

TRAK[®] 3ntr 3D Printers

Printer & MMS Guide

| |
|---------------------|
| Document: P/N 32238 |
| Version: 111620 |

Covers Current Models:

- **3ntr A2**
- **3ntr A4**
- **MMS v2**

TRAK MACHINE
TOOLS



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1 Introduction

Congratulations! Whether you purchased a TRAK 3ntr A2 or A4, you have an industrial-grade, 3D printer that will produce high quality, functional parts, using an accurate and repeatable FFF print process, at low cost per part.

TRAK 3ntr 3D Printers offer:

- An open materials platform enabling selection of a wide range of materials
- Complete flexibility in tailoring/tuning process settings and part characteristics
- Temperature controlled build chambers and printer plates
 - Nozzles up to 840° F (450°C)
 - Bed Up to 320° F (160° C)
 - Chamber up to 194° F (90° C)
- Generous build capacity/volume
 - Print Parts up to 24"x13"x19" for the A2
 - Print Parts up to 12"x7.5"x 8" for the A4
- Simultaneously prints 2 or 3 different print materials
- Integrated camera offering remote web monitoring
- Optional Material Management System to protect expensive environmentally sensitive materials
- KISSlicer software that converts STL files to printer ready g-code programs
- HEPA Filter

1.1 Printer Guide Overview

This Printer Guide covers the following topics:

- Initial printer installation, connection, set-up, and calibrations
- Operating the printer manually from the LCD front panel
- Everyday operating, print job set-up, & maintenance procedures
- Before you print
- Printing parts
- Calibrating the printer
- Maintaining the printer
- Troubleshooting machine/print problems
- Some basic information about print materials

Programming of the TRAK 3ntr 3D printers is not covered within this Printer Guide because programming is performed with separate slicing software that outputs a printer program file (G-code). The TRAK 3ntr is supplied with KISSlicer software and associated reference files necessary to make G-Code files for printing, please consult the appropriate manuals for that software in order to create G-code files for printing.

NOTE - Despite the best efforts for completeness, the scope and detail of the Printer Guide set-up, calibration, operation, and maintenance manual contents can be somewhat limited. Where additional information is required please consult the appropriate manual or contact your dealer.

CAUTION - Section 2 contains important safety information, it is highly recommended that all personnel and operators review and understand this information before starting. Only qualified and trained operators should use this Quick Start Guide.

1.2 Helpful Tips for Using this Printer Guide

You may use the table of contents or the navigational bookmarks in the left panel to browse, navigate and jump to any desired guide chapter or specific procedure. Many procedures require other procedures to be performed as steps – accordingly, hyperlinks to referenced procedure instructions are also embedded for easy reference.

1.2.1 Organization

Individual procedures are organized within chapters based on their functional use/most common application. You can jump directly to any of the chapters based on the job at hand to follow all the steps for that area, or to select individual procedure instructions within the chapter. A table of common navigation links (as shown below) is provided at the end of various pages/section throughout the document to speed navigation through the document

| Printer & MMS Guide Navigational Links | | | | | |
|--|--|----------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| Complete List of Procedure/Work Instructions | | | | | |
| Printer Orientation | Initial Printer Installation, Set-Up & Calibration | Before you Print | Everyday Procedures | Maintain Printer/MMS | Calibrate Printer |

1.2.2 Procedure/Work Instruction Guide Summary

This section outlines a list of the individual procedures/work instructions contained within this guide grouped by category for easy reference. Click the hyperlinks to jump directly to an individual procedure as needed.

| Category | TRAK 3NTR A2/A4 & MMS Procedure |
|--|--|
| Printer Orientation | Safety Precautions Printer Identification Guide: Front, Rear, and Side Views Front Panel Controls LCD Display and Control Menus Overview Operate the Printer Manually Using LCD/Front Panel Controls |
| Initial Printer Installation, Set-Up & Calibration | Initial Printer Set-Up & Calibration Checklist Site Preparation Guide Uncrate & Unpack Printer/MMS Unit Install HEPA Filter Electrical Connections Installation & Initial Set-Up Calibrations Set-Up and Install Printer Server Set-Up and Calibrate MMS Unit |

| Category | TRAK 3NTR A2/A4 & MMS Procedure |
|--|---|
| Print Job Set-Up/ Extruder Configuration | Print Job Set-Up/Configuration Process (Flowchart/Checklist) Review G-Code File for Print Job Set-Up/Config. Requirements Extruder Overview, Handling, & Service Nozzle Change Clean Nozzles Extruder Configuration Change (Normal/Hi TEMP) Install SPFU Unit |
| Everyday Printer Operations | Power on the Printer and MMS Unit Power OFF Sequence (Print Server/MMS/Printer) Operate the Printer Manually Using LCD/Front Panel Controls Load Filament/Materials Filament Care/Storage Purge Nozzle/Filament Clean Nozzles Print Parts Printing Machine Menu (Stop/Pause/Tune during Printing) Filament change - During Printing Remove Parts from Printer Operate the MMS Unit Troubleshooting Tables |
| Printer/MMS Maintenance | Maintain your Printer – Summary Schedule/Frequency Check & Fill Coolant Level Disable Steppers Feeder Roller Cleaning Filament Feeder Installation Extruder Overview, Handling, & Service Extruder Disassembly Printer Firmware Update MMS Firmware Update Controlling Relative Humidity (RH) within MMS Cabinet MMS – Zero Scales/Calibrate Cabinet Troubleshooting Tables |
| Calibrate Printer | Periodic Calibration Schedule/Frequency (Normal Use) Installation & Initial Set-Up Calibrations Z Offset XY Offset Z Nozzle Comparison -3 Nozzles Relative Z Position Calibration Plate Leveling – User Procedure Z Nozzle Leveling Check – Calibration Print Cubes - Calibration Test Print Thermal Calibration |

2 Safety

The safe set-up, calibration, and operation of your TRAK 3ntr 3D printer depends on its proper use and precautions taken by each operator. If these activities are performed incorrectly, there are risks, not limited to, electric shock, pinch/crush, burns, inhalation of fumes/debris that can cause serious injury or death.




Read and follow this Quick Start Guide. Understand the printer operation and safety precautions before setting up, calibrating, or operating the 3D printer.



- Always wear safety glasses, face mask, and safety shoes.
- Always stop the printer before opening the access door and reaching into the printer.
- Always allow the printer, printer surface plate and workpiece to cool adequately before reaching into the printer.
- Have a qualified electrician make all electrical connections and cable wiring
- Never wear gloves, rings, watches, long sleeves, neckties, jewelry, or other loose items when operating the printer.

2.1 Important Safety Notice

Your printer has been built with user safety as main concern, yet it must NOT be used by individuals with reduced mental or physical abilities. This printer is not a toy, is meant to be used by fully responsible and knowledgeable people and printing area must be kept locked in presence of children or people with serious mental problems.

