

# Model JI-300 I2C Host Adapter

## User's Manual



***Jupiter Instruments***

**Version 1.6**

11/3/2012 Edition

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## 1. INTRODUCTION

The JI-300 is a versatile, easy to use PC hosted adapter used to drive I2C communications to/from a target device. The desktop unit can be configured to interface a variety of I2C voltage, and pull-up resistor values can be varied. JI-300's diagnostic features including "excessive clock-stretch", "bus-not-free", and "bus contention" monitoring, as well as status reporting at the conclusion of each message transaction simplifies I2C trouble-shooting. A Windows software application manages the setup and control of the instrument. Communications and unit power is provided via a USB 2.0 connection.

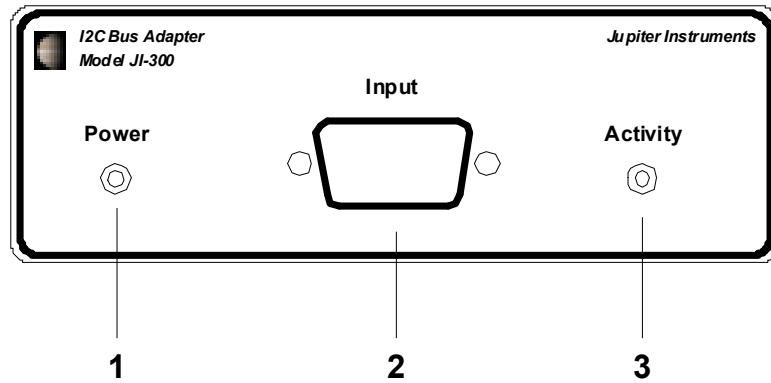
### Features

- Programmable SCL clock frequency from 255Hz to 3.8Mhz (20nS steps)
- Supports Standard-Mode, Fast-Mode, Fast-Mode-Plus, and High-Speed-Mode
- Variable bus voltage from 1.50V to 5.25V (10mV steps)
- Software selectable bus pull-up resistors (16 values including open)
- Low I2C bus capacitance (<40pF typ.)
- USB 2.0 host interface
- Switched target bus voltage available at connector
- Easy to use Graphical User Interface (GUI)
  - I2C Message Controller
    - Message execution status - Success / Failure with details
    - Single-step execution
    - Message looping
  - EEPROM Programming Utility
    - Programming file formats include: Binary, Intel HEX, Motorola S-record
  - Message Scripting
  - Data Logging – select continuous or scheduled
- Create custom software applications by way of either direct or Virtual COM Port (VCP) drivers. Programming requires no in-depth knowledge of USB!
- Includes everything needed to get started – I2C Adapter unit, I2C cable, USB cable, and a CD-ROM containing application software and user's manual.

### Applications

- Firmware debugging and hardware troubleshooting
- Production line testing
- Equipment repair and diagnostics

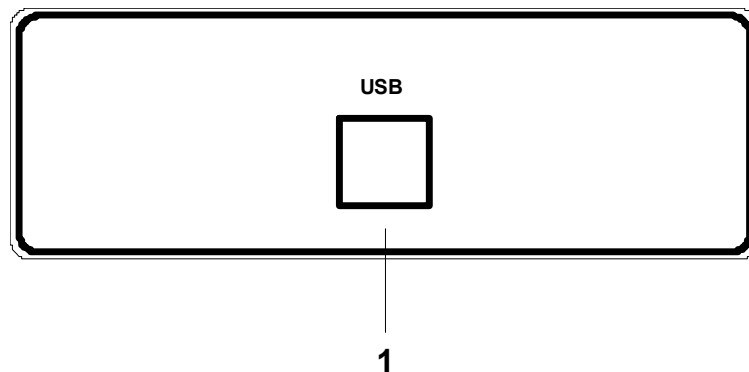
### 1.1 Front Panel Description



1. **Power** – Power on LED
2. **Activity** – I2C bus activity/USB port open LED.
3. **Input** – I2C probe cable jack. 9-pin, Female, D-Sub connector (AMP 745781-4)

Pin-outs:      Pin 1 = SDA  
                    Pin 5 = GND  
                    Pin 6 = SCL  
                    Pin 8 = Vbus  
                    Pin 2, 3, 4, 7, 9 = No Connection

### 1.2 Rear Panel Description



1. **USB** – Type 'B' connector (Molex 67068-0000)

## 2. GETTING STARTED

### 2.1 Software Installation

The JI-300 Host Adapter requires the installation of both a USB driver and application software. The drivers must be installed on the host PC's hard-drive. The application software, however, can be installed locally or executed directly from CD-ROM. See appendix C for detailed instructions on installing both the USB driver and JI-300 application software.

### 2.2 Hardware Setup

Note that USB drivers for the JI-300 must be installed before the Hardware Setup will run successfully.

1. Connect the I2C Host Adapter unit to the host PC using 6' USB cable.
2. After a few seconds, confirm that the JI-300 is powered by verifying that the front panel PWR LED is on.

### 2.3 Communications Check

1. Ensure that the I2C Host Adapter unit is connected to the host PC and power is on.
2. Launch the I2C Host Adapter application by clicking I2C Adapter JI-300.exe.
3. Verify that the I2C Host Adapter main window is displayed as shown in figure 1.

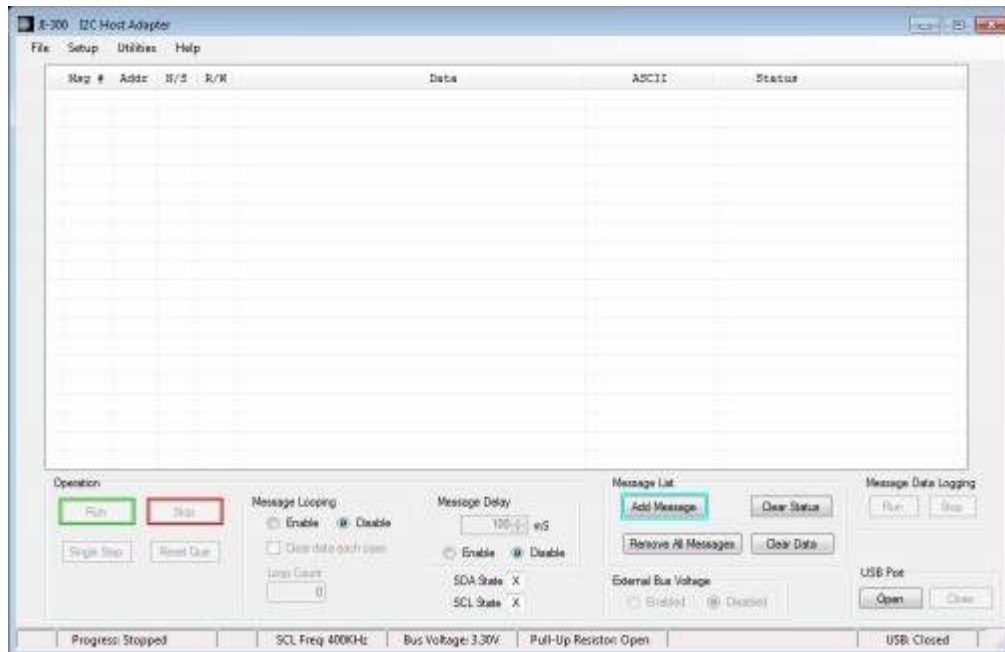


Figure 1. I2C Host Adapter Main Window

If an error occurs and the window does not appear, begin by verifying that the .NET Framework is installed. To do this, click **Start** on your windows desktop, select **Control Panel**, and then double-click the **Add or Remove Programs** icon. When the window appears, scroll through the list of applications and check for the .NET Framework. If not listed, go to <http://msdn2.microsoft.com/en-us/netframework/aa569263.aspx> for instructions on downloading and installing the latest .NET Framework.

4. At the main window, open a USB port by clicking the **Open** button in the USB Connection group.
5. Ensure an open USB port by confirming an open port status.
6. At the menu bar, open the About message box by selecting **Help**, followed by **About**.
7. Verify that the version numbers for the **HW Version x** and **VHDL Version x** are valid (i.e. A, D, 4, etc.) If a question mark (?) or non-alphanumeric character appears, an error has occurred.
8. If no errors have occurred (or if errors have been resolved) the Communications Check has passed.

#### 2.4 I2C Tx/Rx Session

For this exercise, a target slave device or I2C network with at least one slave device is needed. Device power (or network) can be supplied by either the I2C target or JI-300 Adapter. The following steps are for use with a M24C04 I2C target device. (See Figure 2)

1. Ensure that the I2C Host Adapter unit is connected and power is on. (Section 2.2 Hardware Setup)
2. Ensure that the I2C Host Adapter application is running and the USB port is open. (Section 2.3 Communications Check)
3. Connect the I2C probe cable to the D-sub connector on the I2C Host Adapter front panel.
4. Connect the four I2C bus probes (SDA, SCL, PWR, and GND) to the I2C target device. (See Figure 2)

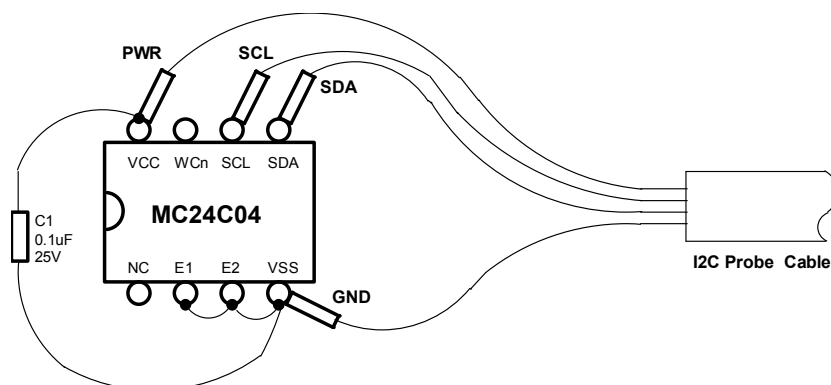


Figure 2. Connections to M24C04 I2C target test device

5. At the main window, click the **Add Message** button to begin adding I2C messages to the list.

Note- To expedite data entry, use setup file STD\_24C04\_Ex1.ser to load data parameters automatically. This file is included with the JI300 CD-ROM or can be downloaded from the Jupiteri.com web site ([www.jupiteri.com/JI-300\\_Files/JI\\_JI-300.html](http://www.jupiteri.com/JI-300_Files/JI_JI-300.html))

