Zaribo/Prusa i3 MK3s - Duet 2 WiFi - RRF 3.11

MK3s - Duet 2 WiFi wiring guide PDF

Latest file listing: md

Hardware changes from stock MK3s:

Note: The config.g file contains notes to facilitate easy adaptation to stock Prusa MK3s.

- Zaribo 220 MK3s Rel3 frame, 10mm movement with blocks
- Bondtech Mosquito Extruder, modified design to use BLTouch
- 0.9 X axis stepper motor, LDO-42STH48-MAC
- 0.9 Y axis stepper motor, LDO-42STH60-MAC
- 1.8 Z axis stepper motors(2), Zaribo 220 teflon coated lead screws
- Duet 2, WiFi
- PanelDue 5i
- PT1000 hotend thermistor
- BLTouch v3.1
- Hotend fan, 24VDC, 6.0 CFM / Digi-Key: G4010L24B-RSR
- Part cooling blower, 24VDC, 5.0 CFM / Digi-Key: B5015E24B-BSR

⁉What do those hardware changes mean for your config?

🔧**Motors, microstepping resolution, and steps/mm.**
Unless you have the same setup as referenced above, you may have to change the microstepping resolution and the steps per millimeter located in the 'config.g' file. To retrieve your current machine's configuration, issue an M503 command in the terminal connected to the running printer. Pay attention to the microstepping assigned to the axis as that can change your steps per millimeter. Read through the /sys/config.g file comments and make the applicable changes as needed. *More about this can be read here: https://duet3d.dozuki.com/Wiki/Choosing_and_connecting_stepper_motors, here: https://www.linearmotiontips.com/microstepping-basics/, and here: https://blog.prusaprinters.org/calculator3416/.*

⚠️Once you have changed/verified the motor settings, review the networking top portion of the file. When completed, copy all the files located in the 'sys', 'macros', and 'filaments' directory over to your sd-card. The 'www' and 'gcode' folder are present in the repository for reference and should not be needed to copy over to the sd-card in normal circumstances. *More can be read about sd-card here: https://duet3d.dozuki.com/Wiki/SDCard, more can be read about macros here: https://duet3d.dozuki.com/Wiki/Macros.*

🔧**Sensorless Homing / Stallguard sensitivity.**
The TMC2660 drivers used on the Duet WiFi support the stallGuard feature. This feature allows the driver to detect motor stalls under some circumstances. Stall detection may be useful for detecting when a motor has skipped steps due to the nozzle hitting an obstruction, and for homing the printer without using endstop switches.
As the given configuration files were authored while using 0.9 degree stepper motors on the X and Y axis, you may need to adjust your stallguard sensitivity and sensorless homing. For stallguard sensitivity, look for the "M915" in the current-sense-homing.g and current-sense-normal.g files. *Read the full documentation here: https://duet3d.dozuki.com/Wiki/Stall_detection_and_sensorless_homing.*

💡**Use the included Macros for filament handling.**
To make filament loading, unloading, and changing the most straightforward and simplistic possible evolution, I have made a macro set that is readily accessible from the PanelDue. To take full advantage of the duet filament system, you will need to make the system filaments PLA, PETG, ABS, and PC. This will allow you to have custom instructions for each different filament, by adding such to the filament's config.g file. *!Note: Based on the current macro version, it is required that each filament's load.g and unload.g remain empty. Placing code into these files will make these macros fail.*
"Set Filament Type" asks what type of filament you are going to use; PLA, PETg, ABS, or PC. Based on the selection, this macro rewrites the "Heat Nozzle" macro to heat the nozzle for the selected filament type. *!Note: This macro only has to be executed once for the given filament type change as it's settings are nonvolatile, regardless of reset or power off. !Note: The script will not let you change the filament type while filament is loaded.*
"Filament Handling" is for any filament unloading, loading, and changing regardless of the printer's state, printing or not. This macro will load, unload, and change filament based on two conditions; whether it detects filament is currently loaded or not, and if a print is in progress or not. *!Note: The logic function in the macro retrieves the current status of the filament sensor to base the perceived desired action to enact. If your printer's filament is currently empty and you intend to load filament, please do not place it into the extruder until requested to do so by the macro. Else the macro will determine that filament is loaded and that you desire to unload filament, instead of load.*
"Heat Nozzle" is created by the "Set Filament Type" macro and can be selected to heat the hotend to the set temperature for the last chosen filament type. You do not need to run this to change filament. The "Filament Handling" macro automatically runs this macro to perform the heating of the hotend to carry out the filament handling, whether it be loading, unloading, or changing.
"Hotmesh" preforms a bed mesh probing routine with a heat stabilized bed. This macro will heat the bed based on the currently set system filament type, wait 5 minutes for the bed temperature to stabilize, and then perform mesh probe. Once initiated, the nozzle will rise to 150mm and then lower 15mm for every 30 seconds elapsed - about minutes 5 in total. Once the nozzle is at the bed, the mesh probing cycle will commence.
"**Save-Z-Baby**" is a tool to assist with making the current baby-steps permanent to be used after the first layer calibration print has been completed. This macro subtracts the current babystep offset from the current Z trigger height and informs the user what offset value to change the G31 Z metric to in the 0:/sys/config.g. Additionally, the macro issues a G31 command with the new calculated z-offset, clears the current babystepping, and then rehomes the machine to make the new z-offset effective. If this is for a specific filament type, recommend placing this yielded information in the filament's config.g - not the 0:/sys/config.g.

Print flow events:

When initiating a print, the following sequence of events occurs in this order.
/sys/start.g is the first codeset that starts at the beginning of each print. This contains the generic processes that apply to all filament types. From this codeset, the fillament's config.g is called and then the bed is heat-stabilized for 2 minutes. To aid in time elapsed indication, the hotend / Z axis is raised and slowly lowered to the bed. Once the hotend is at bed level, the prescribed time has for bed stabilization has elapsed.
/filaments/PETG/config.g is the second codeset initiated. This is triggered from the "M703" command in the "start.g" file. As written in this example, we are set to use the PETG "config.g" file, located in the "filaments/PETG" directory. This contains the gcode commands that are particular to PETG filament type.
Slicer's Start GCode is the last bit of codeset to be executed before the object's sliced gcode starts. This contains the settings particular to the actual print and the exact PETG filament loaded. This would be your *'fine'* settings, where PETG/config.g could be considered your *'medium'* settings, and start.g would be the *'rough'* - performing evaluations to get the printer ready.
The part's actual gcode made by the slicer.
Slicer's End GCode follows the printed object's gcode. This codeset lets the duet know that the print is finished which calls **/sys/stop.g**, the very last codeset that is executed. This last part commonly shutdowns heaters, retracts a bit of filament, turns part cooling fan to 100% to solidify filament for 2 minutes, and then positions the machine to easily retrieve the printed part.