2.2 Safety Issues to be Considered

| | |
|---|--|
| <p style="text-align: center;">Risk of burns</p> | <p>Hot surfaces are involved into the printing process. To minimize risks, be sure not to access any part inside the printing area while printer is working. Once printing process is finished, wait until printed part(s) cool down to room temperature, or use protective gear (gloves) to remove finished prints.</p> |
|  | |
| <p style="text-align: center;">Risk of pinching:</p> | <p>Machine can suddenly start: even if the power of actuators is low, the speed is high enough to hurt. Don't access machine until printing process isn't completed - or- the machine is remotely actuated (i.e.: using a print server).</p> |
|  | |
| <p style="text-align: center;">Risk of fire:</p> | <p>Don't turn on printer close to flammable substances. Don't use any flammable substance to clean the machine inner parts. Do not use printer without supplied removable print tray. Do not use any spray product inside printer. Allow correct printer ventilation: don't obstruct air inlets and outlets, keeping them free from dust and other contaminants.</p> |
|  | |

| | |
|---|--|
| Risk of toxic fumes: | Wrong temperature settings may cause toxic fumes emissions. Be sure to follow guidelines and settings from supplier of your filament. Use printer in a well vented room. If possible, use machine smoke exhaust port: our F1 filtering unit is available – contact us to know more! |
|  | |
| Electrocution Risk: | Do not use in presence of condensing moisture and/or conductive dusts. Disconnect AC power cord before accessing inner parts. Do not attempt any maintenance work on electric or electromechanical parts. Should you notice any electrical malfunctioning immediately stop machine use and report. |
|  | |
| Electromagnetic Interference | Electromagnetic compliance: this is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. |

2.3 Safety Precautions

- 1) Do not operate this machine before the TRAK 3ntr Safety, Installation, Maintenance, Service and Parts List Manual, and the Safety, Programming, Operating & Care Manual have been studied and understood.
- 2) Do not run this machine without knowing the function of every control key, button, knob, or handle. Ask your supervisor or a qualified instructor for help when needed.
- 3) Protect your eyes. Wear approved safety glasses (with side shields) at all times.
- 4) Allow the machine to cool before reaching into it for any reason. The printer bed, printer surface plate, printed part, extruders/nozzles, and other printer interior components can reach very high temperatures and cause serious burns.
- 5) Don't get caught in moving parts. Before operating this machine remove all jewelry including watches and rings, neckties, and any loose-fitting clothing.
- 6) Keep your hair away from moving parts. Wear adequate safety headgear.
- 7) Protect your feet. Wear safety shoes with oil-resistant, anti-skid soles, and steel toes.
- 8) Take off gloves before you start the machine. Gloves are easily caught in moving parts.
- 9) Remove all tools (wrenches, check keys, etc.) from the machine before you start. Loose items can become dangerous flying projectiles.
- 10) Never operate a 3D printer after consuming alcoholic beverages, or taking strong medication, or while using non-prescription drugs.
- 11) Protect your hands. Stop the printer bed movement and extruder translation mechanism:
 - a. Before opening the printer access door
 - b. Before reaching into the machine for any reason
 - c. Before changing parts
 - d. Before removing the printer bed tray, printed parts, or filament debris
 - e. Before you make an adjustment to the extruder, nozzles or any interior mechanism.
- 12) Protect your eyes and the machine as well. Don't use a compressed air hose to remove the debris or clean the machine.
- 13) Keep work area well lighted. Ask for additional light if needed.
- 14) Do not lean on the machine while it is running.

- 15) Prevent slippage. Keep the work area dry and clean. Remove obstacles of any kind around the machine.
- 16) Avoid getting pinched in places where the printer bed or extruder arm movement can cause a crush or pinch injury
- 17) Do not operate the printer with the printer access door open or any of the windows or service access panels removed.

3 Certifications

3.1 EC Declaration of Conformity



EC declaration of conformity



For the following low voltage products:

- A4v3 (3d printer) s/n: 43000 - 45999
- A2v2 (3d printer) s/n: 22000 - 25999
- F1 (filtering unit) s/n: 11000 - 12999

Manufactured by Ideal-Form srl, Via Montegiulio 9 28047 Oleggio (No), ++39 0321 91528

Year of first affixing of CE marking: 2014

We hereby declare on our sole responsibility that the products above are in compliance with the essential requirements of directive

- 2011/65/EU
- 2014/30/EU
- 2014/35/EU
- 1999/5/EC

This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Oleggio, 21/11/2016

A handwritten signature in black ink, appearing to read 'Davide Ardizzo', written over a horizontal line.

Davide Ardizzo / product manager 3d printers

4 Printer Orientation

In this section, you will meet your new TRAK 3ntr 3D printer. Please take a moment to identify the important components of the printer before operating, maintaining, or setting-up the printer.