6. The Add I2C Message window is now displayed. (See Figure 3)

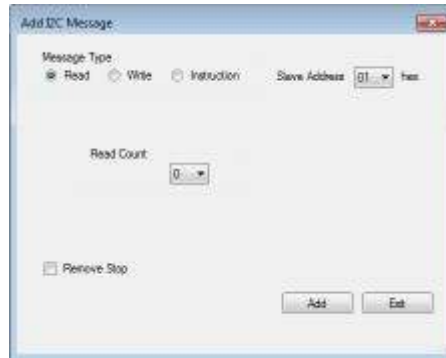


Figure 3. Add I2C Message Window

7. Add the following data to create a write message:

1. **Message Type:** Write (Note: The Message Window will change from a Read to Write when the Write Message Type is selected)
2. **Slave Address:** A0h
3. **Write Data (1):** 10
4. **Write Data (2):** 48
5. **Write Data (3):** 65
6. **Write Data (4):** 6c
7. **Write Data (5):** 6c
8. **Write Data (6):** 6f

8. Click **Add** to add the message to the message list.

9. Next, add another write message. Add the following data:

1. **Message Type:** Write
2. **Slave Address:** A0h
3. **Write Data (1):** 10

10. Now, add a read message.

11. Add the following data to create a read message:

1. **Message Type:** Read
2. **Slave Address:** A1h
3. **Read Count:** 5

12. Click **Add** to add the message to the message list, followed by **Exit**.



- Verify that three messages have been added to the Message List. (See figure 4)

MSG #	Addr	N/S	R/W	Data	ASCII	Status
001	A0		W	10 48 65 6c 6c 6f		
002	A0		W	10		
003	A1		R	XX XX XX XX XX		

Figure 4. I2C Messages

- At the Main Window menu bar, open the setup menu by selecting **Setup**, then **Setup Menu**.

- The Setup menu is now displayed (See Figure 5)

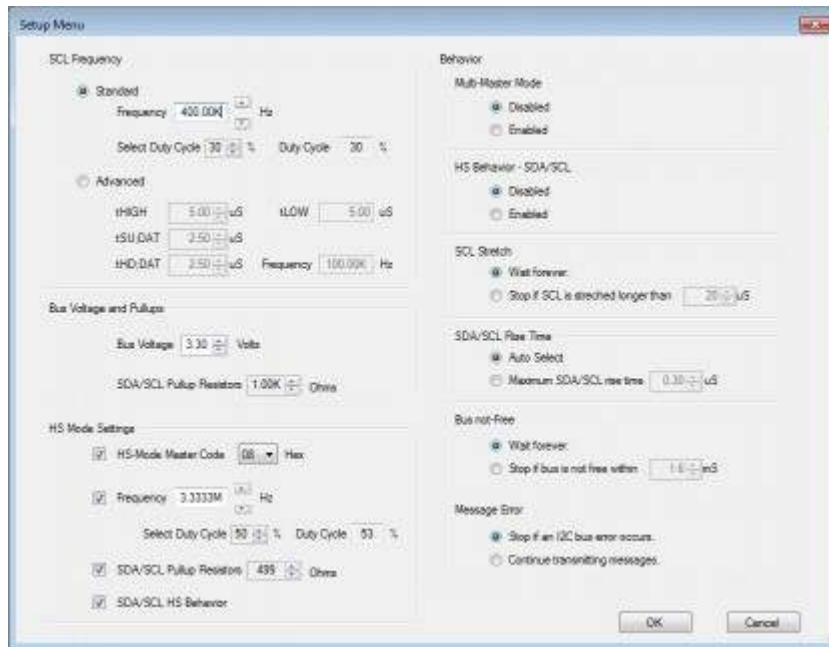


Figure 5. Setup Menu

- At the Bus Voltage group, select a 1K ohm bus pull-up resistor by clicking the up/down buttons.
- Click **OK** to save the selection and close the Setup Window.
- At the main window, turn-on the external bus voltage by clicking **Enable** in the External Bus Voltage group.
- Enable Message Looping by clicking **Enable** in the Message Looping group.
- Now, begin an I2C session by clicking **Reset Que**, followed by clicking **Run** in the Operation group.
- Verify the following actions:
  - The message "Success!" is in the status columns for all messages.

2. The text "Hello!" is in the ASCII column of the read message.
3. The asterisk cursor quickly loops through the three messages.

22. The I2C Tx/Rx exercise is now complete.

## 2.5 I2C High Speed (HS) Exercise

This exercise will familiarize the user with the HS operation of the JI-300. Using the MCP4725 evaluation board from Microchip Technologies, a 12-bit DAC is exercised in the HS mode using an SCL frequency of 3.33 MHz at a bus voltage of 3.3V. Both HS I2C read and write messages, as well as HS configuration instructions for the JI-300 will be examined.

A data sheet for the MCP4725 DAC can be found at [www.microchip.com/downloads/en/DeviceDoc/22039c.pdf](http://www.microchip.com/downloads/en/DeviceDoc/22039c.pdf) and the data sheet for the evaluation board can be found at [www.microchip.com/downloads/en/DeviceDoc/51669a.pdf](http://www.microchip.com/downloads/en/DeviceDoc/51669a.pdf).

1. Ensure that the JI-300 Adapter is connected to the PC and power is on. (Section 2.2 Hardware Setup)
2. Ensure that the Adapter application is running and the USB port is open. (Section 2.3 Communications Check)
3. Launch the I2C Host Adapter application by clicking I2C Adapter JI-300.exe. If the application was open from a previous session, close and then re-open the application to ensure that start-up values are loaded.
4. Connect the four I2C bus probes (SDA, SCL, PWR, and GND) to the MCP4725 evaluation board. (See Figure 6)

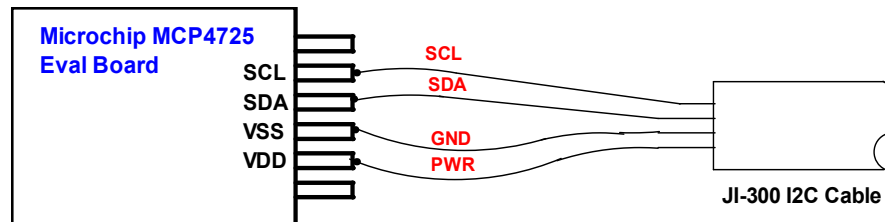


Figure 6. Connections to MCP4725 Evaluation Board

5. Next, a set of messages and instruction will be added to the Message List to exercise the MCP4725 DAC in HS-Mode. Four types will be added: two I2C messages – Read and Write, and two instructions – **HS-Mode Set** and **Comment**. Details of adding these are as follows:
  - a. I2C Read and Write messages: HS Read and Write messages are entered using the standard method via the Add I2C Message window. A single message following the **HS-Mode Set** instruction will be executed at the **HS** rate, followed by a return to Standard-mode. To continue data transfers in the HS-mode for consecutive messages, a repeated-start condition must be created. To do this, check the **Remove the Stop** check box for all messages following the **HS-Mode Set** instruction. To terminate the HS-mode and switch back to Standard mode, remove the repeated-start condition on the final HS message by unchecking **Remove the Stop** check box.

- b. **HS-Mode Set instruction:** The **HS-Mode Set** instruction switches the operation of the JI-300 from Standard-Mode to HS-mode. When executed, SCL frequency, Pull-up resistor values, and HS behavior are changed to the parameters selected in the **HS Behavior Settings** group box at the **Setup Menu** window. JI-300 HS-Mode operation is returned to Standard-Mode following the execution of an I2C Stop condition.

A HS Mode Set instruction is entered via the Add I2C Message window by selecting the Instruction Message Type and making a selection from the Instruction Set pull-down menu. (See Figure 11)

- c. **Comment instruction:** **Comments** are passive instructions used to add text comments to the Message List. Comments are added via the **Add I2C Message** window by selecting the Instruction Message Type and making a selection from the Instruction Set pull-down menu. (See Figure 1)

Now, using the **Add Message** button at the Main Window, adding the following messages and instructions:

Note- To expedite data entry, use setup file HS\_MCP4725\_Ex2.ser to load data parameters automatically. This file is included with the JI300 CD-ROM or can be downloaded from the Jupiteri.com web site ([www.jupiteri.com/JI-300\\_Files/JI\\_JI-300.html](http://www.jupiteri.com/JI-300_Files/JI_JI-300.html))

MSG #	Addr	N/S	R/W	Data	ASCII	Status
001	C0		W	03 21		
002	--	--	--	Tx HS-Code & switch to HS Mode		
003	--	--	--	/ Write FFFH to DAC /		
004	C0	*	W	0F FF		
005	--	--	--	/ Read DAC Register /		
006	C1	*	R	XX XX XX		
007	--	--	--	/ Write 555H to DAC /		
008	C0	*	W	05 55		
009	--	--	--	/ Read DAC Register /		
010	C1	*	R	XX XX XX		

Figure 7. I2C Messages

6. Next, set parameters in the Setup menu. At the Main Window menu bar, open the setup menu by selecting **Setup**, then **Setup Menu**.
7. At the SCL Frequency group, ensure that the Standard Frequency check box is checked, SCL frequency is 400 KHz, and the duty cycle is 30%.
8. At the Bus Voltage group, select a 1K ohm bus pull-up resistor by clicking the up/down buttons.
9. Verify that the bus voltage is 3.30V.