Additional notes:

💡 **Electrically independent Z motors**: On printers, such as MK3, which uses two Z motors to raise/lower the bed or gantry, you can have the firmware probe the bed and adjust the motors individually to eliminate tilt. The auto calibration uses a least-squares algorithm that minimizes the sum of the height errors. The deviation before and expected deviation after calibration is reported. Run G32 to initiate the process. *Read the full documentation here: https://duet3d.dozuki.com/Wiki/Bed_levelling_using_multiple_independent_Z_motors.*

💡 **PINDA v2**: Pinda version 2 is upgraded from the previous version in that it now has an integrated thermistor, which this configuration electrically ties to thermistor E1 on the duet. Pinda temperature compensation has to be mitigated via g-code macro but will be handled via integrated function within the duet firmware shortly. *Read @Argo's posting in the Duet forums: https://forum.duet3d.com/topic/16972/pinda-2-probe-with-temperature-compensation?_=1593546022132.*

💡 **BLTouch v3.1**: The config.g has comment sections for using this probe and the wiring guide covers the electrical installation of the BLTouch v3.1 in the last few pages. *Read the full documentation here: https://duet3d.dozuki.com/Wiki/Connecting_a_Z_probe*

Example start gcode for ideaMaker Slicer:

(ideaMaker example profile files are included in the repository)

```
; ideaMaker Start G-Code

; Set nozzle and bed to the specific temperatures declared within this slicer
M140 S{temperature_heatbed}                      ; set bed temp
M104 S{temperature_extruder1}                    ; set extruder temp
M116                                             ; wait for all temperatures

; Run macro to print primeline at a 'randomized' Y position from -1.1 to -2.9
M98 P"0:/sys/primeLine.g"                        ; primeline macro

; Set pressure advance
M572 D0 S0.07                                    ; set pressure advance
```

Example end gcode for ideaMaker Slicer:

```
; ideaMaker End G-Code
M400                                             ; Make sure all moves are complete
M0                                               ; Stop everything and run sys/stop.g
```

Example start gcode for Simplify3D Slicer:

```
; Simplify3D Start G-Code

; Set nozzle and bed to the specific temperatures declared within this slicer
M140 S[bed0_temperature]                         ; set bed temp
```

```
M104 S[extruder0_temperature]                    ; set extruder temp
M116                                             ; wait for all temperatures

; Run macro to print primeline at a 'randomized' Y position from -1.1 to -2.9
M98 P"0:/sys/primeLine.g"                        ; primeline macro

; Set pressure advance
M572 D0 S0.07                                    ; set pressure advance
```

Example end gcode for Simplify3D Slicer:

```
; Simplify3D End G-Code
M400                                             ; Make sure all moves are complete
M0
```

Example start gcode for Prusa Slicer:

```
; PrusaSlicer Start G-Code:

; Set nozzle and bed to the specific temperatures declared within this slicer
M140 S[first_layer_bed_temperature]              ; set bed temp
M104 S[first_layer_temperature]                  ; set extruder temp
M116                                             ; wait for all temperatures

; Run macro to print primeline at a 'randomized' Y position from -1.1 to -2.9
M98 P"0:/sys/primeLine.g"                        ; primeline macro

; Set pressure advance
M572 D0 S0.07                                    ; set pressure advance
```

Example end gcode for Prusa Slicer:

```
; PrusaSlicer End G-Code
M400                                             ; Make sure all moves are complete
M0                                               ; Stop everything and run sys/stop.g
```

**It is highly recommend to read through the very detailed Duet Wiki pages at https://duet3d.dozuki.com, RepRapFirmware supported G-code reference can be found here https://duet3d.dozuki.com/Wiki/Gcode#main.*

DUET System (sd-card contents) files follow:

***Always use the github folders as they will contain the latest revisions of these files.**

file dump - v08/24/20

Directory / File list follow:

/filaments
/filaments/ABS
config.g
load.g
unload.g
/filaments/PC
config.g
load.g
unload.g
/filaments/PETG
config.g
heightmap.csv
load.g
unload.g
/filaments/PLA
config.g
load.g
unload.g
/macros
Filament Handling
Heat Nozzle
Set Filament Type
/macros/Maintenance
Hotmesh
Save-Z-Baby
/sys
bed.g
cancel.g
config.g
current-sense-homing.g
current-sense-normal.g
deployprobe.g
filament-change.g
filaments.csv
filaset
homeall.g
homex.g
homey.g
homez.g
pause.g

primeline.g
resume.g
retractprobe.g
sleep.g
start.g
stop.g

File contents follow:

/filaments

/filaments/ABS

/filaments/ABS/config.g

```
; 0:/filaments/ABS/config.g
; Macro use to set 'basic' setting for filament type

M300 S1000 P200 G4 P500 M300 S3000 P300                    ; Play some tones
M140 S75                                                   ; Set the bed temperature to 75c
M104 S150                                                  ; Set the extruder warm-up temperature to 150c
                                                           ; Note: actual extruder temperature will be set from
the slicer

; Insert additional filament specific settings here
```

/filaments/ABS/load.g

```
; LEAVE EMPTY
```

/filaments/ABS/unload.g

```
; LEAVE EMPTY
```

/filaments/PC

/filaments/PC/config.g

```
; 0:/filaments/PC/config.g
; Macro use to set 'basic' setting for filament type

M300 S1000 P200 G4 P500 M300 S3000 P300                    ; Play some tones
M140 S75                                                   ; Set the bed temperature to 75c
M104 S150                                                  ; Set the extruder warm-up temperature to 150c
                                                           ; Note: actual extruder temperature will be set from
the slicer

; Insert additional filament specific settings here
```

/filaments/PC/load.g

```
; LEAVE EMPTY
```

/filaments/PC/unload.g

```
; LEAVE EMPTY
```

/filaments/PETG

/filaments/PETG/config.g

```
; 0:/filaments/PETG/config.g
; Macro use to set 'basic' setting for filament type

M300 S1000 P200 G4 P500 M300 S3000 P300                    ; Play some tones
M140 S75                                                   ; Set the bed temperature to 75c
M104 S150                                                  ; Set the extruder warm-up temperature to 150c
                                                           ; Note: actual extruder temperature will be set from
the slicer

; Insert additional filament specific settings here
```