4.1 Printer Identification Guide: Front, Rear, and Side Views

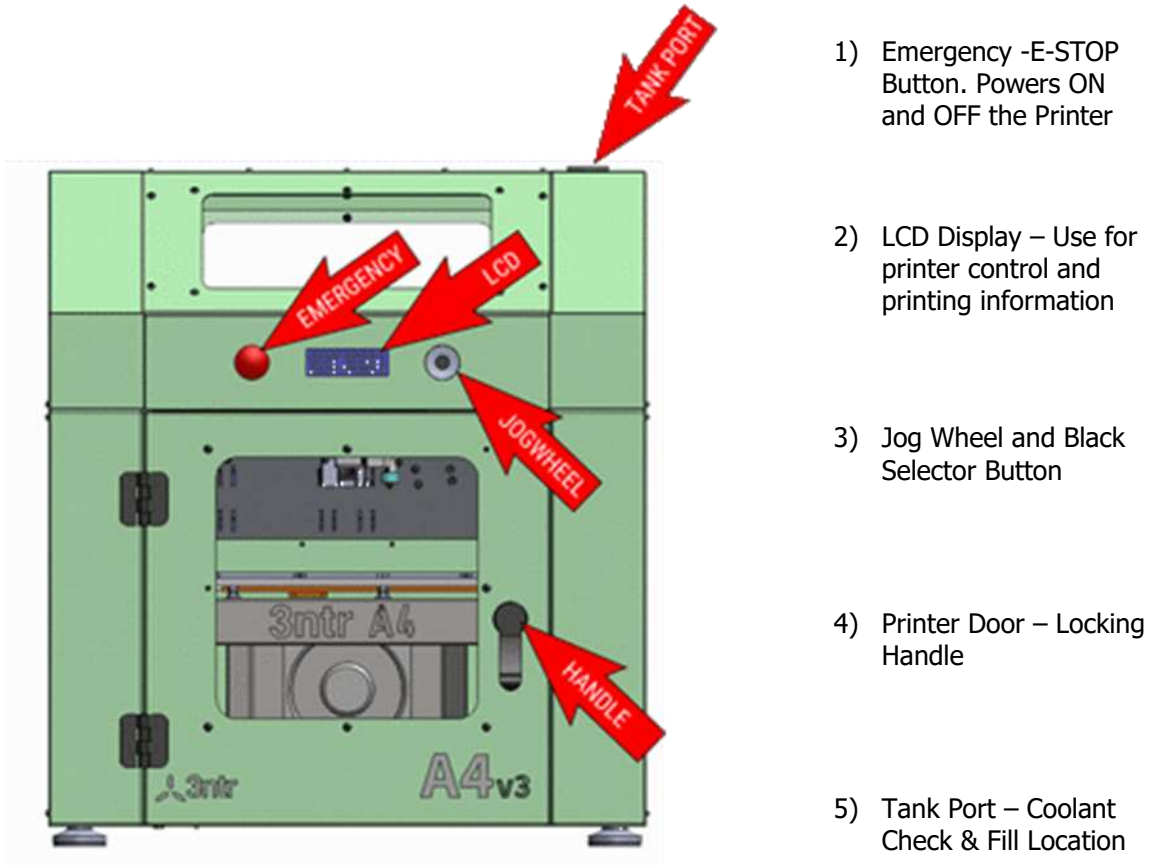
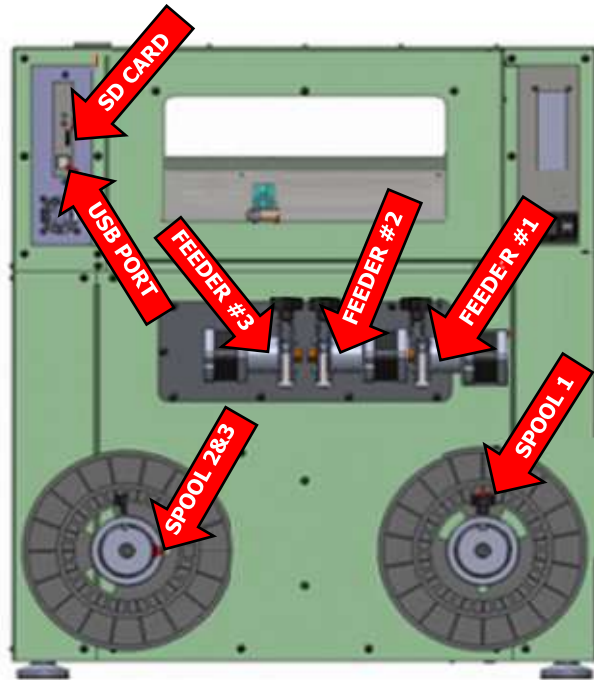
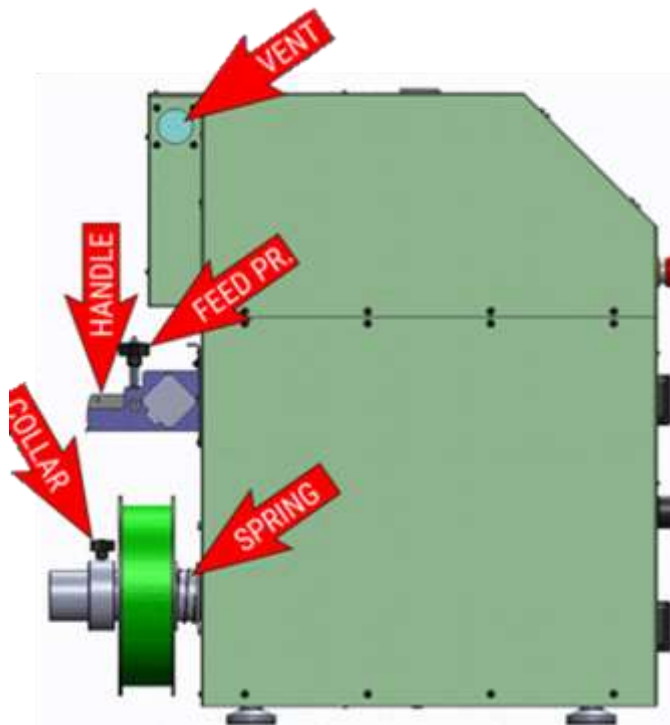


Figure 4.1.1 Printer Front View



- 1) SD Card Port: Insert SD card with print (g-code files).
- 2) USB Port for PC or Print Server connection.
- 3) Filament Feeders – Feed mechanism for extruders #1, #2, #3.
- 4) AC Inlet – Printer Power Cord plugs in here. Power On-OFF switch.
- 5) Spool Holders – Filament Spools are mounted here for Extruders #1, #2, #3.

Figure 4.1.2 Printer Rear View



- 1) VENT – Print fume extraction port. Remove plate and install HEPA filter elbow/hose here.
- 2) Feeder PR – Feeder pressure knob, adjusts filament feeder pressure.
- 3) Handle – engages or releases filament feeder (engaged position shown)
- 4) AC Inlet – Printer Power Cord plugs in here. Power On-OFF switch.
- 5) Collar – Filament Spools are mounted here for Extruders #1, #2, #3.

Figure 4.1.3 Printer Side View

4.2 Front Panel Controls

All relevant machine duties can be performed using the printer front panel controls. Front panel controls consist of a power/E-Stop button, LCD display screen, jog wheel, and black selector button.

- Power E-Stop button – Push in to Emergency STOP printer. Pull with clockwise turn to power ON the printer.
- LCD Display – Displays printer information, status, control menus.
- Jog Wheel – Rotate in either direction to navigate menus, change values, control printer
- Black Jog Wheel Button – Push to select/initiate



Figure 4.2.1 Printer Front Panel Controls

Printer manual operation and control is performed by navigating through various menus that appear on the LCD screen using the jog wheel to scroll up/down, increase/decrease a value, and pressing the black jog wheel button to select/initiate.

| Printer & MMS Guide Navigational Links | | | | | |
|--|--|----------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| Complete List of Procedure/Work Instructions | | | | | |
| Printer Orientation | Initial Printer Installation, Set-Up & Calibration | Before you Print | Everyday Procedures | Maintain Printer/MMS | Calibrate Printer |

5 Initial Printer Installation, Set-Up & Calibration

Before your TRAK 3ntr A2/A4 printer is ready to 3D print parts, it must be properly installed, set-up, and calibrated. Factory Trained personnel should have performed and completed this entire process after delivery; however, the instructions are provided within this guide in the event the printer is to be shipped/moved to a new location after the initial set-up.

Procedure instructions unique to the initial installation Set-Up & Calibration (not used elsewhere) are contained within this section. Those procedure instructions common to both initial Set-Up and Calibration and other printer use are only listed within this Section; however, the procedure instruction details reside in the other sections of the guide with hyperlinks to allow easy access.

NOTE - Those new to the TRAK 3ntr A2/A4 printers may find using the separate, dedicated set-up document TRAK3ntr A2 A4 Printer & MMS – Set-Up and Calibration Quick Start Guide faster and easier than using this guide for new printer installations because it has all the procedures presented in a step-step process for beginners.