10. Now, HS-Mode parameters will be entered for HS-Mode Master Code, SCL frequency, Pull-up resistor, and HS behavior via the HS Behavior Settings group.

Enter HS Mode Setting data as follows:

1. HS-Mode Mater Code: 08h
2. Frequency: 3.3333MHz
3. Duty Cycle: 50%
4. SDA/SCL Pull-Up: 499 ohms
5. SDA/SCL HS Behavior: Selected

Ensure all check boxes are checked.

11. Click **OK** to save the selection and close the Setup Window.
12. At the main window, turn-on the external bus voltage by clicking **Enable** in the External Bus Voltage group.
13. Enable Message Looping by clicking **Enable** in the Message Looping group.
14. Now, begin an I2C session by clicking **Reset Que**, followed by clicking **Run** in the Operation group.
15. Successful operation is as follows:
  6. Message looping continues endlessly.
  7. The message "Success!" is in the status columns for all messages (except comments).
  8. The data field for message #6 reads: c0 ff f0.
  9. The data field for message #10 reads: c0 55 50.
  10. SCL Frequency value at the bottom tray flashes between 3.33MHz and 400K
  11. Pull-up resistor value at the bottom tray flashes between 499 and 1.0K
16. The I2C HS exercise is now complete.

### 3. EEPROM PROGRAMMING UTILITY

This fully integrated utility is designed for programming a variety of EEPROM and memory devices either in-circuit or standalone. All essential programming functions are provided including device read, program, and verify, as well as buffer edit, pre-fill, load, and save operations. EEPROM image data can be loaded from a file, copied from another device, or entered manually using HEX values and/or ASCII characters. Data can be saved to disk via Intel HEX, Motorola S-Record, or raw Binary file formats.

**Features:**

- Devices: Over 100 devices including Atmel, Generic, Microchip, NXP, ST Micro, and GP Block Reads
- Supported file formats: Intel HEX, Motorola S-Record, and raw Binary.
- Programming voltage: 1.50V to 5.25V
- SCL clock rate: 254Hz to 4.0MHz with variable setup and hold times

#### 3.1 EEPROM Programming Session

This exercise will familiarize the user with the fundamental programming features of the JI-300 EEPROM programming utility.

Before beginning this exercise, be sure that you are somewhat familiar with the controls on the EEPROM Programming Utility window (Section 4.5) and that you have previously run both the “Communications Check” and “I2C Tx/Rx Session” exercises in section 2.0.

For this exercise, a target slave device (included with the JI-300 kit) or I2C network with at least one slave device will be needed. Device power (or network) can be supplied by either the I2C target or JI-300 Adapter. The following steps are for use with the test M24C04 I2C target device.

1. Begin by executing all 21 steps in the I2C Tx/Rx Session in section 2.4. This will ensure a working HW connection and valid HW settings.
2. Open the EEPROM Programming Utility window by clicking **Utilities**, followed by **EEPROM Programming** at the main window menu bar.
3. Verify that the EEPROM Programming Utility window is now displayed (See Figure 8)

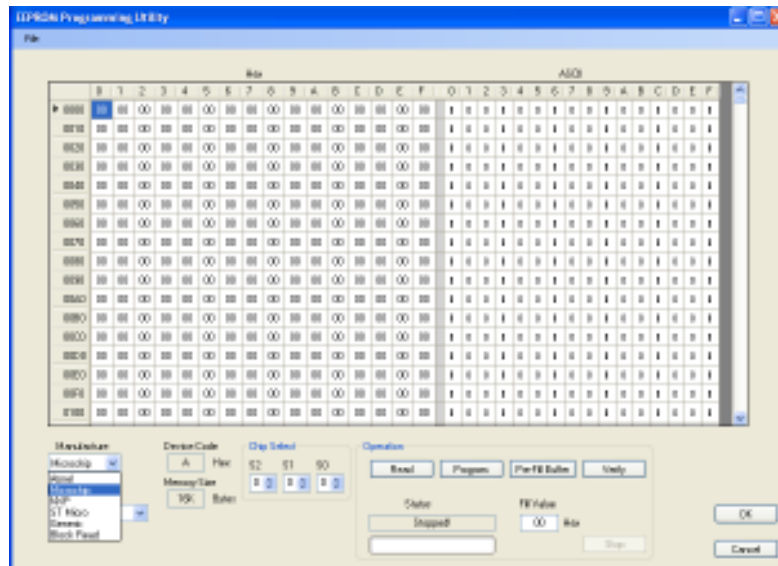


Figure 8. EEPROM Programming Utility window

4. Enter the manufacture and device type for the target EEPROM. For this exercise, text box data is enter as follows:

- **Manufacture:** ST Micro
- **Device:** M24C04

These two text boxes are located at the lower left-hand side of the Programming Utility window.

5. Enter EEPROM chip select data.

- **CS2:** 0
- **CS1:** 0
- **CS0:** N/A

6. Now, verify device settings by successfully reading the EEPROM. This is accomplished by clicking the **Read** button in the Operation group. A read time for this device is approximately 5 seconds and a successfully operation will display “Done!” in the status text box.
7. Next, fill the **Buffer** with ASCII “space” characters by entering 20h in the **Fill Value** text box and then clicking the **Pre-Fill Buffer** button.
8. Verify that the **Buffer** contains the HEX value 20h.
9. Type the word “Top” beginning at address 000h in the ASCII section of the **Buffer**.
10. Type the word “Bottom” beginning at address 1f0h in the ASCII section of the **Buffer**.
11. Program the EEPROM by clicking the **Program** button.
12. A message box will appear asking, “Are you sure you want to program this device?” Click yes. Programming begins.
13. After approximately 5 to 10 seconds programming will end and “Done Programming!” will be displayed in status text box.

14. To verify that both **Buffer** and EEPROM data agree, click the **Verify** button. After approximately 5 seconds, the operation will end and “Verification Successful!” will be displayed in the **Status** text box.
15. To illustrate a verification error, fill the **Buffer** with ASCII “space” characters. As before, enter 20h in the **Fill Value** text box and then click the **Pre-Fill Buffer** button.
16. Click the **Verify** button. When finished, verify that:
  - a. The status text box displays “Verification Error: 9 Byte(s)”
  - b. 9 address locations are marked red.
  - c. The red marked locations are where the “Top” and “Bottom” text was typed.
17. Correct the verification error by clicking the **Read** button. Re-verify by again clicking the **Verify** button.
18. After approximately 5 seconds, verify that “Verification Successful!” is displayed in the status text box and the text “Top” appears at the top of the **Buffer** and “Bottom” appears at the bottom of the **Buffer**.
19. Save **Buffer** data to file by clicking **File** at the menu bar, followed by **Save Buffer**, followed by **Intel HEX**.
20. The Save File dialog box is now displayed. Type in an appropriate file name such as “HEXFile\_Test1” and click **Save**.
21. **Buffer** data is now saved to file HEXFile\_Test1.hex in an Intel HEX file format.
22. Next, the **Buffer** will be loaded from a file. First, however, the **Buffer** contents will be filled with “X”s.
23. Enter 58h in the **Fill Value** text box and then click the **Pre-Fill Buffer** button.
24. Load **Buffer** data to file by clicking **File** at the menu bar, followed by **Load Buffer**, followed by **Intel HEX**.
25. The Open File dialog box is now displayed. Type in the file name entered in step 20 (“HEXFile\_Test1”) and click **Open**. **Buffer** data is now reloaded.
26. Verify that “Top” appears at the top of the **Buffer** and “Bottom” appears at the bottom of the **Buffer**.
27. The EEPROM Programming exercise is now complete.

## 4. MAIN WINDOW AND MENU DESCRIPTIONS

### 4.1 Main Window

The I2C Host Adapter *Main Window* is shown in Figure 9.

