

PG2051

89C2051/89C1051 Programmer - Fast serial download

AirBorn
ELECTRONICS

DISTINCTIVE CHARACTERISTICS

- Erases, Programs & Verifies 89C2051 & 89C1051
- 89C2051 Devices use FLASH program memory
 - Can be reprogrammed 1000 times per chip
 - 10ms electronic erasure, vs. 30 minute UV
- Programmer interface is PC serial compatible
 - 9600 Baud, 8 data, 2 stop bits, no parity
 - Accepts standard Intel Hex files
 - Programs on the fly - during serial download
- Stand-alone test switch
 - Allows chip operating test without PC download
 - Tests for blank chip without PC download
 - Reads & Verifies chip data against last checksum
- Green/Red Indicator LEDs
- Programs Security bits, if required
 - Dipswitch selectable
- One Step program operation, as set by dipswitch
 - Download starts Test/Erase/Program/Verify
- No special PC software required
- Fast operation - programs a chip in 6 seconds (typ)
- Powered by DC plug pack (supplied)

GENERAL DESCRIPTION

The PG2051 is a development programmer for the ATMEL AT89C2051 (Referred to as the 89C2051) and the AT89C1051. The PG2051 allows testing, erasure, programming, verification and security protection of 89C2051 devices. The programmer is fast, small and simple to use.

The Programmer may be connected to a PC or other host by a serial cable. The data to be downloaded to the programmer is transmitted in Intel Hex format. The programmer will erase & program, verify, write protect and security protect as it receives the file, according to the settings on its Dip switches.

The PG2051 can be used stand-alone by inserting an 89C2051 and pushing the Manual test switch, in this mode it indicates Tested, Blank and Verified checksum conditions.

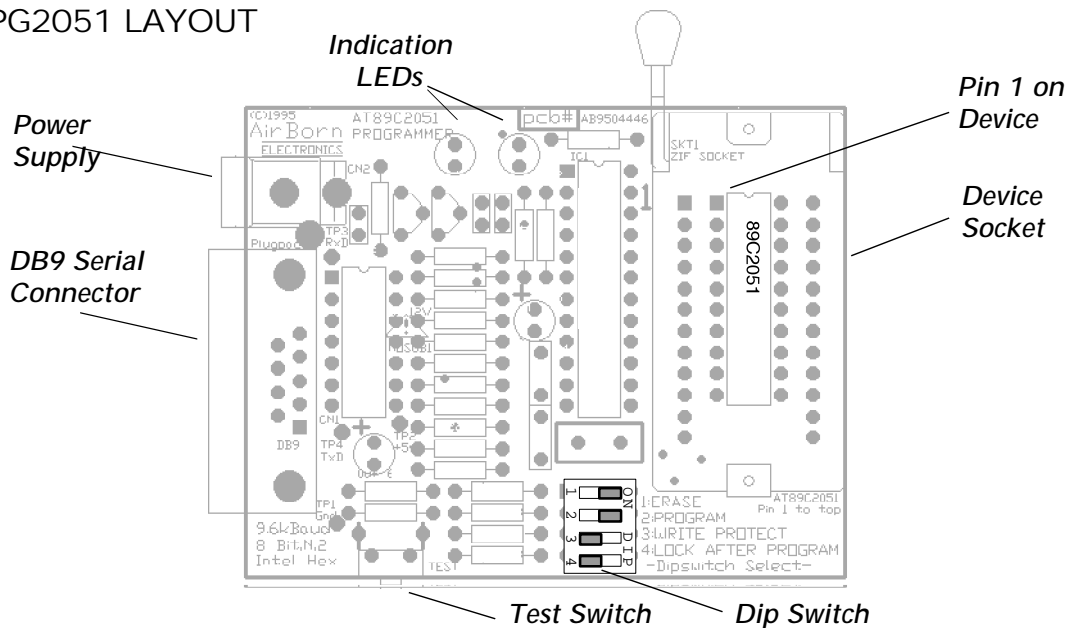
In normal use device programming consists of:

- Insert an 89C2051 (Manual Test if desired)
- Download intel hex file (Causes programming)
- Watch LEDs (Indicates success or failure)

The speed of programming is limited by the speed of download, and for a full 2 kilobyte file - the maximum capacity of the 89C2051 - this will typically be 6 seconds. Shorter programs will complete more quickly. The PC serial should be run at 9600 Baud, no parity, 8 data bits, 2 stop bits - do not using other settings when downloading data.