5.1 Initial Printer Set-Up & Calibration Checklist

Follow the checklist when installing a new printer and applicable items any time the printer is physically moved from its resting position on the printer stand/MMS Unit.

| | TRAK 3NTR Initial Printer Set-up & Calibration Checklist |
|--------------------------|--|
| <input type="checkbox"/> | 1. Uncrate & Unpack Printer/MMS Unit |
| <input type="checkbox"/> | 2. Printer Orientation |
| <input type="checkbox"/> | 3. Install HEPA Filter |
| <input type="checkbox"/> | 4. Remove Factory Printed Part (Cone) |
| <input type="checkbox"/> | 5. Check and Fill Coolant |
| <input type="checkbox"/> | 6. Electrical Connections |
| <input type="checkbox"/> | 7. Power ON the Printer/MMS Unit |
| <input type="checkbox"/> | 8. Operate the Printer Manually Using LCD and Front Panel Controls |
| <input type="checkbox"/> | 9. Load Filament to the Back of Printer |
| <input type="checkbox"/> | 10. Purge Nozzles/Filament |
| <input type="checkbox"/> | 11. Calibrate Printer – Initial Installation & Set-Up Calibrations |
| <input type="checkbox"/> | 12. Print Part from SD Card |
| <input type="checkbox"/> | 13. Set-Up and Install Print Server |
| <input type="checkbox"/> | 14. Set-Up and Calibrate MMS Unit (if applicable) |
| <input type="checkbox"/> | 15. Operate MMS Unit (if applicable) |

Click on the Hyperlinks to jump to the procedure/instructions for each individual step.

5.2 Uncrate & Unpack Printer/MMS Unit

The first steps to get started with your new TRAK 3ntr A2/A4 printer are described in this section. The process will vary if you are using a TRAK supplied 3ntr Printer stand, MMS unit, or some other table/bench for the printer.

5.2.1 Site Preparation Guidelines

Review the requirements for Printer & MMS Unit to select a suitable location before unpacking.

Site Preparation Guide

Space & Weight Requirements:

- | A2 Printer | MMS Unit |
|--|--|
| <ul style="list-style-type: none">• Dimensions = 37" x 32"/61.5" door closed/open• Height = 44.3"/72-78.3" On Stand/MMS Unit• Net (approx.) Weight = 242 lbs.• Shipping (approx.) Weight = 498 lbs.• Shipping Dimensions 42"x 36"x 53"• 4 levelling screws are provided | <ul style="list-style-type: none">• Dimensions = 37" x 31.5"/88.5" doors closed/open• Height = 34.2"• Net (approx.) Weight = 250 lbs. (approx.)• Shipping (approx.) Weight = 425 lbs.• Shipping Dimensions = 46" x 39" x 43"• Mounted on locking casters/wheels |

NOTE: A minimum 24" clearance on both sides, top, front, and rear (beyond Doors OPEN dimension of printer/MMS Unit) is required for materials loading, service, and repair access.

NOTE: A solid and level foundation is required for printer and MMS

Electrical

- | A2 Printer | A2 Printer & MMS Unit |
|---|---|
| <ul style="list-style-type: none">• 220/230 VAC 15A power required for A2 Printer. <p>Note: Also requires 3x 110/120 VAC 15A 60 Hz external power for Print Server, External HEPA filter unit, optional display</p> | <ul style="list-style-type: none">• 220/230 VAC 15A single connection required for A2 Printer and MMS Unit (A2 Printer plugs to MMS, MMS plugs to external power)• Print Server & HEPA filter unit (no external power required for MMS V2) |

NOTE: For shops with 440 VAC, a step-down transformer to 220 VAC must be used. The transformer must be sized to carry a load of 15 amps minimum.

Air

- Not required

Environmental

- Ambient Operating Temperature 16-32°C/61-90°F
- Storage Operating Temperatures 5--40°C/41-104°F

