

**Test Procedure
for the
68HC11 EVBU**

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1 Verifying Power

In order for the evaluation board to function properly it must be supplied with a sufficient amount of power. Every component of the board relies on this supply power, so this power must meet certain requirements. This section presents the procedure for verifying supply power to the EVBU.

1.1 Procedure

1. Plug the wall transformer into a reliable wall outlet.
2. Plug the other end of the adapter into the power jack on the board.
 - The green LED located next of the power jack should now be on verifying the board has power.

1.2 Troubleshooting

If the green LED does not come on:

- Make sure the transformer is correct. (9VDC 200ma)
- Verify that the transformer is properly plugged into a working.

Is the LED still off? If so continue...

- Use a DMM to read the output voltage on the 7805-voltage regulator located to the right of the power jack, which is pin 3. The voltage at this terminal should be very close to 5 Volts. If the voltage is remarkably higher or lower than 5 Volts, the regulator itself may need to be replaced. Please notify your instructor.
- If the last check passed read both the PWD and GND signals on the LED, pins 2 and 1, respectively. If good PWD and GND signals are present on the LED, the LED may need to be replaced. Please notify your instructor.

2 Verifying Serial Communication

The CME119-EVBU is a very powerful board that is easy to learn. There are many exciting and neat features that can be explored on one of these evaluation boards. In order to program the 68HC11 and use these features, BUFFALO (internal program running on the 68HC11) must be able to communicate with the outside world. This interaction is established through serial communication. The following section describes how to verify the serial communication between the PC and the evaluation board.

2.1 Procedure

1. Insert the serial cable into its proper ports on the PC and the evaluation board.
2. If you are using a computer with the 68HC11 compiler installed on it, there will be a folder labeled 68HC11 on the desktop. Double click on the icon named EVBU.ht. Ignore pop-ups (cancel out of them, if they appear).
 - A HyperTerminal screen should appear.

3. If there is not a 68HC11 folder follow the steps given in section [HyperTerminal Setup](#), then continue with the procedure.
4. Press the reset button on the evaluation board.
5. Press enter when the BUFFALO prompt appears >
 - The following text should be displayed on the hyper-terminal screen:
“BUFFALO 3.4 (ext) – Bit User Fast Friendly Aid to Logical Operation”
 - If the above text was displayed on the screen the serial communication between the PC and EVBU is working properly.

2.2 Troubleshooting

If the BUFFALO message does not display:

- Check to see if the serial cable is still properly inserted into its corresponding ports. Try pressing reset again.
- Make sure the serial cable being used is not a null modem cable. Currently at GVSU all serial cables that are null modem cables are marked NULL.
- Verify that the configurations in HyperTerminal matched the one given in section [HyperTerminal Setup](#).

Are you still not receiving the message? If so continue...

- Try changing your serial cable and/or the evaluation board. If the problem was in the cable simply replace old cable with the new one. If the evaluation board was the cause refer to section [Determining the Cause of Communication Failure](#).

2.3 HyperTerminal Setup

This section walks you through configuring the HyperTerminal connection when the GCC 68HC11 folder is not installed.

2.3.1 Procedure

1. The following steps will configure your PC to communicate with the evaluation board.
 - Open the Start -> Menu -> Programs -> Accessories -> Communication -> HyperTerminal. (The second one if two appear).
 - A screen will appear similar to Figure 1.
 - Type in a connection name.
 - Pick an icon and click ok.

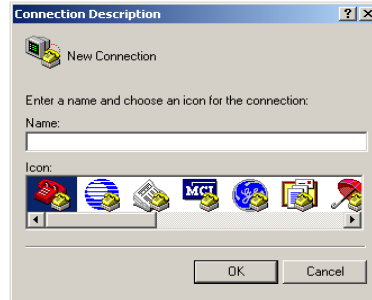


Figure 1: Setup menu for hyper-terminal connection

2. In Figure 2 make sure you select COM1 for the connection to be used.



Figure 2: Selecting the communication port

3. The screen shown in Figure 3 should now be displayed on the screen.

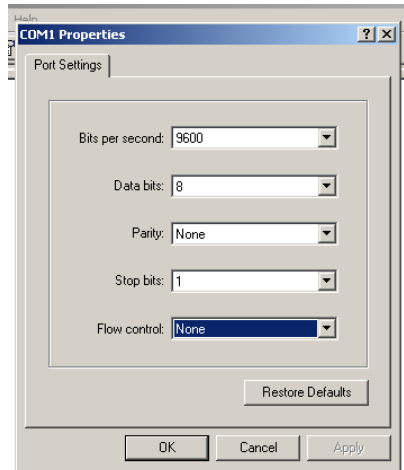


Figure 3: Communication configuration screen.

