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Model 907

Diagnostic Software Manual

Part No. 907-0604-00 Rev. D

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Document Revision History

Document Revision	Details of Revision	Author	Date
A	Production Release (based on 700-0745-00)	T. Vey	May 5, 2008
B	- Updated format. - Added more information on "Installation" section - Added "Troubleshooting" section. - Removed "obsolete" sections (Startup Display Backplane Activity, Switches, Auxiliary SFP Tabs, MAC Address)	A. Cabrera	January 22, 2010
C	Updated to reflect new software revision (v2.0.0.0)	T. Vey	May 19, 2010
D	- Fixed minor typos and errors - Added new graphics to reflect latest changes in software version 2.0 - Updated "Network" tab information	A. Cabrera	February 24, 2011

Reference Documents

Document No.	Description
700-0739-00	907 Diagnostics Protocol Manual: describes the underlying protocols used to communicate between the diagnostic card and the user application.
907-2039-00	Configuration drawing for the 907-DIAG-E diagnostic card: describes connector pin outs, switch settings, on-board diagnostic LEDs, and general specifications.

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1.0   Introduction

The purpose of this document is to provide Model 907 users with information on how to install and use the Model 907 Diagnostic Software with the Model 907 Diagnostic Card (907-DIAG-E).

The Model 907 Diagnostic Software has been created by Focal Technologies Corp. as a sample software application with a Graphical User Interface (GUI) which is intended for assisting engineering and integration of diagnostics on the Model 907 platform. The Model 907 Diagnostic Software provides important information about the status of the optics, video and data channels of Model 907 cards.

Diagnostic readings are accessed through a 10/100 Mbps Ethernet port (RJ45 jack) or a 9600 Baud RS-232 port (3.5 mm stereo jack) on the 907-DIAG-E diagnostic card. The 907-DIAG-E card provides access to real-time diagnostic information from Model 907 cards that support diagnostics (e.g. Model 907Plus Multiplexer Motherboard (907+)). The 907-DIAG-E card is typically stacked on the console side of a Model 907 stack. Examples in this manual are for the Model 907Plus but are generally applicable to other Model 907 cards that support diagnostics.

Since this manual may be updated to include recent additions to card types or capabilities, please contact Focal Technologies Corp. for the most current revision.

2.0   Installation

System Requirements:

- PC with Genuine Intel Pentium or AMD processor
- 256 MB of RAM
- 10 MB of available hard disk space for the application and documentation.
- CD-ROM or DVD drive
- Supported Operating Systems (32-bit and 64-bit): Windows XP; Windows Vista; Windows 7
- .NET Framework (minimum version 3.5)

Notes:
1. A PC with an available serial port (COM) is required for diagnostics via RS-232.
2. To determine which version of the .NET Framework is installed in your PC see the "Troubleshooting" section of this manual.

Installation Procedure

1. Insert the CD provided by Focal Technologies Corp. in your CD-ROM or DVD drive.
2. Copy the "Model 907 Diagnostics v2 Desktop" folder to a local folder in your PC.
   For example: C:\Focal\Model907\Model 907 Diagnostics v2 Desktop
3. Open the "Model 907 Diagnostics v2 Desktop" folder.
4. Double click on the ![Model907.exe] executable file to run the Model 907 Diagnostic Software.

3.0   Application Layout

Figure 3-1 illustrates the main functional areas of the Model 907 Diagnostics Software:
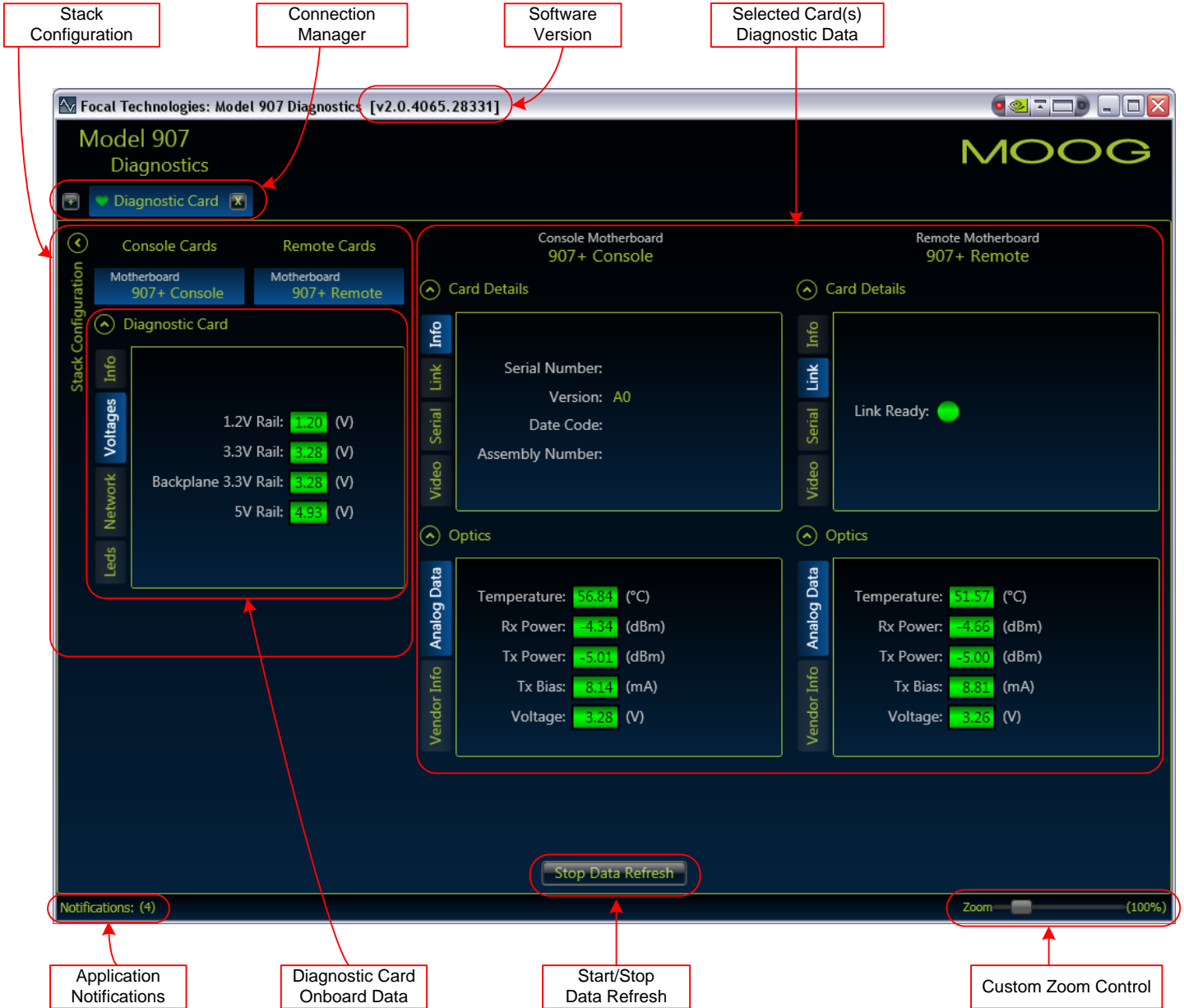

Figure 3-1: Application Layout

3.1   Application Usage

3.1.1   Connection Manager

The 907 Diagnostics Software supports simultaneous connections to multiple 907-DIAG-E diagnostic cards. The communication parameters for each card must be configured using the Connection Manager.

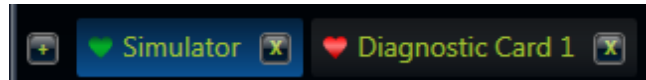To remove a diagnostic card from the list, click the [X] button to the right of the card name.

Figure 3-2: Connection Manager

To add a new diagnostic card to the list:

1. Click the [+] button at the far left of the Connection Manager.
2. Enter a Description, IP Address, Refresh Interval and Connection Timeout for the new card, as depicted in Figure 3-3. Also, select the Enable Auto Connect option if desired.
3. Click "Save Configuration".
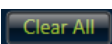
Figure 3-3: Add a New Diagnostic Card Configuration

Note: The 907-DIAG-E card only uses static IP addresses. There are eight default IP addresses for a 907-DIAG-E card (192.168.0.100, 192.168.0.101, 192.168.0.102,…,192.168.0.107) and one "User-defined" IP address. In order to establish a connection between the 907-DIAG-E diagnostic card and a PC, the IP address of both devices must live in the same network. See the troubleshooting section 5.2 for more information about connecting your 907-DIAG-E card to your PC.

