M8722NF SINGLE BOARD COMPUTER

TECHNICAL SPECIFICATION AND USERS MANUAL VERSION 2.0

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1.0 OVERVIEW

The M8722NF is a Single Board Computer (SBC) that functions as a complete embedded system. The onboard peripherals provide a fully functional network connected computer. The M8722NF can be used for prototype development, or integrated into a bigger system.

The availability of a prototyping board (Model MBDEV-A) allows the system designer to experiment with various engineering ideas without modifying the main system board. This can be a valuable time and money saver.

1.1 Features

- Microchip 18F8722 MCU operating at 40MHz.
- 128K bytes of FLASH program space
- 3840 Bytes of RAM
- Realtek 8019AS 10Mb/s Network Interface Controller
- Microchip TC74 Temperature sensor
- Maxim DS1307 Real Time Clock
- Microchip 24LC512 Serial EEPROM. Can Handle up to three devices.
- RS232 Access Port
- Programming port for the 18F8722 MCU
- 3 LEDS for user defined functions
- 2 Switches, 1 for system reset and 1 for user defined function
- LED's and switches can be wired for a front panel access function
- I2C Bus connector allows external devices to be accessed
- 2 complete I/O ports for user functions
- Total of 30 I/O pins available for custom applications
- 4 layer board for superior noise immunity
- An external Development Board is available which allows the SBC to be used for a variety of development projects without need to purchase additional SBCs
- Development System Package includes a complete TCP/IP stack application with ARP, ICMP, UDP, TCP, DHCP, Telnet, HTTP and NTP.
- Availability of a performance oriented TCP/IP Stack using the Salvo multitasking system and the Hitech PIC18 compiler.
- Source code for the GS3 TCP/IP Stack is included in the development system.
- Source code takes full advantage of the system peripherals
- Full online support for software and hardware.

1.2   Hardware Layout

The board size is 4" high by 4.75" wide. On the front there are three connectors. From left to right these are; Network (RJ-45), Serial (DB9) and the 18F8722 programming port.

To the right of the RJ45 network connector are three LEDs defined as: Link, Receive and Transmit.

The right side of the board has three ribbon cable connectors labeled JR1, JR2 and JR3. JR1 and JR2 are the I/O connectors and JR3 is the I2C bus connector.

The back of the board has (from left to right) battery connector, default switch, reset Switch and 4 LEDs. The right most LED is the power LED.
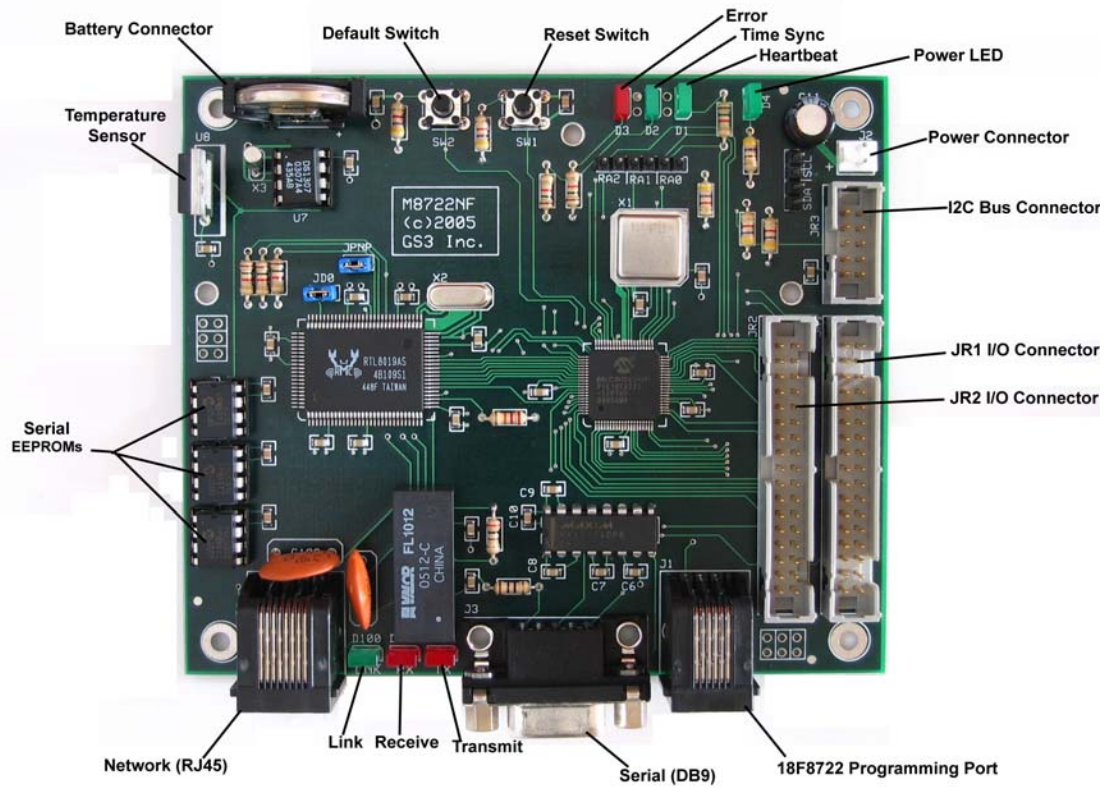The other three are (from left to right), Error, Time Sync, Heartbeat.