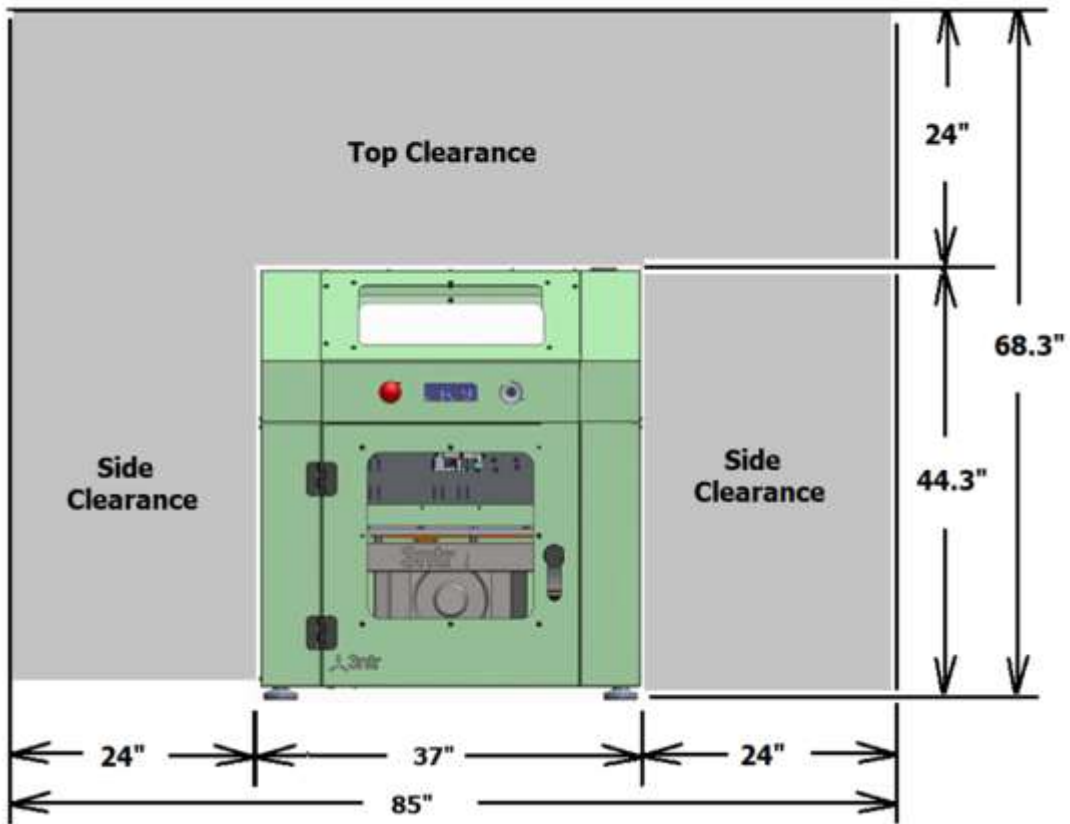


Figure 5.2.1 Printer Dimensions: Front View with Open/Closed Doors

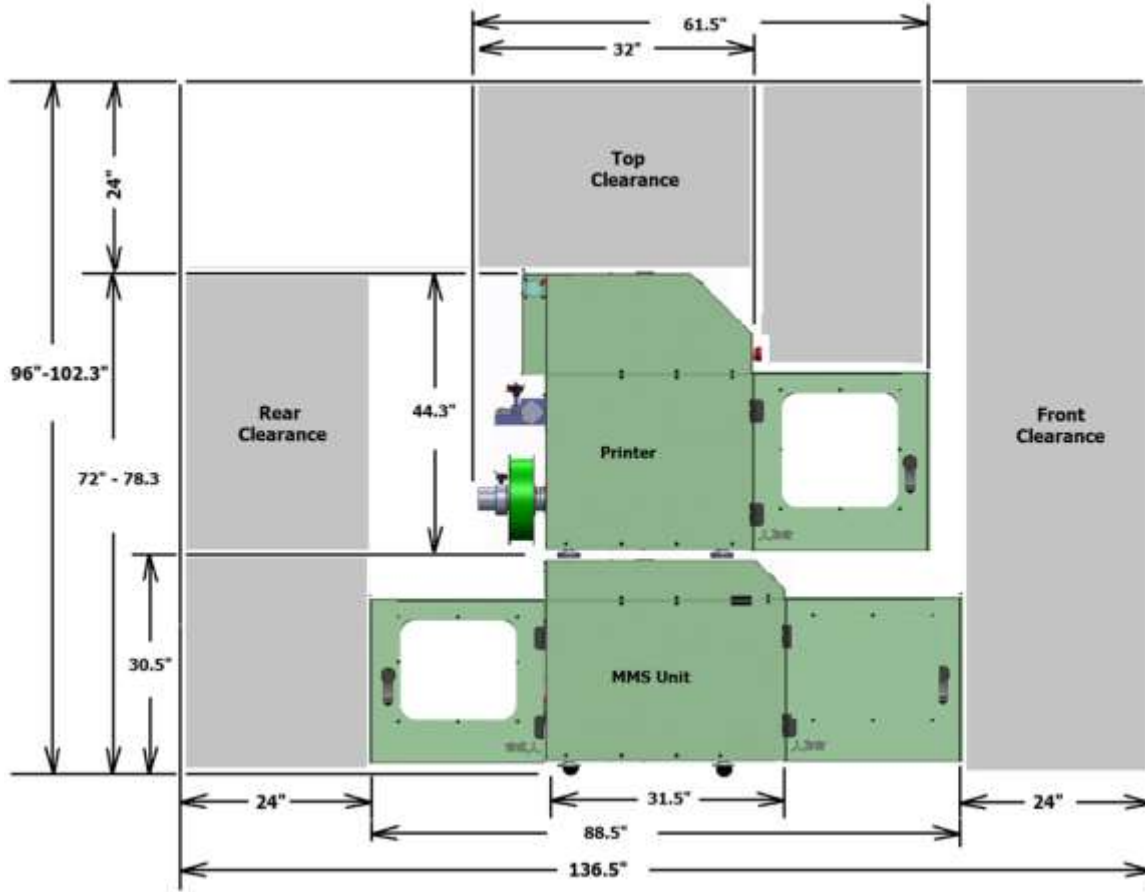


Figure 5.2.2 Stacked Printer & MMS Dimensions: Side View with Open/Closed Doors

Lifting and Moving Printer

CAUTION!

The A2 Printer should be moved by forklift or pallet jack ONLY when mounted on a pallet.

- The printer will be damaged if moved by forklift without the pallet attached.
- Once the pallet has been removed from the printer it must be moved by hand.
- Orient the printer with the sides or front facing the fork truck - The feeder mechanism and filament spool holders on the rear of the printer protrude and can be damaged
- 3 or 4 people are required move the A2 printer by hand - lifting it onto the printer stand, table, or MMS.

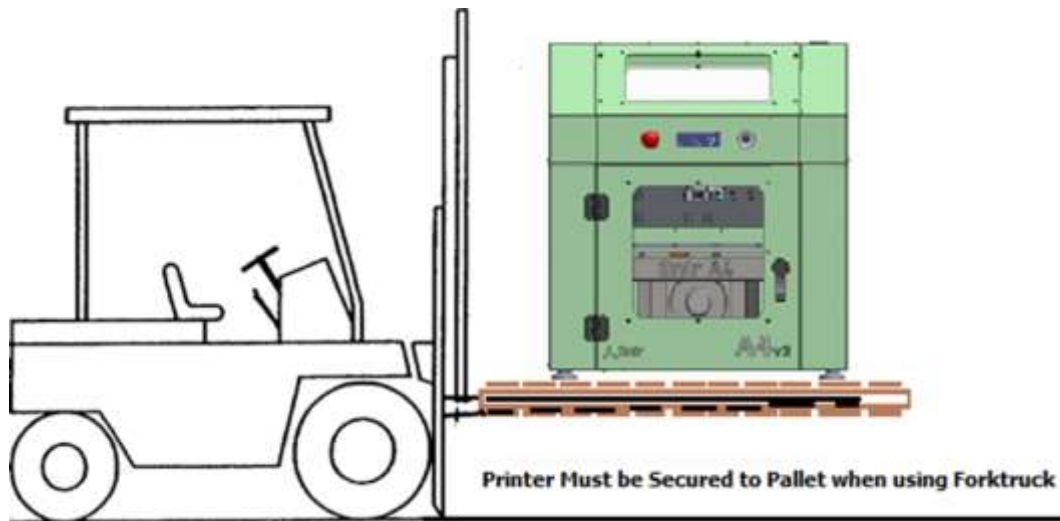


Figure 5.2.3 Moving Printer with Fork Truck (Secured to Pallet)

5.2.2 Uncrate & Unpack MMS Unit (If Applicable)

- 1) Use a fork truck to move the MMS unit as close as possible to the final location before uncrating or removing from the pallet. The MMS unit has wheels and can be rolled on flat level surfaces as needed.
- 2) Remove shipping screws holding top portion of MMS shipping crate to base
- 3) Lift off the top portion of the shipping crate from base
- 4) Remove ratchet straps
- 5) Set-Up a table or desk nearby for placing the printer/MMS/print server components during the unpacking and set-up process.
- 6) Place materials from on top of MMS and place on a table
- 7) Remove protective bubble wrap and foam protection from MMS
- 8) Roll MMS Unit off the shipping pallet and on to the floor
- 9) Open access door to MMS. Remove the contents and place on a table (You may elect to wait to perform this step later, such as after the printer has been placed on the MMS and when ready to install the HEPA filter)
- 10) Remove protective plastic from MMS windows

5.2.3 Uncrate & Unpack Printer

CAUTION - After uncrating printer, DO NOT lift printer directly with forklift or slings. The printer calibration and/or printer housing will be damaged if excessive force is exerted at any location other than the four printer feet. Lift by hand with 3 or preferable 4 people if necessary. Replace printer onto shipping pallet before using fork truck or lift.

