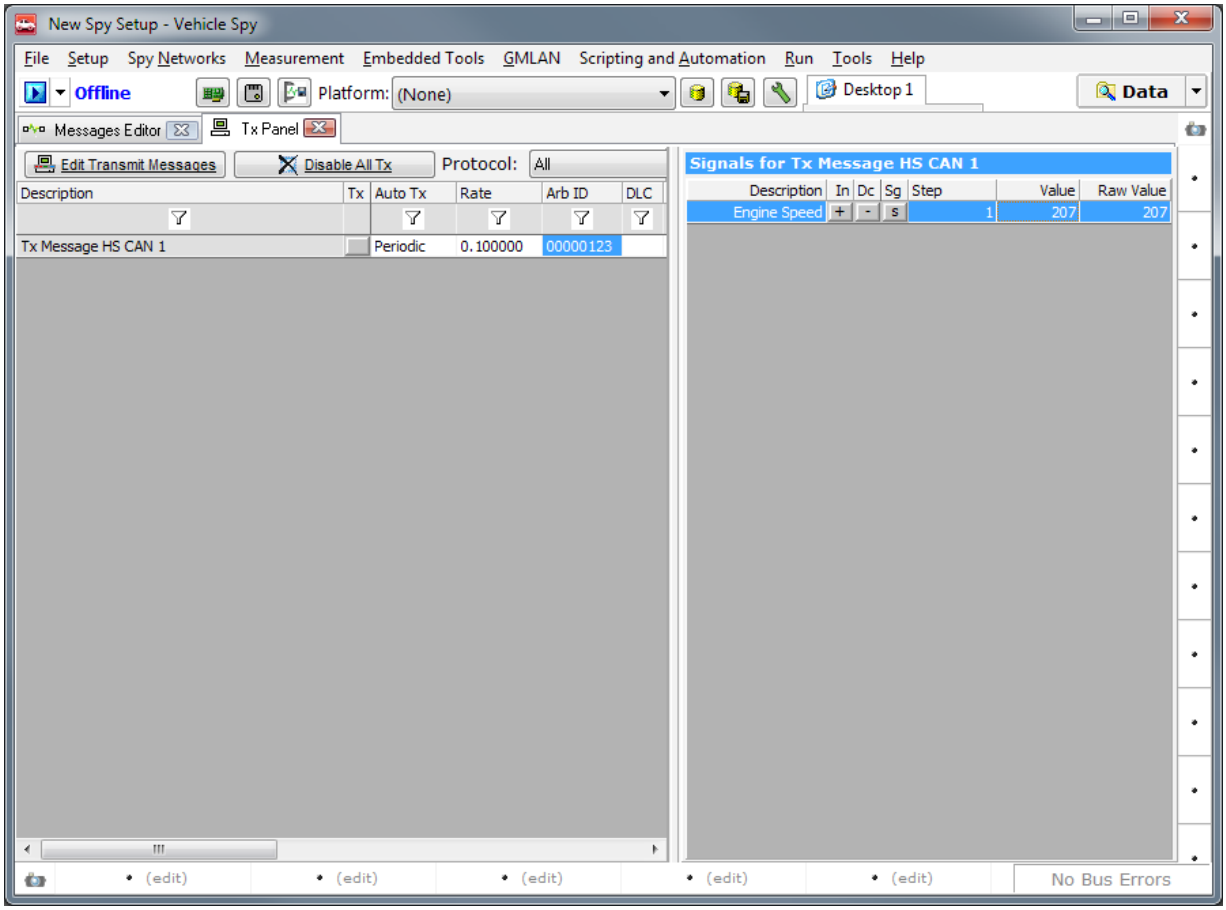


Figure 83: Vehicle Spy Tx Panel with 100 Millisecond Periodic Rate Set and Signal Value Assigned.

Let's now switch to *Messages View* and go online to see our message being transmitted on the CAN network.

13. **Switch to Messages View:** Select *Messages* from the *Spy Networks* menu.

14. **Go Online:** Press the blue arrow button in the top left corner of Vehicle Spy.

You should now see a new "Message HS CAN 1" message show up about every 100 ms (Figure 84). Notice the green dot under the *Tx* column, which labels this as a transmitted message.

15. **Expand Message:** Press the + sign to the left of "Message HS CAN 1".

Vehicle Spy shows you the *Engine Speed* signal with the value we set in both decimal (207) and hexadecimal (0xCF).

