

## Using the ATMEL T89C51RX2 with MINI-MAX/51-C

### Overview

MINI-MAX/51-C includes an ATMEL AT89S53 microcontroller as part of its default configuration. AT89S53 has 12K of Flash program memory and 256 bytes of data RAM. These memory sizes are adequate for a lot of small and medium size applications.

For applications that require more memory, MINI-MAX/51-C supports the T89C51RX2 series micro-controllers from ATMEL Corporation. The table below shows the memory configurations of various ATMEL microcontrollers and ATMEL AT89S53 for comparison.

Microcontroller	Flash Program Memory	Data RAM	EEPROM
AT89S53	12 Kbytes	256 bytes	-
T89C51RB2	16 Kbytes	1280 bytes	-
T89C51RC2	32 Kbytes	1280 bytes	-
T89C51RD2 / ED2	64 Kbytes	1280 bytes	2 KBytes

More memory is one big advantage of T89C51RX2 series.

Other features of T89C51RX2:

**In-Application Programming:** User programs can modify the flash memory while running.

**Faster performance:** T89C51RX2 microcontrollers execute 1 machine cycle in 6 clock cycles ( versus 12 clock cycles for ATMEL AT89S53 and many other 8051 compatible microcontrollers )

**Programmable Counter Array:** Timer values can be captured on external events.

**Reduced EMI Mode:** Electromagnetic interference can be reduced by disabling the Address Latch Enable ( ALE ) output signal of the microcontroller under software control.

**Warning:** The T89C51Rx2 core needs only 6 clock periods per machine cycle.

The X2 bit in the CKCON register allows to switch from 12 clock periods per instruction to 6 clock periods and vice versa. At reset, the standard speed is activated (STD mode).

Setting this bit activates the X2 feature (X2 mode).

T89C51RX2 microcontrollers need to be preconfigured to use 12 clock cycles instead of 6 clock cycles before they can be used on a standard MINI-MAX/51-C that has 22.1184MHz clock frequency. In 6 clock cycle mode, T89C51RX2 can operate only upto 20MHz. However, ATMEL announced the newest AT89C51Rx2 microcontrollers. The newest AT89C51Rx2 core can operate at 24 MHz in X2 Mode.

There are 2 ways to download a program into the T89C51RX2 installed on the MINI-MAX/51-C board:

- 1- Using the MINI-MAX/51-C Loader in Micro-IDE which is part of BiPOM's 8051 Development System, MINI-MAX Set's and BASCOM51 Basic Compiler packages. The MINI-MAX/51-C Loader can be selected using the Download With option under Project->Settings->General in Micro-IDE.
- 2- Using WinLoad, the universal downloader package from BiPOM Electronics. WinLoad can be downloaded from [www.bipom.com](http://www.bipom.com). Using WinLoad, a standard Intel hex file can be downloaded into the T89C51RX2.

## Installation

Installation of the T89C51RB2, T89C51RC2 or T89C51RD2 into the MINI-MAX/51-C is easy. Simply remove the AT89S53 micro-controller from its 44-PLCC socket using a PLCC Extractor tool ( available from BiPOM Electronics ). Make a note of the orientation of the original microcontroller before removing. Insert the T89C51RX2 microcontroller by properly aligning it against the 44-PLCC socket and pushing by finger.

**Warning:** Always use a PLCC Extractor tool when removing the original microcontroller from its socket. Do not use a screwdriver or other tool as this may crack the 44-PLCC socket and render the MINI-MAX/51-C board unusable.