The 89C2051 should be inserted into the programmer with pin 1 at the top left position of the socket.

PG2051 LAYOUT



HARDWARE

DC POWER SOURCE

The PG2051 programmer unit is supplied with a DC plug pack power supply (Also called an AC adaptor). Use only this DC plug pack with the unit to avoid damage to the programmer. The current consumption of the programmer unit is less than 50ma, and the voltage of the DC power supply under this small load is a nominal 16VDC, negative to the centre pin of the 2.5mm DC power socket.

SERIAL CONNECTOR

The connector required for interface to the PG2051 programmer is a DB9 male. The cable required from a PC to the PG2051 is DB9 female to DB9 male straight through - meaning pin 1 of the first connector goes to pin 1 of the second connector, pin 2 to pin 2 and so forth. If the PC serial port has a DB25 connector, a DB25 to DB9 adaptor will also be required. Cable length should not exceed 6m.

The DB9F-DB9M cable and the DB25-DB9 adaptor are standard accessories available from PC hardware suppliers.

The PG2051 unit requires no handshaking signals, however many PC programs need correct assertion of handshake signals before they will transmit. The PG2051 loops back the PC handshake outputs so that the inputs are correctly asserted.

The Pinout of the PG2051 Connector is:

Pin 1,4,6	Looped together	DCD,DTR,DSR
Pin 2	TxD (Unused)	RxD on PC
Pin 3	RxD on PG2051	TxD on PC
Pin 5	Ground	Gnd on PC
Pin 7,8	Looped together	RTS,CTS on PC
Pin 9	No connection	RI on PC

For hosts other than a PC the only two connections that must be made are RxD (Pin 3) and Ground (Pin 5). TxD (Pin 2) should be connected if possible for future upgradeability. Signal level should be compliant with the EIA232 standard.

SERIAL PROTOCOL

Downloaded files should be Intel[®] Hex format, Serial at 9600 Baud, 8 data bits, 2 stop bits, no parity. Ensure that the full 8 bits and 2 stop bits is present in your configuration of the PC serial port.

CARE & ENVIRONMENT

In common with most development programmers, the PG2051 is supplied as a bare board with rubber feet. Protect the unit from short circuit, liquid spills, impact, humidity, and foreign matter.

HOST SOFTWARE

DEVELOPMENT SOFTWARE

The 89C2051 uses the 8051 instruction set and I/O - the serial port, all timers, interrupts, registers and instructions (including Long Jumps and Calls) are implemented. The basic S/W difference is that the device has only 2k of program memory, whereas a standard 8051 has 4k. 89C2051 software development can use standard 8051 assemblers, C compilers (in Tiny mode), and library code.

DOWNLOAD

On a PC, the data may be downloaded by any program that can transmit data out through the COM port. From the DOS prompt this can be performed using the copy command after the serial port is appropriately configured using the mode command. The two commands are:

```
Mode COM1:9600,N,8,2
Copy Myfile.hex COM1
```

Where the source file name should replace "Myfile.hex", and COM2 might need to be specified instead of COM1.

During the development process, a batch file is usually executed to compile and/or assemble then link the code. These two command lines can be appended to the end of the batch file to automatically program a new device after each assembly.

A final batch file might look like:

```
Tasm -51 example.asm example.hex
@echo Insert an 89C2051 into programmer
@pause
mode COM1:9600,N,8,2
copy example.hex COM1
```

Download can also be achieved using a terminal emulator in ASCII Transfer mode. A number of products will do this satisfactorily, including Telix and Windows Terminal. Using one of these products to download can be a very useful way to start using the PG2051, when perhaps the serial connection is not 100% proven, or one of a number of different files may need to be downloaded.