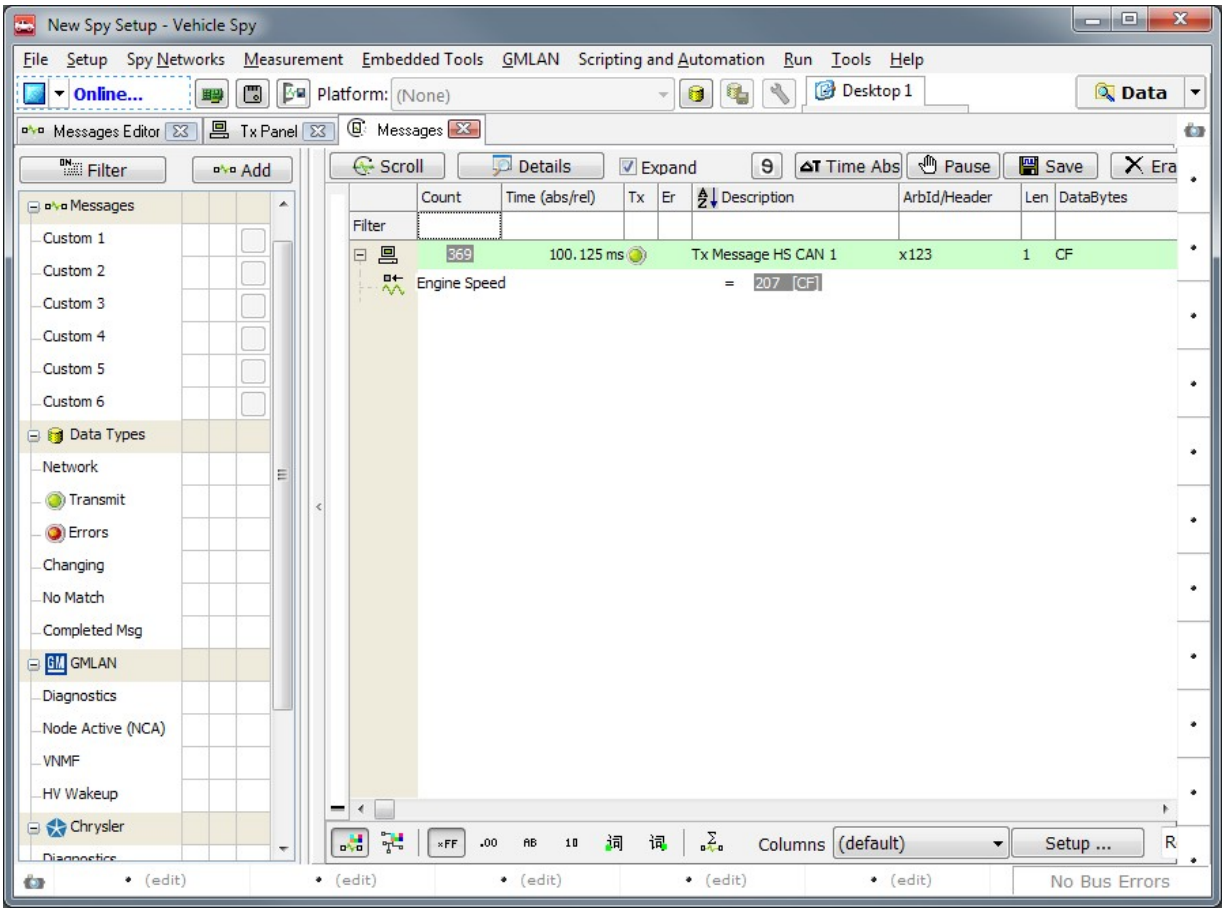


Figure 84: Vehicle Spy Messages View Showing Custom Transmitted Message and Signal.

Naturally, in a real example we would want to create a more realistic depiction of engine speed. This can be done in a variety of ways in Vehicle Spy, such as writing a function block program to describe engine behavior and control message transmission.

6.4 Interfacing to Automotive Ethernet (BroadR-Reach / 100BASE-T1)

The neoVI ION can be used to monitor and transmit on a BroadR-Reach (100BASE-T1) Automotive Ethernet network, with the help of a device that changes the BroadR-Reach PHY into the standard 10/100 Ethernet PHY used by the ION. Intrepid sells an inexpensive tool for this exact purpose, called the RAD-Moon media converter.

Figure 85 shows the neoVI ION Connection diagram of Figure 46 modified to illustrate a typical Automotive Ethernet application. The RJ-45 jack on the ION network interface cable is connected to the RAD-Moon's RJ-45 jack using a standard Ethernet cable. The BroadR-Reach ECU or network is connected to the RAD-Moon's Mini50 connector on the other side of the

converter. Power for the RAD-Moon is provided via the USB host slot on the ION, allowing the ION to power the RAD-Moon on or off as needed.

