# NeoLoch, LLC

Inquisitor PSRAM Blade V 1.00 Quick Reference Guide
Pseudo Static RAM (DRAM)

The name might be a bit confusing, and I think some explanation is required for those not in the know. Early DRAM required three voltages, +12V, +5V and -5V. Eventually, DRAM that only required +5V was released it was called Pseudo SRAM due to only requiring a single voltage, +5V.

This change in voltage requirement made DRAM far easier to implement and wide variety of sizes and configurations became available. This Blade provides an easy interface to testing variety of PSRAM.

Core Connections and Power Requirements
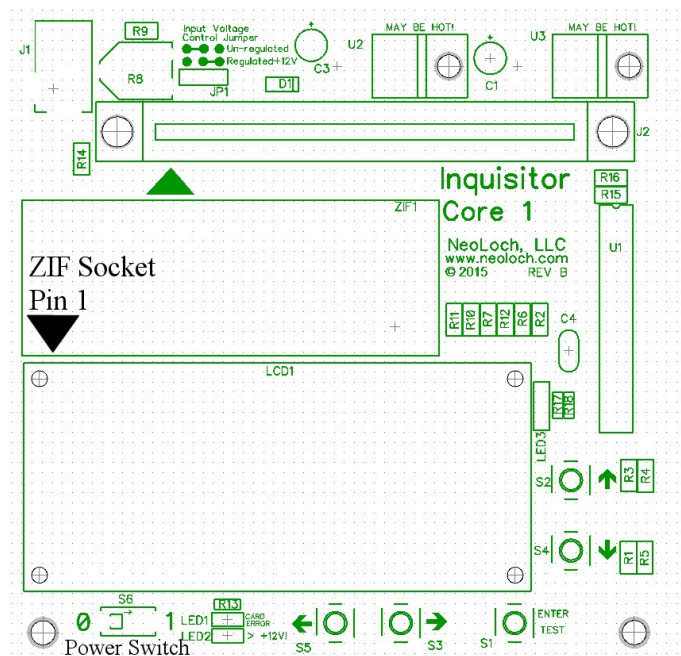
CN1: Card edge connector.

CN2: ICSP connector, this port is designed to attach to a PICKit 2, PICkit 3 or compatible programmer.

To change tester blades, always turn off the power before removing or inserting a blade. If the fingers on the card edge connector cross during card removal or insertion, the blade may be damaged.

Testing a RAM IC

Step 1: Use the left or right arrow keys to select the test you wish to do.

Step 2: Insert the RAM IC with pin one closest to the ZIF lever. Lower the lever to lock the IC in place.

Step 3: Press the "Enter / Test" button and the test will begin. If the RAM IC passes "RAM IC: * Okay *" will appear on the screen, if the IC is bad "RAM IC: * BAD *" will appear on the screen, and you'll be able to scroll through the test results using the up and down arrow keys.

Display RAM Results

If a RAM tests bad, you can use the up and down arrows keys to get a better idea of what happened during each scan. The first address a bad bit was detected at is listed along with the number of bad bits encountered during that pass.

For 4 bit and 8 bit RAM ICs, passes 1 through 16 display which bits failed during that pass, this is a cumulative result and doesn't necessarily mean that all bits failed on all addresses.
Pass 17 shows the result of the address check and displays the starting address that failed and the number of failed addresses after that point.

For 1 bit RAM ICs:
- Pass 1 writes all zeros to the RAM IC
- Pass 2 writes all ones to the RAM IC
- Pass 3 segments the RAM up into bytes. Each byte range is tested by writing and reading values from 0x00 through 0xFF.

LED Result

At the conclusion of a test, LED 3 on the main board will visually display the result. Green means the RAM passed and red means the RAM failed. During the test the LED will be orange. When changing tests the result LED will be turned off.

Available RAM Tests & System Options

Test Type	Time to Complete (Approximate)
3764	28 to 39 seconds
4164 / 6665 / 9064	28 to 39 seconds
4256 / 41256	2:11 to 3:05 minutes
4416	*9 to 13 seconds
4464 / 41464	34 to 57 seconds
44256	2:20 to 3:28 minutes
4516	8 to 10 second
81416	6 to 9 second

Settings: Using the <- and -> keys will scroll through not only the available tests, but also settings.

Long Test

Yes: All scan passes will be conducted.
No: Only test 1 and 2 will be executed, this writes all 0's and all 1's to the memory to detect problems. The short test is not as effective at detecting bad RAM as the long test.

LED Setting

Normal: The LED on the core module operates normally.
Reversed: The LED is reversed, use this setting if the bi-color LED was installed incorrectly.

System Information

Use the up and down arrow keys to scroll through the system information notices which include: Core PCB version, Blade PCB version and +5V voltage reading.

Individual Test Settings

To access individual test settings make sure the bad ram detect flag is cleared, this is accomplished in one of three ways:

- On the completion of a successful test.
- Using the left or right arrow key to change tests and then return to the original test.
- Power cycle the tester.