- 1) Use a fork truck to move the printer unit as close as possible to the final location before uncrating or removing from the pallet. The printer has fixed feet (not casters) thus must be lifted and carried to its final position.
- 2) Remove shipping screws holding top portion of printer shipping crate to base
- 3) Lift off the top portion of shipping crate from base
- 4) Remove contents of printer and place on table.
- 5) Remove protective wrapping from outside printer
- 6) Open the access door to the printer bed and identify the protective materials and film at all locations inside. Remove protective materials and plastic film from all printer windows and access doors.

NOTE - Protective film must be removed or it will melt from the heat during the printing process, causing damage to the printer.

5.2.4 Place Printer and MMS Unit/Printer Stand in Desired Location

If doing so, ensure the table or stand is rated for the weight of the printer and materials (A2=50 kg/A4 = 130 kg), is sufficiently flat, properly leveled, and is sturdy enough to prevent movement or vibration during printing.

- 1) Move MMS Unit or Printer stand to desired location.
- 2) Lock wheels on MMS Unit or Printer Stand to prevent movement.
- 3) Get 3 or 4 people to lift the printer.
- 4) Place printer on MMS Unit/Printer Stand

5.3 Install HEPA Filter

In this section, we will install/connect the HEPA filter Unit. Proper connection is required to remove contaminants and maintain printer chamber temperatures during printing.

5.3.1 Install HEPA Filter (Common to MMSV2 & External Filter Unit)

NOTE – The final steps of HEPA Filter installation differ if; A) using an MMS V2 Unit that incorporates a permanently affixed, internal HEPA filter unit OR B) if using a printer stand or no MMS unit. Determine which instructions Section 5.2 (MMS2 V2) or Section 5.3 (External HEPA Filter Unit) are applicable and follow them for completion.

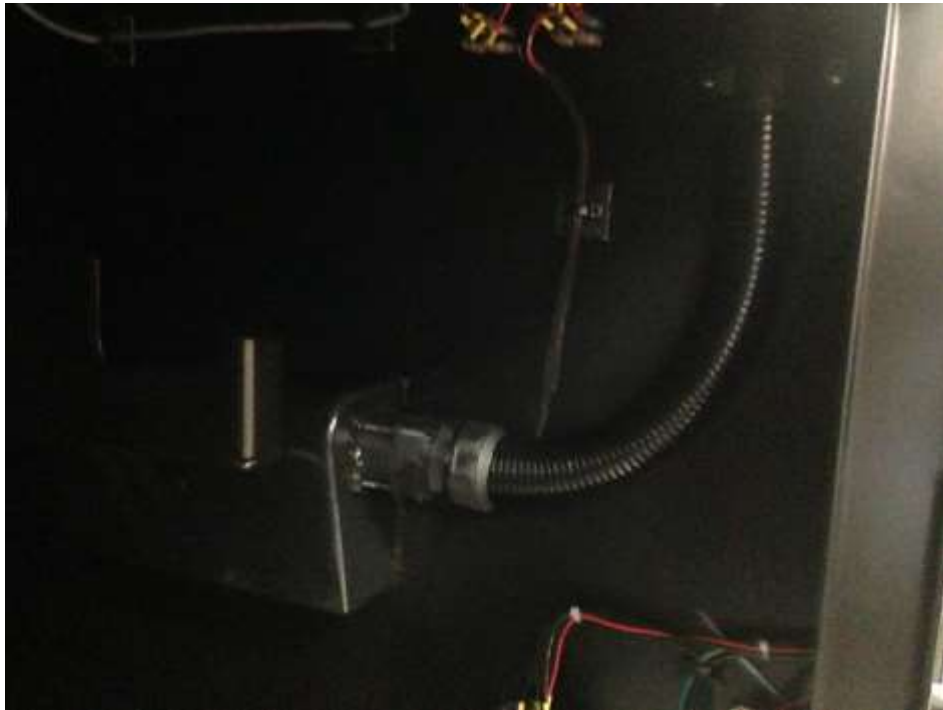


Figure 5.3.1 HEPA filter unit within MMS V2

- 1) If using an external HEPA filter unit, then locate the air filter package including filtering unit, filter cartridge, and power supply. Not applicable for MMS V2



Figure 5.3.2 External HEPA Filter components after assembly

- 2) Locate the air filter hose within the MMS unit and the 90-degree adapter elbow packaged within the Print Server box.
- 3) Get tools including a 2.5mm hex driver (Set included with printer) and 7mm socket.



Figure 5.3.3 Tools for HEPA Filter installation

- 4) Remove the printer front window/cover plate to gain access to the nuts holding the rear filter hose cover plate. Remove Qty. 4 of 2.5mm screws



Figure 5.3.4 Front Printer cover & screws (A4 Printer Shown)

- 5) Proceed to remove the rear cover plate (blinking plate for HEPA filter tube) using a 7mm socket to hold the nuts from the inside of the left rear upper corner of machine



Figure 5.3.5 Blanking Plate cover & screws for removal



Figure 5.3.6 Blanking plate cover nuts in printer interior; hold with 7mm socket

- 6) Uncoil the filter hose. Press the supplied 90-degree elbow into one end of the hose. Place 90-degree elbow into opening where blanking plate was removed, with hose hanging vertically down.



Figure 5.3.7 HEPA Filter 90° Elbow Adapter Installed

- 7) Have a helper or second person screw the plastic nut onto elbow from the inside of the printer to secure elbow in place



Figure 5.3.8 Interior View of Printer with Nut Retaining HEPA Filter Hose

- 8) Replace the Qty. 4 Blanking plate screws that were removed. Have your helper replace the nuts and hold them in place (from the insides) with a 7mm socket. Tighten the 2.5mm screws.
- 9) Follow the separate instructions for Step 10, as applicable for MMS V2 (Section 5.2) or External HEPA Filter Unit (Section 5.3).

5.3.2 Complete HEPA Filter Installation (for MMS V2 Only)

- 10) If using MMS V2, Press the hanging filter hose end securely into the external tube inlet on the MMS V2 Unit. **NOTE** - Not Applicable for printer stand, no MMS, or early MMS with external HEPA filter unit.



Figure 5.3.9 External Tube Inlet on MMS V2

- 11) If using an MMS V2 unit with internal HEPA filter unit, verify operation of the filter unit (fan), check that the indicator light is lit and the hour meter is operating after the MMS V2 unit has been connected to power and turned ON. **NOTE** – Not applicable to external HEPA filter unit.
- 12) HEPA filter installation is now complete.

5.3.3 Complete HEPA Filter Installation (External HEPA Filter Unit Only)

- 13) Place the external HEPA filter unit on the lower tray of the printer stand if available. Otherwise, place the HEPA filter unit behind the printer in a safe location that does not block access. Route the HEPA filter hose along the side of the printer stand/early MMS unit. Press the end of the hose firmly into the HEPA filter unit. **NOTE** – Not applicable for MMS V2.