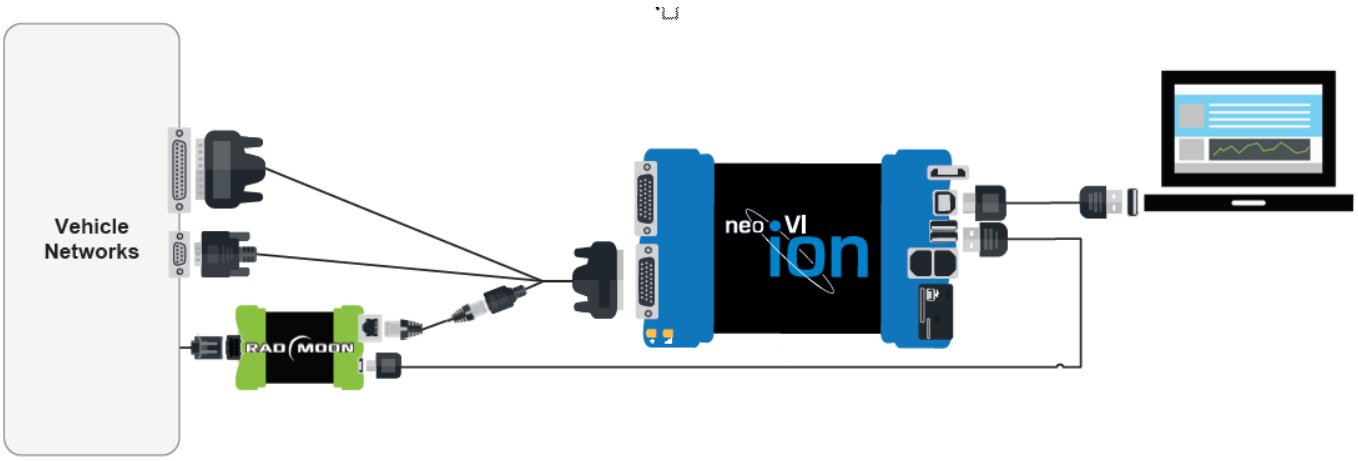


Figure 85: neoVI ION Connection Diagram for Automotive Ethernet Using RAD-Moon Media Converter.

6.5 Using the Ethernet Interface for DoIP and XCP

This section will be detailed in a future version of this manual.

6.6 Standalone Logging

This section will be detailed in a future version of this manual.

6.7 Logging with Wireless neoVI

This section will be detailed in a future version of this manual.

7 Advanced Features

In this chapter we provide additional information on some of the neoVI ION's new and advanced features.

Note that some of these features are not yet currently implemented in the neoVI ION, but their capabilities will be provided in future firmware upgrades, at which time this manual will be updated to explain their use.

7.1 neoVI API

The neoVI ION comes with support for a full API that allows you to control the device from other software packages or custom-written software. For instructions on using the API,

please consult its documentation on the Intrepid website at: http://www.intrepidcs.com/support/ICSDocumentation/neoVIDLL/neoVIDLLhelpdoc.html.

7.2 USB Host

The neoVI ION comes with a USB host port that allows other devices to be plugged into it (see Figure 6 in Section 2.3). Due to the difficulties associated with driver development, this port is intended for specific devices rather than general purpose use. It is especially designed to work with devices such as the Intrepid neoVI MIC microphone/trigger pendant, or the RAD- Moon (as seen in Section 5.3).

8 Reference: Connector Pinouts and Cable Signal Mappings

This section contains complete pinouts for the connectors on the neoVI ION, as well as those on the network interface cables used to attach to it. For your convenience, tables are also provided that show the mappings of signals between pin numbers on the connectors of each network cable.

Note that the USB cable is industry standard and not covered here.

8.1 neoVI ION Connector Pinouts

We'll start with the pinouts for the connectors on the neoVI ION itself.

HD-26 Connector Pinout

A list of pin assignments for the HD-26 connector can be found in Table 4, with pin numbering for the connector illustrated in Figure 86.

Pin #	Name	Description
1	ETH TX+	Ethernet transmit channel, positive
2	HS CAN 4 L	High Speed CAN channel 4, low
3	HS CAN 5 L	High Speed CAN channel 5, low
4	HS CAN 1 L	High Speed CAN channel 1, low
5	MS CAN L	Medium Speed CAN channel, low
6	HS CAN 2 L	High Speed CAN channel 2, low
7	HS CAN 3 L	High Speed CAN channel 3, low
8	HS CAN 6 L / LSFT CAN L	High Speed CAN channel 6, low / Low Speed Fault Tolerant CAN channel 1, low
9	ETH TX-	Ethernet transmit channel, negative
10	GND	Ground
11	ETH RX+	Ethernet receive channel, positive
12	HS CAN 4 H	High Speed CAN channel 4, high
13	HS CAN 5 H	High Speed CAN channel 5, high
14	HS CAN 1 H	High Speed CAN channel 1, high
15	MS CAN H	Medium Speed CAN channel, high
16	HS CAN 2 H	High Speed CAN channel 2, high
17	HS CAN 3 H	High Speed CAN channel 3, high
18	HS CAN 6 H / LSFT CAN H / SW CAN 2	High Speed CAN channel 6, high / Low Speed Fault Tolerant CAN channel 1, high / Single Wire CAN channel 2
19	V BATT	DC Input Power
20	ETH RX-	Ethernet receive channel, negative
21	HS CAN 7 L / LSFT CAN 2 L	High Speed CAN channel 7, low / Low Speed Fault Tolerant CAN channel 2, low