4. On the screen in Figure 3 the fields should read as follows:
 - Bits per second: 9600
 - Data bits: 8
 - Parity bits: None
 - Stop bit: 1
 - Flow control: None

2.4 Determining the Cause of Communication Failure

To better help you narrow down the cause of the communication problem, this section will look at two chips on the EVBU, the 68HC11 and the MAX232. All communication starts and ends at the 68HC11 so it is easy to see why it would be verified under this section. Having the MAX232 fail will break the link between PC and board causing communication to fail.

2.4.1 Testing the 68HC11

1. Gather the following list of equipment:
 - DMM
 - Oscilloscope
 - Logic Probe
 - EVBU schematic attached to this documentation.
2. Use the schematic and reference manual to locate the 68HC11 and its pin layout on the evaluation board.
3. Check the PWD (pin 26 –VDD) and GND (pin 1 – VSS) pins with either the DMM or logic probe for their voltage readings.
 - The reading at VDD should be around 5 volts and the reading at VSS should be zero.

4. If step three was successful go on to measuring the voltage at the Reset pin (pin 17).
 - The corresponding voltage here is 5 volts, until the reset button is pressed when the voltage will momentarily drop to zero and then back to five.
5. The next set of signals to test is the clock signals, XTAL (pin 8) and EXTAL (pin 7).
6. Use the oscilloscope probes to obtain a reading on both pin 8 and pin 7.
 - The oscilloscope should read back both signals oscillating at about 8MHz.

2.4.2 Troubleshooting the 68HC11

In the event that one or more procedures did not get marked off, please notify your instructor about replacing the 68HC11.

2.4.3 Testing the MAX232

1. Locate the MAX232 on the schematic.
2. Use the DMM or the logic probe to check the voltage on the VCC (pin 16) and GND (pin 15) pins on the MAX232.
 - Pin16 should have a voltage of 5 and pin 15 should have a reading of zero volts.
3. Check the voltage of pins 7, and 14.
 - When the system is idling pins 7, and 14 should both have a voltage reading of -8.5 volts or lower.
4. Check the voltage of pins 2 and 6.
 - This pin should have a voltage reading of 8.5 volts or higher.

If any of the above procedures failed the MAX232 chip may need changing. Please notify your instructor. These are the most simplest and quickest ways to determine whether or not the MAX232 chip is working properly. Most of the pins of the MAX232 will carry a voltage of either +10 or -10 volts depending on the device. For more information on troubleshooting a MAX232 obtain the data sheet from this link (<http://pdfserv.maxim-ic.com/en/ds/MAX220-MAX249.pdf>).

3 Verifying the Board's Memory

There are several types of memory present on the EVBU, internal/external EEPROM, internal EPROM, and internal/external RAM. Memory is a very important tool to have. Making sure this tool is working correctly is the goal of the section. Although there are five different types of memory on the board this section will only explicitly test two of them, external RAM and internal EEPROM. The reasons for excluding the others from being validated in this documentation can be found in the paragraph below.

The reason why the internal RAM and internal EPROM are not tested in this procedure is because we are assuming if the Buffalo message appears on the screen that Buffalo is running. Buffalo is stored on the internal EPROM and it uses many portions of the internal RAM for things like stacks, variables and interrupts. Accidentally overwriting one of these locations could make the evaluation board unreliable and/or corrupt Buffalo.

3.1 Procedure

1. Make sure the jumpers on the evaluation board are configured properly. The configuration for these jumpers can be found in section [Jumper Configuration](#).
2. Press the reset button located on the evaluation board.
3. Hitting the return key on the keyboard will give the command prompt to communicate with the 68HC11.

3.1.1 Testing the External RAM

4. On the command line type: BF 0200 0FFF AA and press the return key.
 - Buffalo should return back to the command prompt with any message.
5. Now enter the same command but replace AA with the value 55.
 - Buffalo should once again return directly back to the command prompt.
6. Repeat steps three and four with the address block starting at 1040 and ending at 7FFF.
 - If the message ROM followed by an addressed displayed on the screen while performing steps three and four at any time, refer to the section [Troubleshooting – External RAM](#).

3.1.2 Testing the Internal EEPROM

7. Repeat steps three and four with the address block B600 to B7FF.
 - If the screen displayed the ROM message on this block refer to the section [Troubleshooting – Internal EEPROM](#).

3.2 Troubleshooting – External RAM

1. Gather the following equipment:

- DMM
 - Logic probe
 - CME11E9 schematic
 - Oscilloscope
2. Make sure the jumpers correctly located on the board. To determine if your board's jumpers are correct go to the section labeled [Jumper Configuration](#).
 3. Locate the address decoder chip labeled ATF16V8BQL
 4. Use the logic probe or the DMM to measure the voltages at VCC (pin 20) and GND (pin 10).
 - The voltage at these two pins should read five and zero volts respectively.
 5. While Buffalo is idling measure the following signals with either the oscilloscope or logic probe: {M1 (pin19), OE (pin 15), WR (pin 16) R/W (pin 11)}
 - All of the above signals should give back an oscillation that is from five to zero volts. On the logic probe the pulse light will continuously pulse and if you used the oscilloscope the signal will continuously rise and fall within the give voltage range.