DOWNLOAD DATA

More than one Intel Hex file may be transmitted to the PG2051, as long as they follow in rapid succession - no more than a second between files. For this reason, multiple files should be read from your hard disk, not a floppy drive. The "Intel Hex terminator" is not required, and is ignored if sent.

Download data should not have two values for the same location in memory. This causes the location to be overwritten - something that is usually not possible with PROM. A Hex file that writes to the same byte location twice can cause each programming attempt to fail - which is very confusing to the operator, as it is normally a chip failure that causes this. This caution is needed when using the PG2051 and all other programming equipment using Hex files.

BINARY DATA

Most 8051 development software is capable of producing Intel Hex files. To program a binary file using the PG2051 it is necessary to translate it into Intel Hex format first, using a utility such as the program BINTOHEX.

PG2051 OPERATION

POWER ON

At power on the PG2051 programmer unit indicates operation by flashing the Red and Green indication LEDs rapidly. The PG2051 changes to an idle-condition display after a short period where the both indication LEDs are illuminated at half brightness. From the idle condition the PG2051 is ready for Manual test or download.

MANUAL TEST SWITCH

The PG2051 can be used stand-alone by inserting an 89C2051 and operating the Manual test switch, in this mode the PG2051 Tests, Blank checks, and Verifies the checksum.

The Test results are listed under LED STATUS INDICATIONS. The manual test switch verifies the checksum of the device against the checksum of the last PC download.

Secured devices - devices programmed and then locked by setting the security bit - will read as blank when manually tested.

DOWNLOAD AND PROGRAMMING

Downloading an Intel Hex file to the PG2051 triggers 89C2051 TESTING and then programming, as selected by the DIPSWITCH SETTINGS, then 89C2051 VERIFICATION. By selecting the correct Dipswitch options, the programming operation becomes automatic, and it is only necessary to insert the device, download, and watch the LEDs for the result.

89C2051 TESTING

The 89C2051 is tested when the manual test switch is operated or when an Intel Hex download begins. The test consists of powering up the chip and reading the device signature. If a valid signature cannot be read from the device then the BAD CHIP indication is shown (see LED STATUS INDICATIONS). If a valid signature is read, the test is passed.

89C2051 VERIFICATION

During Manual test and after programming, the 89C2051 data is verified by reading all bytes and comparing the checksum with that of the last download. The result is displayed on the LED STATUS INDICATORS.

DIPSWITCH SETTINGS

There are four Dipswitches, each controlling a programming function. There is a special case when all four dipswitches are off. When all four dipswitches are off, no erase program or security setting operation occurs during the download, so the 89C2051 chip data is verified byte-for-byte by comparison with the download data instead. LEDs show the verify result.

Special download software outside the scope of this document may temporarily override the dipswitch settings.

1. ERASE DIPSWITCH

When this dipswitch is ON, the 89C2051 will be erased when the start of an Intel Hex file is received by the PG2051. This readies the 89C2051 for programming. If the ERASE dipswitch is on and all others are off, the device is erased but not programmed by the download. When erased, the entire 89C2051 FLASH program memory is set to hex value 0FFh.

2. PROGRAM DIPSWITCH

When this dipswitch is ON the 89C2051 will be programmed with the data in the Intel Hex file received by the PG2051. If the ERASE dipswitch is off and the PROGRAM dipswitch is on, the device programming is attempted without first erasing the device.

3. WRITE PROTECT DIPSWITCH

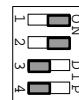
When this dipswitch is ON further programming of the 89C2051 FLASH memory is disabled, when the current download to the PG2051 has completed. This setting may be overridden by erasing the 89C2051 device and then reprogramming in entirety.

4. LOCK AFTER PROGRAM DIPSWITCH

When both the WRITE PROTECT and the LOCK dipswitches are ON, further programming of the 89C2051 FLASH memory, and further verification of the 89C2051 FLASH memory, is disabled when the current download to the PG2051 has completed.

If LOCK is desired, WRITE PROTECT should be set ON as well. Attempts to read from a secured device will return "Blank" data, but the device will still execute. The security setting may be overridden by erasing the 89C2051 device and then reprogramming in entirety.