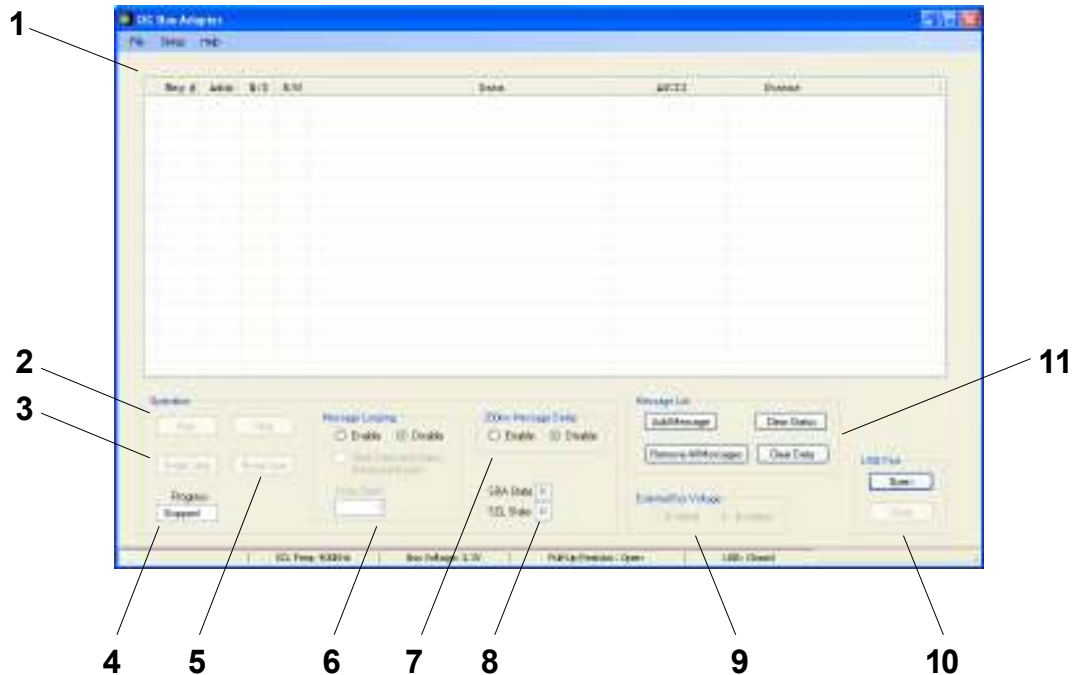


Figure 9. I2C Host Adapter Main Window

1. **Message List** – I2C messages are stored here. Messages are added via the **Add Message** button. To **Insert**, **Edit**, or **Delete** an existing message, double-click the message number.
2. **Run/Stop** – These buttons control the transmission of I2C messages. The **Run** button initiates a session where by I2C messages stored in the message list are squelchy executed. The session starts at the cursor position and ends either by the execution of the lasted message in the list or by clicking the **Stop** button.
3. **Single Step** – This button is used to transmit a single I2C message.
4. **Progress** – Status of the current session is displayed here.
5. **Reset Que** – Clicking this button moves the cursor to the first message in the message list.
6. **Message List Looping** – This group provides control and monitoring of the message list looping function. When **Enabled**, a session will cyclically execute all I2C messages stored in the message list when a session is started. A **Clear Data & Status** check box provides the option of clearing both Data and Status columns at the beginning of each loop pass.
7. **200mS Message Delay** – This function, when **Enabled**, inserts a small delay (approx. 200ms) between each message transmission.
8. **I2C Bus State** – The present state of the SCL and SDA signals is displayed here.
9. **External Bus Voltage** – Control (On/Off) of the external bus voltage (Vbus) is performed here.



10. **USB Port – Open/Close** USB port from this area.

11. **Message List --**

- a. **Add Message** – Clicking this button will either add a Read or Write message to the Message List. Messages will be appended to the bottom of the list.
- b. **Clear Data** – Clicking this button will remove all read data from the Message List.
- c. **Clear Status** – Clicking this button will remove all status comments from the Message List.
- d. **Clear Message List** – Clicking this button will remove all messages from the Message List

#### 4.2 Setup Menu

The *Setup Menu* provides a convenient means of configuring and maintaining an I2C hardware setup (See Figure 10.)

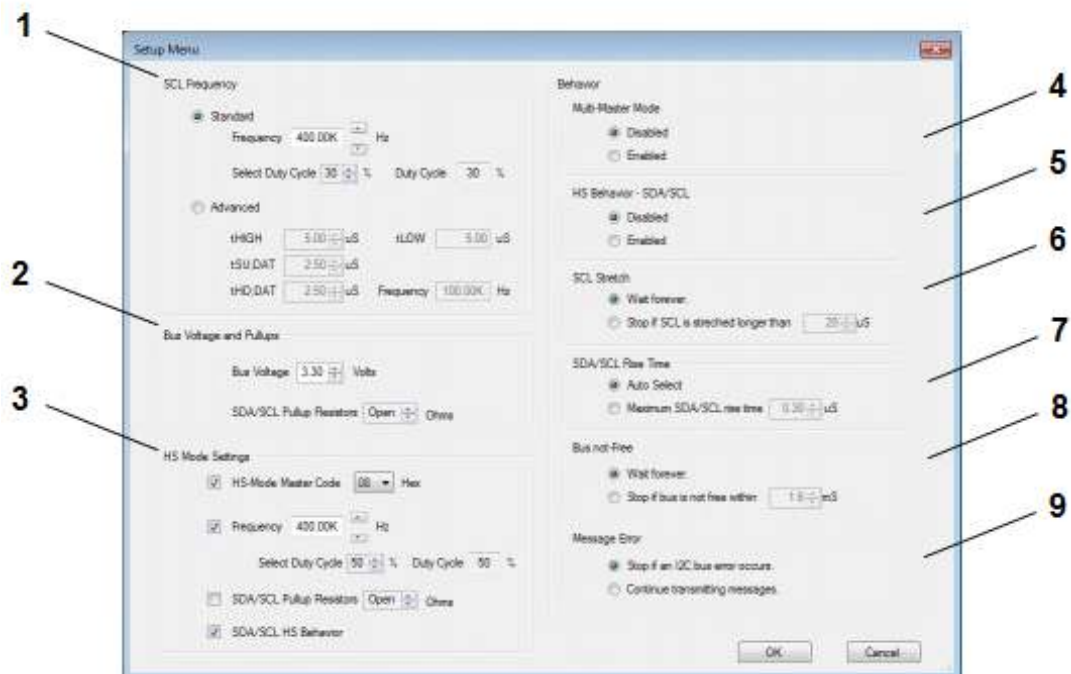


Figure 10. Setup Menu

1. **SCL Frequency** – Two methods are provided to configure the SCL Clock: **Standard** and **Advanced**. When selecting **Standard**, Frequency and Duty cycle data is entered and the tHIGH, tSU,DAT, and tHD,DAT values that comprise the SCL waveform are automatically calculated and loaded. Note that tSU,DAT, and tHD,DA values are held nearly equal (+/- 1 bit). If a unique SCL waveform is desired, the **Advanced** mode is selected. In this mode tHIGH, tSU,DAT, and tHD,DAT data is entered directly. The resultant SCL frequency and tLOW value is then calculated and displayed.
2. **Bus Voltage and Pull-ups** – The I2C Bus voltage and SDA/SCL pull-up resistor values are entered here.

3. **HS Mode Settings** – This group contains the SCL frequency, Pull-Up, Master code, and Behavioral parameters used exclusively during HS-Mode operation. Parameters are loaded following the execution of the “Tx HS-Code & HS-Mode” instruction and replaced with Standard/Fast Mode parameters following executing of an I2C Stop I2C conditions.
4. **Multi-master Mode** – JI-300 multi-master mode is enabled/disabled here.
5. **HS Behavior SDA/SCL** – When enabled, the selection suppresses JI-300’s ability to detect and act on SCL clock stretch conditions and rise-time errors. This allows the JI-300 to run un-encumbered to the maximum HS clock rate of 3.567MHz.
6. **SCL Stretch** – During a Slave SCL stretch event, the behavior of the JI-300 can be configured to:
  - a. Wait indefinitely on a SCL stretch event – **Wait Forever** selection
  - b. Stop if the selected SCL stretch value is exceeded.
7. **SCL/SDA Rise Time** – The maximum expected rise-time value for either the SCL or SDA signal is entered here. I2C physical layer parameters such as pull-up resistors, bus voltage, and bus capacitance can affect rise-time. Two methods are provided to configure the rise-time:
  - a. Nominal I2C system – **Auto Select** selection
  - b. Specialized I2C system – Rise-time value is entered
8. **Bus not Free** – The behavior of the JI-300 can be configured to either wait indefinitely for a “bus free” condition or stop if a “bus free” condition is not available within a specified time.
9. **Message Error** – In the event of a bus error during an I2C transmission session, the behavior of the JI-300 can be configured to:
  - a. Stop all transmissions
  - b. Note the error and continue transmitting

#### 4.3 Add/Edit I2C Message Window - Read

The *Add/Edit I2C Message Window - Read* is used to both edit and add new Read messages to the Message List (Figure 11.)

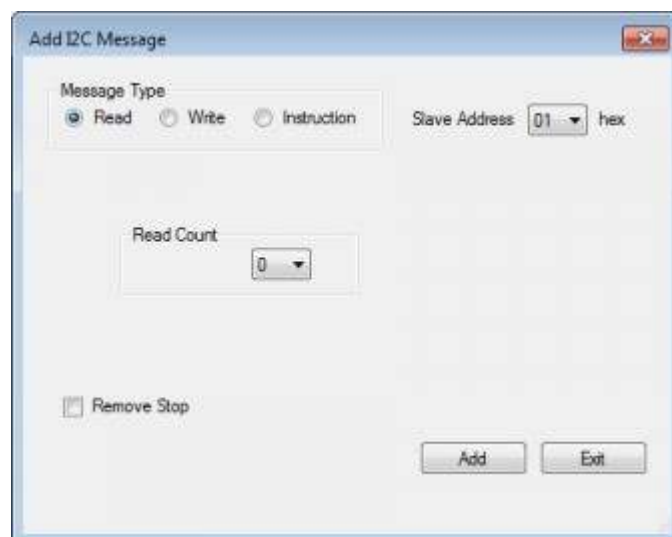


Figure 11. Add/Edit I2C Message Menu - Read

#### 4.4 Add/Edit I2C Message Window - Write

The *Add/Edit I2C Message Window - Write* is used to both edit and add new Write messages to the Message List (Figure 12.)

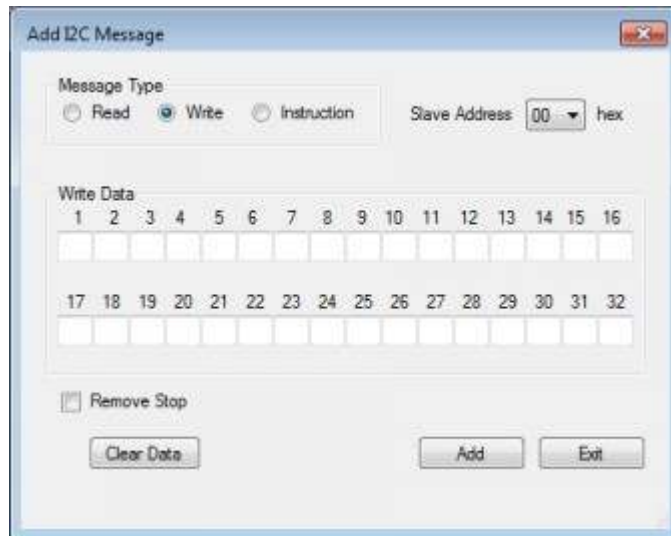


Figure 12. Add/Edit I2C Message Window - Write

#### 4.5 Add/Edit I2C Message Window - Instruction

The *Add/Edit I2C Message Window - Instruction* is used to add message execution instructions to the Message List (Figure 13.)

