G Codes and M Codes for 3D printing

These are codes for the Marlin RepRap firmware. These codes are fairly standard accross 3D printers, and are mostly consistent with NIST G Code standards. This information was collated directly from the Marlin firmware and from reprap.org/wiki/G-code.

Common codes - without details	
Code	**Description**
G0	Rapid Movement
G1	Coordinated Movement X Y Z E
G2	CW ARC
G3	CCW ARC
G4	Dwell S<seconds> or P<milliseconds>
G28	Home all Axis
G90	Use Absolute Coordinates
G91	Use Relative Coordinates
G92	Set current position to coordinates given
M0	Unconditional stop
M18	Disable all stepper motors; same as M84
M84	Disable steppers until next move or set an inactivity timeout
M104	Set extruder target temp
M105	Read current temp
M106	Fan on
M109	Set extruder target temp and wait for it to be reached
M112	Emergency stop
M114	Output current position to serial port
M140	Set bed target temp
M190	Set bed target temp and wait for it to be reached
M220	set speed factor override percentage
M221	set extrude factor override percentage

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Common codes - with details			
Code	**Description**	**Parameters**	**Examples with Explanations**
G0	Rapid Movement	G0 X## Y## Z## E## F## S## Most RepRap Firmwares treat G0 and G1 as the same command	G0 X12 (move to 12mm on the X axis) G0 F1500 (Set the feedrate to 1500mm/minute)
G1	Coordinated Movement X Y Z E	G1 X## Y## Z## E## F## S## Not all variables need to be used, but at least one has to be used X## The position to move to on the X axis Y## The position to move to on the Y axis Z## The position to move to on the Z axis E## The amount to extrude between the starting point and ending point F## The feedrate per minute of the move between the starting point and ending point (if supplied) S## Flag to check if an endstop was hit (S1 to check, S0 to ignore, S2 see note, default is S0)1	G1 X90.6 Y13.8 E22.4 (Move to 90.6mm on the X axis and 13.8mm on the Y axis while extruding 22.4mm of material) 1. G1 F1500 (set the feedrate to 1500mm/minute) 2. G1 X50 Y25.3 E22.4 (move to 50mm on the X axis and 25.3mm on the Y axis while extruding 22.4mm of filament between the two points.) 1. G1 F1500 (set a feedrate of 1500 mm/minute) 2. G1 X50 Y25.3 E22.4 F3000 (move accelerating to a feedrate of 3000 mm/minute as it does so)
G2	CW ARC	I## The point in X space from the current X position to maintain a constant distance from J## The point in Y space from the current Y position to maintain a constant distance from	G2 X90.6 Y13.8 I5 J10 E22.4 (Move in a Clockwise arc from the current point to point (X=90.6,Y=13.8), with a center point at (X=current_X+5, Y=current_Y+10), extruding 22.4mm of material between starting and stopping)
G3	CCW ARC	X## The position to move to on the X axis Y## The position to move to on the Y axis I## The point in X space from the current X position to maintain a constant distance from J## The point in Y space from the current Y position to maintain a constant distance from E## The amount to extrude between the starting point and ending point	G3 X90.6 Y13.8 I5 J10 E22.4 (Move in a Counter-Clockwise arc from the current point to point (X=90.6,Y=13.8), with a center point at (X=current_X+5, Y=current_Y+10), extruding 22.4mm of material between starting and stopping)
G4	Dwell S<seconds> or P<milliseconds>	G4 S## Wait for ## seconds G4 P## Wait for ## milliseconds	G4 S2 (wait for 2 seconds) G4 P2000 (wait for 2000 milliseconds) same thing
G28	Home all Axis	G28 X Y Z X Flag to go back to the X axis origin Y Flag to go back to the Y axis origin Z Flag to go back to the Z axis origin	G28 (Go to origin on all axes) G28 X Z (Go to origin only on the X and Z axis)
G90	Use Absolute Coordinates		G90 All coordinates from now on are absolute relative to the origin of the machine. (This is the RepRap default.)
G91	Use Relative Coordinates		G91 All coordinates from now on are relative to the last position.
G92	Set current position to coordinates given	G92 X## Y## Z## E##	G92 X10 E90 Allows programming of absolute zero point, by reseting the current position to the values specified. This would set the machine's X coordinate to 10, and the extrude coordinate to 90. No physical motion will occur. G92 without coordinates, all axes are set to zero.
M0	Unconditional stop		M0 The RepRap machine finishes any moves left in its buffer, then shuts down. All motors and heaters are turned off. It can be started again by pressing the reset button on the master microcontroller. M1 is the same in Marlin. See also M112.