/filaments/PETG/heightmap.csv

```
RepRapFirmware height map file v2 generated at 2020-08-17 03:17, min error -0.050, max error 0.123, mean 0.042,
deviation 0.033
xmin,xmax,ymin,ymax,radius,xspacing,yspacing,xnum,ynum
25.00,225.00,10.00,195.00,-1.00,25.00,23.12,9,9
  0.043,  0.044,  0.023,  0.015, -0.035, -0.009, -0.004, -0.013, -0.050
  0.041,  0.084,  0.057,  0.038, -0.014, -0.001,  0.038,  0.022, -0.033
  0.029,  0.068,  0.074,  0.053, -0.003,  0.015,  0.035,  0.050,  0.011
  0.048,  0.052,  0.053,  0.043,  0.008,  0.023,  0.050,  0.061,  0.015
  0.038,  0.036,  0.018,  0.031,  0.012,  0.039,  0.043,  0.070,  0.035
  0.038,  0.039,  0.049,  0.034,  0.015,  0.039,  0.063,  0.076,  0.040
  0.013,  0.047,  0.072,  0.071,  0.036,  0.056,  0.098,  0.102,  0.056
  0.009,  0.042,  0.060,  0.074,  0.038,  0.079,  0.112,  0.123,  0.078
  0.006,  0.045,  0.042,  0.054,  0.049,  0.087,  0.095,  0.102,  0.064
```

/filaments/PETG/load.g

```
; LEAVE EMPTY
```

/filaments/PETG/unload.g

```
; LEAVE EMPTY
```

/filaments/PLA

/filaments/PLA/config.g

```
; 0:/filaments/PLA/config.g
; Macro use to set 'basic' setting for filament type

M300 S1000 P200 G4 P500 M300 S3000 P300                    ; Play some tones
M140 S60                                                   ; Set the bed temperature to 60c
M104 S150                                                  ; Set the extruder warm-up temperature to 150c
                                                           ; Note: actual extruder temperature will be set from
the slicer

; Insert additional filament specific settings here
```

/filaments/PLA/load.g

```
; LEAVE EMPTY
```

/filaments/PLA/unload.g

```
; LEAVE EMPTY
```

/macros

/macros/Filament Handling

```
; 0:/macros/Filament Handling
; Macro used for all filament handling evolutions

if state.status != "processing"                            ; Printer is not currently printing!

   if sensors.filamentMonitors[0].filamentPresent = true   ; Filament is detected, currently loaded

      M291 P"Press OK to begin filament UNLOADING, else press CANCEL to exit." R"Filament Handling" S3
      M98 P"0:/macros/Heat Nozzle"                         ; Heat nozzle to predetermined temp
      M291 P"Ready for filament unloading. Gently pull filament and press OK." R"Filament Handling" S2
      M291 P"Retracting filament..." T5                    ; Display another message
      G1 E-150 F5000                                       ; Retract filament
      M400                                                 ; Wait for the moves to finish
      T0 M702                                              ; Select tool 0, set filament is unloaded
      M104 S-273                                           ; Turn off hotend
      M140 S-273                                           ; Turn off heatbed
      M98 P"0:/macros/Filament Handling"; run again        ; Now that filament is unloaded, let's ask to load
filament

   else

      M291 P"Press OK to begin filament LOADING, else press CANCEL to exit." R"Filament Handling" S3
      M98 P"0:/macros/Heat Nozzle"                         ; Heat nozzle to predetermined temp
      M291 P"Ready for filament loading. Insert filament and press OK." R"Filament Handling" S2
      M291 P"Feeding filament..." T5                       ; Display new message
      G1 E150 F450                                         ; Feed 150mm of filament at 600mm/min
      G1 E20 F100                                          ; Feed 20mm of filament at 100mm/min
      G4 P1000                                             ; Wait one second
      G1 E-1 F1800                                         ; Retract 10mm of filament at 1800mm/min
      M400                                                 ; Wait for moves to complete
      M98 P"0:/sys/filaset"                                ; Set system filament type
      M400                                                 ; Wait for moves to complete
      M104 S-273                                           ; Turn off hotend
      M140 S-273                                           ; Turn off heatbed

else

   M291 P"Press OK to begin filament CHANGE, else press CANCEL to exit." R"Filament Handling" S3
   M98 P"0:/sys/filament-change.g"                         ; Call filament-change.g
   M24                                                     ; Start/resume SD print
```

/macros/Heat Nozzle

```
; 0:/macros/Heat Nozzle
; Heat nozzle to set temp

M291 R"Filament Handling" P"Heating nozzle for PETg, please wait." S0 T10
T0                                                         ; Select Tool 0
M109 S230                                                  ; set temp to 230c and wait
```

/macros/Set Filament Type

```
; 0:/macros/Set Filament Type
; Macro used to set system's loaded filament type

if sensors.filamentMonitors[0].filamentPresent = false        ; if filament is loaded then reject action to
change filament type

  M291 P{"System filament is currently set to " ^ move.extruders[0].filament ^ ". Press OK to change filament
type, else press CANCEL to exit."} R"Filament Handling" S3

  ; Set PLA temp
  M28 "0:/macros/Heat Nozzle"                                 ; Begin writing to SD card file
  M291 R"Filament Handling" P"Heating nozzle for PLA, please wait." S0 T10
  T0                                                          ; Activate Hotend
  M109 S200                                                   ; set temp to 200c and wait
  M29                                                         ; Stop writing to SD card

  M28 "0:/sys/filaset"                                        ; Begin writing to SD card file
  T0 M702                                                     ; Set system filament as UNLOADED
  T0 M701 S"PLA"                                              ; Set system filament as PLA
  M29                                                         ; Stop writing to SD card

  M291 S3 R"Filament Handling" P"Filament type currently set to PLA. Press cancel to save this selection or OK
to proceed to next filament type."

  ; Set PETg temp
  M28 "0:/macros/Heat Nozzle"                                 ; Begin writing to SD card file
```

```
  M291 R"Filament Handling" P"Heating nozzle for PETg, please wait." S0 T10
  T0                                                        ; Activate Hotend
  M109 S230                                                 ; set temp to 230c and wait
  M29                                                       ; Stop writing to SD card

  M28 "0:/sys/filaset"                                      ; Begin writing to SD card file
  T0 M702                                                   ; Set system filament as UNLOADED
  T0 M701 S"PETG"                                           ; Set system filament as PETG
  M29                                                       ; Stop writing to SD card

  M291 S3 R"Filament Handling" P"Filament type currently set to PETg. Press cancel to save this selection or OK
to proceed to next filament type."

  ; Set ABS temp
  M28 "0:/macros/Heat Nozzle"                               ; Begin writing to SD card file
  M291 R"Filament Handling" P"Heating nozzle for ABS, please wait." S0 T10
  T0                                                        ; Activate Hotend
  M109 S250                                                 ; set temp to 250c and wait
  M29                                                       ; Stop writing to SD card

  M28 "0:/sys/filaset"                                      ; Begin writing to SD card file
  T0 M702                                                   ; Set system filament as UNLOADED
  T0 M701 S"ABS"                                            ; Set system filament as ABS
  M29                                                       ; Stop writing to SD card

  M291 S3 R"Filament Handling" P"Filament type currently set to ABS. Press cancel to save this selection or OK
to proceed to next filament type."

  ; Set PC temp
  M28 "0:/macros/Heat Nozzle"                               ; Begin writing to SD card file
  M291 R"Filament Handling" P"Heating nozzle for PC, please wait." S0 T10
  T0                                                        ; Activate Hotend
  M109 S270                                                 ; set temp to 270c and wait
  M29                                                       ; Stop writing to SD card

  M28 "0:/sys/filaset"                                      ; Begin writing to SD card file
  T0 M702                                                   ; Set system filament as UNLOADED
  T0 M701 S"PC"                                             ; Set system filament as PC
  M29                                                       ; Stop writing to SD card

  M291 S3 R"Filament Handling" P"Filament type currently set to PC. Press cancel to save this selection or OK to
proceed to next filament type."

else

  M291 S3 R"Filament Handling" P"Filament is currently loaded. Please unload filament before changing filament
type."
```