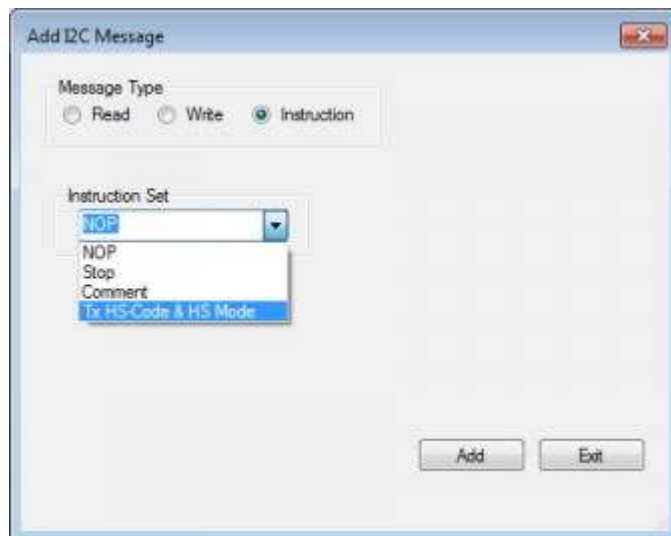


Figure 13. Add/Edit I2C Message Window - Instruction

#### 4.6 EEPROM Programming Utility window

This fully integrated programming utility is located under the Utilities tab at the main window menu bar.

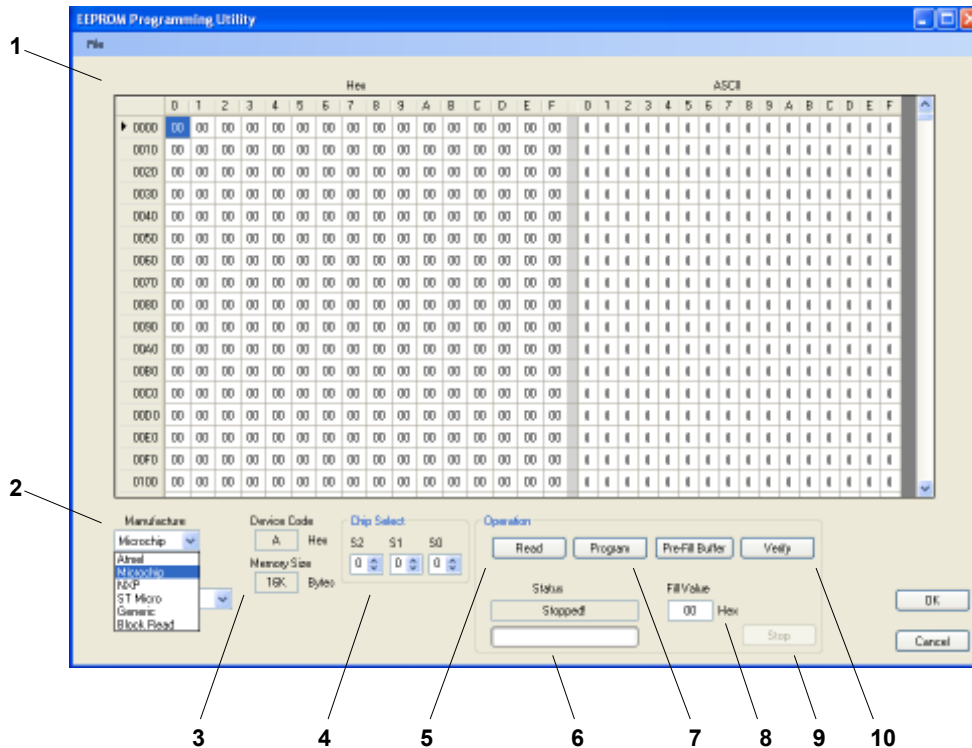


Figure 14. EEPROM Programming Utility window

1. **Buffer** – Memory data either read from, or waiting to be written to an EEPROM is displayed here. The **Buffer** can be loaded (as well as saved) via several popular file formats (Intel HEX, Motorola S-Record, and raw Binary) and edited manually using HEX values and/or ASCII characters.
2. **Manufacture & Device** – Select an EEPROM by manufacture and part number or select a generic memory device.
3. **Device Code** – The device code for the target EEPROM is displayed here. The code is selected automatically for generic and commercial devices. For general-purpose block memory, however, the code is selected manually.
4. **Chip Selects** – Select the state (0 or 1) of the target device chip selects (CS).
5. **Read** – Clicking this button reads the contents of the EEPROM into the **Buffer**.
6. **Status** – Status of the session is displayed here.
7. **Program** – Data from the **Buffer** is written to the target EEPROM device when this button is clicked. *Note: The programmed device is **not automatically verified** after programming.* Use the **Verify** function to ensure that the device was properly programmed.
8. **Pre-Fill Buffer** – The HEX **Fill Value** is copied to all locations within the **Buffer**. The **Fill Value** data range is from 00h to ffh.

9. **Stop** – If, for any reason it is necessary to immediately terminate an operation, the **Stop** button is used.
10. **Verify** – Verify compares the content of the **Buffer** with that of an EEPROM device. Data discrepancies are displayed as red-marked boxes in the **Buffer**. At the conclusion, operation success or failure is displayed in the **Status** box.

## 5. MESSAGE SCRIPTING

Scripting provides an alternate method of creating and editing I2C messages for use in the JI-300 application environment. Messages are constructed using a simple text editor such as Windows Notepad. The JI-300 scripting language includes both I2C commands (Read & Write), and JI-300 instructions (Stop, Comment, etc.) Script files are loaded into the JI-300 application and executed as conventional I2C messages.

### 5.1 Language Statements

#### I2C Commands

##### 1. I2C Write

Description: This command is used to write data to a slave device. A maximum of 32 and a minimum 0 bytes can be transmitted. The first two characters following the write character (w) specifies the slave address. The remaining characters constitute the data payload. A carriage-return and line-feed terminates the statement.

Syntax: `waaaa.....aa<CR><LF>`

Address & Direction: `aa` Upper 7-bits = slave address. LSB = direction (0 = write)  
Range = *even bytes* from 00h to FEh.

Data: `aa.....aa` Write Data 32 bytes maximum.

Example:

Command	Description
<code>wa031abc34892&lt;CR&gt;&lt;LF&gt;</code>	Write 31h, abh, c3h, 48h, and 92h to slave address 50h.
<code>w2c1235ab&lt;CR&gt;&lt;LF&gt;</code>	Write 12h, 35h, and abh to slave address 16h.

##### 2. I2C Write without a Stop

Description: This command is identical to the "I2C Write" command, except that it does not issue an I2C stop event .

Syntax: `yaaaa.....aa<CR><LF>`

Address & Direction: `aa` Upper 7-bits = slave address. LSB = direction (0 = write)  
Range = *even bytes* from 00h to FEh.

Data: `aa.....aa` Write Data 32 bytes maximum.

Example:

Command	Description
<code>ya031abc34892&lt;CR&gt;&lt;LF&gt;</code>	Write 31h, abh, c3h, 48h, and 92h to slave address 50h.

y2c1235ab<CR><LF>

Write 12h, 35h, and abh to slave address 16h.

### 3. I2C Read

Description: This command is used to read data from a slave device. A maximum of 32 and a minimum 0 bytes can be read. The first two characters following the read character (q) specifies the number of bytes to read. The next two characters specify the slave address. A carriage-return and line-feed terminates the statement.

Syntax: q**aaaa**<CR><LF>

Read Count: **aa** Range 00h to 20h.

Address & Direction: **aa** Upper 7-bits = slave address. LSB = direction (1 = read)  
Range = *odd bytes* from 01h to FFh.

Example:

Command	Description
q14a3<CR><LF>	Read 20 bytes from slave address 51h.
q0ab1<CR><LF>	Read 10 bytes from slave address 58h.

### 4. I2C Read without Stop

Description: This command is identical to the "I2C Read" command, except that it does not issue an I2C stop event .

Syntax: d**aaaa**<CR><LF>

Read Count: **aa** Range 00h to 20h.

Address & Direction: **aa** Upper 7-bits = slave address. LSB = direction (1 = read)  
Range = *odd bytes* from 01h to FFh.

Example:

Command	Description
d14a3<CR><LF>	Read 20 bytes from slave address 51h.
d0ab1<CR><LF>	Read 10 bytes from slave address 58h.

## JI-300 Instructions

### 1. Stop

Description: This instruction stops message execution during an I2C session.

Syntax: \*S<CR><LF>

Address: N/A

Data: N/A

Example:

Command	Description
*S<CR><LF>	Stop message execution.

### 2. NOP

Description: This instruction performs no operation during an I2C session. It is typically used to temporarily remove an I2C command while saving the location in the message list.

Syntax: \*N<CR><LF>

Address: N/A

Data: N/A

Example:

Command	Description
*N<CR><LF>	Perform no operation.

### 3. Comment

Description: Use this instruction to add comments to the message list.

Syntax: \*C~aaa...aaa~<CR><LF>

Address: N/A

Data: N/A

Example:

Command	Description
* C~Hello world~<CR><LF>	Adds the comment "Hello world" to the message list.