Note that these are typical LED names. Users can configure these LEDs for any purpose.

The left side of the board has 3, 8pin DIP sockets, where the Serial EEPROMs are connected to.

See Figure 2 below.

Fig. 2

2.0

INITIAL SYSTEM SETUP

2.1   Power Requirements

The M8722NF SBC, requires a +5V, 100ma DC Power Supply. Please note that this is the minimum power requirement. A real world application would probably need a power supply with a higher current rating in order to accommodate external peripherals. The M8722NF-D Development System provides an external power supply providing +5V at 300mA including the appropriate connector.

The power supply should be connected to the board on connector J2. J2 is a polarized connector. Pin1 is Ground and Pin 2 is +5V. Please Note the "+" symbol behind J2 for correct connection.

The development board, MBDEV-A, can use the same power supply as the M8722NF but has the option of using an external power supply. Please see the development board setup section, in the USER_GUIDE, for details.

2.2   Rubber feet and threaded offset selection

The M8722NF board can be configured in two different ways: Development or subsystem.

If the board is to be used as a part of a development system, it is highly recommended that the user place insulating feet on the four board corners. The installation of insulating feet on the board reduces stresses from connectors and IC mounting.

If the board is to be used as a subsystem, i.e. a bigger project, then a plastic or metal threaded offset should be used.

Note: All board holes are connected to the "**board ground"**. The selection of a plastic or metal offset will be determined by the application. Ideally, the board should not be grounded directly but only though the power supply ground lead. This will reduce the effects of ground loops. Normally, this is not an issue.

2.3 Serial Cable Connection

The M8722NF SBC has a serial port connector, which can be used for debugging and other user functions. To use the serial port, plug in a male DB9 serial cable to connector J3. The DB9 serial connector has a standard serial configuration and is compatible with most straight-through serial cables. Plug in the other side of this cable to your computer.

If a Development System is purchased, then the user will also get a copy of the GS3 Software. The serial port settings are: 38400, 8-N-1, Hardware Handshake RTS/CTS. A copy of the software will also be programmed into the board.

If the M8722NF SBC is purchased alone, then the user will get the Microchip stack code with modifications. This will set the baud rate at 9600, 8-N-1, no hardware handshake. A copy of this software will be loaded on the board.

2.4 Programming cable connection

The Microchip standard programming cable is a 6 conductor twisted pair cable with a RJ12 connector on one side. The RJ12 cable is usually connected to the Microchip ICD-2 development system or a Microchip Programmer.

This cable is provided with the purchase of a programming system from Microchip. This cable should be connected to connector J1 on the board.

2.5 Network cable connection

The M8722NF SBC is capable of connecting with your network at a 10Mb/s rate. Just connect a RJ45 straight-through cable from connector J4 to your network switch or hub.

When the board is powered up, the link LED will go on to indicate a good connection.

2.6 Power up

When power is applied the following message will be displayed on the serial port:

```
GS3 Embedded System Software
Version: x.x.x.x, Mon Jun 6 18:16:05 EDT 2005
(C)Copyright 2003-2005 GS3 Technologies, Inc.
```
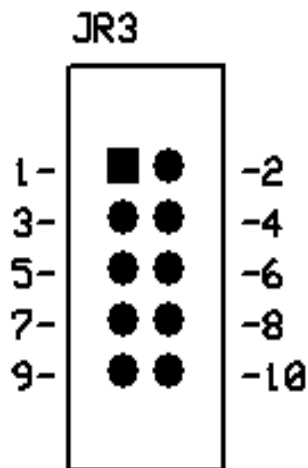
The system is now online.

3.0 SYSTEM INTERFACING

The M8722NF SBC provides I/O pins, which can be user-configured for custom applications. The I/O pins can be accessed via the JR1 and JR2 and JR3 connectors. The function of each connector is described below.