/macros/Maintenance

/macros/Maintenance/Hotmesh

```
; 0:/macros/Maintenance/Hotmesh
; Called to perform automatic heated bedmesh compensation
; This saves the heightmap to the system's set filament's type directory (0:/filaments/XXXX/heightmap.csv)

if state.status = "processing"                              ; Printer is currently printing!
   M99                                                      ; Abort this macro

T0                                                          ; Ensure tool is selected
M703                                                        ; Heat bed to set temp based off current system
filament type
M104 S-273                                                  ; Turn off hotend
M106 S0                                                     ; Turn part cooling blower off if it is on
M291 P{"Performing bed heatup per " ^ move.extruders[0].filament ^ " profile. This process will take
approximately 6 minutes."} R"Hotmesh" S0 T10
G28                                                         ; Home
G1 X105 Y105                                                ; Place nozzle center of bed

; Give 5 minutes for stabilization
G91                                                         ; Set to Rel Positioning
while iterations <=9                                        ; Perform 10 passes
    G1 Z15 F300                                             ; Move Z 15mm up
    G4 S0.5                                                 ; Wait .5 seconds
G1 Z3 F300                                                  ; Raise an additional 3mm
M116                                                        ; Wait for all temperatures
M291 P"Bed temperature at setpoint. Please wait 5 minutes for stabilization, Z indicates countdown." R"Hotmesh"
S0 T10
; Start countdown - use Z as indicator
while iterations <=9                                        ; Perform 10 passes
    G4 S30                                                  ; Wait 30 seconds
    G1 Z-15 F300                                            ; Move Z 15mm down
G90                                                         ; Set to Absolute Positioning

M291 P"Performing homing, gantry alignment, and mesh probing. Please wait." R"Hotmesh" S0 T10
G32                                                         ; Home and Level gantry
M400                                                        ; Clear queue
M558 F50 A4 S-1                                             ; slow z-probe, take 5 probes and yield average
G29                                                         ; Perfrom bed mesh
G29 S3 [P{"0:/filaments/" ^ move.extruders[0].filament ^ "/heightmap.csv"}] ; Save heightmap.csv to filament
type's directory
M558 F200 A1                                                ; normal z-probe
M104 S-273                                                  ; Turn off hotend
M140 S-273                                                  ; Turn off heatbed
M291 P"Hotmesh complete. Hotend and Heatbed are turned off. Performing final homing routine. Please wait."
R"Hotmesh" S0 T10

G28                                                         ; Home
M18                                                         ; Free all
```

/macros/Maintenance/Save-Z-Baby

```
; 0:/macros/Maintenance/Save-Z-Baby
```

```
; This macro subtracts the current babystep offset from the current Z trigger height and informs the user what
offset
; value to change the G31 Z metric to in the 0:/sys/config.g. Additionally, the macro issues a G31 command with
the new
; calculated z-offset, clears the current baby-stepping and then rehomes the machine to make the new z-offset
effective.
; If this is for a specific filament type, recommend placing this yielded information in the filament's config.g
- not
; the 0:/sys/config.g.


if state.status != "processing"                                     ; Printer is not currently printing!

   if move.axes[2].babystep !=0                                     ; If no babysteps are currently adjusted -
exit routine
      echo {"Previous Z probe trigger height: " ^ sensors.probes[0].triggerHeight ^ ", New: " ^
sensors.probes[0].triggerHeight - move.axes[2].babystep}
      echo {"Edit the G31 command in your config.g with a new Z offset of: " ^ sensors.probes[0].triggerHeight -
move.axes[2].babystep}
      M291 P{"Set probe offset to " ^ sensors.probes[0].triggerHeight - move.axes[2].babystep ^ ", clear
babysteps, and REHOME ALL?"} R"!WARNING! Do not proceed if printing!" S3
      M400                                                          ; Finish all current moves / clear the
buffer
      G31 Z{sensors.probes[0].triggerHeight - move.axes[2].babystep} ; set G31 Z offset to corrected
      M500 P10:31                                                   ; save settings to config-overide.g - G31
P31 saves trigger height
      M290 R0 S0                                                    ; set babystep to 0mm absolute
      G28                                                           ; home all
      M291 P"Ensure M501 exists in 0:/sys/config, or manually edit the G31 Z offset, to make this change
```

```
      M291 P"Ensure M501 exists in 0:/sys/config, or manually edit the G31 Z offset, to make this change
permanent." R"Note on making change permanent." S3
   else
      echo "Babystepping is not currently active, nothing to do."

else
   M291 S2 P"This would be detrimental to the ongoing print. Please run this macro when the print is finished,
and the bed is clear & ready for the homing sequence to be conducted." R"WARNING"
```