3.1.2   Application Notifications

Click the [Notifications: (3)] button in the lower left corner of the main window to view application notifications.
Typical entries include connection, disconnection, and communication error events, but can also include various other informational messages related to application usage.

The current number of notifications is displayed in brackets.

Click the [Clear All] button to remove all current notifications from the list.

Click the [Close] button to hide the Application Notification window.

Figure 3-4: Application Notifications

3.1.3   Connect and Disconnect Diagnostic Communications

Click **Start Data Refresh** to begin retrieving data from the 907-DIAG-E diagnostics card.

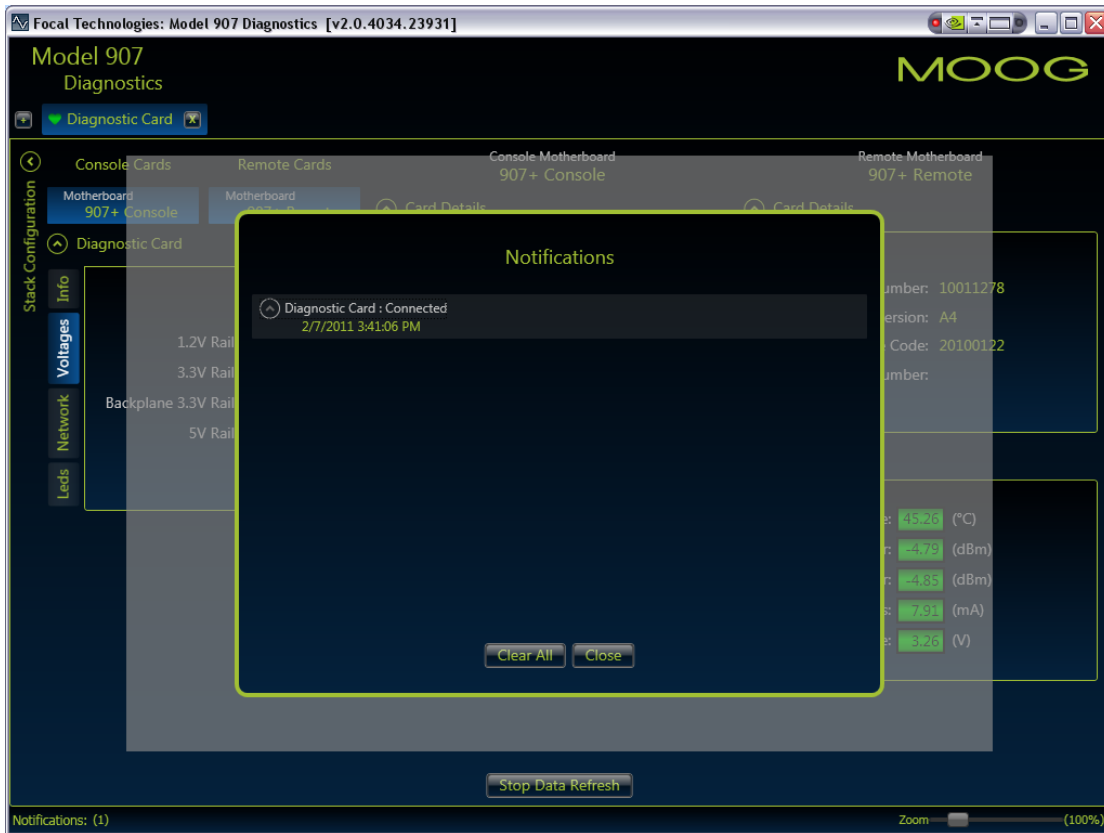Click **Stop Data Refresh** to disconnect from the 907-DIAG-E diagnostics card.

Note: The Start Data Refresh button changes to the Stop Data Refresh button after you click on it and vice versa.

When the "Start Data Refresh" button is pressed, the 907 Diagnostics Software will attempt to connect to the diagnostics card using the IP Address specified in the Connection Manager.

The Software adds an entry to the Application Notifications window after each connection attempt.

There are two ways to view the current connection status to a diagnostic card.

1. There is a "heartbeat" symbol next to the description of each 907-DIAG-E card in the connection manager. The heartbeat indicator can be used to monitor the connection status of all diagnostic cards at the same time.

    a. When communications to a diagnostic card are active, the heart is green 💚.
    b. When communications to a diagnostic card are disconnected or inactive, the heart is red ❤️.

Figure 3-5: Connection Status – Heartbeat Symbol

2. When communications to the diagnostics card are disconnected, a slowly pulsing red overlay is applied to the main application window. A large "Not Connected to Diagnostic Card" message is displayed directly above the buttons used to start/stop data refresh.

Figure 3-6: Connection Status – "Not Connected" Overlay

3.2   Diagnostics Data

After a connection has been established to a diagnostic card, the received data is formatted and displayed in the main application window.

Typically, the "Stack Configuration" is displayed in a list on the left-hand side of the screen. Diagnostic data for one or more cards can be displayed by clicking on the card description.

The data for each selected card is organized into a collapsible "expander" panel. An expander panel for any particular device contains a number of tabs for each sub-module within the device. For example, an Optics device might contain a tab for "Analog Data" and another for "Vendor Info".

3.2.1   Stack Configuration

When a connection is first established to a diagnostic card, the Software polls the system to determine which cards are present in the current configuration.

Before a connection to a diagnostic card has been established, the Stack Configuration displays "Not Detected" for each possible card location.

Figure 3-7: Stack Configuration – Before Connection Established

After a connection to a diagnostic card has been established, the Stack Configuration displays the card description for each supported card that is detected in the stack. Slots without detected cards are removed from the list.

Figure 3-8: Stack Configuration – After Connection Established

Click on any card in the list to display diagnostic data for that card. To select multiple cards at the same time, hold the "CTRL" key while clicking.

3.2.2   Card Details

All supported cards have an "Info" tab displayed in the "Card Details" panel. The information displayed is typically the Serial Number, FPGA version, Date Code and Assembly Number of the 907 card.

The remaining tabs in the "Card Details" panel are specific to each particular type of card. Each 907 card model has a unique set of capabilities that dictates which tabs are available.

For example, a 907+ card supports a number of channels of onboard video and a number of channels of onboard serial data. Therefore, the "Card Details" panel for a 907+ contains "Video" and "Serial" tabs that display the status of each channel.

In contrast, a 907-GBE2 card supports two Ethernet ports and therefore contains a tab titled "Ports" that displays status information for each port.
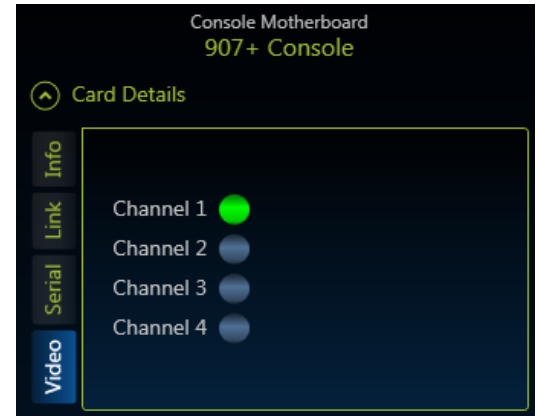

Figure 3-9: Card Details (907+ Video Tab)

3.2.3   Optical Data

The "Optics" panel displays formatted data for a small form-factor pluggable (SFP) optical transceiver. The information displayed can be classified in two sections: Vendor information and Analog Data.
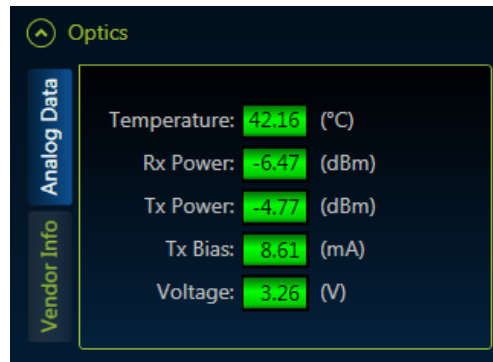

Figure 3-10: Optics Data

Alarm, Warning, and Measured values are read directly from the SFP device. The Temperature, Voltage, Rx Power, Tx Power, and Tx Bias Current fields are automatically highlighted based on the measured value compared to the Alarm and Warning levels.
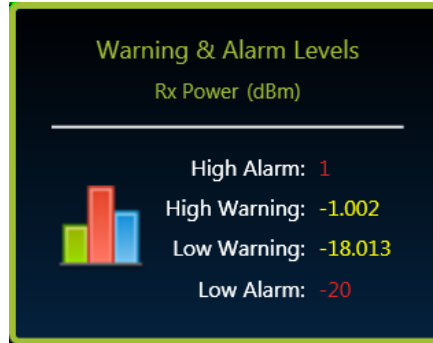
Figure 3-11: Optics Alarm and Warning Levels

Hover the mouse over the measurement of choice to display the Alarm and Warning Levels.

