Xytronic LF-1600 Open Source Firmware

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Selecting the correct firmware hex image:

The `hex` subdirectory of this package contains various pre-built configurations of the firmware.

- There are hex images available for legacy (through-hole) boards and newer SMD boards.
- Images for controller types AtMega-88 (the original controller on legacy through-hole board) or AtMega-88p (the original controller on SMD board) or AtMega-328p (upgrade controller) are available.
- Images with or without debug support (debug vs. release) are available.

If you don't know which one pick, take either `hex/board_legacy/atmega88/release` or `hex/board_smd/atmega88p/release` depending on your board type.

Installing the firmware:

1. Erase the chip:

   If you use avrdude, a command similar to the following can be used:

   ```
   avrdude -B 200 -p m88 -c avrisp2 -P usb -e
   ```

   or

   ```
   avrdude -B 200 -p m88p -c avrisp2 -P usb -e
   ```

   or

   ```
   avrdude -B 200 -p m328p -c avrisp2 -P usb -e
   ```

2. Set the fuse bits of the AtMega88 to:

   ```
   LFUSE = 0xE2
   ```

   ```
   HFUSE = 0xCD
   ```

   ```
   EFUSE = 0xF9
   ```

   Set the fuse bits of the AtMega88p to:

   ```
   LFUSE = 0xE2
   ```

   ```
   HFUSE = 0xCD
   ```

   ```
   EFUSE = 0xF9
   ```

   Set the fuse bits of the AtMega328p to:

   ```
   LFUSE = 0xE2
   ```

   ```
   HFUSE = 0xC9
   ```

   ```
   EFUSE = 0xFD
   ```

   Note that the original firmware uses different fuses. So this step must not be omitted.

   If you use avrdude, a command similar to the following can be used:

   ```
   avrdude -B 200 -p m88 -c avrisp2 -P usb -U lfuse:w:0xE2:m -U hfuse:w:0xCD:m -U efuse:w:0xF9:m
   ```

   or

   ```
   avrdude -B 200 -p m88p -c avrisp2 -P usb -U lfuse:w:0xE2:m -U hfuse:w:0xCD:m -U efuse:w:0xF9:m
   ```

   or

   ```
   avrdude -B 200 -p m328p -c avrisp2 -P usb -U lfuse:w:0xE2:m -U hfuse:w:0xC9:m -U efuse:w:0xFD:m
   ```

3. Flash the firmware image file xytronic-lf.hex to the program memory of the AtMega88.

   If you use avrdude, a command similar to the following can be used:

   ```
   avrdude -B 1 -p m88 -c avrisp2 -P usb -U flash:w:xytronic-lf.hex
   ```

   or

   ```
   avrdude -B 1 -p m88p -c avrisp2 -P usb -U flash:w:xytronic-lf.hex
   ```

   or

   ```
   avrdude -B 1 -p m328p -c avrisp2 -P usb -U flash:w:xytronic-lf.hex
   ```

4. Write the EEPROM image file xytronic-lf.eep.hex to the EEPROM memory of the AtMega88.

   If you use avrdude, a command similar to the following can be used:

   ```
   avrdude -B 1 -p m88 -c avrisp2 -P usb -U eeprom:w:xytronic-lf.eep.hex
   ```

   or

   ```
   avrdude -B 1 -p m88p -c avrisp2 -P usb -U eeprom:w:xytronic-lf.eep.hex
   ```

   or

   ```
   avrdude -B 1 -p m328p -c avrisp2 -P usb -U eeprom:w:xytronic-lf.eep.hex
   ```