Figure 5.3.10 External HEPA Filter Unit & hose routing on printer stand

- 14) For the external HEPA filter unit, plug the power cord adapter into the HEPA filter unit, and the power adapter to 110/120 VAC external power. Turn the power ON. Listen for operation of the filter unit (fan). The indicator light should be lit and the hour meter should be operating as shown. **NOTE** – Not applicable for MMS V2.



Figure 5.3.11 External HEPA Filter Unit Power Supply & Cord

- 15) HEPA filter installation is now complete.

5.4 Remove Factory Printed Part (Cone)

The 3ntr printer was set-up, calibrated, and functionally validated at the factory by printing a cone. The cone printed immediately before shipment is located on the printer bed and must be removed during initial printer set-up and calibration. The process to remove this part and other parts is identical.

See Section [Remove Parts from Printer](#) for the procedure.

5.5 Check and Fill Coolant

The printer is delivered from the factory filled with coolant and with a bottle of coolant for refills. Due to the criticality of proper coolant to extruder function, always check for the proper coolant level, and refill as required during the printer initial set-up.

See Section [Check & Fill Coolant Level](#) for the procedure.

5.6 Electrical Connections

In this section, you will make the electrical connection to the printer and MMS unit (if applicable)

CAUTION – Employ a licensed electrician to help with electrical connection and wiring where these instructions are unclear, or your site installation specifics are different.

A2 printers are all configured for 220VAC US Power. A4 printers are typically configured for 110V US power; however, may be optionally configured for 220 V US power. If you have an A4 printer - refer to your order paperwork and/or contact the dealer to determine the actual power configuration for your A4 printer before proceeding.

5.6.1 Verify Input Power Source Voltage/Phase

3ntr printers configured for 220VAC (All A2 and some A4 Printers) are powered with a single phase 230V and a ground connection. The neutral line is not used. Verify socket wiring with a multi-meter before connecting printer/MMS unit or wiring printer cable.

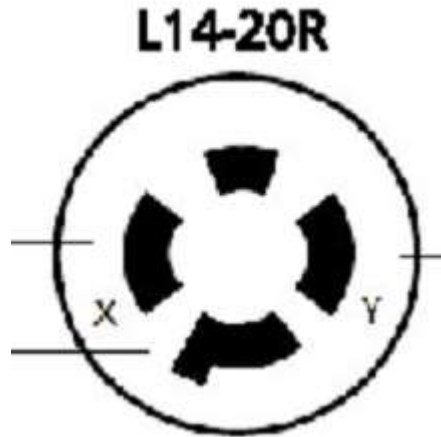


Figure 5.6.1 L14-20R Receptacle

5.6.2 MMS Unit 220V Electrical Power Connection

NOTE: This section only applies if an MMS unit is to be used with the printer.

The MMS units connects to a 220VAC Single phase connection as shown above in Figure 5.6.1. Since the printer receives its power from the MMS unit, the printer should also be configured for 220VAC Single phase power. The printer connects to the outlet on the top of the MMS unit. The power cable supplied with the MMS terminates in bare wires so that a plug compatible with your facility can be installed.

- 1) Obtain standard 220 VAC Single phase power cable OR wire supplied MMS cable following instructions in section below: "Wiring a Printer or MMS Power Cable for 220V Single Phase"



Figure 5.6.2 Typical 3ntr A2 Printer or MMS Power Cable

- 2) Plug power cable into MMS Unit



Figure 5.6.3 MMS Unit Power Plug and Switch

- 3) Plug cable into external power receptacle:

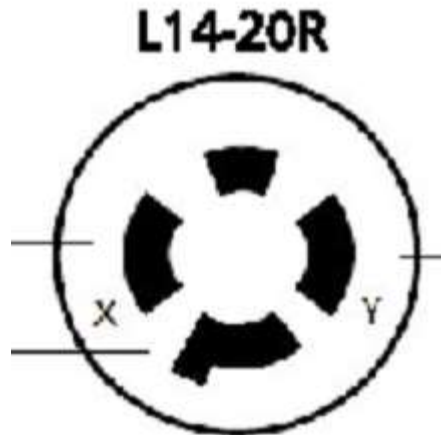


Figure 5.6.4 L14-20R Receptacle

5.6.3 Standard 3ntr 220V Electrical Power Connections

- 1) Inspect power connection locations on printer/MMS units and supplied cables to ensure the connectors are matching and cables are for the correct voltage/phase as the printer.
- 2) Plug power cable into Printer



Figure 5.6.5 Printer Power Connection



Figure 5.6.6 Printer Power Plug

- 3) If there is no MMS unit, plug Printer cable into appropriate wall outlet.
- 4) If there is an MMS unit, plug the Printer power cable into the power outlet on the MMS Unit



Figure 5.6.7 Printer power outlet on MMS Unit

5.6.4 Wiring a Printer or MMS Power Cable for 220V Single Phase

NOTE – In most cases, re-wiring a power cable is not required. If your printer was designed for 220VAC power and was shipped with a standard 110 VAC cable, you will need to either A) contact your dealer and obtain the correct power cable (Preferred) or B) Have a qualified electrician wire one for your 220 VAC power source. The supplied cable is rated for the appropriate current in either case.

- 1) Wire Cable plug for 220VAC Single Phase as shown.

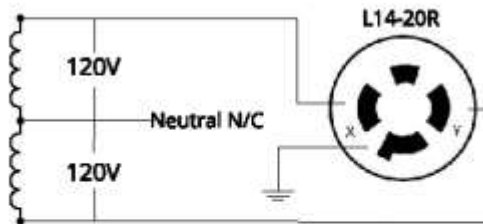
CAUTION – The neutral line is not used. Connecting it as if it were ground will damage other systems connected to the printer



**Figure 5.6.8 220 VAC Power Plug Wiring.
Green = Ground. Black and White = 230 VAC single phase**

3ntr Wiring Diagram

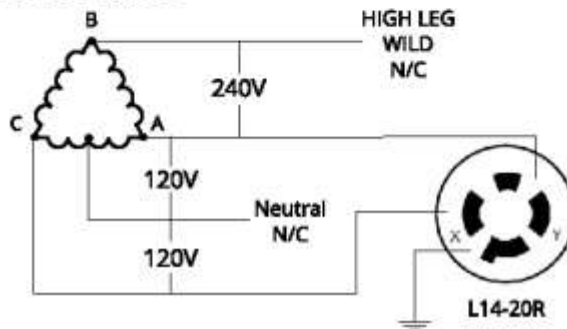
Two Phase



208 to 240 VAC ACROSS X - Y

PRINTER AND OPTIONAL CABINET
NEED 20 AMP SERVICE

Three Phase



- 2) Verify cable wiring with a multi-meter before connecting to printer/power. Measure between the printer power cable ground and any 110VAC wall socket ground. This should be zero "0" volts. If there is a potential present, it is likely a neutral line has been used where a ground wire should have been.