## 5.2 Scripting Rules

1. Script files shall contain plain text. Files can be created using a simple text editor such as Windows Notepad.



2. Each statement must be terminated by a Carriage Return followed by a Line Feed. All simple text editors insert these control characters automatically when the line is terminated by the Enter key.
3. Single statement per line.
4. Blank lines are permitted.
5. Avoid white spaces and tabs.
6. Ensure that the script file extension is .txt

### 5.3 Scripting Exercise

This exercise will familiarize the user with scripting fundamentals of the JI-300.

The JI-300 application provided two script functions: **Import** and **Export**. Import reads a script file into the I2C Message List and Export writes I2C messages from the Message List to a script file. These functions are located at the **File** tab at the main window bar.

The best way to get started creating scripts is to first create a sample I2C message using the standard I2C message entry method (i.e. Add Message Window). This I2C message (or messages) will be used as a prototype or model for other I2C messages that need to be created. Next, export this message using the Export function to create a script file. Using a text editor, open the script file and begin editing. Simply cut, paste, and copy I2C messages to change the desired message parameter(s) (i.e. slave address, direction, data bytes, message function, etc.) Finally, import (using the Import function) the newly created script file into the JI-300 application to check for syntax error, and to execute messages.

Follow the steps below to begin the scripting exercise.

1. Begin by launching the JI-300 host adapter application.
2. At the main window, click the **Add Message** button to open the Add I2C Message window.
3. Add the following two messages to the Message List (see section 2.4, step 5 for help in adding messages)
  1.
    - a. Message Type: Write
    - b. Slave Address: A0
    - c. Data: 20, 30, 31, 32, 33
    - d. Remove Stop: No
  2.
    - a. Message Type: Read
    - b. Slave Address: A1
    - c. Read Count: 4
    - d. Remove Stop: No
4. When complete, verify that the message list has been populated as shown below:

MSG #	Addr	N/S	R/W	Data	ASCII	Status
001	A0		W	20 30 31 32 33	0123	
002	A1		R	XX XX XX XX		

--	--	--	--	--	--	--	--

Figure 15. Message List

5. Next, create a script file by clicking on the **Export** function. This function is located beneath the **File** tab at the main window bar. Click **File**, followed by **Export**, followed by **I2C Messages**.
6. The **Save As** dialog box is now displayed. Type in an appropriate file name such as “JI-300 Script1” and click **Save**.
7. The I2C messages contained in the Message List are now saved to script file “JI-300 Script1.txt”
8. Now, using Windows Notepad, open the newly created script file.
9. Verify that the file contains two lines of text as shown below:

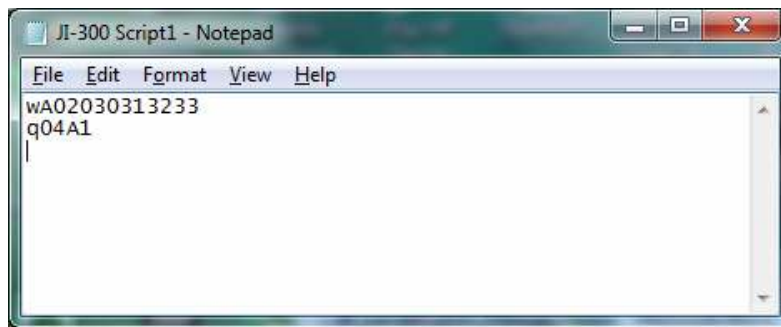


Figure 16. Script File

10. Using the Scripting Language Statements in section 5.1, decode the two lines of text and verify that it is the same as those entered into the Message List.
11. Next, copy and paste the two text lines back into the Notepad window. Repeat this three times. Verify that eight lines of text are displayed as shown below:

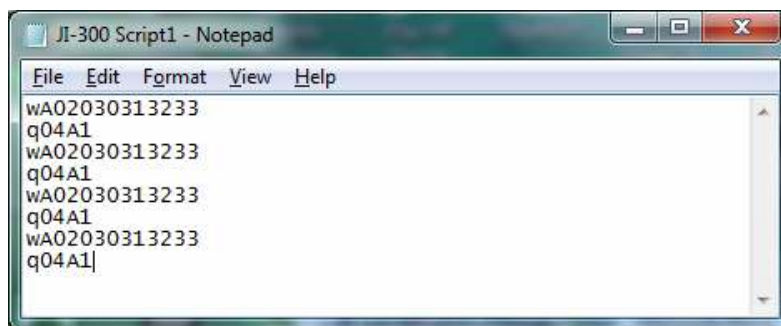


Figure 17. Script File

12. Now, edit the lines of text as follows:
  1. Line 3:
    - Remove the Stop from this Write message by replacing character 'w' with 'y'.

2. Line 4:
  - Remove the Stop from this Read message by replacing character 'q' with 'd'
3. Line 5:
  - Change the slave address of this Write message from A0h to B2h by replacing "A0" by "B2" in character locations 2 and 3.
4. Line 6:
  - Change the slave address of this Read message from A1h to 93h by replacing "A1" by "93" in character locations 4 and 5.
5. Line 7:
  - Add the following six data bytes to this Write message: 34h, 35h, 36h, 37h, 38h, 39h. To do this, append this text string: "343536373839".
6. Line 8:
  - Change the number of data bytes this message reads from 4 to 32 by replacing "04" by "20" in character locations 2 and 3.

13. Verify the following file edits:

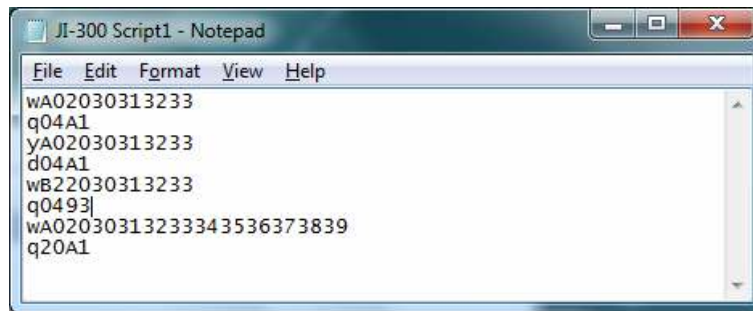


Figure 18. Script File

14. Save the file and close the text editor.
15. At the JI-300 application, import the edited script file. To do this, click **File**, followed by **Import**, followed by **I2C Messages**.
16. The warning message "Do you want to overwrite I2C messages" may appear. If so, click yes.
17. The **Open** dialog box is now displayed. Find the "JI-300 Script1" file and click **Open**.
18. The script file will load and its contents will display in the message list. Verify that the message list has been populated as shown below:

	MSG #	Addr	N/S	R/W	Data	ASCII	Status
	001	A0		W	20 30 31 32 33	0123	
	002	A1	*	R	xx xx xx xx		
	003	A0	*	W	20 30 31 32 33	0123	

	004	A1		R	xx xx xx xx	
	005	B2		W	20 30 31 32 33	0123
	006	93		R	xx xx xx xx	
	007	A0		W	20 30 31 32 33 34 35 36 37 38 39	0123456789
	008	A1		R	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	
					xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	

- 19. These steps illustrate the process of creating and editing an I2C message script file.
- 20. The scripting exercise is now complete.

## APPENDIX A

### 1.0 Specifications

#### Hardware

##### PC Interface

Type:	USB 2.0
Connector:	Standard Type B Socket

##### Power

USB port:	5V @ 300mA (max) Note that all power is supplied by the USB port.
-----------	---

##### I2C Interface

Connector:	Standard 9-Pin, D-sub, Female
Pin-outs:	Pin 1 = SDA Pin 4, 5 = GND Pin 6 = SCL Pin 8 = Vbus Pin 2, 3, 7, 9 = No Connection
SCL/SDA Bus Voltage (Vbus) Range:	Programmable - 1.50V to 5.25V (10mV steps) +/-2%
Input Threshold:	VIL: 0.2Vbus (typical) VIH: 0.7Vbus (typical) VTH: 0.1Vbus (typical)
Input Voltage Range:	-0.3V to 6.0V (operational) -5.0V to 10.0V (maximum rating)
SCL Frequency:	Programmable – Standard: 7.0KHz to 4.0MHz Advanced: 254Hz to 4.0MHz (20nS steps)
SCL/SDA Sink Current:	27mA (typical) short-circuit protected
SCL/SDA Pull-up Resistors:	Programmable – 273 to 4.99K ohms & Open (16 selections) +/-3%
Input Capacitance:	< 40pF without test cables
External Bus Voltage:	Switched Vbus available to power external I2C target. Current limited to 90mA (typical)

### LEDs

Power:	Power-On (USB device enumeration)
SCL/SDA Activity:	LED provides two functions: <ul style="list-style-type: none"><li>• I2C Bus activity</li><li>• Software "Open" success - Indicated by LED blinking three times when the software application successfully opens a USB connection unit.</li></ul>

### Enclosure

Dimensions:	4.1" x 1.1" x 5.5"
Material:	Vinyl-clad steel cover with an extruded aluminum base.
Weight:	0.9 lbs.