Table 1: SFP Data Highlight Colors

Background Color	Indicates
Green	The measured value is within normal operating parameters.
Yellow	The measured value is between the High Warning and High Alarm thresholds or between the Low Warning and Low Alarm thresholds.
Red	The measured value is GREATER THAN the High Alarm threshold or LESS THAN the Low Alarm threshold.

3.2.4   Diagnostic Card Onboard Data

The "Diagnostic Card" panel contains a collection of tabs used to display information that is extracted directly from the 907-DIAG-E card.

"Info" tab

The "Info" tab displays the Serial Number, Firmware Version, Date Code, Assembly Number and PCB Number of the 907-DIAG-E card.
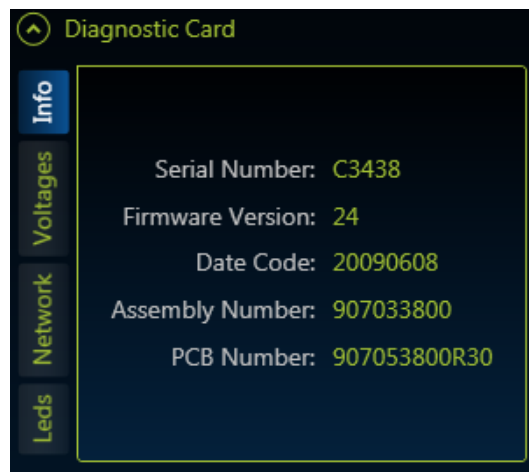

Figure 3-12: Diagnostic Card Info

"Voltages" tab

The "Voltages" tab displays formatted data for voltages read by the 907-DIAG-E card. Measured values are read directly from the diagnostics board. Alarm and Warning levels are pre-configured by Focal Technologies and can be seen by hovering the mouse over the voltage reading of choice.

The 1.2V, 3.3V and 5V monitors show the voltage measured at three different on board voltage regulators that provide power to different components in the 907-DIAG-E diagnostic card.

The 3.3V backplane monitor shows the voltage measured at one of the pins of the backplane PC/104 connector of the 907-DIAG-E card.

The following figure shows the "Voltages" tab of the Diagnostic Card.

Figure 3-13: Diagnostic Card Voltages

The following table shows the meaning of the background colors of the "Voltages" tab.

Table 2: Voltage Highlight Colors

Background Color	Indicates
Green	The measured value is within normal operating parameters.
Yellow	The measured value is between the High Warning and High Alarm thresholds or between the Low Warning and Low Alarm thresholds.
Red	The measured value is GREATER THAN the High Alarm threshold or LESS THAN the Low Alarm threshold.

"Network" tab

The "Network" tab displays formatted data about the network parameters of the currently selected 907-DIAG-E card.

Important: An open connection to the diagnostic card must already be established before you can modify the network parameters of the 907-DIAG-E card. If you are not able to establish a successful connection between your PC and the 907-DIAG-E card, please refer to section 5.2 Failed Connection Attempt.

The following steps describe how to set "user-defined" network parameters on the 907-DIAG-E card using the Ethernet port.

1. Under the "Diagnostic Card" view, click on the "Network" tab to see the current network parameters of your 907-DIAG-E card.
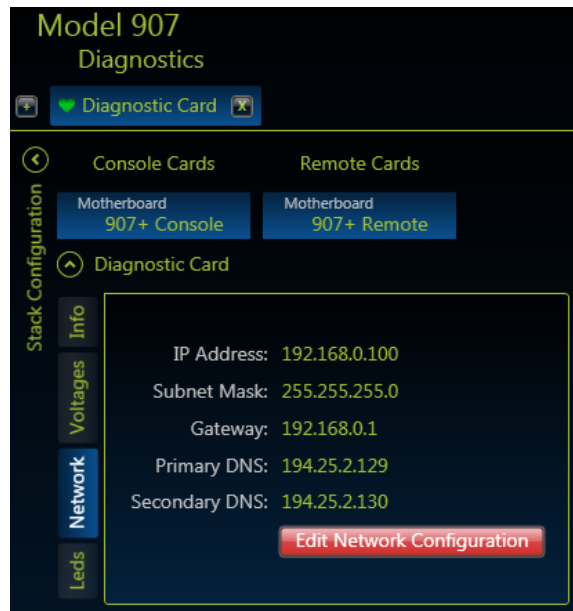

Figure 3-14: Diagnostic Card Network Configuration Display

2. Click on the "Edit Network Configuration" button and enter the new network parameters in the "Network Configuration Editor".
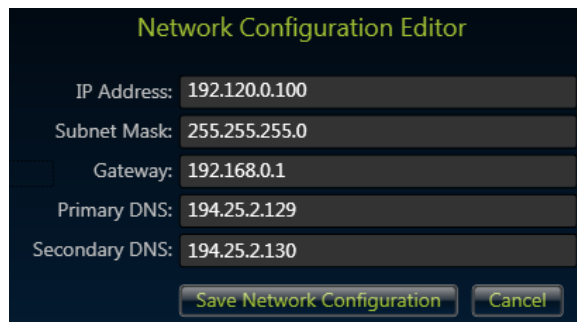

Figure 3-15: Network Configuration Editor

Note that in this step you can set a new "user-defined" IP address for your 907-DIAG-E card.

Before you go to the next step, it is recommended that you write down the new network parameters that you entered.

3. Click on the "Save Network Configuration" button to transfer the new settings to the 907-DIAG-E card. After you click this button you will be disconnected from the 907-DIAG-E card.

4. Power OFF your 907-DIAG-E card.

5. On the 907-DIAG-E board, change switch SW1 pin 4 to the "ON" position. This will enable the "user-defined" network parameters of the diagnostic card.

    Before you go to the next step, you need to ensure that your PC is now in the same network as your 907-DIAG-E card in order to establish a successful connection between the two devices. For example, if you entered a new static IP address for your diagnostic card such as 10.110.0.120 with subnet mask 255.255.0.0 then your PC's IP address must have a 10.110.xxx.xxx format. You can use the **ipconfig** command in the Command Prompt to verify your computer's IP address.

6. Power ON your 907-DIAG-E card.

7. On the Model 907 Diagnostic Software, under the Connection Manager area, click on the description name of your 907-DIAG-E card.

8. Click the "Start Data Refresh" button to reconnect to your 907-DIAG-E card.

"LEDs" tab

The "LEDs" tab allows custom configuration of the seven on-board LEDs and of the connector header that drives eighteen external LEDs on the 907-DIAG-E card.

Note: The user-configurable LED functionality is only available on 907-DIAG-E cards with firmware version 22 and above.

Click on the "Edit LED Configurations" button to display the LED Configuration Editor.
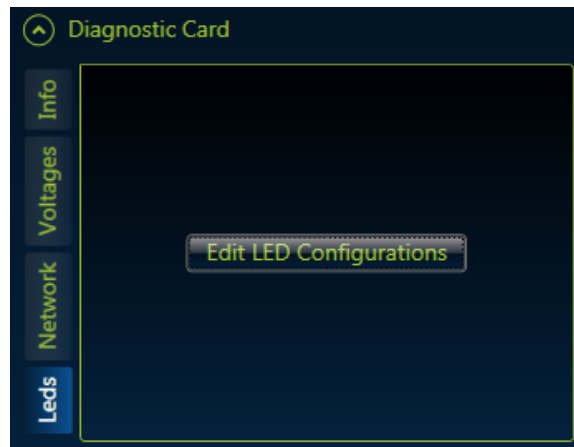

