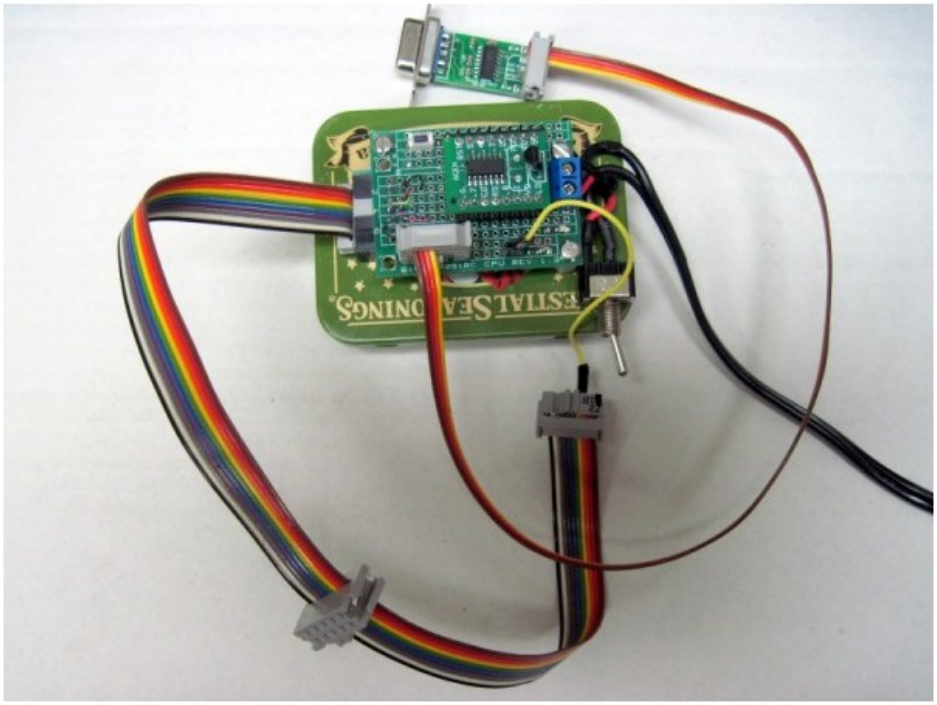
MIND

Mini AGEN Development System



The Mini AGEN Development System (MIND), "Mindy", is a project that allows software development with the AGEN module and the serial bootloader included in every MyForth program image. Because all of our software uses MyForth, the serial bootloader is always available as an alternative to using the Silicon Laboratories Debug Adaptor and IDE.

The operation of the serial bootloader is described in the MyForth manual available at Kibler Electronics.

The MIND system consists of a socketed AGEN module mounted on a small piece of perfboard. The perfboard includes features such as a power input and I/O connectors and indicator LEDs. The perfboard is mounted on a weighted mint tin for increased mechanical stability and off-board mounting of a power switch.

For off-line reference, you can download a PDF version of this manual.

by

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Features and Specifications

The Mini AGEN Development System (MIND), "Mindy", is a project that allows software development with the AGEN module and the serial bootloader provided as part of every MyForth image. The MyForth manual is available elsewhere at this site (Kibler Electronics). All of our products use MyForth.

The MIND system consists of a socketed AGEN module mounted on a small piece of perfboard with the following features:

- A two-terminal screw-down connector for 5 Volt power and a blue LED power indicator.
- A reset switch for use with the serial bootloader
- A 10-pin shrouded IDC connector for I/O connections
- A test LED connected to an IDC socket pin for patching to I/O pins
- A row of stake pins to provide convenient ground connections for instruments

Like some of our other systems, the board is mounted on a small mint tin that is weighted with junk nuts and bolts. An on/off switch is glued to the top of the tin near the power connector. The power input cable is tie-wrapped to one of the standoffs attaching the board to the top of the tin. Rubber grommets glued to the bottom of the tin minimize sliding on the desktop.

The cover photo for this application shows the development board mounted on the base with power, serial and I/O cabling. Also shown is a typical connection between an I/O pin on the I/O cable and the on-board test LED. This connection is made with a yellow solderless breadboard jumper.

Figure 1 shows a schematic of the board and AGEN module.