STANDARD SETTINGS: NORMAL OPERATION



Normal operation
Erase, Program on
(May be verified)

The illustrated dipswitch settings are suitable for normal operation - Download will cause Erase then Programming of the 89C2051 device. The device may be subsequently verified.

STANDARD SETTINGS: SECURITY OPERATION



Security operation
Erase, Prog, Lock on
(Reads as 'Blank')

The illustrated dipswitch settings are suitable for security operation - Download will cause Erase, programming, then security bit locking. The device will be subsequently unreadable.

When SECURITY OPERATION (as distinct from NORMAL OPERATION) is selected for the PG2051, the 89C2051 VERIFICATION operation occurs prior to setting the lock bits, so the LED STATUS INDICATIONS are correct for the programming operation. Further manual test will return the "Blank device" indication.


LED STATUS INDICATION

At power-on the PG2051 programmer unit indicates operation by flashing the Red and Green indication LEDs rapidly.

During the few seconds of download the Red and Green indication LEDs will be active in response to the serial data and programming operation.

When the manual test switch is operated, or a programming operation has completed, the PG2051 indicates the condition of the 89C2051 device on the status LEDs.


LED STATUS INDICATION CONDITIONS

 Red/Grn on - Idle


A short period after power on, or any operation, the PG2051 changes back to an idle-condition display where both indication LEDs are illuminated at half brightness.

 Red/Grn flash - Blank


The 89C2051 tests correctly and is blank. A Blank 89C2051 has all bytes set to OFFh. Secured devices will test as blank.

 Grn solid - Program Verified

89C2051 VERIFICATION - the checksum matches. After download this indication means the 89C2051 data matches the data downloaded.

 Red flash - Bad chip

89C2051 TESTING Failed - the device signature inside the 89C2051 chip could not be read - implying that the 89C2051 is not operating, or the PG2051 socket is empty.

 Red solid - failed Prog,
or data didn't checksum

The 89C2051 TESTING was okay, but the data in the device does not match the last download. The 89C2051 is not programmed correctly.

During manual test, this indication means that the checksum of the 89C2051 does not match the checksum of the last download. When a special verify operation is performed (All Dipswitches off during download), this indication means that the 89C2051 data did not completely match the download data on a byte for byte compare.

The "failed Prog" indication can be caused by a chip that will not program correctly, data errors during the download, and attempting to program over already programmed bytes without erasing - this can occur when attempting to write two different values to the same program location, or when attempting to program without erasing.

GETTING STARTED

INSTALLATION AND TEST OF THE PG2051

- Connect the plug pack (refer to DC POWER SOURCE)
- Insert a new 89C2051 device (note correct orientation of the chip - refer to PG2051 LAYOUT)
- Press the manual test switch (refer to MAN. TEST SWITCH)
- Observe LEDs (refer to LED STATUS INDICATION)
- LEDs should indicate a Blank device

Connect serial cable to PC, refer to SERIAL CONNECTOR.

Download is normally accomplished as part of a "make" batch file when assembling (refer to DOWNLOAD). However for test it is often more convenient to use a terminal emulator - such as Telix or Windows Terminal.

Using a terminal emulator set to 9600,N,8,2 as specified under SERIAL PROTOCOL, transmit a single colon character - ":". If the connections to the PG2051 are correct, and the character is transmitted by the PC COM port correctly, the PG2051 will respond to the single colon character by testing the 89C2051 in its socket.

If a terminal emulator is not available, a colon may be easily transmitted from the DOS prompt with the command lines:

```
Mode com1:9600,N,8,2  
Echo :>com1
```

COM2 may be used if required. This command works without interrupts, and also from a Windows "MSDOS box".

If the PG2051 does not respond, some detective work will be required. Check the terminal emulator settings, the cable to the PG2051, the COM port itself, and interrupt settings of both the COM port and other devices in the system (e.g. network cards). Proprietary programs such as "CheckIt" and devices such as RS232-LED testers may be helpful in isolating the problem. An LED tester will show no signal from the PG2051 - this is normal - COMs to the PG2051 is one way.

When the PG2051 responds to ":" the system is tested and ready for use - set the Dipswitch to normal STANDARD SETTINGS, download an Intel Hex file, and program!

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