M18	Disable all stepper motors; same as M84		M18 Disables stepper motors and allows axis to move 'freely.'
M84	Disable steppers until next move or set an inactivity timeout	M84 S## S## The number of seconds of inactivity before disabling motors	M84 Stop the idle hold on all axis and extruder. In some cases the idle hold causes annoying noises, which can be stopped by disabling the hold. Be aware that by disabling idle hold during printing, you will get quality issues. This is recommended only in between or after printjobs. On Marlin, M84 can also be used to configure or disable the idle timeout. For example, "M84 S10" will idle the stepper motors after 10 seconds of inactivity. "M84 S0" will disable idle timeout; steppers will remain powered up regardless of activity.
M104	Set extruder target temp	M104 S## S## The taget temperature in Celcius	M104 S190 Set the temperature of the current extruder to 190oC and return control to the host immediately (i.e. before that temperature has been reached by the extruder)
M105	Read current temp		M105 Request the temperature of the current extruder and the build base in degrees Celsius. The temperatures are returned to the host computer.
M106	Fan on	M106 S## S## The speed of the fan 0-255	M106 S127 Turn on the cooling fan at half speed. Mandatory parameter 'S' declares the PWM value (0-255). M106 S0 turns the fan off.
M109	Set extruder target temp and wait for it to be reached	M109 S## M109 R## S## Wait for extruder current temp to reach target temp. Waits only when heating. R## Wait for extruder current temp to reach target temp. Waits when heating and cooling	M109 S185 R240 Sets extruder temperature to 185 and waits for the temperature to be between 185 - 240.
M112	Emergency stop		M112 Any moves in progress are immediately terminated, then RepRap shuts down. All motors and heaters are turned off. It can be started again by pressing the reset button on the master microcontroller. See also M0 and M1.
M114	Output current position to serial port		M114 This causes the RepRap machine to report its current X, Y, Z and E coordinates to the host.
M140	Set bed target temp	M140 S## R## S## The taget temp of the bed in Celcius S## The holding temp of the bed in Celcius	M140 S55 Set the temperature of the build bed to 55C and return control to the host immediately (i.e. before that temperature has been reached by the bed). M140 S65 R40. Sets the target bed temp to 65C and establishes a standby temp of 40C.
M190	Set bed target temp and wait for it to be reached	M190 S## R## S## Wait for bed current temp to reach target temp. Waits only when heating R## Wait for bed current temp to reach target temp. Waits when heating and cooling	M190 S60 This will wait until the bed temperature reaches 60 degrees, communicating the temperature of the hot end and the bed every second.
M220	set speed factor override percentage	M220 S## S## Resents the preinter speed to this percentage of the orginal speed	M220 S80 Slow down to 80% of the defined speed M220 S200 Increase the speed to double what was coded.
M221	set extrude factor override percentage	M221 S## S## The extrude factor override percentage	M221 S70 Reduces the extrusion rate to 70%.

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All codes in Marlin	
Code	**Description**
G0	Rapid Movement
G1	Coordinated Movement
G2	CW ARC
G3	CCW ARC
G4	Dwell S<seconds> or P<milliseconds>
G10	retract filament according to settings of M207
G11	retract recover filament according to settings of M208
G28	Home all Axis
G29	Detailed Z-Probe, probes the bed at 3 or more points. Will fail if you haven't homed yet.
G30	Single Z Probe, probes bed at current XY location.
G31	Dock sled (Z_PROBE_SLED only)
G32	Undock sled (Z_PROBE_SLED only)
G90	Use Absolute Coordinates
G91	Use Relative Coordinates
G92	Set current position to coordinates given
M Codes	
M0	Unconditional stop
M1	Same as M0
M17	Enable/Power all stepper motors
M18	Disable all stepper motors; same as M84
M20	List SD card
M21	Init SD card
M22	Release SD card
M23	Select SD file (M23 filename.g)
M24	Start/resume SD print
M25	Pause SD print
M26	Set SD position in bytes (M26 S12345)
M27	Report SD print status
M28	Start SD write (M28 filename.g)
M29	Stop SD write
M30	Delete file from SD (M30 filename.g)
M31	Output time since last M109 or SD card start to serial
M32	Select file and start SD print (Can be used _while_ printing from SD card files):
M42	Change pin status via gcode Use M42 Px Sy to set pin x to value y, when omitting Px the onboard led will be used.
M80	Turn on Power Supply
M81	Turn off Power Supply
M82	Set E codes absolute (default)
M83	Set E codes relative while in Absolute Coordinates (G90) mode
M84	Disable steppers until next move,or use S<seconds> to specify an inactivity timeout, after which the steppers will be disabled. S0 to disable the timeout.
M85	Set inactivity shutdown timer with parameter S<seconds>. To disable set zero (default)
M92	Set axis_steps_per_unit same syntax as G92
M104	Set extruder target temp
M105	Read current temp
M106	Fan on
M107	Fan off