3.1 JR3 – I2C Bus, power, timing and interrupt connector.

The function of each pin is as follows:

1. I2C Bus SCL pin
2. Ground
3. I2C Bus SDA pin
4. Ground
5. INTX Pin. This pin is connected to the 18F1822 CPU, pin 57, (RB1). This pin could be used to generate an interrupt to the CPU.
6. Ground
7. SYS_SYNC pin. This pin is connected, via a 4.7K pullup resistor, to pin 34 (RA4) of the 18F1822 CPU. The GS3 Software generates a 1PPS signal via this pin.
8. Ground
9. +5 Volt power connection
10. +5 Volt power connection

3.2 JR1 – CPU I/O Access Ports.

The board design has alternate pins connected to ground to improve system noise immunity when interfacing with external systems.
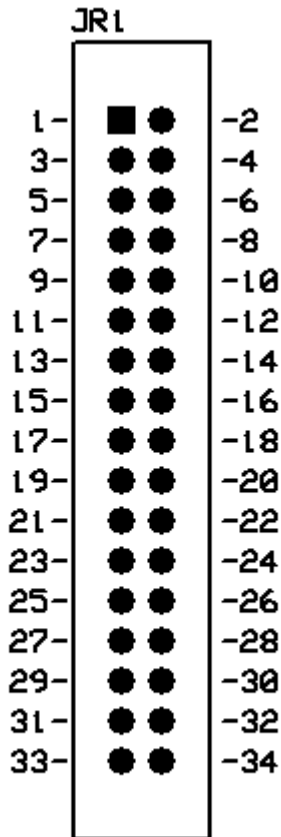
1.	CPU I/O Pin RJ0
2.	Ground
3.	CPU I/O Pin RJ1
4.	Ground
5.	CPU I/O Pin RJ2
6.	Ground
7.	CPU I/O Pin RJ3
8.	Ground
9.	CPU I/O Pin RB3
10.	Ground
11.	CPU I/O Pin RB5
12.	Ground
13.	CPU I/O Pin RJ7
14.	Ground
15.	CPU I/O Pin RJ6
16.	Ground
17.	CPU I/O Pin RH6
18.	Ground
19.	CPU I/O Pin RH7
20.	Ground
21.	CPU I/O Pin RF5
22.	Ground
23.	CPU I/O Pin RF6
24.	Ground
25.	CPU I/O Pin RF7
26.	Ground

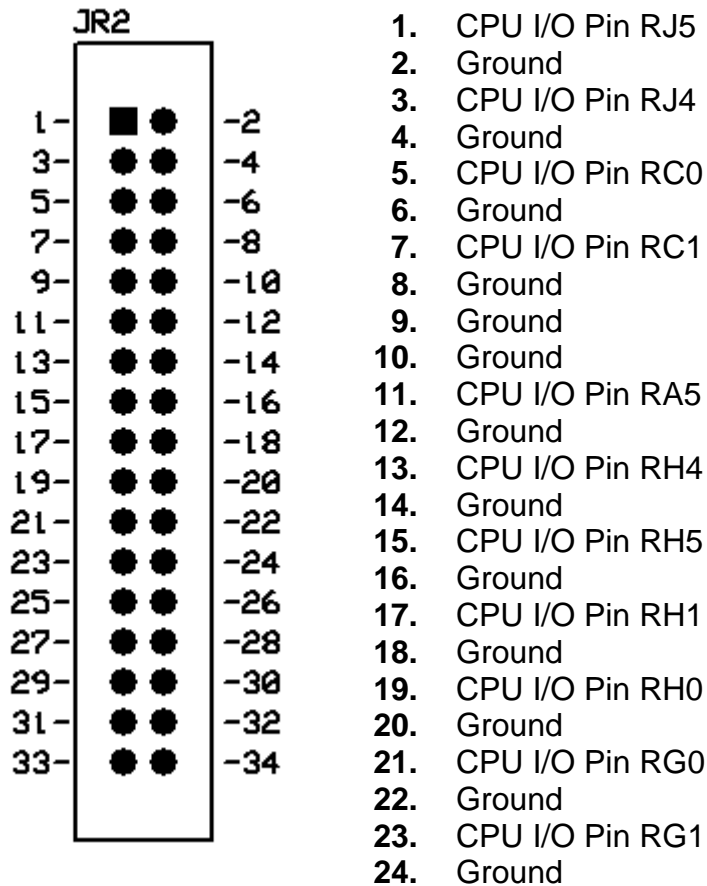|	
27.	CPU I/O Pin RE7
28.	Ground
29.	CPU I/O Pin RH3
30.	Ground
31.	CPU I/O Pin RH2
32.	Ground
33.	Ground
34.	Ground

3.3   JR2 – CPU I/O Access Ports.

The board design has alternate pins connected to ground to improve system noise immunity when connected with external systems.