Figure 3-16: Diagnostic Card LED Configuration Display

The LED Configuration Editor is intended for system integrators. Please contact Focal for assistance.
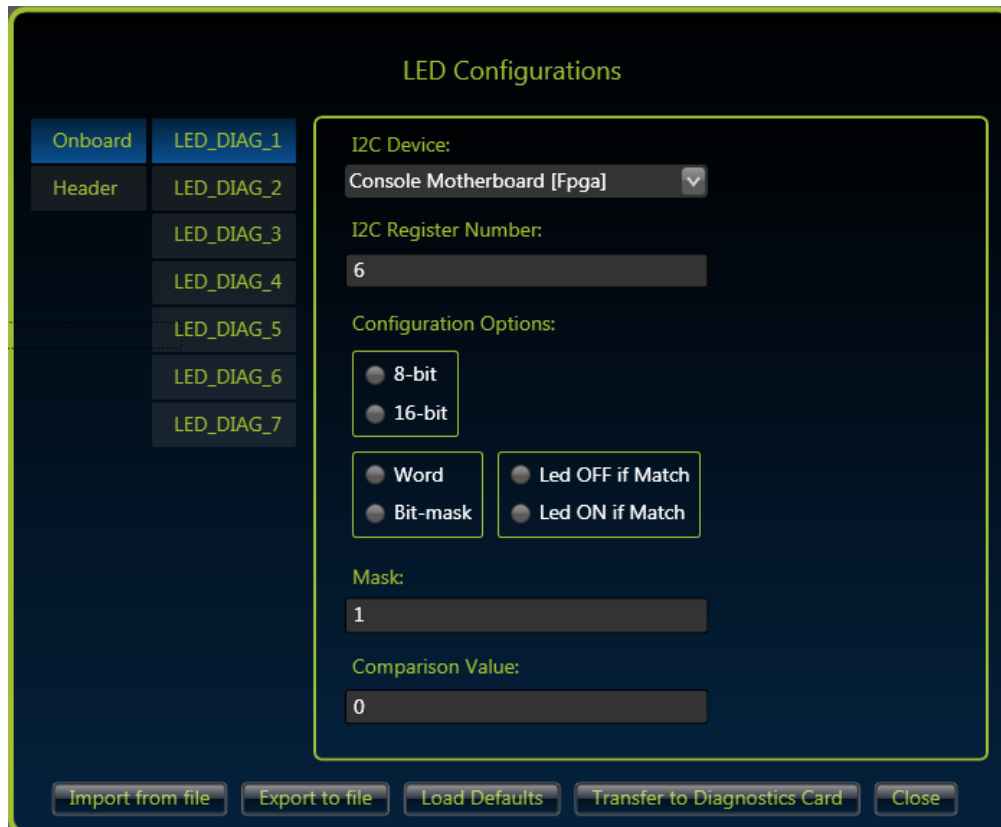

Figure 3-17: Diagnostic Card LED Configuration Editor

4.0   Diagnostics via RS-232 Interface

In addition to the 10/100 Mbps Ethernet interface, the 907-DIAG-E diagnostic card provides an RS-232 port. Like the Ethernet interface, the RS-232 interface can be used to monitor on-board and backplane voltages, read and configure network parameters, and read and write to I2C addresses.

Windows HyperTerminal can be used to access the RS-232 data stream. The HyperTerminal COM port connection should be configured for 9600 baud, 8 data bits, no parity, 1 stop bit, and no flow control, as shown in Figure 4-1.
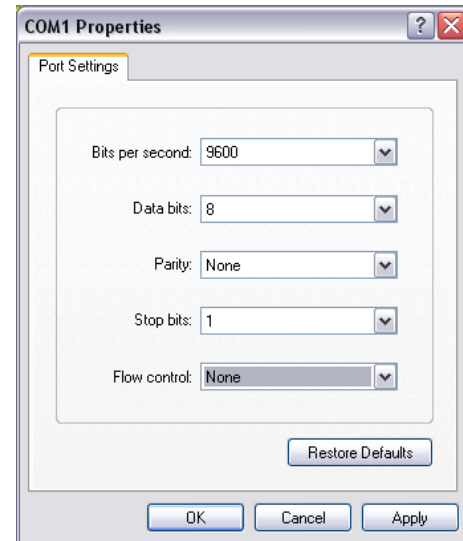
Figure 4-1: Windows HyperTerminal Configuration

When the 907-DIAG-E card is powered on, it will output a menu to HyperTerminal as shown in Figure 4-2. The data displayed upon power up includes the network configuration of the current switch configuration. If pin 4 of DIP switch SW1 is ON, the data displayed will be the user-configurable network profile, otherwise it will be the defaults assigned by the SW1 settings. If no display is shown, HyperTerminal may not have been reading characters at the moment the card was powered and "*Enter*" must be pressed to refresh the main menu.

To select an option from the menu, just press the number (1 to 8) corresponding to the command that you want to use.
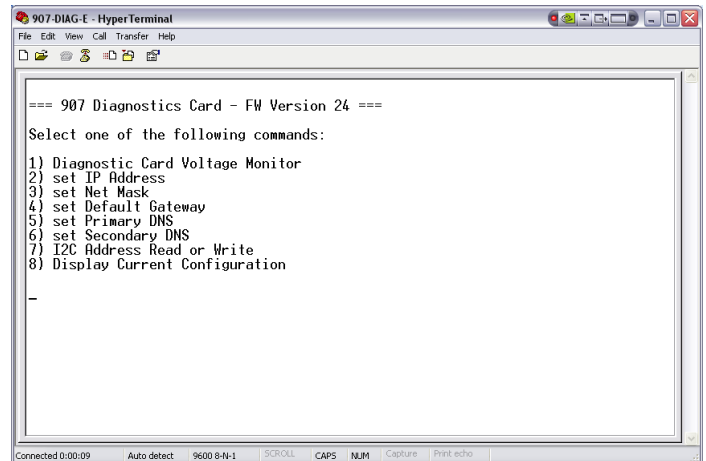
Figure 4-2: Main Menu & Network Configuration

Menu Item 1: Diagnostic Card Voltage Monitor

Selecting menu item *1* will issue a display of all monitored voltages from the 907-DIAG-E card as shown in Figure 4-3. The 1.2V, 3.3V and 5V monitors show the voltage measured at three different on board voltage regulators that provide power to different components in the 907-DIAG-E diagnostic card.
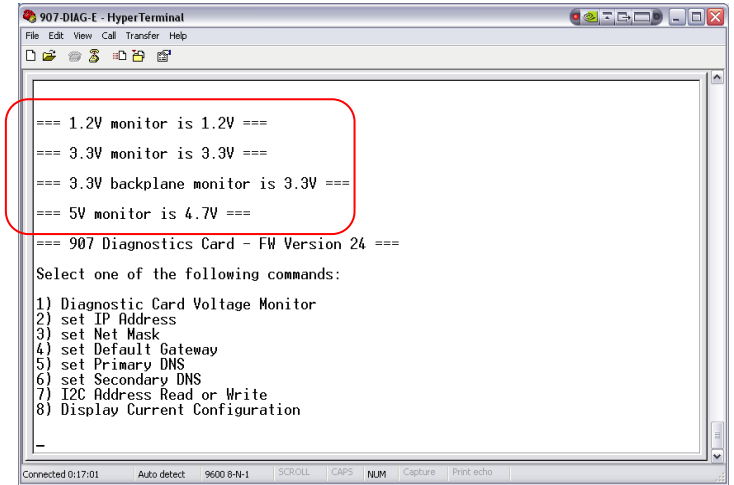The 3.3V backplane monitor shows the voltage measured at the backplane PC/104 connector of the 907-DIAG-E card.

Figure 4-3: Voltage Monitor Display

Menu items 2 to 6 are used for 907-DIAG-E diagnostic card Ethernet port configurations. Details are shown in Figure 4-4 through Figure 4-13.