/sys

/sys/bed.g

```
; 0:/sys/bed.g
; Called to perform automatic bed compensation via G32

M561                                                    ; Clear any existing bed transform.
G28                                                     ; Home all axis.

M558 F50 A5 S0.003                                      ; Slow z-probe, up to 5 probes until disparity is
0.003 or less - else yield average.
while iterations <=2                                    ; Perform 3 passes.
   G30 P0 X25 Y105 Z-99999                              ; Probe near a leadscrew, halfway along Y-axis.
   G30 P1 X225 Y105 Z-99999 S2                          ; Probe near a leadscrew and calibrate 2 motors.
   G1 X105 F10000                                       ; Move to the center of the bed.
   G30                                                  ; Probe the bed at the current XY position.
   M400                                                 ; Finish all moves, clear the buffer.

M558 F50 A5 S-1                                         ; Slow the z-probe, perform 5 probes and yield the
average.
while move.calibration.initial.deviation >= 0.003       ; Perform additional leveling if previous deviation
was over 0.003mm.
   if iterations = 5                                    ; Perform 5 addition checks, if needed.
      M300 S3000 P500                                   ; Sound alert, the required deviation could not be
achieved.
      M558 F200 A1                                      ; Set normal z-probe speed.
      abort "!!! ABORTED !!! Failed to achieve < 0.002 deviation. Current deviation is " ^
move.calibration.initial.deviation ^ "mm."
   G30 P0 X25 Y105 Z-99999                              ; Probe near the left leadscrew, halfway along Y-
axis.
   G30 P1 X225 Y105 Z-99999 S2                          ; Probe near the right leadscrew and calibrate 2
motors.
   G1 X105 F10000                                       ; Move the nozzle to the center of the bed.
   G30                                                  ; Probe the bed at the current XY position.
   M400                                                 ; Finish all moves, clear the buffer.

M558 F200 A1                                            ; Set normal z-probe speed.
echo "Gantry deviation of " ^ move.calibration.initial.deviation ^ "mm obtained."
G1 Z8                                                   ; Raise head 8mm to ensure it is above the Z probe
trigger height.
```

/sys/cancel.g

```
; 0:/sys/cancel.g
; Called when a print is canceled after a pause.

M83                                                     ; Set the extrusion values as relative.
M104 S-273                                              ; Turn off the hotend.
M140 S-273                                              ; Turn off the heatbed.
M107                                                    ; Turn off part cooling fan.
G1 F1000.0                                              ; Set the feed rate.
G1 E-2                                                  ; Retract 2mm of filament.
M98 P"current-sense-homing.g"                           ; Set the current and sensitivity for homing, non-
print, routines.
M400                                                    ; Finish all moves, clear the buffer.
M18 YXE                                                 ; Unlock the X, Y, and E axis.
```