Statistics

To view statistics, select the test you wish to see statistics for, then press the up or down arrow key until the statistics item appears. Statistics includes the total number of tests, how many passed and how many failed.

To clear statistics press enter and follow the on-screen instructions.

Multiple Scans Per Test

You have the option to do multiple scans each time you press the enter key. To access this feature first make sure the bad ram flag is clear. Then press the up or down arrow key until the multiple scans menu item appears. You can change the setting using the following keys:

- Left Arrow: add 10 to the test total.
- Right Arrow: add 1 to the test total.
- Enter: Reset test total to 1.
- Up and Down: Move to next setting / return to test main menu.

Example: If you change the number of scans to 10 and then test a RAM, the test will be run 10 times on that RAM. This allows you to test a RAM multiple times without having to keep pressing the enter key for each test.

Abort Test on First Failure

The abort test on first failure feature allows you to save time when testing larger RAMs that can take several minutes to test. When this feature is turned on the test will abort when a failure is detected and report the RAM as bad.

Select the test you wish to change the setting on, press the down or up arrow key until you see the abort test setting, then use the enter key to change the setting.

Understanding RAM Speed Report

When a test is started, the MCU attempts to get an idea of how quickly the RAM is responding to data requests. Due to MCU limitations, the MCU can only

group the response into a set number of categories and each category represents a time frame that the data was detected in.

When the RAM's speed is determined, the speed of the test is adjusted to match the speed of the RAM under test.

The following table lists the numbers that appear on the screen during testing and what they mean:

Display	Meaning
109	Data arrived in less than 109ns.
343	Data arrived between 110ns and 343ns.
577	Data arrived between 344ns and 577ns.
811	Data arrived between 578ns and 811ns.
1.1	Data arrived between 812ns and 1.01µs
1.3	Data arrived between 1.01µs and 1.28µs
1.5	Data arrived between 1.28µs and 1.51µs
1.8	Data arrived between 1.51µs and 1.75µs
---	Data took longer than 1.75µs to appear.

RAM test speeds vary depending on the detected response time of the test subject, so the following table lists RAM testing times from fastest to slowest.

The Testing Process For 4 & 8 Bit RAM

4 and 8 Bit RAM Scans 1 through 16
These scan consist of writing 0X00 through 0X0F for 4 bit memories, or 0X00 through 0XFF for 8 bit memories.

Scan 1 consists of writing 0X00 to each memory location and then reading the data back for verification. Each next scan will increment the test value by 0X01 (4 bit) or 0X11 (8 bit).

4 & 8 Bit Pass 17 – Address Check
It's possible that a RAM IC's memory is just find while the addressing block has a failure, permitting, for example, two different addresses to access the same memory location. Pass 17 writes a different offset value to each memory location to detect if there's an address issue.

For 4-bit devices this consists of writing 0X00 to

address 0X00, 0X01 to address 0X01, and so on. Once the program reaches address 0X10 however, the offset value kicks in and we write 0X01 to address 0X10. This offset value slowly increases with every rollover of the nibble that's being written to the RAM IC.

This offset will cause a bad address to come out on the read back, and reveal an otherwise hard to detect issue.

For 8 bit devices, the process is the same except the offset doesn't kick in until a rollover has happened from the full 8 data bits (byte).

The Testing Process For 1 Bit RAM

Bit Pass 1 – Write and Read all 0's
During this scan, 0 is written to and read from each address.

1 Bit Pass 2 – Write and Read all 1's
During this scan, 1 is written to and read from each address.

1 Bit Pass 3 – Byte Read Write
This scan breaks up the RAM into as many bytes (8 bits) as the size of the RAM will permit, so addresses 0 through 7 becomes the first byte, 8 through 15 the second, 16 through 23 the third, and so on.

Each byte is assigned a incremental value and the entire length of the RAM is written to. The data is then read back and the process started again using a new starting incremental value. A total of 16 passes are conducted this way to ensure that every bit is exercised in a varied pattern.

Firmware Versions and Known Bugs

Version 1.0
- Initial release, no known problems.

Kit contents and parts placement

Kit Contents:	Parts Placement
1 – PCB (PSRAM)	**C1 & C2**: 0.1uF MLCC capacitor.
1 – PIC18F47K40 (Programmed)	**C3**: 2.2uF electrolytic capacitor.
1 – 40 Pin Socket	**K1, K2 & K3**: Reed Relay (polarized).
2 – 0.1uF Capacitors	**U1**: 40 pin socket & PIC MCU.
1 – 2.2uF Capacitor	
1 – 390 Ohm Resistor	
3 – Reed Relays	**R3**: 390 Ohm resistor.
1 – 2x5 Green LED	**LED1** – 2x5 Green LED
1 – Quick Reference Guide	

Missing a part? Need help?
Contact us at sales@neoloch.com
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