Menu Item 2: Set IP Address
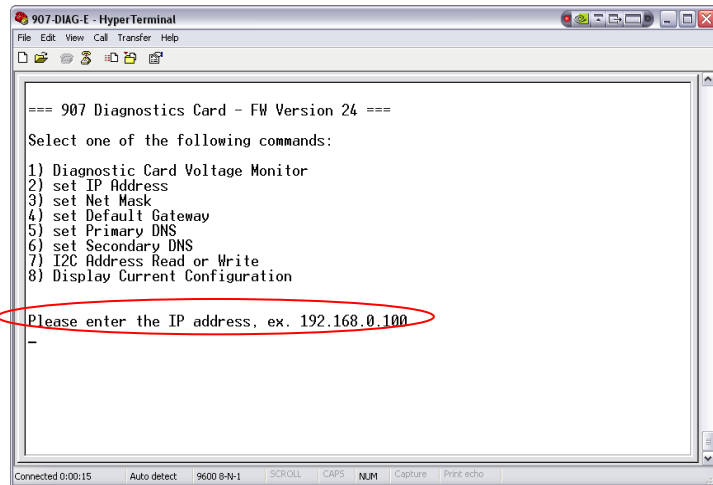
Figure 4-4: Set IP Address Menu
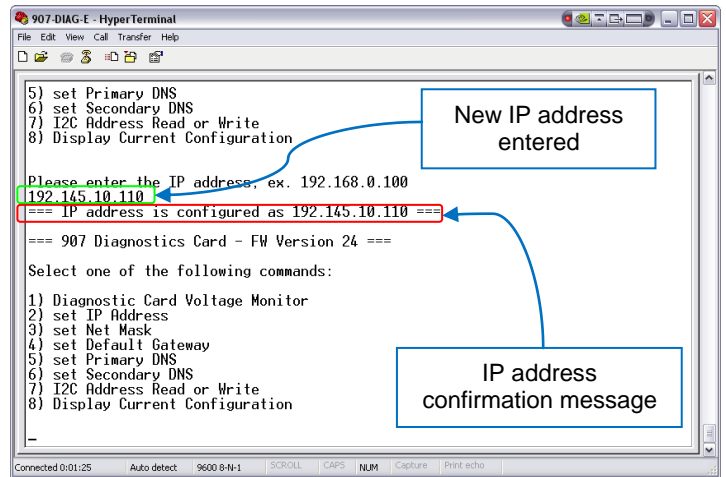
Figure 4-5: Set IP Address Response

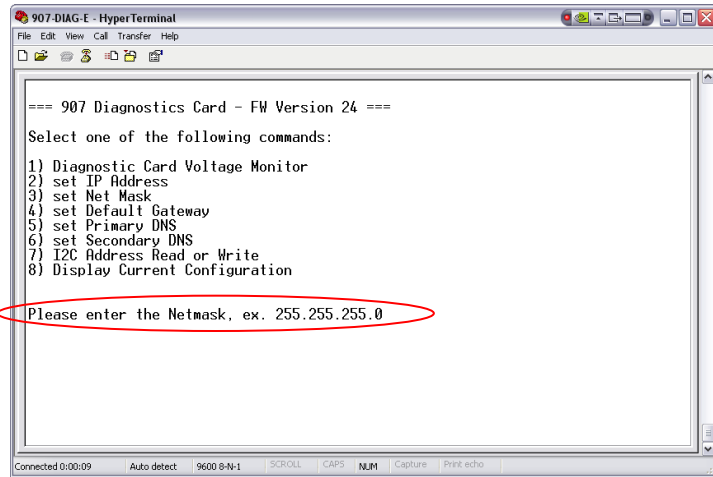## Menu Item 3: Set Net Mask

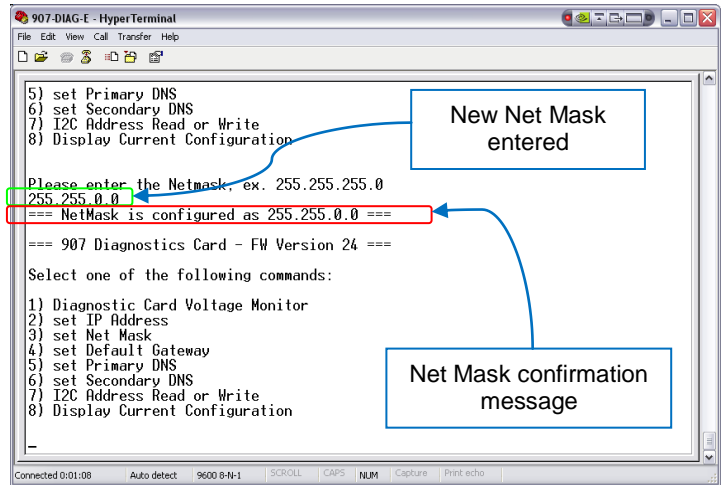**Figure 4-6: Set Net Mask Menu**

Figure 4-7: Set Net Mask Response
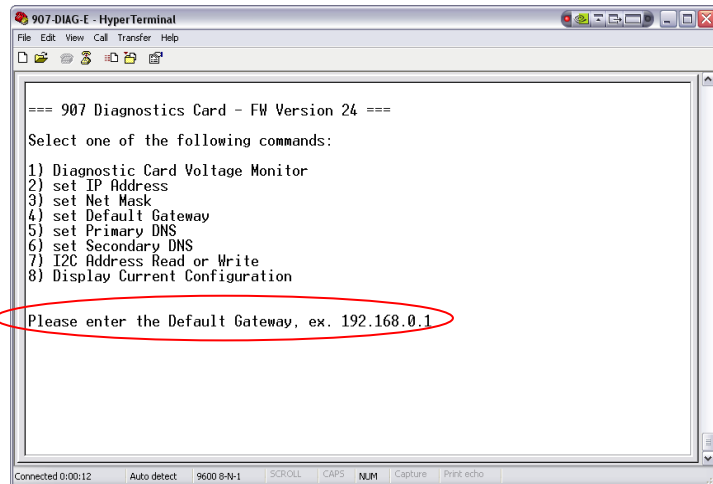
Menu Item 4: Default Gateway
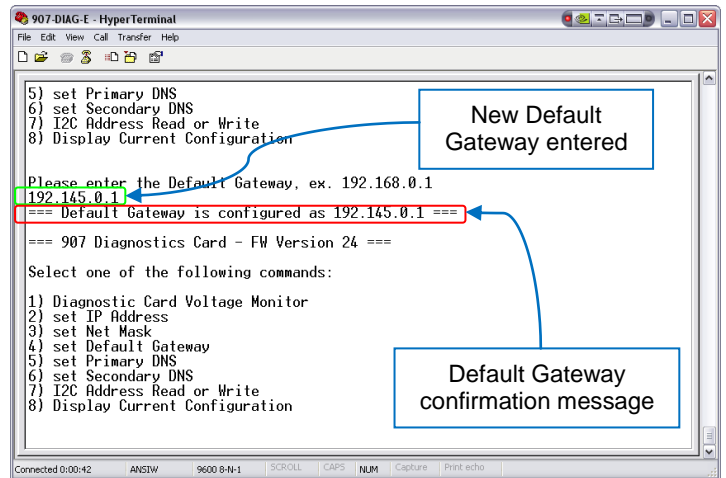

Figure 4-8: Set Default Gateway Menu

Figure 4-9: Set Default Gateway Response
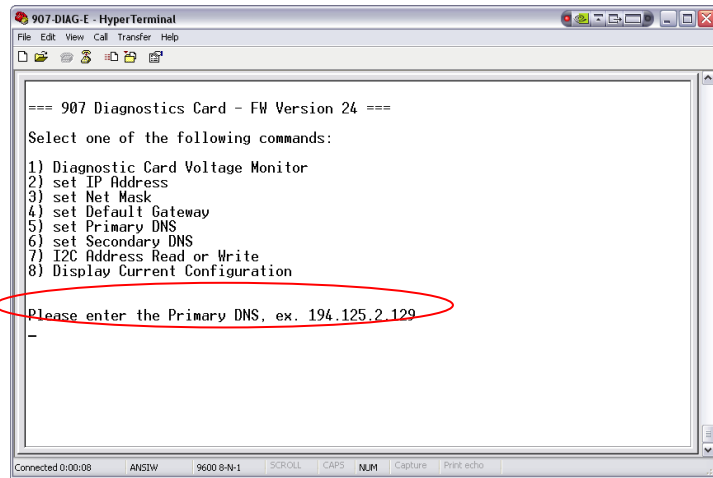
Menu Item 5: Primary DNS
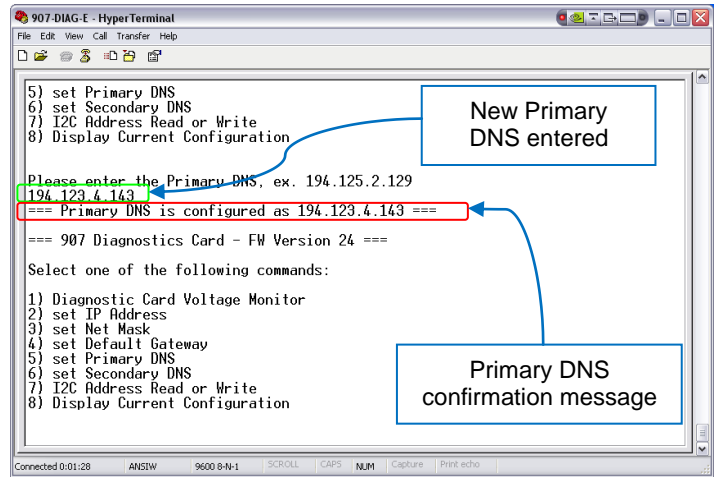