Pin #	Name	Description
22	ISO K/LIN 1	LIN channel 1
23	LIN 2	LIN channel 2
24	LIN 3	LIN channel 3
25	ETH ACTIVATE / LIN 4	Ethernet activation line and LIN 4
26	HS CAN 7 H / LSFT CAN 2 H / SW CAN / LIN 5	High Speed CAN channel 7, high / Low Speed Fault Tolerant CAN channel 2, high / Single Wire CAN channel 1 / LIN 5

Table 4: neoVI ION HD-26 Connector Pinout.

Figure 86: neoVI ION HD-26 Connector Pin Numbering.

8.2 ION Ethernet Cable Adapter Connector Pinouts and Signal Mapping

The primary cable for connecting the ION to vehicle networks has four connectors: HD- 26, DB-25, DB-9 and RJ-45. The HD-26 connector mates to the HD-26 on the ION and uses the same pinout shown in Table 4; the others are described below, followed by a signal mapping table.

DB-25 Connector Pinout

Table 6 lists the pins of the DB-25 connector on the ION Ethernet Cable Adapter.

Pin #	Name	Description
1	HS CAN 7 H / LSFT CAN 2 H / SW CAN	High Speed CAN channel 7, high / Low Speed Fault Tolerant CAN channel 2, high / Single Wire CAN channel 1
2	N/C	No connection
3	HS CAN 6 H / LSFT CAN H / SW CAN 2	High Speed CAN channel 6, high / Low Speed Fault Tolerant CAN channel 1, high / Single Wire CAN channel 2
4	HS CAN 6 L / LSFT CAN L	High Speed CAN channel 6, low / Low Speed Fault Tolerant CAN channel 1, low
5	MS CAN H	Medium Speed CAN channel, high
6	MS CAN L	Medium Speed CAN channel, low
7	HS CAN 7 L / LSFT CAN 2 L	High Speed CAN channel 7, low / Low Speed Fault Tolerant CAN channel 2, low
8	ISO K/LIN 1	K-Line channel 1 / LIN channel 1
9	N/C	No connection
10	N/C	No connection
11	N/C	No connection
12	N/C	No connection
13	GND	Ground
14	HS CAN 1 H	High Speed CAN channel 1, high
15	HS CAN 1 L	High Speed CAN channel 1, low
16	HS CAN 2 H	High Speed CAN channel 2, high
17	HS CAN 2 L	High Speed CAN channel 2, low
18	HS CAN 4 H	High Speed CAN channel 4, high
19	HS CAN 3 H	High Speed CAN channel 3, high
20	HS CAN 3 L	High Speed CAN channel 3, low
21	HS CAN 5 H	High Speed CAN channel 5, high
22	HS CAN 5 L	High Speed CAN channel 5, low
23	HS CAN 4 L	High Speed CAN channel 4, low
24	N/C	No connection
25	V BATT	DC Input Power

Table 6: ION Ethernet Cable Adapter DB-25 Connector Pinout.

DB-9 Connector Pinout

Table 7 contains the pinout for the DB-9 connector on this cable.

Pin #	Name	Description
1	LIN 1	LIN channel 1
2	LIN 2	LIN channel 2
3	LIN 3	LIN channel 3
4	ETH ACTIVATE	Ethernet activation line
5	GND	Ground
6	N/C	No connection
7	N/C	No connection
8	N/C	No connection
9	N/C	No connection

Table 7: ION Ethernet Cable Adapter DB-9 Connector Pinout.

RJ-45 Connector Pinout

The pinout for the RJ-45 (Ethernet) connector on this cable can be found in Table 8.

Pin #	Name	Description
1	ETH TX+	Ethernet transmit channel, positive
2	ETH TX-	Ethernet transmit channel, negative
3	ETH RX+	Ethernet receive channel, positive
4	N/C	No connection
5	N/C	No connection
6	ETH RX-	Ethernet receive channel, negative
7	N/C	No connection
8	N/C	No connection

Table 8: ION Ethernet Cable Adapter RJ-45 Connector Pinout.

Cable Signal Mapping

For easy reference, Table 9 shows the mapping of signals for the ION Ethernet Cable Adapter, by pin order on the HD-26 that connects to the ION.