JR2

```
 1-  ■ ●  -2
 3-  ● ●  -4
 5-  ● ●  -6
 7-  ● ●  -8
 9-  ● ●  -10
11-  ● ●  -12
13-  ● ●  -14
15-  ● ●  -16
17-  ● ●  -18
19-  ● ●  -20
21-  ● ●  -22
23-  ● ●  -24
25-  ● ●  -26
27-  ● ●  -28
29-  ● ●  -30
31-  ● ●  -32
33-  ● ●  -34
```

1.   CPU I/O Pin RJ5
2.   Ground
3.   CPU I/O Pin RJ4
4.   Ground
5.   CPU I/O Pin RC0
6.   Ground
7.   CPU I/O Pin RC1
8.   Ground
9.   Ground
10.   Ground
11.   CPU I/O Pin RA5
12.   Ground
13.   CPU I/O Pin RH4
14.   Ground
15.   CPU I/O Pin RH5
16.   Ground
17.   CPU I/O Pin RH1
18.   Ground
19.   CPU I/O Pin RH0
20.   Ground
21.   CPU I/O Pin RG0
22.   Ground
23.   CPU I/O Pin RG1
24.   Ground
25.   CPU I/O Pin RG2
26.   Ground
27.   CPU I/O Pin RG3
28.   Ground
29.   CPU I/O Pin RG4
30.   Ground
31.   Connected to RS232 DB9 pin 1 (DCD). Is sometimes used as a 1PPS signal.
32.   Ground
33.   Ground
34.   Ground

4.0 SOFTWARE SETUP AND INSTALLATION

With the purchase of an M8722NF SBC you will get a copy of the Microchip TCP/IP stack software (Version 2.20.04.01) that has been patched to work on the GS3 board. This software will also be loaded on the board.

Please note that the M8722NF SBC does not include an LCD display so the software (as delivered) will not drive such a peripheral.

4.1   GS3 TCP/IP stack description

If a Development System is purchased, then the user will also be provided with the GS3 TCP/IP stack.

The GS3 TCP/IP stack is based on the Microchip TCP/IP stack (Version 2.20.04.01) but has been re-written for high performance in mind.

To achieve the best performance, the system uses the Pumpkin Inc., Salvo Multitasking Operating System and the HI-TECH Software PICC-18 C Compiler.

Please note that in order to take advantage of the GS3 TCP/IP stack, the Salvo OS(full source) and the HI-TECH compiler must be owned by the user.

The software was developed on Linux using Linux based tools.
The user will be provided with the proper Makefile and scripts to build the software system.

A copy of the GS3 Stack will also be pre-loaded on the board.

4.2   GS3 TCP/IP Software Installation

These instructions assume that the user is working on a Linux based system. GS3 Technologies does not support Windows at this time.

Windows users must untar/unzip the software and perform the installation manually. Windows users must also own the proper development system in order to build the software.

If the Microchip Stack is to be installed, then just untar/unzip the "GS3_M8722_TCPIP_Basic_Vx.x.x.tgz" file. The source code will be in the "Microchip" directory. The user can now work with this code to build a system. The GS3 Modified Microchip stack can also be downloaded from the GS3 Web site: http://www.gs3tech.com

To install the GS3 Stack software, follow these instructions:

Note: The software will be included in a CDROM, on the Development System or emailed to registered users.

Copy the "GS3_M8722_TCPIP_Custom_Vx.x.x.tgz" file to a directory of your choice and issue the following commands.

```
$ tar –xzvf GS3_M8722_TCPIP_Custom_Vx.x.x.tgz
```

Directories: Microchip, bin and GS3Stack will be created. Files: "README", "INSTALL" and USER_GUIDE will also be created.

Please read the "README", "INSTALL" and "USER_GUIDE files, for updated install information. If you are ready to continue run:

```
$ cd bin
$ ./configure
```

The script will try to find out what system you are running and will ask you for input, when certain configuration parameters need to be set.

The configure script will also test the installation.

Please read the USER_GUIDE for complete details.

5.0 BOARD SCHEMATICS

Notes:
All +5V Connections are decoupled to ground via a .1uF cap.

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Notes:
All +5V Connections are decoupled to ground via a .1uF cap.

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MBDEV-A Development Board

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