Figure 4-10: Set Primary DNS Menu

Figure 4-11: Set Primary DNS Response
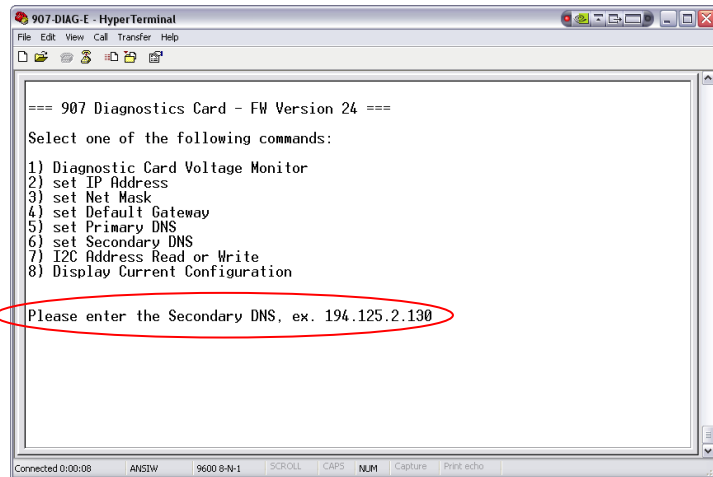
Menu Item 6: Secondary DNS
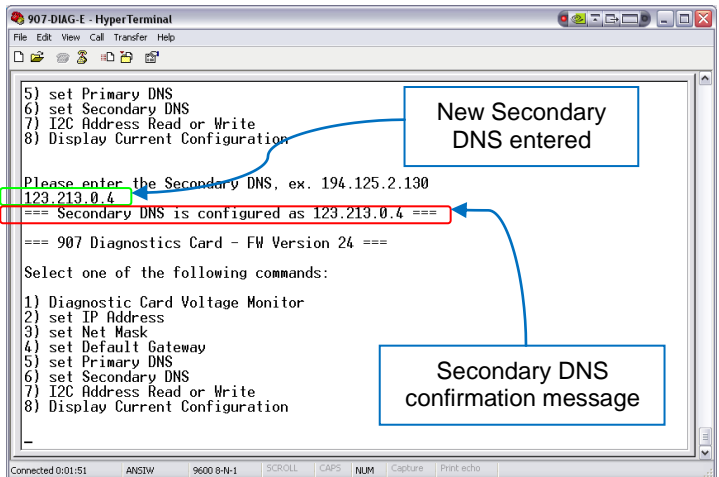

Figure 4-12: Set Secondary DNS Menu

Figure 4-13: Set Secondary DNS Response

Menu Item 7: I2C Address Read or Write

Figure 4-14 and Figure 4-15 show how to use the RS-232 interface to directly read I2C values from cards in the console stack. First, select menu item *7*, then enter in "*r*" to read. When prompted, enter in the I2C address to read from, in decimal (refer to the appendix of the *907 Diagnostics Protocol Manual* for a list of available register addresses) followed by the start-byte, and the number of bytes to read. Ensure the start-byte plus the number of bytes to read does not exceed 256.
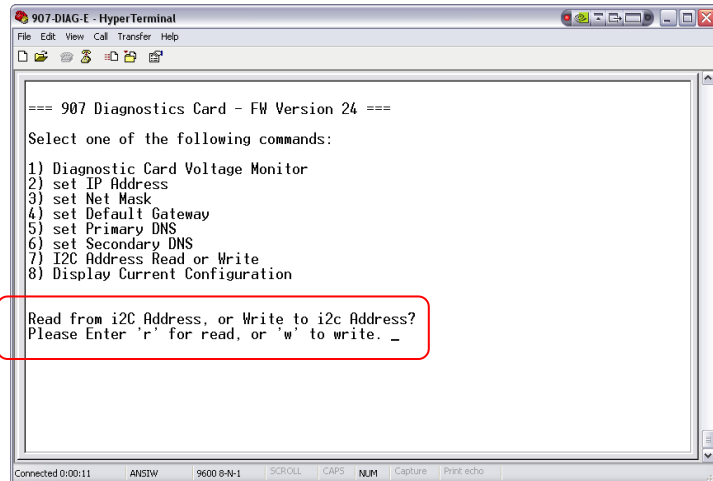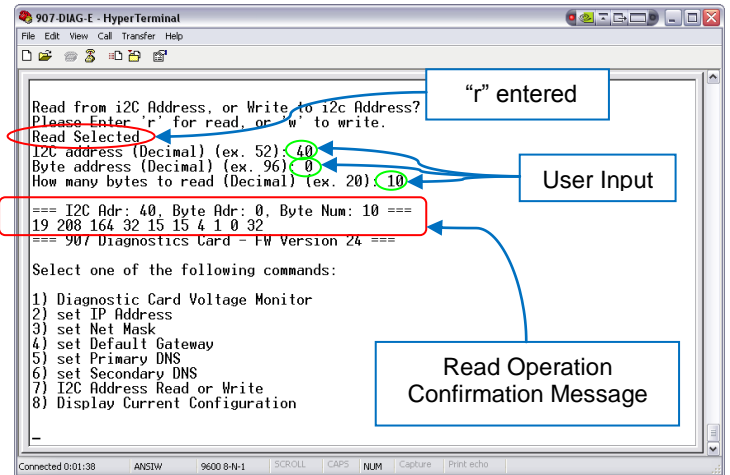

Figure 4-14: I2C Register Read Menu

Figure 4-15: Confirmation of I2C Read Operation

Figure 4-16 and Figure 4-17 show how to use the RS-232 interface to directly write I2C values to cards in the console stack. First, select menu item *7*, then enter in "*w*" to write. When prompted, enter in the I2C address to write to, followed by the start-byte, the number of bytes to write, followed by the bytes. Ensure the start-byte plus the number of bytes to write does not exceed 256. Also ensure the register fields you have attempted to write to have write permissions.