### General

#### I2C bus

Address Format:	7-bit
Bus Modes:	Master & Multi-Master
SCL Programmable Parameters:	<ul style="list-style-type: none"><li>- tSU;DAT (20nS steps)</li><li>- tHD;DAT (20nS steps)</li><li>- tHIGH (20nS steps)</li></ul>

#### Data Transfer

Tx/Rx Status Report:	<ul style="list-style-type: none"><li>- Bus not-Free condition</li><li>- Clock Stretch occurrence</li><li>- SDA signal contention (Master Mode)</li><li>- Loss of arbitration (Multi-Master mode)</li><li>- Missing ACK</li></ul>
Behavior Setup:	<ul style="list-style-type: none"><li>- Bus not Free (programmable max. time)</li><li>- Clock Stretch (programmable max. time)</li><li>- Repeated Start (Selectable)</li></ul>

## **APPENDIX B**

### **1.0 PC System Requirements**

- Microsoft Windows 2000/XP/Vista or Windows 7
- Pentium 4 or equivalent processor (600 MHz minimum)
- USB 2.0 port –
- CD-ROM drive
- 50 MB Free hard disk space
- 256 MB Memory

## APPENDIX C

### 1. Installing USB Device Driver

Two types of drivers will be installed: Virtual COM Port (VCP) and Direct Drive (D2XX). The VCP driver allows control of the JI-300 adapter via ASCII serial commands sent using a terminal emulation program such as Windows Hyper Terminal. The D2XX driver allows direct access to a USB device via a DLL interface. Both drivers are supplied by the manufacture of the USB interface IC designed into the JI-300. Complete USB driver information can be found at the FTDI website: (<http://www.ftdichip.com/FTDrivers.htm>)

Instructions below assist with the installation of JI-300 drivers for the following Windows Operating systems: Windows 2000/XP/Vista or Windows 7

#### a. Windows 7

To install drivers for the JI-300 under Windows 7, follow the instructions below:

##### Internet Connection

1. Ensure the host PC is connected to the internet.
2. Connect the JI-300 to a spare USB port on the PC.
3. Windows 7 will silently connect to Windows Update website and install the required driver(s).
4. At the conclusion of the installation, verify that the red PWR LED on the front panel of the JI-300 is on. Installation is now complete.
5. If the drivers were not automatically found or the PWR LED did not illuminate, continue to the "No Internet Connection" steps below.

##### No Internet Connection

1. Please refer to the FTDI Drivers Installation Guide for Windows 7 for detailed instructions.  
([http://www.ftdichip.com/Documents/AppNotes/AN\\_119\\_FTDI\\_Drivers\\_Installation\\_Guide\\_for\\_Windows7.pdf](http://www.ftdichip.com/Documents/AppNotes/AN_119_FTDI_Drivers_Installation_Guide_for_Windows7.pdf))

#### b. Windows Vista

To install drivers for the JI-300 under Windows Vista, follow the instructions below:

##### Internet Connection

1. Ensure the host PC is connected to the internet.
1. Connect the JI-300 to a spare USB port on the PC.
2. Vista will silently connect to Windows Update website and install the required driver(s).



3. At the conclusion of the installation, verify that the red PWR LED on the front panel of the JI-300 is on. Installation is now complete.
4. If the drivers were not automatically found or the PWR LED did not illuminate, continue to the “No Internet Connection” steps below.

No Internet Connection

1. Please refer to the FTDI Drivers Installation Guide for Windows Vista for detailed instructions.  
([http://www.ftdichip.com/Documents/AppNotes/AN\\_103\\_FTDI\\_Drivers\\_Installation\\_Guide\\_for\\_VISTA\(FT\\_000080\).pdf](http://www.ftdichip.com/Documents/AppNotes/AN_103_FTDI_Drivers_Installation_Guide_for_VISTA(FT_000080).pdf))

c. Windows XP

To install drivers for the JI-300 under Windows XP, follow the instructions below. For additional installation information, please refer to the FTDI Drivers Installation Guide for Windows XP

([http://www.ftdichip.com/Documents/AppNotes/AN\\_104\\_FTDI\\_Driver\\_Installation\\_Guide\\_for\\_WindowsXP\(FT\\_000093\).pdf](http://www.ftdichip.com/Documents/AppNotes/AN_104_FTDI_Driver_Installation_Guide_for_WindowsXP(FT_000093).pdf))

1. Temporarily disconnect the host PC from the Internet. (Simply remove the network cable from the PC)
2. Insert the JI-300 CD-ROM into the computer’s CD drive (or download the latest drivers from the [FTDI Web Site](#) and unzip them to a temporary location on your PC.)
3. Connect the JI-300 unit to a spare USB port.
4. Now, verify that the “Found New Hardware Wizard” window is displayed as shown in Figure 21.



Figure 21. Found New Hardware Wizard Window

5. Select “No, not at this time” from the options, and then click “Next”.
6. At the “Found New Hardware Wizard” window (Figure 22), select “Install from a specific list or location (Advanced)”, and then click “Next”.

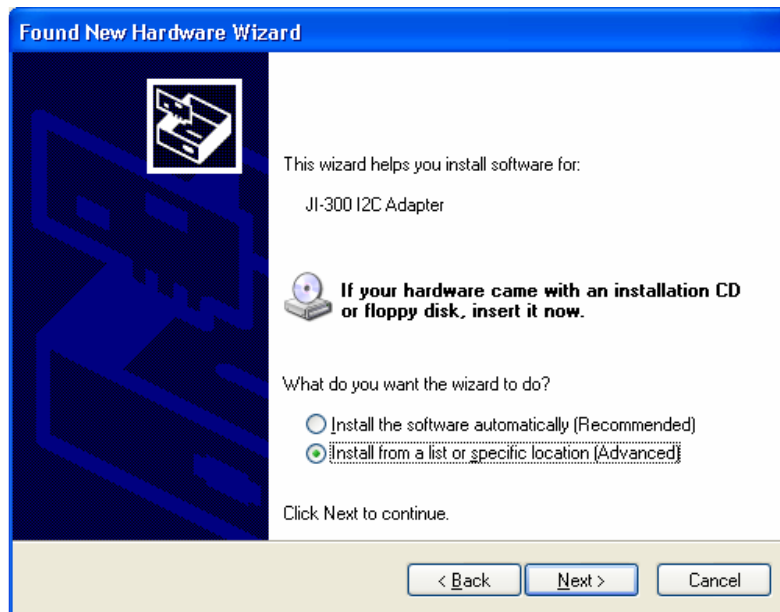


Figure 22. Found New Hardware Wizard Window #2

7. At the “Found New Hardware Wizard” window (Figure 23), select “Search for the best driver in these locations” followed by “Search removable media (floppy, CD-ROM...)”. Click Next.

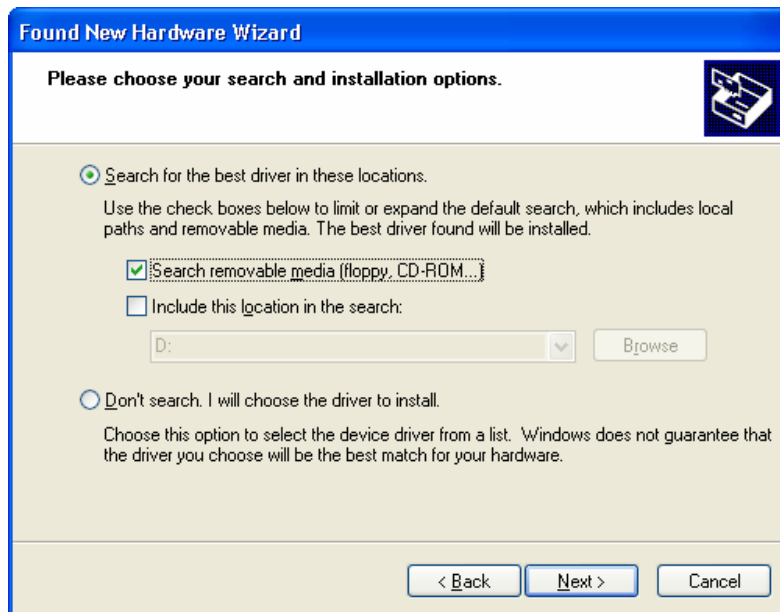


Figure 23. Found New Hardware Wizard Window #3

8. A window is now displayed showing the driver software being located and then copied (Figure 24).

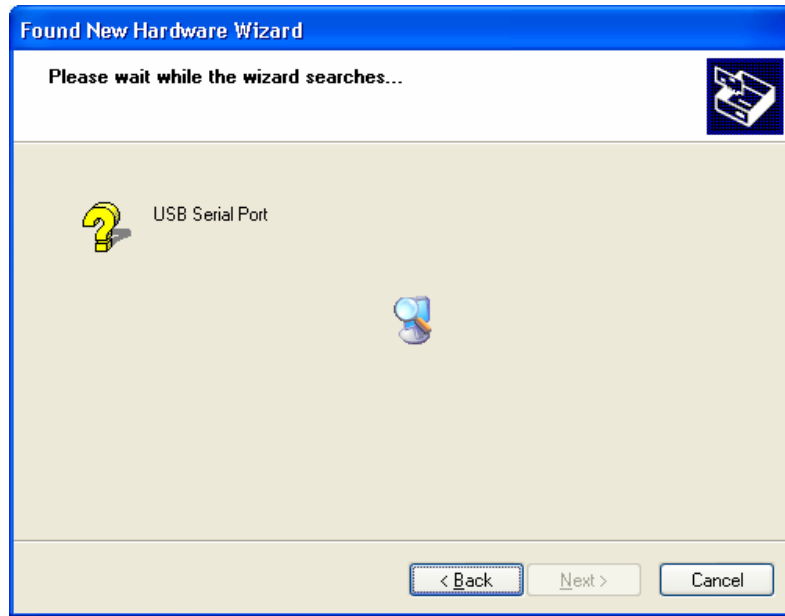


Figure 24. Driver Coping Window

9. A window indicating that the installation was successful should now be displayed (Figure 25).



Figure 25. Installation Success Window

10. The D2XX driver is now installed. Click Finish.

11. Repeat steps 5 through 11 to install the VCP driver.
12. The installation is now complete.

d. Windows 2000

To install drivers for the JI-300 under Windows 2000, follow the instructions below. For additional installation information, please refer to the Windows 2000 Installation Guide ([http://www.ftdichip.com/Documents/InstallGuides/Windows\\_2000\\_Installation\\_Guide.pdf](http://www.ftdichip.com/Documents/InstallGuides/Windows_2000_Installation_Guide.pdf))

1. Temporarily disconnect the host PC from the Internet. (Simply remove the network cable from the PC)
2. Insert the JI-300 CD-ROM into the computer's CD drive (or download the latest drivers from the [FTDI Web Site](#) and unzip them to a temporary location on your PC.)
3. Connect the JI-300 unit to a spare USB port.
4. Now, verify that the "Found New Hardware Wizard" window is displayed as shown in Figure 26.