Note: If any of the above signals are not oscillating or have a steady value of zero volts the address decoder may need to be changed. Please notify your instructor.

6. Locate the external RAM chip in the U5 socket labeled CY62256LL.
7. Use the logic probe or the DMM to verify VCC (pin 28) and GND (pin 14) signals.
 - Voltage at VCC reads 5 volts and the voltage at GND should be zero.
8. Measure the following signals with either the logic probe or the oscilloscope: {WE (pin 27), OE (pin 22), CE (pin 20)}
 - The response of all the above signals should be an oscillation between zero and five volts.

3.3 Troubleshooting – Internal EEPROM

If the internal EEPROM on the evaluation board is not working there could only be one problem, the 68HC11 chip is bad. Please inform your instructor of this issue for further instructions.

3.4 Jumper Configuration

Jumpers can make the evaluation board respond in a number of ways. Having the wrong jumper activated may be the means of an external device working or not working. This section will help you determine whether or not the CME11E9 board is in the proper jumper configuration.

3.4.1 Procedure

1. Use Figure 4 to locate the jumpers on the evaluation board.
2. Making sure the VPP Connector jumper is deactivated.
3. In the Mode Select make sure all the jumpers are deactivated.
4. If not already done, activate (jump) pins 2 and 3 on the TRACE/PROG section.
5. In the middle of the board the SYNC jumper.
6. Activate the green labeled jumper (JP3) and the yellow labeled jumper (JP4).
7. Make sure JP7 (red) and JP6 (blue and white) are activated.
8. The rest of the jumpers should be deactivated unless otherwise informed differently from your instructor.

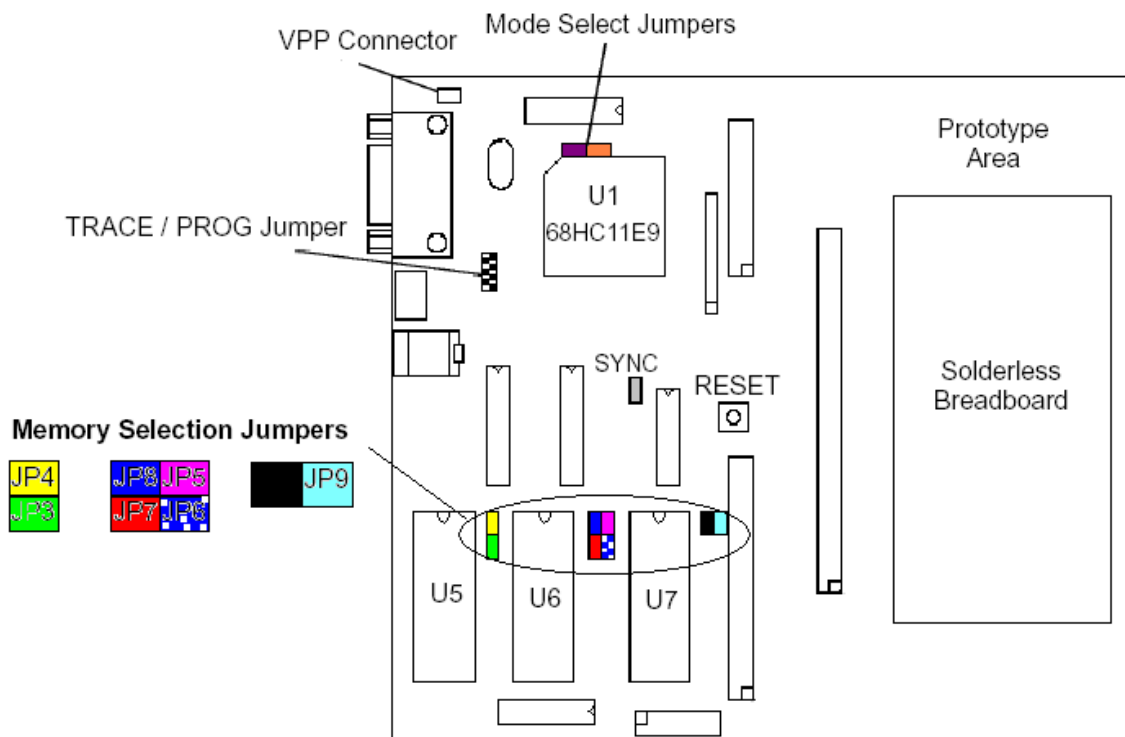


Figure 4: Shows the location of all jumpers on the evaluation board.