In this example the 907-DIAG-E diagnostic card is connected to the 907Plus card and we have written to byte number 0xF9 (decimal 249) of the console FPGA status register, which is the writable byte-wide field controlling the over-ride enable for switch 1 and switch 2. Note that the text response "*Complete*" reports that the I2C write operation was successful; there is no explicit verification that the register address and byte address were writable and have therefore retained the new values. After a write sequence, it is good practice to read register values back to confirm they were written as expected.
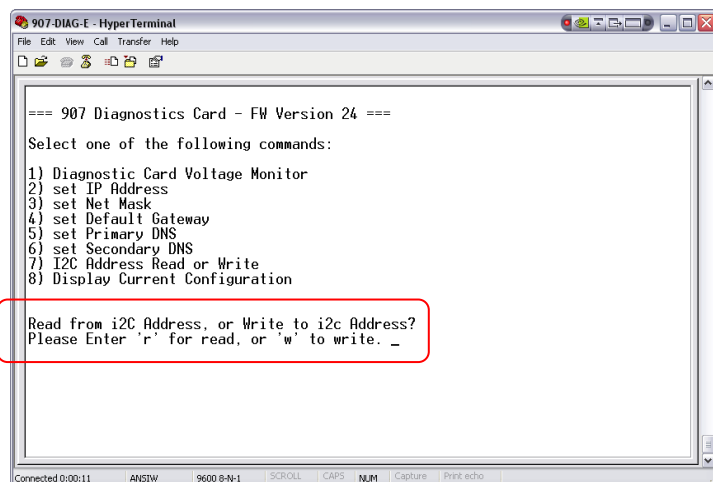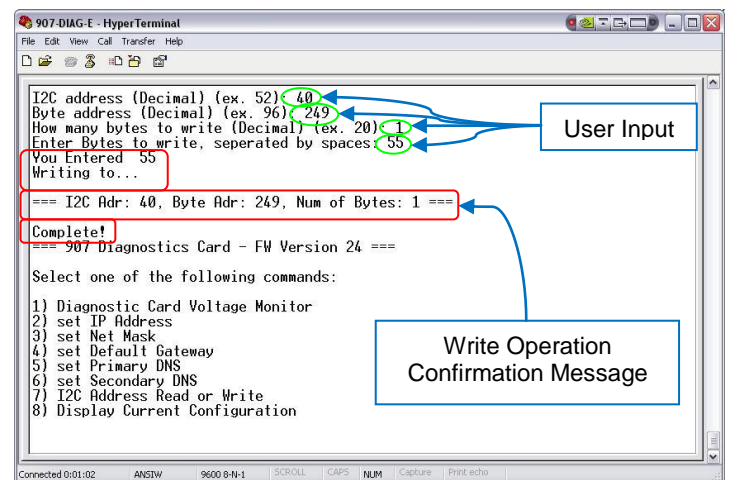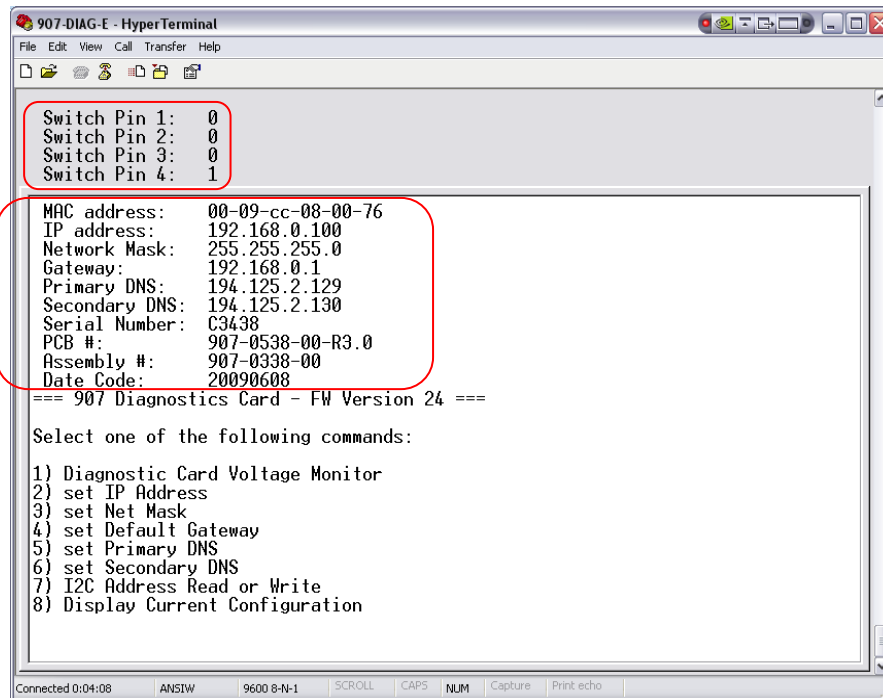

Figure 4-16: I2C Register Write Menu

Figure 4-17: Confirmation of I2C Register Write Operation

Menu Item 8: Display Current Configuration

Selecting menu item *8* provides the current pin state of the 907-DIAG-E diagnostic card's configuration switch (SW1) and network configuration as shown in Figure 4-18. The pin state is consistent with the diagnostic card configuration drawing – *0* represents the OFF state, and *1* represents the ON state.

Figure 4-18: Current Configuration Display

5.0   Troubleshooting

5.1   How to determine which versions of the .NET Framework are installed

To determine which versions of the .NET Framework are installed on your PC, locate the %systemroot%\Microsoft.NET\Framework folder. To open this folder, you can paste this address into a Windows Explorer address bar.

If you see a folder with the format v3.5 or higher then you meet the ".NET Framework" requirement to run the Model 907 Diagnostic Software.

For more information about how to determine which versions of .NET Framework are installed on your PC visit Microsoft at http://msdn.microsoft.com/

The latest version of the .NET Framework is available from Microsoft at www.microsoft.com/downloads.

5.2   Failed Connection Attempt

The following may be useful in troubleshooting a failed connection attempt to the 907-DIAG-E diagnostic card.

- **Power**
    - o The 907-DIAG-E receives power through its backplane PC/104 connector and it should be mounted on the 907 console stack.
    - o The Power LED D10 on the 907-DIAG-E diagnostic card should be ON.

- **Ethernet Cable**
    - o Verify that the Ethernet cable that you are using to connect your PC and the 907-DIAG-E is in good condition.
    - o When connecting your PC and the 907-DIAG-E diagnostic card directly, typically an Ethernet crossover cable is used; however, some newer computers can also use an Ethernet straight through cable.

- **Network configuration**
    - o To verify if the problem is related to network configuration try the following:

    1. Temporarily configure one of the 907-DIAG-E cards to use one of the default IP addresses. The configuration drawing 907-2039-00 contains a table showing eight static IP addresses and their corresponding switch settings. For instance, if the four switches of DIP switch SW1 are in the OFF position as shown in Figure 5-1, then the static IP address of the 907-DIAG-E would be 192.168.0.100

Figure 5-1: Switch settings example

    2. Set the IP address on your PC to 192.168.0.199 or to another IP address that is in the 192.168.xxx.xxx network.
    If you are using Windows XP, you can change the IP address on your PC by following the steps below. If you are using another Windows release, the steps will be similar.
        a) Click Start → Control Panel → Network and Internet Connections → Network Connections
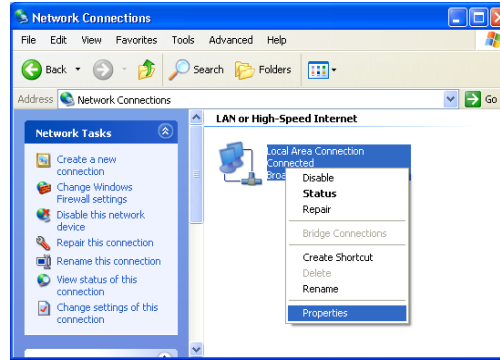   b) Find and right click on the active Local Area Connection and choose **Properties**

Figure 5-2: Network Connections Window

c) In the **General** tab of the window that will open, click once the **Internet Protocol (TCP/IP)** item, and click **Properties**.
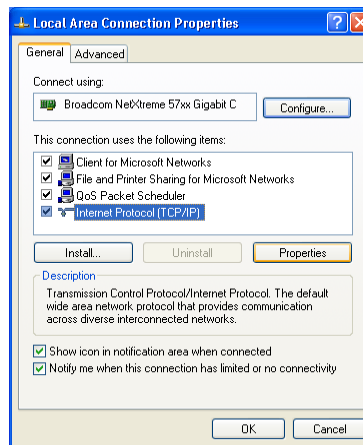

Figure 5-3: Local Area Connection Properties Window

d) In the **General** tab of the Internet Protocol (TCP/IP) Properties window, click **Use the following IP address** and enter:
- IP address 192.168.0.199
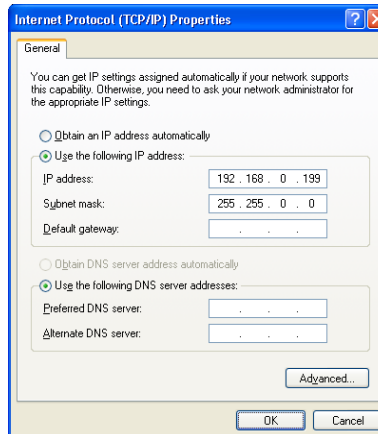- Subnet mask 255.255.0.0

Figure 5-4: Internet Protocol (TCP/IP) Properties Window

e) Click OK and Click Close on the Local Area Connection Properties window. Now you have changed the IP address of your PC to 192.168.0.199

3. Connect your PC and your 907-DIAG-E card directly via an Ethernet crossover cable as shown in Figure 5-5 (console and remote stacks are not shown).
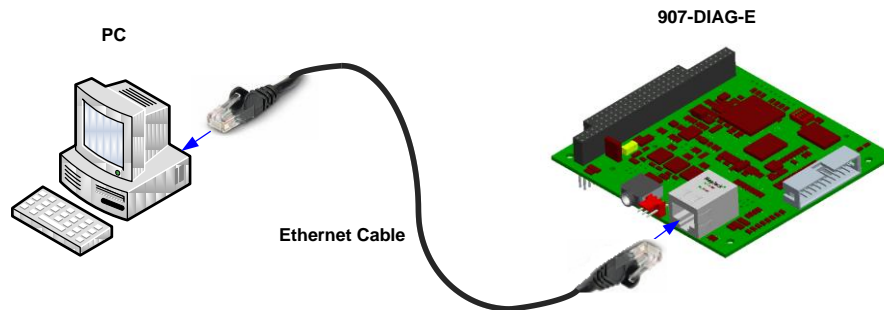

PC

907-DIAG-E

Ethernet Cable

Figure 5-5: Ethernet connection, PC to 907-DIAG-E card

4. Perform a "Ping Test" to verify the communication between your PC and the 907-DIAG-E card. To use the **ping** command you could do the following:
   a) Click Start → Run
   b) Type in **cmd** and click OK (This will open the Command Prompt).
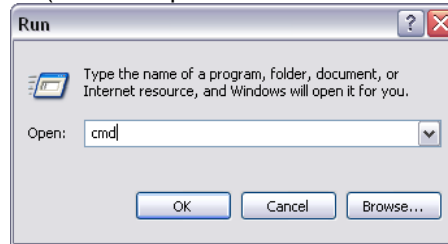

Figure 5-6: Run Window

   c) Type **ping** and enter the IP address of your 907-DIAG-E. For example, ping 192.168.0.100
   d) You should see a response from the 907-DIAG-E card similar to the one shown in Figure 5-7.