/sys/config.g

```
; 0:/sys/config.g
; Configuration file for MK3s Duet WiFi, firmware version 3.11
; Go to https://github.com/rkolbi/RRF-machine-config-files/blob/master/Prusa%20MK3s/Duet-MK3s.pdf
; for corresponding wiring information.

; General preferences
G90                                                     ; Set absolute coordinates
M83                                                     ; Set relative extruder moves
M550 P"ZMK3-BMGm"                                       ; Set printer name

; Network
M551 P"3D"                                              ; Set password
M552 S1                                                 ; Enable network
M586 P0 S1                                              ; Enable HTTP
M586 P1 S1                                              ; Enable FTP
M586 P2 S0                                              ; Disabled Telnet
M575 P1 S1 B38400                                       ; Enable support for PanelDue

; Drive Mappings S0 = backwards, S1 = forwards
M569 P0 S1                                              ; Drive 0 goes forwards: X Axis
M569 P1 S1                                              ; Drive 1 goes forwards: Y Axis
M569 P2 S1                                              ; Drive 2 goes forwards: Z Axis Left
M569 P3 S0                                              ; Drive 3 goes backward: E Axis
M569 P4 S1                                              ; Drive 4 goes forwards: Z Axis Right (using E1)

; Motor Configuration
; !!! For stock motors, use the following as a starting point:
; M906 X620.00 Y620.00 Z560.00 E650.00 I10.             ; Set motor currents (mA) and motor idle factor in
percent
; M350 X16 Y16 Z16 I1                                   ; Set X, Y, and Z Microstepping with interpolation
; M350 E32 I0                                           ; Set Extruder Microstepping without interpolation
; M92 X100.00 Y100.00 Z400.00 E280.00                   ; Steps per mm
; !!! Also note that you should edit the current-sense-homing.g file and increase current to 50 on X and Y, 100
on Z.
; !!! M913 X20 Y20 Z60   --->   M913 X50 Y50 Z100
```

```
;
M350 X16 Y16 E16 Z16 I1                                     ; Set X, Y, Z, and E microstepping with
interpolation.
M92 X200.00 Y200.00 Z400.00 E415.00                         ; Set steps per mm
M566 X480.00 Y480.00 Z24.00 E300.00 P1                      ; Set maximum instantaneous speed changes (mm/min)
M203 X15000.00 Y15000.00 Z900.00 E2000.00                   ; Set maximum speeds (mm/min)
M201 X4000.00 Y4000.00 Z1000.00 E5000.00                    ; Set accelerations (mm/s^2)
M906 X1340.00 Y1600.00 Z550.00 E550.00 I50                  ; Set initial motor currents (mA) and motor idle
factor in percent
M84 S1000                                                   ; Set idle timeout before shifitng to idle-current

; Motor remapping for dual Z and axis Limits
M584 X0 Y1 Z2:4 E3                                          ; Set two Z motors connected to driver outputs Z and
E1
M671 X-37:287 Y0:0 S10                                      ; Leadscrew at left connected to Z, leadscrew at
right connected to E1

; Set bed dimensions
M208 X0:250 Y-4:215 Z-0.1:205                               ; X carriage moves from 0 to 250, Y bed goes from 0
to 210
M564 H0                                                     ; Allow unhomed movement

; Endstops for each Axis
M574 X1 S3                                                  ; Set endstops controlled by the motor load detection
M574 Y1 S3                                                  ; Set endstops controlled by the motor load detection

; Stallgaurd Sensitivity
M98 P"current-sense-homing.g"                               ; Set the current and sensitivity for normal routine,
per the macro

; Z-Probe Settings for BLTouch
M558 P9 C"^zprobe.in" H2.5 F200 T10000                      ; BLTouch, connected to Z probe IN pin
M950 S0 C"exp.heater3"                                      ; BLTouch, create servo/gpio 0 on heater 3 pin on
expansion
G31 P1000 X22.8 Y3.8 Z1.32                                  ; BLTouch, Z offset with MICRO SWISS NOZZLE
M574 Z1 S2                                                  ; Set Z axis endstop, controlled by probe
M557 X25:225 Y10:195 P9                                     ; Define mesh grid for probing

; Z-Probe Setting for PINDA v2
; 1 - If using PindaV2, Remove above M558 & M950 lines, replace with the following M558 & M308 line
; 2 - Uncomment one of the Z-Offsets below, follow the wiki guide steps to get the proper Z-offset for your
printer
; 3 - Comment out the 2 BLTouch lines in the homez and homeall files
;
; M558 P5 C"^zprobe.in" I1 H1 F1000 T6000 A20 S0.005              ; Prusa PindaV2
; M308 S2 P"e1_temp" A"Pinda V2" Y"thermistor" T100000 B3950      ; Prusa PindaV2
;
; Z-Offsets - Read here: https://duet3d.dozuki.com/Wiki/Test_and_calibrate_the_Z_probe
; G31 P1000 X23 Y5 Z0.985                                   ; PEI Sheet (Prusa) Offset Spool3D Tungsten Carbide
; G31 P1000 X23 Y5 Z0.440                                   ; PEI Sheet (Prusa) Offset MICRO SWISS NOZZLE
; G31 P1000 X23 Y5 Z1.285                                   ; Textured Sheet (Prusa) Offset MICRO SWISS NOZZLE
; G31 P1000 X23 Y5 Z0.64                                    ; Textured Sheet (thekkiinngg) Offset MICRO SWISS
NOZZLE

; Heatbed Heaters and Thermistor Bed
M308 S0 P"bed_temp" Y"thermistor" A"Build Plate" T100000 B4138 R4700 ; Set thermistor + ADC parameters for
heater 0 Bed
M950 H0 C"bedheat" T0                                       ; Creates Bed Heater
M307 H0 A91.5 C264.0 D10.2 S1.00 V24.0 B0                   ; Bed PID Calibration @ 75c - updated 11AUG2020
M140 H0                                                     ; Bed uses Heater 0
M143 H0 S120                                                ; Set temperature limit for heater 0 to 120C Bed

; Filament Sensor
M591 D0 P2 C"e0stop" S1                                     ; Filament Runout Sensor

; HotEnd Heaters and Thermistor HotEnd
; !!! Use this line for stock thermisotr: M308 S1 P"e0_temp" Y"thermistor" A"Nozzle" T100000 B4725 R4700  ; Set
thermistor + ADC parameters for heater 1 HotEnd
M308 S1 P"e0_temp" Y"pt1000" A"Mosquito"                    ; Set extruder thermistor for PT1000
M950 H1 C"e0heat" T1                                        ; Create HotEnd Heater
M307 H1 A311.0 C130.0 D4.3 S1.00 V24.1 B0                   ; Hotend PID Calibration @ 240c - updated 09AUG2020
M143 H1 S285                                                ; Set temperature limit for heater 1 to 285C HotEnd
M302 S190 R190                                              ; Allow cold extrudes, S-Minimum extrusion
temperature, R-Minimum retraction temperature

; Fans
M950 F1 C"Fan1" Q1000                                       ; Creates HOTEND Fan
                                                            ; FAN 40X10MM 24VDC - 6.0 CFM (0.168m³/min).
                                                            ; Digi-Key: G4010L24B-RSR
M106 P1 T45 S255 H1                                         ; HOTEND Fan Settings
M950 F0 C"Fan0" Q5000                                       ; Creates PARTS COOLING FAN
                                                            ; BLOWER 50X15MM 24VDC - 5.0 CFM (0.140m³/min)
                                                            ; Digi-Key: B5015E24B-BSR
M106 P0 H-1                                                 ; Set fan 1 value, PWM signal inversion and
frequency. Thermostatic control is turned off PARTS COOLING FAN
; The following lines are for auto case fan control, attached to 'fan2' header on duet board
M308 S4 Y"drivers" A"TMC2660"                               ; Case fan - configure sensor 2 as temperature
warning and overheat flags on the TMC2660 on Duet
                                                            ; !!! Reports 0C when there is no warning, 100C if
any driver reports over-temperature
                                                            ; !!! warning , and 150C if any driver reports over-
temperature shutdown
M308 S3 Y"mcu-temp" A"Duet2Wifi"                            ; Case fan - configure sensor 3 as thermistor on pin
e1temp for left stepper
M950 F2 C"fan2" Q100                                        ; Case fan - create fan 2 on pin fan2 and set its
frequency
M106 P2 H4:3 L0.15 X1 B0.3 T40:70                           ; Case fan - set fan 2 value
M912 P0 S-5.5                                               ; MCU Temp calibration - default reads 5.5c higher
than ambient

; Tools
M563 P0 D0 H1 F0                                            ; Define tool 0
G10 P0 X0 Y0 Z0                                             ; Set tool 0 axis offsets
G10 P0 R0 S0                                                ; Set initial tool 0 active and standby temperatures
to 0C
T0                                                          ; Set Tool 0 active
```

```
; Relase X, Y, and E axis
M18 XYZE                                                ; Unlock the X, Y, and E axis
```

/sys/current-sense-homing.g

```
; 0:/sys/current-sense-homing.g
; Set the current and sensitivity for homing, non-printing, routines

M915 X S2 F0 H400 R0                                    ; Set the X axis sensitivity.
M915 Y S2 F0 H400 R0                                    ; Set the Y axis sensitivity.
M913 X30 Y30 Z60                                        ; Set the X, Y, and Z drivers current percentage for
non-print moves, per config.g.
```

/sys/current-sense-normal.g

```
; 0:/sys/current-sense-normal.g
; Set the current and sensitivity for normal routines

M913 X100 Y100 Z100                                     ; Set the X, Y, and Z drivers to 100% of their normal
current per config.g.
M915 X S3 F0 H200 R0                                    ; Set the X axis sensitivity.
M915 Y S3 F0 H200 R0                                    ; Set the Y axis sensitivity.
```

/sys/deployprobe.g

```
; 0:/sys/deployprobe.g
; Called to deploy a physical Z probe

M280 P0 S10                                             ; Deploy the BLTouch probe.
```

/sys/filament-change.g

```
; 0:/sys/filament-change.g
; Called when a print from SD card runs out of filament

M25
G91                                                     ; Set relative positioning.
G1 Z20 F360                                             ; Raise the Z axis 20mm.
G90                                                     ; Set absolute positioning.
G1 X200 Y0 F6000                                        ; Go to the parking position.
M300 S800 P8000                                         ; Play a beep sound.

M98 P"0:/macros/Filament Handling"                      ; Unload and load filament using the macro.
M400                                                    ; Finish all moves, clear the buffer.

M291 P"Press OK to recommence print." R"Filament Handling" S2

M98 P"0:/macros/Heat Nozzle"                            ; Get nozzle hot to continue the print.
M116                                                    ; Wait for all temperatures, shouldn't need this but
just incase.
M121                                                    ; Recover the last state pushed onto the stack.
```