4 Verifying the Parallel I/O

The parallel I/O registers are basically the strong point on the HC11. These ports allow the HC11 to manipulate different types of data. In the following section the I/O registers will be tested, verifying that the data you gave the HC11 or received from the HC11 holds true value. You might notice that there is not a troubleshooting section provided in the section. The reason for leaving it out is because these registers are internal to the HC11 and not by any means fixable.

4.1 Procedure

1. Download the executable file EVBU_Tester.s19 from the C2D2 site on the engineering web page. (<http://www.gvsu.edu/engineering>)
2. Now that the file has been obtained load the file onto the HC11. Type on the BUFFALO prompt
 - load t
3. In the HyperTerminal window select the Transfer menu and open the option send text file.
4. Open the s19 file you previously downloaded, click ok and wait for the HC11 to upload the file.
5. In order for the program to work properly you will need to connect an EVBU I/O Tester to the MCU port of the evaluation board. To receive an EVBU I/O Tester please inform your instructor.
6. Plug the tester into the MCU port making sure that the corresponding connector for your particular board is positioned so that the side marked HC11 is facing the HC11 on the evaluation board.
7. **BEFORE RUNNING THE TESTER PROGRAM REMOVE ALL OTHER WIRES, COMPONENTS, DEVICES, ETC. FROM THE EVALUATION BOARD. HAVING EXTRA CIRCUITRY ON THE EVALUATION BOARD WHEN THE TESTER PROGRAM IS RUNNING MAY DAMAGE THE HC11 AND THE EVALUATION BOARD. THIS IS VERY IMPORTANT!!**
8. Once again make sure there are no extra components on the EVBU. To run the program type
 - go 1040

The program is fully automated and the following steps are provided for you inside the program itself. A table will be displayed for each feature of the parallel I/O registers, standard I/O, bi-directional I/O and the analog/digital converter. In this table the status of each pin will be outputted telling you whether or not the pin has passed or failed the test.

5 Quick Guide to Troubleshooting the EVBU

5.1 Is your EVBU is not powering up?

Here are a few quick checks that may help determine the cause of the problem.

1. Check to see if you are using the correct transformer.
 - 9VDC ~200ma
2. Check the condition of the voltage regulator. (7805)
 - 5VDC on the output

- $\geq 7\text{VDC}$ on the input

For a complete reference to this problem check out the section [Verifying Power](#).

5.2 Don't think the EVBU is communicating with the PC?

1. Check your serial cable. Make sure it is not marked NULL.
2. Check the settings for your HyperTerminal connection.
 - 9600 Bps
 - 8 data bits
 - No parity bit
 - 1 stop bit
 - No flow control
3. Make the HyperTerminal is transmitting/receiving on the proper port. E.g. COM1.

For a more in-depth look at this problem refer to section [Verifying Serial Communication](#).

5.3 External RAM? Internal EEPROM? Do they work?

1. To quickly check the condition of your External RAM type the following commands on the BUFFALO prompt.
 - BF 0200 0FFF AA
 - BF 0200 0FFF 55

If the above commands came back error free then the ext. RAM is okay.

2. To check the condition of the Internal EEPROM type:
 - BF B600 B7FF AA
 - BF B600 B7FF 55

If no errors returned the int. EEPROM is okay. If your problem is not detected by now it would be a good idea to read section

[Verifying the Board's Memory](#), as it is a great tool for troubleshooting the EVBU's memory.

5.4 Not sure if a pin is working?

Basically all you need to do is run the program EVBU_Tester.s19.

To obtain this program refer to section [Verifying the Parallel I/O](#).

6 Troubleshooting the Wallace Robots

The main focus of the documentation to this point was testing the EVBU. In this section the main focus will be on the Wallace robot 226 boards. While reading this section you will notice only certain topics are mentioned. The reasons for this are as follows: the robots are operating off of rechargeable batteries and on the board itself there is no external memory devices. For a complete guide for testing and troubleshooting these robots please either read through the robots manual or contact Prof. Sterian.

- Make sure the robot is fully charged for best performance. Seeing that Prof. Sterian is the only personnel authorized to charge the robots you can assume they will always be fully charged prior to operation.
- Verifying the communication between the HC11 and the PC can be done the same way as in the section labeled [Verifying Serial Communication](#).
- For verifying the status of a pin, section [Verifying the Parallel I/O](#) can be used. Note the cable used for testing the parallel I/O on the robots is different from the cable used on the EVBU's, so make sure you used the correct cable.

If there are any other problems or concern with the robots please contact Prof. Sterian (steriana@claymore.engineer.gvsu.edu) before attempting to address the situation yourself.