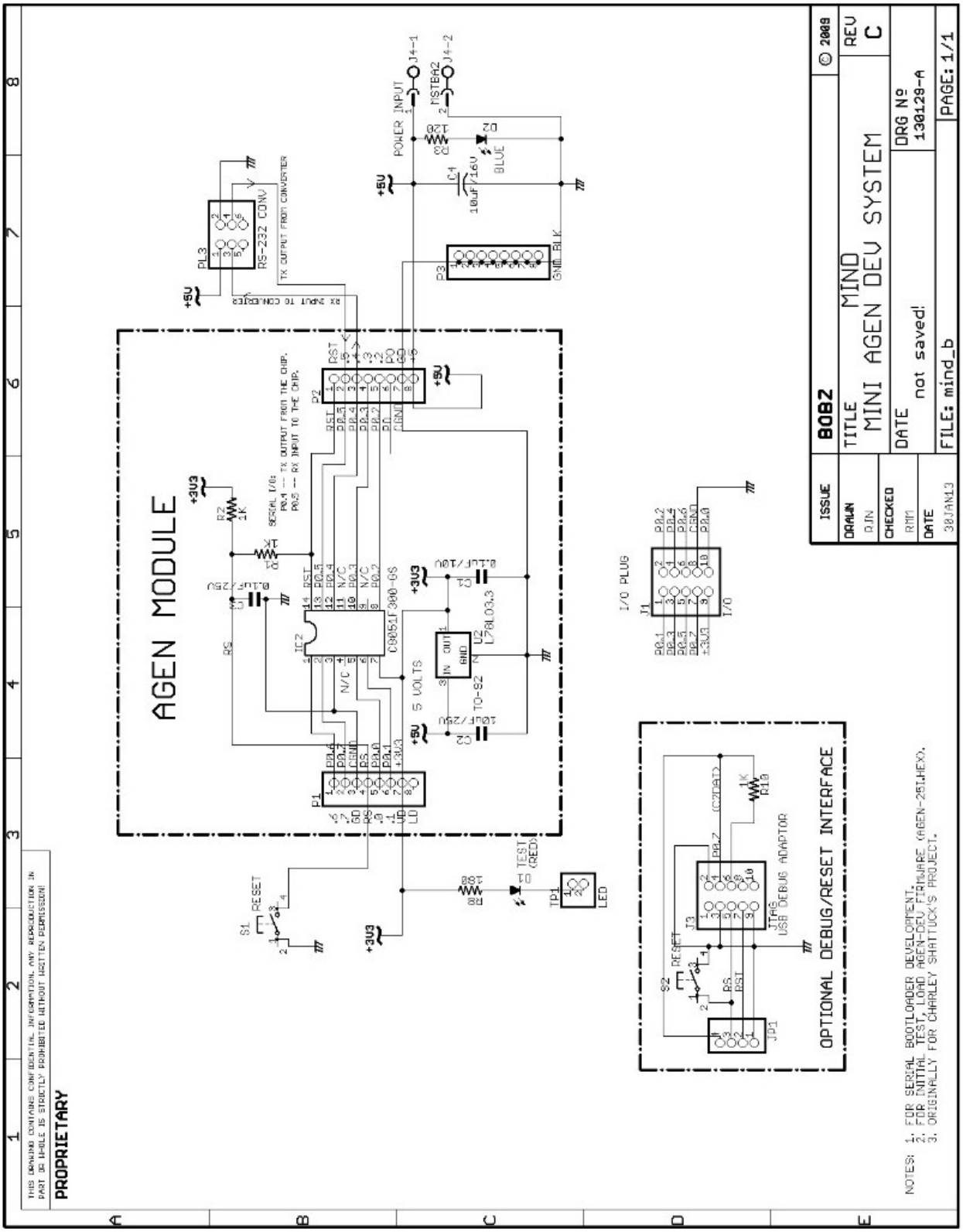

Figure 1 -- Schematic of AGEN Mini Development System

Features and Specifications (Cont.)

Figure 2 is a closeup view of the development board. The following paragraphs describe the features shown in this photo.

Power -- At the far right of the photo is the 5 Volt power input cable, the on/off switch (mounted on the tin) and the power input terminal. Immediately below the terminal is an 0805 SMT blue LED and its limiting resistor.

AGEN Module -- The AGEN module is plugged into a socket to to left of the power input. Not shown (under the AGEN module) is a 10 uF input bypass capacitor.

Reset Switch -- The reset switch is at the top left of the board. To the right of the switch is a row of grounded stake pins to make instrument connections easier.

I/O Connections -- On the far left of the board, mounted from the bottom side of the board, is the 10-pin right-angle shrouded IDC connector used to bring out I/O and power. This connector is shown with a socketed ribbon cable plugged in. Signal outputs follow the resistor color code. For example, port 0, pin 0 (P0.0) connects to the black (0) wire. Similarly, P0.2 connects to the red (2) wire and P0.6 connects to the blue (6) wire. The P0.4 (yellow) and P0.5 (green) connections are brought out on the connector but they also connect to the RS-232 socket on the bottom left of the board. The 3.3 Volt output of the AGEN board connects to pin 9 (white) and the common ground connects to pin 8 (gray). The I/O cable has two IDC sockets mounted on it, one on the end and one in the middle. The end socket is intended for connections to the application. The middle connector provides access to cable wires. For example, solderless breadboard jumpers can be inserted into the middle cable for oscilloscope or multimeter access.