/sys/filaments.csv

```
RepRapFirmware filament assignment file v1 generated at 2020-08-01 15:01
extruder,filament
0,PETG
```

/sys/filaset

```
T0 M702
T0 M701 S"PETG"
```

/sys/homeall.g

```
; 0:/sys/homeall.g
; Home X, Y, and Z axis

M98 P"current-sense-homing.g"                           ; Ensure the current and sensitivity is set for
homing routines.

; !!! If using Pinda, comment-out the following two lines
M280 P0 S160                                            ; BLTouch, alarm release.
G4 P100                                                 ; BLTouch, delay for the release command.

G91                                                     ; Set relative positioning.
G1 Z3 F800 H2                                           ; Lift the Z axis 3mm.

; HOME X
G1 H0 X5 F1000                                          ; Move slowly away.
G1 H1 X-255 F3000                                       ; Move quickly to the X endstop.
G1 H0 X5 F1000                                          ; Move slowly away.
G1 H1 X-255 F3000                                       ; Move quickly to the X endstop, a second check.

; HOME Y
G1 H0 Y5 F1000                                          ; Move slowly away.
G1 H1 Y-215 F3000                                       ; Move quickly to the Y endstop.
G1 H0 Y5 F1000                                          ; Move slowly away.
G1 H1 Y-215 F3000                                       ; Move quickly to the Y endstops, a second check.

; HOME Z
G1 H2 Z2 F2600                                          ; Raise the Z axis 2mm to ensure it is above the Z
probe trigger height.
G90                                                     ; Set absolute positioning mode.
G1 X105 Y105 F6000                                      ; Go to the center of the bed for probe point.

M558 F1000 A1                                           ; Set the Z-probe to fast for the first pass.
G30                                                     ; Perform Z probing.
G1 H0 Z5 F400                                           ; Lift the Z axis to the 5mm position.

M558 F50 A5 S-1                                         ; Set the Z-probe to slow for the second pass, take 5
probes and yield the average.
```

```
G30                                                     ; Perform Z probing.
G1 H0 Z5 F400                                           ; Lift the Z axis to the 5mm position.

M558 F200 A1                                            ; Set the Z-probe to normal speed.
```

/sys/homex.g

```
; 0:/sys/homex.g
; Home the X axis

M98 P"current-sense-homing.g"                           ; Ensure the current and sensitivity is set for
homing routines.

G91                                                     ; Set relative positioning.
G1 Z3 F800 H2                                           ; Lift the Z axis 3mm.

G1 H0 X5 F1000                                          ; Move slowly away.
G1 H1 X-255 F3000                                       ; Move quickly to the X endstop.
G1 H0 X5 F1000                                          ; Move slowly away.
G1 H1 X-255 F3000                                       ; Move quickly to the X endstop, the second check.

G1 Z-3 F800 H2                                          ; Place Z axis back to the starting position.
```

/sys/homey.g

```
; 0:/sys/homey.g
; Home the Y axis

M98 P"current-sense-homing.g"                           ; Ensure the current and sensitivity is set for
homing routines.

G91                                                     ; Set relative positioning.
G1 Z3 F800 H2                                           ; Lift the Z axis 3mm.

G1 H0 Y5 F1000                                          ; Move slowly away.
G1 H1 Y-215 F3000                                       ; Move quickly to the Y endstop.
G1 H0 Y5 F1000                                          ; Move slowly away.
G1 H1 Y-215 F3000                                       ; Move quickly to the Y endstop, second check.

G1 Z-3 F800 H2                                          ; Place Z back to the starting position.
```

/sys/homez.g

```
; 0:/sys/homez.g
; Home the Z axis

M98 P"current-sense-homing.g"                           ; Ensure the current and sensitivity is set for
homing routines.

; !!! If using Pinda, comment-out the following two lines
M280 P0 S160                                            ; BLTouch, alarm release.
G4 P100                                                 ; BLTouch, delay for the release command.

G91                                                     ; Set relative positioning.
G1 H0 Z3 F6000                                          ; Lift Z axis 3mm.
G90                                                     ; Set absolute positioning.

G1 X105 Y105 F6000                                      ; Go to the center of the bed for probe point.

M558 F1000 A1                                           ; Set probing speed to fast for the first pass.
G30                                                     ; Perform Z probing.
G1 H0 Z5 F400                                           ; Lift Z axis to the 5mm position.

M558 F50 A5 S-1                                         ; Set probing speed to slow for second pass, take 5
probes and yield the average.
G30                                                     ; Perform Z probing.
G1 H0 Z5 F400                                           ; Lift Z axis to the 5mm position.

M558 F200 A1                                            ; Set normal z-probe speed.
```

/sys/pause.g

```
; 0:/sys/pause.g
; Called when a print from SD card is paused

M120                                                    ; Push the state of the machine onto the memory
stack.

if sensors.filamentMonitors[0].filamentPresent = false
   G1 E-3 F1000                                         ; If the filament has run out, retract 6mm of
filament.

M83                                                     ; Set relative extruder moves.
G1 E-3 F3000                                            ; Retract 3mm of filament.
G91                                                     ; Set relative positioning.
G1 Z10 F360                                             ; Raise Z 10 mm.
G90                                                     ; Set absolute positioning.
G1 X10 Y0 F6000                                         ; Move to the parking position.
M300 S80 P2000                                          ; Play a beep sound.
```

/sys/primeline.g

```
; 0:/sys/primeline.g
; Print prime-line at a 'randomized' Y position from -1.1 to -2.9

; Charge! tune
M400                                                    ; Finish all moves, clear the buffer.
G4 S1
M300 P200 S523.25
G4 P200
M300 P200 S659.25
G4 P200
```

```
M300 P200 S739.99
G4 P250
M300 P285 S880.00
G4 P450
M300 P285 S880.00
G4 P285
M300 P625 S1108.73
G4 S1
M400

G1 X0 Z0.6 Y{-2+(0.1*(floor(10*(cos(sqrt(sensors.analog[0].lastReading * state.upTime))))))} F3000.0;
G92 E0.0                                                    ; Reset the extrusion distance.
G1 E8                                                       ; Purge Bubble.
G1 X60.0 E11.0 F1000.0                                      ; Intro line part 1.
G1 X120.0 E16.0 F1000.0                                     ; Intro line part 2.
G1 X122.0 F1000.0                                           ; Wipe 2mm of filament.
G92 E0.0                                                    ; Reset the extrusion distance.
M400                                                        ; Finish all moves, clear the buffer.
```