M109	S## Wait for extruder current temp to reach target temp. Waits only when heating. R## Wait for extruder current temp to reach target temp. Waits when heating and cooling IF AUTOTEMP is enabled, S<mintemp> B<maxtemp> F<factor>. Exit autotemp by any M109 without F
M112	Emergency stop
M114	Output current position to serial port
M115	Capabilities string
M117	display message
M119	Output Endstop status to serial port
M126	Solenoid Air Valve Open (BariCUDA support by jmil)
M127	Solenoid Air Valve Closed (BariCUDA vent to atmospheric pressure by jmil)
M128	EtoP Open (BariCUDA EtoP = electricity to air pressure transducer by jmil)
M129	EtoP Closed (BariCUDA EtoP = electricity to air pressure transducer by jmil)
M140	Set bed target temp
M150	Set BlinkM Color Output R: Red<0-255> U(!): Green<0-255> B: Blue<0-255> over i2c, G for green does not work.
M190	S## Wait for bed current temp to reach target temp. Waits only when heating R## Wait for bed current temp to reach target temp. Waits when heating and cooling
M200	D<millimeters> set filament diameter and set E axis units to cubic millimeters (use S0 to set back to millimeters).
M201	Set max acceleration in units/s^2 for print moves (M201 X1000 Y1000)
M202	Set max acceleration in units/s^2 for travel moves (M202 X1000 Y1000) Unused in Marlin!!
M203	Set maximum feedrate that your machine can sustain (M203 X200 Y200 Z300 E10000) in mm/sec
M204	Set default acceleration: S normal moves T filament only moves (M204 S3000 T7000) in mm/sec^2 also sets minimum segment time in ms (B20000) to prevent buffer under-runs and M20 minimum feedrate
M205	advanced settings: minimum travel speed S=while printing T=travel only, B=minimum segment time X= maximum xy jerk, Z=maximum Z jerk, E=maximum E jerk
M206	set additional homing offset
M207	set retract length S[positive mm] F[feedrate mm/min] Z[additional zlift/hop], stays in mm regardless of M200 setting
M208	set recover=unretract length S[positive mm surplus to the M207 S*] F[feedrate mm/sec]
M209	S<1=true/0=false> enable automatic retract detect if the slicer did not support G10/11: every normal extrude-only move will be classified as retract depending on the direction.
M218	set hotend offset (in mm): T<extruder_number> X<offset_on_X> Y<offset_on_Y>
M220	S<factor in percent> set speed factor override percentage
M221	S<factor in percent> set extrude factor override percentage
M226	P<pin number> S<pin state> Wait until the specified pin reaches the state required
M240	Trigger a camera to take a photograph
M250	Set LCD contrast C<contrast value> (value 0..63)
M280	set servo position absolute. P: servo index, S: angle or microseconds
M300	Play beep sound S<frequency Hz> P<duration ms>
M301	Set PID parameters P I and D
M302	Allow cold extrudes, or set the minimum extrude S<temperature>.
M303	PID relay autotune S<temperature> sets the target temperature. (default target temperature = 150C)
M304	Set bed PID parameters P I and D
M400	Finish all moves
M401	Lower z-probe if present
M402	Raise z-probe if present
M404	N<dia in mm> Enter the nominal filament width (3mm, 1.75mm) or will display nominal filament width without parameters
M405	Turn on Filament Sensor extrusion control. Optional D<delay in cm> to set delay in centimeters between sensor and extruder
M406	Turn off Filament Sensor extrusion control
M407	Displays measured filament diameter
M500	stores parameters in EEPROM
M501	reads parameters from EEPROM (if you need reset them after you changed them temporarily).
M502	reverts to the default "factory settings". You still need to store them in EEPROM afterwards if you want to.
M503	print the current settings (from memory not from EEPROM)

M540	Use S[0|1] to enable or disable the stop SD card print on endstop hit (requires ABORT_ON_ENDSTOP_HIT_FEATURE_ENABLED)
M600	Pause for filament change X[pos] Y[pos] Z[relative lift] E[initial retract] L[later retract distance for removal]
M665	set delta configurations
M666	set delta endstop adjustment
M605	Set dual x
M700	Turn off print pressure to syringe 0 RMH 10/31/14
M701	Turn on print pressure to syringe 0 RMH 10/31/14
M702	Turn off purge pressure to syringe 0 RMH 10/31/14
M703	Turn on purge pressure to syringe 0 RMH 10/31/14
M750	Turn off vaccuum pump RMH 10/31/14
M751	Turn on vaccuum pump RMH 10/31/14
M907	Set digital trimpot motor current using axis codes.
M908	Control digital trimpot directly.
M350	Set microstepping mode.
M351	Toggle MS1 MS2 pins directly.