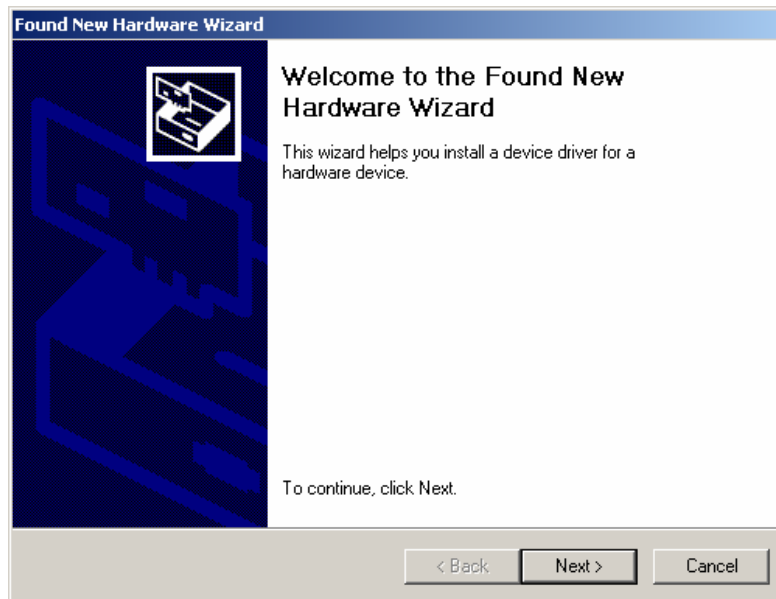


Figure 26. Found New Hardware Wizard Window

5. Click "Next", to continue.
6. At the next "Found New Hardware Wizard" window (Figure 27), select "Search for a suitable driver for my device (recommended)" as shown below, then click next.



Figure 27. Found New Hardware Wizard Window #2

7. At the next “Found New Hardware Wizard” window (Figure 28), check the box next to “CD-ROM drives” and uncheck all others. Click next.

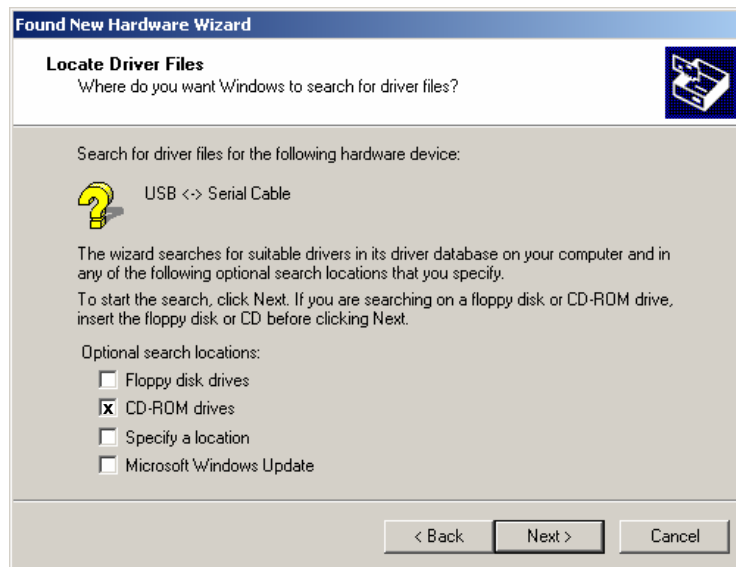


Figure 28. Found New Hardware Wizard Window #3

- Once Windows has found the required .INF driver file (Figure 29), click next to proceed.

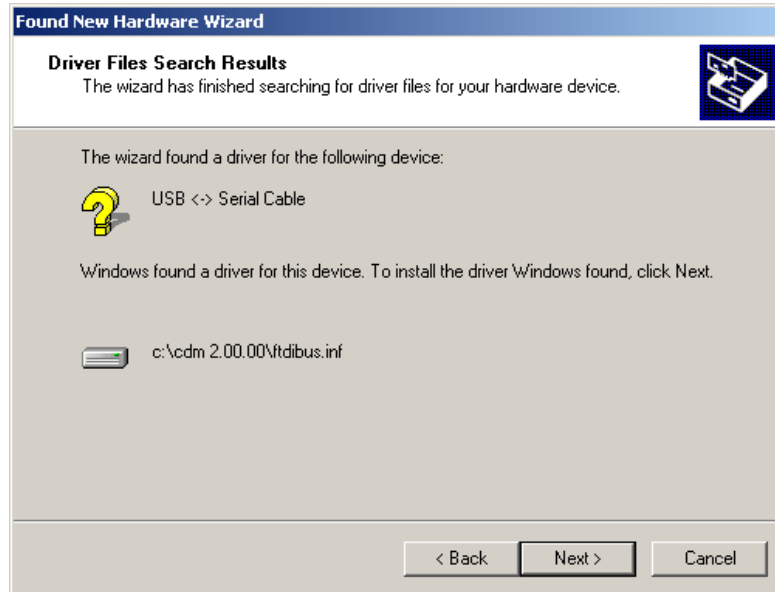


Figure 29. Driver Found Window

- A window indicating that the installation was successful should now be displayed (Figure 30). Click Next.

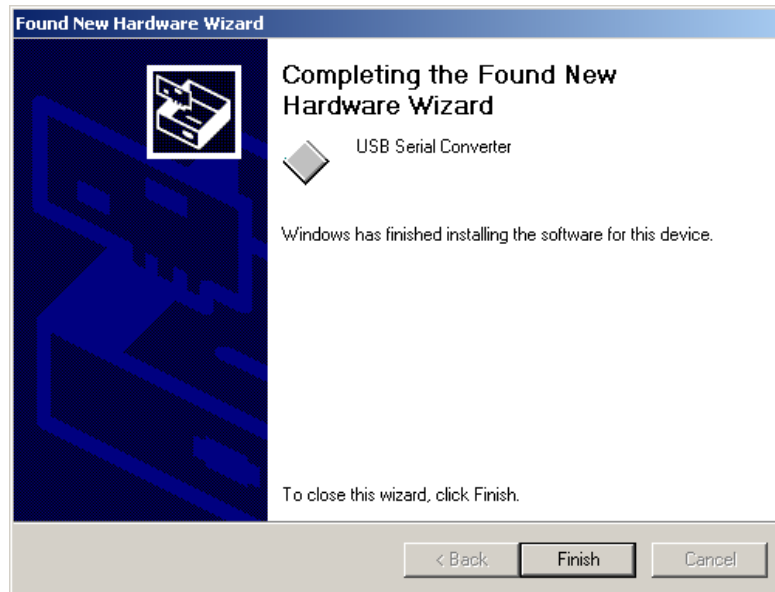


Figure 31. Installation Success Window

- The installation is now complete.

## **2.0 Installing Application Software**

To install:

1. Insert the CD-ROM into the host PC's CD/DVD drive, or download the latest executable [http://www.jupiteri.com/JI-300\\_Files/JI300\\_V4.1.2\\_ZIP.zip](http://www.jupiteri.com/JI-300_Files/JI300_V4.1.2_ZIP.zip) to a temporary folder on the hard drive and unzip.
3. Using Windows Explorer, find the "setup.exe" file located on either the CD drive or temporary folder. Double click on the file to begin the installation.
4. Follow the instructions on the screen until the installation is complete.
5. Software installation is now complete.

## APPENDIX D

### 1.0 General Information

#### 1.1 Warranty

The equipment is warranted for one year from date of purchase against defects in materials or workmanship. Jupiter Instruments reserves the right to repair or replace products at its own and complete discretion. Customer must obtain from Jupiter Instruments a Return Authorization Number (RMA) prior to returning any products to Jupiter Instruments. Products returned under this Warranty must be unmodified and in original packaging. Jupiter Instruments reserves the right to refuse warranty repairs or replacements for any products that are damaged or not in original form.

The customer is responsible for the shipping and insurance cost arising from the return of products to Jupiter Instruments. Jupiter Instruments will return all in-warranty products with shipping cost prepaid.

#### 1.2 Thirty-Day Return Policy

Customers may return Jupiter Instruments products for a full refund if Jupiter Instruments is contacted within thirty days of the customer's receipt of the product. Customer may return Jupiter Instruments products for credit, exchange, or a refund. Customer must obtain from Jupiter Instruments a Return Authorization Number (RMA) prior to returning any products to Jupiter Instruments. Products must be returned unmodified and in original packaging. Jupiter Instruments reserves the right to refuse return rights for any products that are damaged or not in original form. Volume orders may be subject to a significant restocking fee.

#### 1.3 Limitation of Liability

Jupiter Instruments' liability shall be limited to the repair or replacement of defective products in accordance with the Jupiter Instruments limited warranty.

Jupiter Instruments shall not be liable for any incidental, special or consequential damages for breach of any warranty, expressed or implied, directly or indirectly arising out of Jupiter Instruments' sale of merchandise, including any failure to deliver any merchandise, or arising out of customer's installation or use, whether proper or improper, of the product, separately or in combination with other equipment, or from any other cause. Use the JI-300 at your own risk.

Products sold by Jupiter Instruments are not authorized for use as critical components in life support devices or systems.

#### 1.4 Contact Us

- Address: Jupiter Instruments  
Mission Viejo, CA 92692
- Email: [Sales@Jupiteri.com](mailto:Sales@Jupiteri.com)  
[Tech@Jupiteri.com](mailto:Tech@Jupiteri.com)
- Phone: Sales and Information: (949)-716-0154
- Website [www.Jupiteri.com](http://www.Jupiteri.com)