Signal Name	Signal Description	HD-26 Pin #	DB-25 Pin #	DB-9 Pin #	RJ-45 Pin #
ETH TX+	Ethernet transmit channel, positive	1			1
HS CAN 4 L	High Speed CAN channel 4, low	2	23		
HS CAN 5 L	High Speed CAN channel 5, low	3	22		
HS CAN 1 L	High Speed CAN channel 1, low	4	15		
MS CAN L	Medium Speed CAN channel, low	5	6		
HS CAN 2 L	High Speed CAN channel 2, low	6	17		
HS CAN 3 L	High Speed CAN channel 3, low	7	20		
HS CAN 6 L / LSFT CAN L	High Speed CAN channel 6, low / Low Speed Fault Tolerant CAN channel 1, low	8	4		
ETH TX-	Ethernet transmit channel, negative	9			2
GND	Ground	10	13	5	
ETH RX+	Ethernet receive channel, positive	11			3
HS CAN 4 H	High Speed CAN channel 4, high	12	18		
HS CAN 5 H	High Speed CAN channel 5, high	13	21		
HS CAN 1 H	High Speed CAN channel 1, high	14	14		
MS CAN H	Medium Speed CAN channel, high	15	5		
HS CAN 2 H	High Speed CAN channel 2, high	16	16		
HS CAN 3 H	High Speed CAN channel 3, high	17	19		
HS CAN 6 H / LSFT CAN H / SW CAN 2	High Speed CAN channel 6, high / Low Speed Fault Tolerant CAN channel 1, high / Single Wire CAN channel 2	18	3		
V BATT	DC Input Power	19	25		
ETH RX-	Ethernet receive channel, negative	20			6
HS CAN 7 L / LSFT CAN 2 L	High Speed CAN channel 7, low / Low Speed Fault Tolerant CAN channel 2, low	21	7		
ISO K/LIN 1	LIN channel 1	22		1	
LIN 2	LIN channel 2	23		2	
LIN 3	LIN channel 3	24		3	
ETH ACTIVATE	Ethernet activation line	25		4	
HS CAN 7 H / LSFT CAN 2 H / SW CAN	High Speed CAN channel 7, high / Low Speed Fault Tolerant CAN channel 2, high / Single Wire CAN channel 1	26	1		

Table 9: ION Ethernet Cable Adapter Signal Mapping.

8.3 neoVI-OBD-1 Cable Connector Pinouts and Signal Mapping

This OBD cable contains a DB-25 connector that mates to the DB-25 on the ION Ethernet Cable Adapter and an OBD-II / J1962 connector for your vehicle or bench.

DB-25 Connector Pinout

Table 10 shows the pinout of the DB-25 connector on the neoVI-OBD-1.

Pin #	Name	Description
1	SW CAN	Single Wire CAN channel
2	N/C	No connection
3	N/C	No connection
4	N/C	No connection
5	MS CAN H	Medium Speed CAN channel, high
6	MS CAN L	Medium Speed CAN channel, low
7	ISO L	ISO 9141-2 L-Line
8	ISO9141/K/LIN1	ISO 9141-2 K-Line / LIN channel 1
9	N/C	No connection
10	N/C	No connection
11	N/C	No connection
12	N/C	No connection
13	GND	Ground
14	HS CAN 1 H	High Speed CAN channel 1, high
15	HS CAN 1 L	High Speed CAN channel 1, low
16	HS CAN 2 H	High Speed CAN channel 2, high
17	HS CAN 2 L	High Speed CAN channel 2, low
18	N/C	No connection
19	HS CAN 3 H	High Speed CAN channel 3, high
20	HS CAN 3 L	High Speed CAN channel 3, low
21	N/C	No connection
22	N/C	No connection
23	N/C	No connection
24	N/C	No connection
25	V BATT	DC Input Power

Table 10: neoVI-OBD-1 Cable DB-25 Connector Pinout.

OBD-II / J1962 Connector Pinout

Table 11 contains the pinout for the OBD-II / J1962 connector on this cable.

Pin #	Name	Description
1	Discretionary (SW CAN)	Single Wire CAN channel
2	J1850 +	J1850 line, positive
3	Discretionary (MS CAN H)	Medium Speed CAN channel, high
4	Chassis GND	Chassis Ground
5	Signal GND	Signal Ground
6	Discretionary (HS CAN H)	High Speed CAN channel, high
7	ISO9141/K/LIN1	ISO 9141-2 K-Line / LIN channel 1
8	Discretionary	Discretionary
9	Discretionary (ALDL)	Assembly Line Diagnostics Link
10	J1850 -	J1850 line, negative
11	Discretionary (MS CAN L)	Medium Speed CAN channel, low
12	Discretionary	Discretionary
13	Discretionary	Discretionary
14	Discretionary (HS CAN L)	High Speed CAN channel, low
15	ISO L	ISO 9141-2 L-Line
16	VBATT	Unswitched Vehicle Battery Positive

Table 11: neoVI-OBD-1 Cable OBD-II / J1962 Connector Pinout. The table shows standard signals for the OBD-II connector; this includes J1850, which is not supported by the NEOVI ION.