Serial -- The serial connection is a 2X3 IDC connector that matches the pinout of a commonly-available RS-232 adapter. This is covered up by the ribbon cable socket and not visible in the photo. Only four signals are brought out to the adapter: 5 Volts, ground, Tx and Rx. One of the unused pins can be cut off so that the socket can be keyed. The cover photo shows the inexpensive serial convertor used for the serial connection. A closeup view of this converter is shown in the DCON documentation.

Indicator -- A red LED indicator, an 0805 SMT, and its limiting resistor is mounted at the bottom right of the board. The resistor is (barely) visible but the LED is hidden by the yellow wire. One side of the LED connects to 3.3 Volt power from AGEN; the other side connects to a 2-pin IDC socket through a limiting resistor. Both pins of the IDC socket are connected together. A two-pin connector was used primarily to provide mechanical stability. The photo shows a yellow solderless breadboard jumper plugged into the indicator socket. A typical connection to an I/O cable socket pin is shown in the cover photo.

Wiring -- Wiring to the board is performed with point-to-point connections with wire wrap wire. We are planning to make a PC Board available for AGEN project development. The wiring and mounting of the board, as shown (with base, etc.) is a weekend project. Assembly time is approximately 4 to 6 hours.

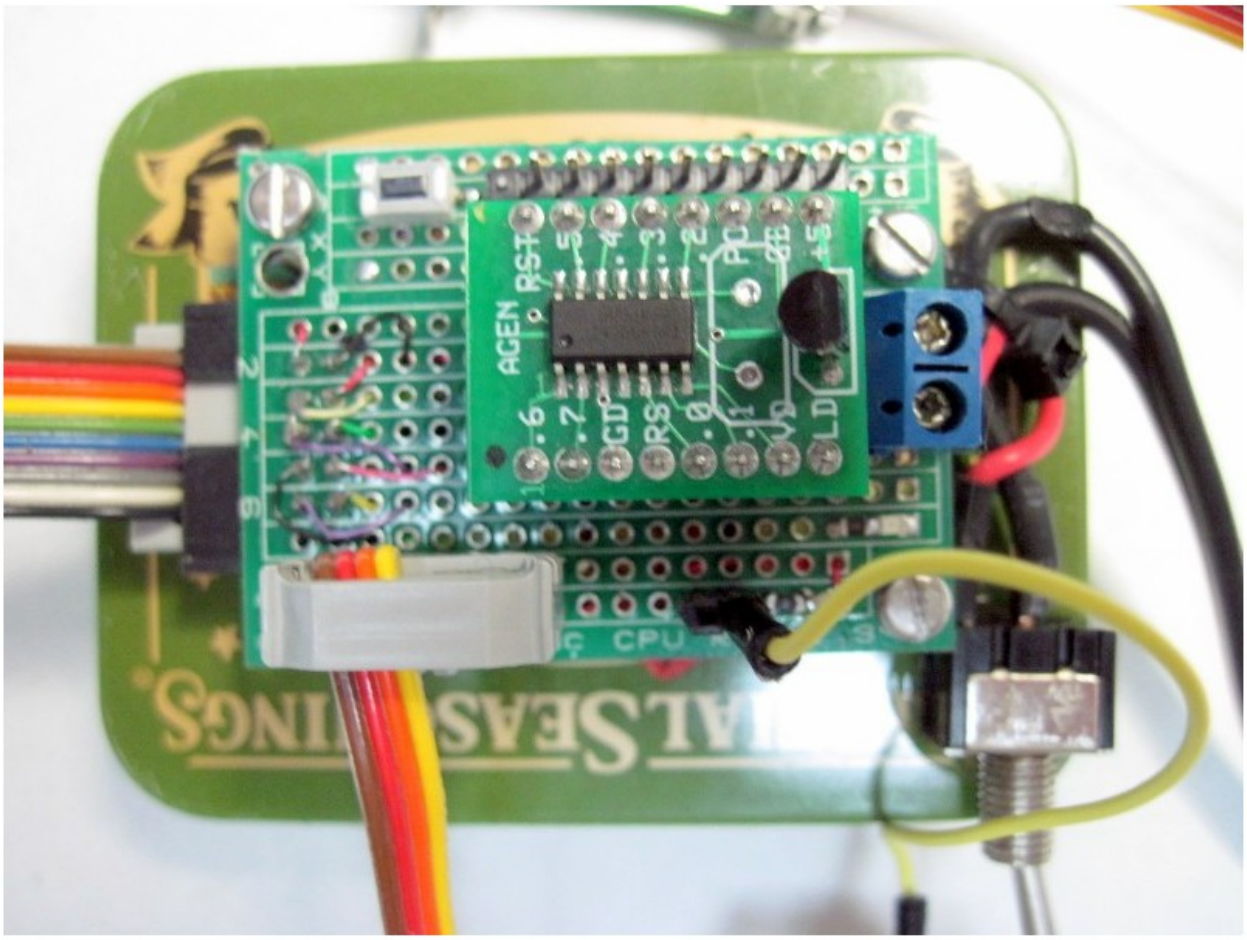

Figure 2 - Closeup of the MIND Development Board

Design

The project was originally designed for Charley Shattuck, the creator of MyForth, so that he could do development on his Linux system using the MyForth serial bootloader as an alternative to using the Silicon Laboratories Debug Adaptor and IDE.

Using the serial bootloader allows a much faster turnaround for downloading changes. Using the bootloader with an interactive "tether" makes it easy to test any definition on the chip. As convenient and efficient as this is, compared to the normal IDE development cycle, it does use two of the processor pins for the serial link. This is not a problem for many applications and the link can be dropped if the two serial I/O pins are needed for application I/O.

Note that there is (barely) enough room on the board for a 4-pin stake pin header to bring out the signals needed for the SL Debug Adaptor. Although not implemented on this project, the needed connections are shown as an option on the schematic. From the option circuitry, it is evident that the Debug Adapter cannot be connected via the I/O connector: it requires access to the RST line. One caution when implementing this optional connection: long wires on the RST line can cause the AGEN module to act erratically (e.g., from stray signal pickup). This is not as much a problem with the RS line which is terminated with a capacitor.

Operation

Assuming that the system has just been built and is furnished with a new AGEN module, it may be necessary to test the wiring and connections.