Figure 5-7: Verifying IP Address Changes with Ping

5. If the "Ping Test" is successful, go to Step 7, if not go to Step 6.

6. If the "Ping Test" is not successful then you need to review your network connection again and verify that the 907 cards have not been damaged.

   In general, each device in a network should have its own IP address. When using Internet Protocol Version 4 (IPv4), the IP address has a 32-bit (4-byte) number (e.g. 192.168.50.110) and it is composed of a network identifier and a host identifier. The IP address of a device can be dynamic or static. A device such a PC can have either a static IP address (assigned manually) or a dynamic IP address (e.g. assigned automatically via a Dynamic Host Configuration Protocol or DHCP server).

In general a PC can use a dynamic IP address as long as the assigned address lives in the same network as the 907-DIAG-E diagnostic card's IP address.

The 907-DIAG-E card only uses static IP addresses. There are eight default IP addresses for a 907-DIAG-E card (192.168.0.100, 192.168.0.101, 192.168.0.102,…,192.168.0.107) and one "User-defined" IP address.

You can use the **ipconfig** command in the Command Prompt to view your computer's IP address. If the IP address of your PC has a format similar to 169.254.xxx.xxx, that typically means that your PC is set to obtain an IP address automatically (e.g. via a DHCP server) and that this operation failed. To change the IP settings of your PC go to Step 2.

Note that in this case you are trying to communicate directly from your PC to the 907-DIAG-E card using one of the card's default IP addresses and therefore the computer's IP address must be in the same network (i.e. 192.168.xxx.xxx). Remember that your computer's ID (the last xxx.xxx digits) must be different from your card's ID. (E.g. PC IP address: 192.168.0.1**99** and 907-DIAG-E IP address: 192.168.0.1**00**)

Once you have your 907-DIAG-E card and your PC in the same network go to the "Ping Test" Step 4.

7. Run the 907 Diagnostics Software.

8. Click the "Start Data Refresh" Button to connect to the 907-DIAG-E diagnostic card.

Refer to section 3.2.4 "Network" of this manual for details about how to change the 907-DIAG-E card's IP address to something different from the default IP addresses.

5.3   How to verify which IP address the 907-DIAG-E is using

To verify which IP address the 907-DIAG-E diagnostic card is using, you will need to make use of the RS-232 port on the card. The mating RS-232 connector for the 907-DIAG-E card is the round "stereo plug" connector shown in Figure 5-8. Refer to configuration drawing 907-2039-00 for more details.
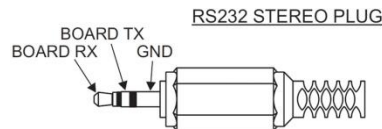

Figure 5-8: Stereo Plug Connector

1. Connect the serial cable from your PC to the 907-DIAG-E card as shown in Figure 5-9 (remote and console stacks are not shown).
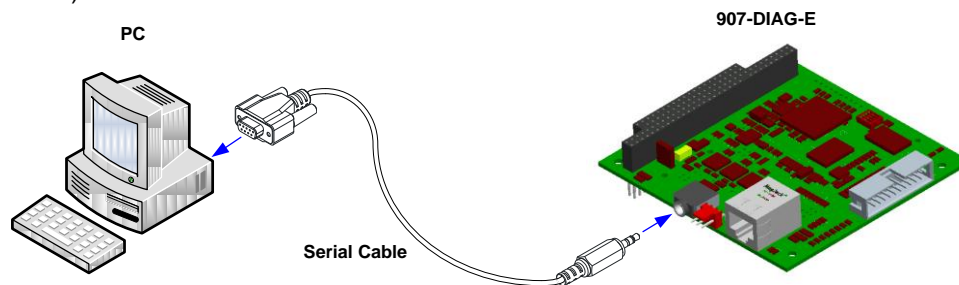

Figure 5-9: Serial Connection, PC to 907-DIAG-E card

2. Power up the system and open Windows HyperTerminal. For Windows XP you can follow the steps below (instructions for another Windows release will be similar).
    Click Start → All Programs → Accessories → Communications → HyperTerminal

3. Enter a name for your connection (e.g. 907-DIAG-E) and select the port that you are using on your PC to connect to the RS-232 serial port of the 907-DIAG-E card (e.g. COM1).
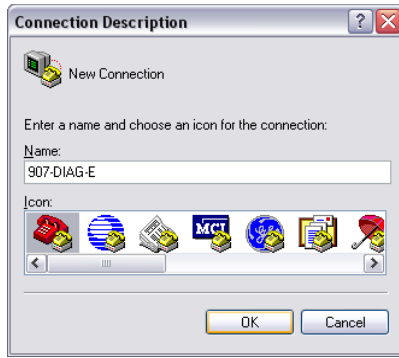

Figure 5-10: Connection Description Window

Figure 5-11: "Connect To" window

4. In the COM Properties window set the port properties as shown in Figure 5-12 (Bit per second: 9600, Data bits: 8, Parity: None, Stop bits: 1, Flow control: None).
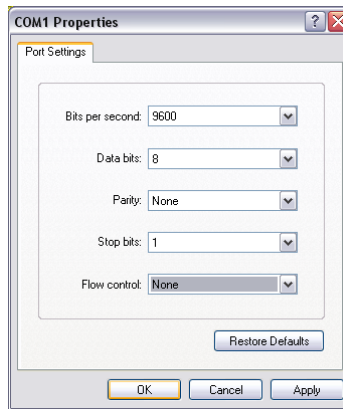
Figure 5-12: Communication Port Properties

5. Click OK (the HyperTerminal window will appear) and press "Enter" to refresh the main menu.
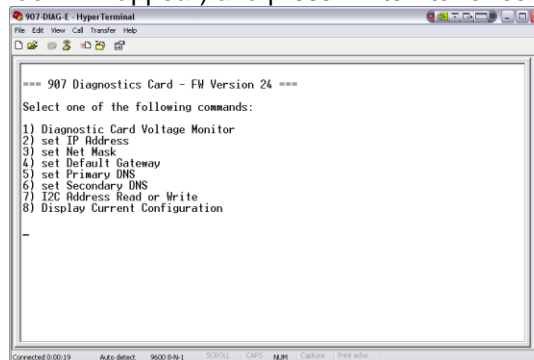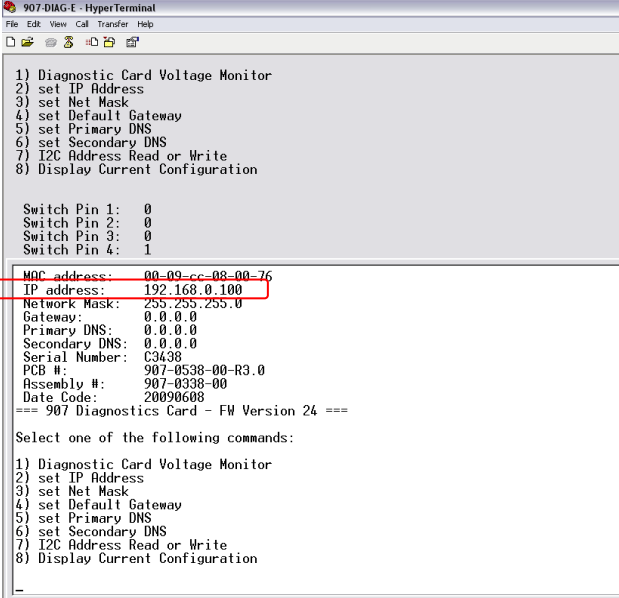

Figure 5-13: Main Menu

6. Press "8" to select the option "Display Current Configuration."

7. Now you can see the IP address of your 907-DIAG-E diagnostic card.

Figure 5-14: Current Configuration Display Example