Cable Signal Mapping

Table 12 contains the mapping of signals for the neoVI-OBD-1 cable. The signal names for both connectors are shown and the table is based on the OBD-II connector's pin order.

OBD-II Pin #	OBD-II Signal	DB-25 Signal	DB-25 Pin #
1	Discretionary (SW CAN)	SW CAN	1
2	J1850 +	N/C	2
3	Discretionary (MS CAN H)	MS CAN H	5
4	Chassis GND	N/C	N/C
5	Signal GND	GND	13
6	Discretionary (HS CAN H)	HS CAN 1 H	14
7	ISO9141/K/LIN1	ISO9141/K/LIN1	8
8	Discretionary	N/C	N/C

OBD-II Pin #	OBD-II Signal	DB-25 Signal	DB-25 Pin #
9	Discretionary (ALDL)	HS CAN 3 H	19
10	J1850 -	HS CAN 3 L	20
11	Discretionary (MS CAN L)	MS CAN L	6
12	Discretionary	HS CAN 2 H	16
13	Discretionary	HS CAN 2 L	17
14	Discretionary (HS CAN L)	HS CAN 1 L	15
15	ISO L	ISO L	7
16	VBATT	VBATT	25

Table 12: neoVI-OBD-1 Cable Signal Mapping.

8.4 neoVI-OBD-MULTI (Regular and RightAngle) Cable Connector Pinouts and Signal Mapping

These two cables have the same pinouts and signal mappings, as they differ only in the physical construction of the OBD-II connector.

DB-25 Connector Pinout

Table 13 shows the pinout of the DB-25 connector on the neoVI-OBD-1.

Pin #	Name	Description
1	N/C	No connection
2	N/C	No connection
3	N/C	No connection
4	N/C	No connection
5	MS CAN H	Medium Speed CAN channel, high
6	MS CAN L	Medium Speed CAN channel, low
7	ISO L	ISO 9141-2 L-Line
8	ISO9141/K/LIN1	ISO 9141-2 K-Line / LIN channel 1
9	N/C	No connection
10	N/C	No connection
11	N/C	No connection
12	N/C	No connection
13	GND	Ground
14	HS CAN 1 H	High Speed CAN channel 1, high

15	HS CAN 1 L	High Speed CAN channel 1, low
16	HS CAN 2 H	High Speed CAN channel 2, high

Pin #	Name	Description
17	HS CAN 2 L	High Speed CAN channel 2, low
18	N/C	No connection
19	HS CAN 3 H	High Speed CAN channel 3, high
20	HS CAN 3 L	High Speed CAN channel 3, low
21	N/C	No connection
22	N/C	No connection
23	N/C	No connection
24	N/C	No connection
25	V BATT	DC Input Power

Table 13: neoVI-OBD-MULTI Cable DB-25 Connector Pinout.

OBD-II / J1962 Connector Pinout

The pinout for the OBD-II / J1962 connector on this cable can be found in Table 14.

Pin #	Name	Description
1	Discretionary	Discretionary
2	J1850 +	J1850 line, positive
3	Discretionary	Discretionary
4	Chassis GND	Chassis Ground
5	Signal GND	Signal Ground
6	CAN H	High Speed CAN channel, high
7	ISO9141/K	ISO 9141-2 K-Line
8	Discretionary	Discretionary
9	Discretionary	Discretionary
10	J1850 -	J1850 line, negative
11	Discretionary	Discretionary
12	Discretionary	Discretionary
13	Discretionary	Discretionary
14	CAN L	High Speed CAN channel, low
15	ISO L	ISO 9141-2 L-Line
16	VBATT	Unswitched Vehicle Battery Positive

Table 14: neoVI-OBD-MULTI Cable OBD-II / J1962 Connector Pinout. The table shows standard signals for the OBD-II connector; this includes J1850, which is not supported by the NEOVI ION.

Cable Signal Mapping

Table 15 contains the mapping of signals for the neoVI-OBD-MULTI regular and right angle cables. The signal names for both connectors are shown and the table is based on the OBD-II connector's pin order.

OBD-II Pin #	OBD-II Signal	DB-25 Signal	DB-25 Pin #
1	Discretionary	HS CAN 3 H	19
2	J1850 +	N/C	N/C
3	Discretionary	MS CAN H	5
4	Chassis GND	N/C	N/C
5	Signal GND	GND	13
6	CAN H	HS CAN 1 H	14
7	ISO9141/K	ISO9141/K/LIN1	8
8	Discretionary	N/C	N/C
9	Discretionary	HS CAN 3 L	20
10	J1850 -	N/C	N/C
11	Discretionary	MS CAN L	6
12	Discretionary	HS CAN 2 H	16
13	Discretionary	HS CAN 2 L	17
14	CAN L	HS CAN 1 L	15
15	ISO L	ISO L	7
16	VBATT	VBATT	25

Table 15: neoVI-OBD-MULTI Cable Signal Mapping.