A program is available to test an AGEN chip (and platform). The hex programming file for this test program, chip.hex, can be used with the Silicon Laboratories IDE and Debug Adapter to program an AGEN module for use with MIND. Of course, if the module has been previously loaded with a program image, this file can be downloaded with the serial bootloader. You can download the MIND project files and use chip.hex as you choose. The project files contain all of the source and utilities needed for a MyForth project directory.

Test

The test program uses Charley Shattuck's standalone interpreter to provide an interactive test environment. The serial link operates at 9600 baud, 8N1 with local echo turned off. When a terminal is connected to MIND and power is applied, the module should display the help screen that shows the version, I/O configuration, commands and operational notes.

The test program allows the user to toggle, set or clear individual port pins or all port pins together. The help screen itself validates the correct operation of the serial link. Individual port pins (except P0.4 and P0.5 used for serial I/O) can be exercised by connecting a solderless breadboard jumper between one of the I/O cable socket pins and the test LED.

Power

The following is a condensed version of our standard section on drawing 3.3 Volt power from the AGEN module.

The module is not protected against input voltage reversal. Take care to verify that the correct voltage polarity is applied to the power input pins.

The AGEN board has a 3.3 Volt regulator to provide regulated power to the chip. The output of the regulator is also connected to an output pin to supply small amounts of 3.3 Volt power to other circuits (e.g., LED indicators). The power output appears on header P1, pin 7 (P1/7). Ground returns are available at pins P1/3 and P2/7.

If you are wiring a socket for AGEN, first test the connections with a continuity checker. Verify the correct output voltage soon after applying power to the module. The output voltage should be within a tenth of a Volt of 3.3 Volts.

The regulator is rated for a maximum input voltage of 16 Volts, a maximum current of 100 milliamperes and a dissipation of 250 milliwatts.

If applying more than 5 Volts to the regulator input, observe the device limitations, as illustrated by the calculations below.

Operating at 5 Volts, there is approximately 1.7 Volts across the regulator. Holding the regulator's dissipation to approximately half of the maximum is prudent. Thus, the maximum current drawn from the regulator should be approximately: (125 milliwatts)/(1.7 Volts) = 73.5 milliamperes.

When operating at 3.3 Volts without an external crystal, the module's quiescent current draw is approximately 10 milliamperes. Operating with a crystal module draw can be somewhat higher. **Thus, the draw from loads external to the module should be limited to approximately 50 milliamperes.**

Revision Summary

Revision	Date	Description
1	31Jan13	Initial release for Charley Shattuck