/sys/resume.g

```
; 0:/sys/resume.g
; Called before a print from SD card is resumed

M98 P"current-sense-normal.g"                               ; Ensure the drivers current and sensitivity is set
for normal routines.
G1 E3 F400                                                  ; Extract 3mm of filament.
G1 R1 X0 Y0 Z5                                              ; Go back to the last print position with Z 5mm
above.
G1 R1 Z0                                                    ; Go to Z position of the last print move.
M121                                                        ; Recover the last state pushed onto the stack.
```

/sys/retractprobe.g

```
; 0:/sys/retractprobe.g
; Called to retract a physical Z probe

M280 P0 S90                                                 ; Retract the BLTouch probe.
```

/sys/sleep.g

```
; 0:/sys/sleep.g
; Called when M1 (Sleep) is being processed.

M104 S-273                                                  ; Turn off the hotend.
M140 S-273                                                  ; Turn off the heatbed.
M107                                                        ; Turn off the part cooling fan.
M400                                                        ; Finish all moves, clear the buffer.
M18 XEZY                                                    ; Unlock all axis.
```

/sys/start.g

```
; 0:/sys/start.g
; Executed before each print - BEFORE ANY SLICER CODE IS RAN
; This also loads the heightmap from the system's set filament type directory
; (0:/filaments/XXXX/heightmap.csv), if the heightmap does not exist, it will
; create one, and then save in the filament's directory. The HotMesh macro is
; a better choice to generate the heightmap as it performs a heat stabilization
; routine for ~5 minutes.

M122                                                        ; Clear diagnostic data to cleanly capture print
evolution statistics.

T0                                                          ; Ensure the tool is selected.
M280 P0 S160                                                ; BLTouch, alarm release.
G4 P100                                                     ; BLTouch, delay for the release command.
M572 D0 S0.0                                                ; Clear pressure advance.
M220 S100                                                   ; Set speed factor back to 100% in case it was
changed.
M221 S100                                                   ; Set extrusion factor back to 100% in case it was
changed.
M290 R0 S0                                                  ; Clear any baby-stepping.
M106 S0                                                     ; Turn part cooling blower off if it is on.
M703                                                        ; Execute loaded filament's config.g.
G28                                                         ; Home all.

;G1 Z5 X100 Y100                                            ; [PINDA] Place nozzle center of the bed, 5mm up.

G1 Z160 F300                                                ; [BLTouch] Last chance to check nozzle cleanliness.

M300 S4000 P100 G4 P200 M300 S4000 P100                     ; Give a double beep.
M116                                                        ; Wait for all temperatures.
M300 S4000 P100                                             ; Give a single beep.

; [BLTouch] Start countdown - use Z as indicator
G91                                                         ; [BLTouch] Set to Relative Positioning.
while iterations <=9                                        ; [BLTouch] Perform 10 passes.
    G4 S12                                                  ; [BLTouch] Wait 12 seconds.
    G1 Z-15 F300                                            ; [BLTouch] Move Z 15mm down.
G90                                                         ; [BLTouch] Set to Absolute Positioning.

;G4 S120                                                    ; [PINDA] wait an additional 2 minutes for the bed to
stabilize.

G32                                                         ; Level the gantry.
G29 S1 [P{"0:/filaments/" ^ move.extruders[0].filament ^ "/heightmap.csv"}] ; Load bed mesh for the system's set
filament type.
if result > 1                                               ; If the file doesn't exist, perform mesh and save.
   G29                                                      ; Perform mesh now.
   G29 S3 [P{"0:/filaments/" ^ move.extruders[0].filament ^ "/heightmap.csv"}] ; Save heightmap.csv to filament
type's directory.
```

```
M400                                                    ; Finish all moves, clear the buffer.
G90                                                     ; Absolute Positioning.
M83                                                     ; Extruder relative mode.
M98 P"0:/sys/current-sense-normal.g"                    ; Ensure that motor currents and sense are set for
printing.
G1 X0 Y0 F800                                           ; Final position before slicer's temp is reached and
primeline is printed.
G1 Z2 F300                                              ; Final position before slicer's temp is reached and
primeline is printed.

; The primeline macro is executed by the slicer gcode to enable direct printing.
; of the primeline at the objects temp and to immediately print the object.
; following primeline completion.

; Slicer generated gcode takes it away from here.
```

/sys/stop.g

```
; 0:/sys/stop.g
; Called when M0 (Stop) is run (e.g. when a print from SD card is canceled)

M83                                                     ; Set extruder to relative mode.
M106 S255                                               ; Turn the part cooling fan fully on.
M572 D0 S0.0                                            ; Clear pressure advance.
M220 S100                                               ; Set the speed factor back to 100% incase it was
changed.
M221 S100                                               ; Set the extrusion factor back to 100% incase it was
changed.
G1 E-2                                                  ; Retract 2mm of filament.
M104 S-273                                              ; Turn off the hotend.
M140 S-273                                              ; Turn off the heatbed.
G1 F1000.0                                              ; Set feed rate.
M98 P"current-sense-homing.g"                           ; Adjust the current and sensitivity for homing
routines.

; Let cool and wiggle for bit to reduce end stringing
M300 S4000 P100 G4 P200 M300 S4000 P100                 ; Give a double beep.
G91                                                     ; Set to Relative Positioning.
G1 Z2 F400                                              ; Move Z axis up 3mm.

; Start countdown - use X/Y as indicators of counting
while iterations <=9                                    ; Perform 10 passes.
    G4 S6                                               ; Wait 6 seconds.
    G1 X1 Y1 F1000                                      ; Wiggle +1mm.
    G4 S6                                               ; Wait 6 seconds.
    G1 Z0.5 X-1 Y-1 F1000                               ; Wiggle -1mm, Z +0.5.

G90                                                     ; Set to Absolute Positioning.

G1 X220 Y205 Z205 F400                                  ; Place nozzle to the right side, build plate to
front, Z at top.
M400                                                    ; Finish all moves, clear the buffer.
M107                                                    ; Turn off the part cooling fan.
M18 YXE                                                 ; Unlock the X, Y, and E axis.

; Play a triumphant tune to celebrate a successful print.
G4 S1
M300 P250 S750
G4 P251
M300 P200 S1250
G4 P201
M300 P250 S750
G4 P251
M300 P200 S1250
G4 P201
M300 P250 S2500
G4 P251
M300 P150 S2000
G4 P151
M300 P150 S2500
G4 P151
M300 P350 S3700
G4 P351
M400                                                    ; Finish all moves, clear the buffer.
```