8.5 neoVI FIRE/RED J1939 Cable Connector Pinouts and Signal Mapping

This cable converts the neoVI DB-25 connector to a 9-pin Deutsch connector for use in commercial vehicles.

DB-25 Connector Pinout

Table 16 contains the pinout of the DB-25 connector for this cable.

Pin #	Name	Description
1	N/C	No connection
2	N/C	No connection
3	N/C	No connection
4	N/C	No connection
5	MS CAN H	Medium Speed CAN channel, high
6	MS CAN L	Medium Speed CAN channel, low
7	N/C	No connection
8	N/C	No connection
9	N/C	No connection
10	N/C	No connection
11	N/C	No connection

Pin #	Name	Description
12	N/C	No connection
13	GND	Ground
14	HS CAN H	High Speed CAN channel, high
15	HS CAN L	High Speed CAN channel, low
16	N/C	No connection
17	N/C	No connection
18	N/C	No connection
19	N/C	No connection
20	N/C	No connection
21	N/C	No connection
22	N/C	No connection
23	N/C	No connection
24	N/C	No connection
25	V BATT	DC Input Power

Table 16: neoVI FIRE/RED J1939 Cable DB-25 Connector Pinout.

Deutsch 9-Pin Connector Pinout

The pinout for the Deutsch connector on this cable is found in Table 17.

Pin #	Name	Description
1/A	Ground (-)	Ground
2/B	Battery (+)	Battery Power
3/C	CAN High (+)	High Speed CAN channel 1, high
4/D	CAN Low (-)	High Speed CAN channel 1, low
5/E	CAN Shield	CAN shield
6/F	J1708 (+)	J1708 channel, high
7/G	J1708 (-)	J1708 channel, low
8/H	CAN2 High (+)	High Speed CAN channel 1, high
9/J	CAN2 Low (-)	High Speed CAN channel 1, low

Table 17: neoVI FIRE/RED J1939 Cable Deutsch 9-Pin Connector Pinout. The table shows standard signals for the Deutsch 9-pin connector; this includes J1708, which is not supported by the NEOVI ION.

Cable Signal Mapping

Table 18 contains the mapping of signals for the neoVI FIRE/RED J1939 cable. The signal

names for both connectors are shown and the table is based on the Deutsch 9-pin connector's pin order.

Deutsch Pin #	Deutsch Signal	DB-25 Signal	DB-25 Pin #
1/A	Ground (-)	GND	13
2/B	Battery (+)	VBATT	25
3/C	CAN High (+)	HS CAN H	14
4/D	CAN Low (-)	HS CAN L	15
5/E	CAN Shield	N/C	N/C
6/F	J1708 (+)	N/C	N/C
7/G	J1708 (-)	N/C	N/C
8/H	CAN2 High (+)	MS CAN H	5
9/J	CAN2 Low (-)	MS CAN L	6

Table 18: neoVI FIRE/RED J1939 Cable Signal Mapping.

8.6 ION OBD Cable with DoIP Support Connector Pinouts and Signal Mapping

This special OBD cable replaces the ION Ethernet Cable Adapter and contains HD-26, DB- 25, DB-9 and OBD-II connectors. The HD-26 connector mates to the HD-26 on the ION and uses the same pinout shown in Table 4; the other connectors are described below, along with a signal mapping table.

DB-25 Connector Pinout

Table 19 lists the pins of the DB-25 connector on this cable.

Pin #	Name	Description
1	HS CAN 7 H / LSFT CAN 2 H / SW CAN	High Speed CAN channel 7, high / Low Speed Fault Tolerant CAN channel 2, high / Single Wire CAN channel 1
2	N/C	No connection
3	HS CAN 6 H / LSFT CAN H / SW CAN 2	High Speed CAN channel 6, high / Low Speed Fault Tolerant CAN channel 1, high / Single Wire CAN channel 2
4	HS CAN 6 L / LSFT CAN L	High Speed CAN channel 6, low / Low Speed Fault Tolerant CAN channel 1, low
5	HS CAN 5 H	High Speed CAN channel 5, high
6	HS CAN 5 L	High Speed CAN channel 5, low
7	N/C	No connection
8	ISO K/LIN 1	K-Line channel 1 / LIN channel 1
9	N/C	No connection
10	N/C	No connection
11	N/C	No connection

Pin #	Name	Description
12	N/C	No connection
13	GND	Ground
14	HS CAN 4 H	High Speed CAN channel 4, high
15	HS CAN 4 L	High Speed CAN channel 4, low
16	HS CAN 2 H	High Speed CAN channel 2, high
17	HS CAN 2 L	High Speed CAN channel 2, low
18	N/C	No connection
19	HS CAN 3 H	High Speed CAN channel 3, high
20	HS CAN 3 L	High Speed CAN channel 3, low
21	N/C	No connection
22	N/C	No connection
23	N/C	No connection
24	N/C	No connection
25	V BATT	DC Input Power

Table 19: ION OBD Cable with DoIP Support DB-25 Connector Pinout.

DB-9 Connector Pinout

Table 20 contains the pinout for the DB-9 connector on this cable.

Pin #	Name	Description
1	LIN 1	LIN channel 1
2	LIN 2	LIN channel 2
3	LIN 3	LIN channel 3
4	ETH ACTIVATE	Ethernet activation line
5	GND	Ground
6	N/C	No connection
7	N/C	No connection
8	N/C	No connection
9	N/C	No connection

Table 20: ION OBD Cable with DoIP Support DB-9 Connector Pinout.

OBD-II / J1962 Connector Pinout

Table 21 shows the pinout for the OBD-II / J1962 connector on the cable.

Pin #	Name	Description
1	MS CAN H	Medium Speed CAN channel, high
2	N/C	No connection
3	ETH TX+	Ethernet transmit channel, positive
4	N/C	No connection
5	GND	Ground
6	HS CAN H	High Speed CAN channel, high
7	N/C	No connection
8	ETH ACTIVATE	Ethernet activation line
9	MS CAN L	Medium Speed CAN channel, low
10	N/C	No connection
11	ETH TX-	Ethernet transmit channel, negative
12	ETH RX+	Ethernet receive channel, positive
13	ETH RX-	Ethernet receive channel, negative
14	HS CAN L	High Speed CAN channel, low
15	N/C	No connection
16	VBATT	DC power input

Table 21: ION OBD Cable with DoIP Support OBD-II / J1962 Connector Pinout.

Cable Signal Mapping

Table 22 shows the mapping of signals for the ION OBD Cable with DoIP Support, ordered by pin number on the HD-26 that connects to the ION.

Signal Name	Signal Description	HD-26 Pin #	DB-25 Pin #	DB-9 Pin #	OBD-II Pin #
ETH TX+	Ethernet transmit channel, positive	1			3
HS CAN 4 L	High Speed CAN channel 4, low	2	15		
HS CAN 5 L	High Speed CAN channel 5, low	3	6		
HS CAN 1 L	High Speed CAN channel 1, low	4			14
MS CAN L	Medium Speed CAN channel, low	5			9
HS CAN 2 L	High Speed CAN channel 2, low	6	17		
HS CAN 3 L	High Speed CAN channel 3, low	7	20		
HS CAN 6 L / LSFT CAN L	High Speed CAN channel 6, low / Low Speed Fault Tolerant CAN channel 1, low	8	4		
ETH TX-	Ethernet transmit channel, negative	9			11
GND	Ground	10	13	5	5
ETH RX+	Ethernet receive channel, positive	11			12
HS CAN 4 H	High Speed CAN channel 4, high	12	14		
HS CAN 5 H	High Speed CAN channel 5, high	13	5		
HS CAN 1 H	High Speed CAN channel 1, high	14			6
MS CAN H	Medium Speed CAN channel, high	15			1
HS CAN 2 H	High Speed CAN channel 2, high	16	16		
HS CAN 3 H	High Speed CAN channel 3, high	17	19		
HS CAN 6 H / LSFT CAN H / SW CAN 2	High Speed CAN channel 6, high / Low Speed Fault Tolerant CAN channel 1, high / Single Wire CAN channel 2	18	3		
V BATT	DC Input Power	19	25		16
ETH RX-	Ethernet receive channel, negative	20			13
HS CAN 7 L / LSFT CAN 2 L	High Speed CAN channel 7, low / Low Speed Fault Tolerant CAN channel 2, low	21			
ISO K/LIN 1	LIN channel 1	22	8	1	
LIN 2	LIN channel 2	23		2	
LIN 3	LIN channel 3	24		3	
ETH ACTIVATE	Ethernet activation line	25		4	9
HS CAN 7 H / LSFT CAN 2 H / SW CAN	High Speed CAN channel 7, high / Low Speed Fault Tolerant CAN channel 2, high / Single Wire CAN channel 1	26	1		

Table 22: ION OBD Cable with DoIP Support Signal Mapping.

9 Support Contact Information

If you have a problem you cannot resolve on your own, feel free to contact ICS for assistance at one of our offices.

9.1 ICS United States Headquarters

Our primary support personnel can be reached at our American headquarters in the Detroit area, using the following contact information:

- **Phone:** (800) 859-6265 or (586) 731-7950, extension 1.
- **Fax:** (586) 731-2274.
- **Email:** icssupport@intrepidcs.com

Intrepid's normal support hours are from 8 am to 5 pm, Monday to Friday, United States Eastern time. If you require assistance outside standard business hours, feel free to contact us and a member of our support team will get back to you as soon as possible.

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