CAUTION – Do not connect the printer or any peripherals until the ground/neutral line has been sorted out and there is no potential between printer ground and the 110V ground.

5.6.5 3ntr A4 printer with 120 VAC US Power Connection

Plug in the printer cord to a normal 120 VAC 15A US outlet as with any appliance.

5.7 Power ON Printer and MMS Unit (if applicable)

See Section [Power on the Printer and MMS Unit \(If applicable\)](#) for the procedure.

5.8 Printer Orientation

See Section [Printer Orientation](#) to familiarize yourself with the printer and controls.

5.9 Operate the Printer Manually Using LCD Screen

See Section [Operate the Printer Manually Using LCD/Front Panel Controls](#) to learn manual operation.

5.10 Load Filament to the Back of Printer

The printer is delivered with 2 spools of ABS/ASA filament suitable for initial set-up calibration and test prints. For simplicity, use this material.

See Section [Load Filament/Materials](#) for the procedure.

5.11 Purge Nozzles/Filament

See Section [Purge Nozzle/Filament](#) for the procedure.

5.12 Clean Nozzles (Not Normally Required on Initial Set-Up)

If unacceptable flow conditions are encountered, or a filament/material other than the factory supplied ABS/ASA is to be used, clean the nozzles as required.

See Section [Clean Nozzles](#) for the procedure.

5.13 Installation & Initial Set-Up Calibrations

Your TRAK 3NTR Printer has been fully calibrated and successfully completed a test print at the factory before shipment, thus should not require re-calibration under normal circumstances. Since there is the

possibility of rough handling during transit and delivery, there are several basic calibrations to be performed on the initial printer set-up.

NOTE – This list of Installation & Initial Set-Up Calibrations should also be performed any time the printer is lifted/moved from the pedestal/MMS unit.

Mandatory Installation & Set-Up Calibrations to Perform:

- 1) Z nozzle Calibration – 3 nozzles relative Z position.
See Section [Z Nozzle Comparison -3 Nozzles Relative Z Position Calibration](#) for Procedure.
- 2) Z Offset – Calibration Print, Read Result, Enter & Save
See Section [Z Offset](#) for Procedure.
- 3) XY Offset – Calibration Print, Read Result, Enter & Save
See Section [XY Offset](#) for Procedure.

Additional calibration procedures should only need be performed upon initial set-up (if indicated by specific printing issues) or periodically where noted. If calibration and test prints indicate additional calibration steps are required, please see the Section [Calibrate Printer](#) and contact your dealer.

Optional Additional Calibrations to Perform:

- 1) Plate Leveling – User Procedure
See Section [Plate Leveling – User Procedure](#) for Procedure
- 2) Z Nozzles Leveling Check – Calibration Procedure
See Section [Z Nozzle Leveling Check – Calibration Print](#) for Procedure
- 3) Cubes Calibration Test Print:
See Section [Cubes - Calibration Test Print](#) for Procedure.
Print the CUBES file on the SD card, into "04" folder (be sure to have ABS spool on nozzle #1).
If the small cubes are correctly printed (optimal plate adhesion, no cube has detached from tray during print) you can pass to next phase – otherwise you must re-check plate levelling.
- 4) Multiextruder Calibrations: To fully exploit the machine you must perform the following duties:
Remove front panel. Print the TEST_2_EXTR file (if you have a two nozzle machine) or TEST_3_EXTR file (if you have a three nozzle machine) on the SD card (be sure to have ABS spools on all nozzles)

5.14 Print Part from SD Card

For early test print during the initial set-up and calibration process, additional print job set-up steps are not necessary so long as the correct print (g-code) files from the 0.4mm nozzle size directory and factory supplied ABS/ASA materials are used.

See Section [Print Parts](#) for the procedure.

NOTE – New TRAK A2/A4 printers are typically shipped with a fixed print job set-up (0.4mm nozzles, no SPFU) and standard materials to simplify the initial calibration and test prints. You must perform the you must perform the print job set-up/printer configuration process before printing ONLY IF:

- a) the printer has been shipped in a non-standard configuration,

- b) you are printing other parts (non-factory g-code files) or
- c) you are using other types of materials for printing test parts,

If required, see Section [Before you Print](#) for the print job set-up/printer configuration procedure.

5.15 Set-Up and Install Printer Server

Once the printer has been set-up, calibrated, and successfully printed test parts, the Print/MMS Server can be installed.

5.15.1 Introduction to Print Server

The print server, once set-up and connected, enables remote monitoring of the printer via a webcam and full remote control of all manual and automatic functions of the printer. The print server type shipped with your printer may vary depending on whether an MMS unit is also ordered. See Figures 15.2.1 and 15.2.2 for typical appearances.

CAUTION - An operator present at the machine may not be aware of manual printer control commands sent remotely. Before using Print Server to control the machine or print - ensure all personnel and/or print operators are either not present or notified in advance of remote-control operation.

CAUTION - Use the webcam or an operator on-site to ensure all aspects of the printer status/condition are suitable for the remote operational commands issued from Print Server.

- Nozzles/Extruders and all associated hardware must be installed and connected.
- Filament loaded and feed handles locked (if printing)
- Printer tray should be empty, clean, and locked into position.
- Access panels should be in place and the access door closed.

5.15.2 Assemble, Connect, and Start-Up Printer Server

It is typically easiest to assemble, connect, and set-up the print server on a desk adjacent to the printer before putting it within the MMS unit, printer stand, or other location.

- 1) Open the Print Server Box and find the Print Server Computer, USB printer cable, Display Port to HDMI/DVI video cable, Print Server power adapter cable, and USB data drive containing documentation, test parts (g-code programs), and other information.
NOTE - The print server computer may appear different than shown below, these are short run production items, and the external appearance may change frequently,
- 2) Obtain a USB keyboard, USB mouse, computer monitor with HDMI/DVI video input, and an ethernet cable (these items not included with printer)



Figure 5.15.1 Print Server, Cables, & Accessories

- 3) Layout components on a desk near the 3D Printer. Connect Printer Server to power with the power adapter cable. Connect keyboard, mouse, and computer monitor display to Print Server computer.



Figure 5.15.2 Print Server & Cable Connections – Typical for MMS Unit

IMPORTANT - If your Print Server resembles the unit in Figure 15.2.2, make the connections exactly as shown in Figure 15.2.2 – The ports are specifically configured for this arrangement.



Figure 5.15.3 Cable Connections Locations for Print Server – No MMS

- 4) Label the ports appropriately (with the connected device name) to avoid future mis-connection and port mismatch malfunction.
- 5) Locate the USB port on the 3D Printer (just below the SD card) and connect the printer to the Print Server Computer. Note (mark with pen or tape) the specific port to avoid having to reselect it in print server later/use trial and error to figure out which port is assigned to the printer.



Figure 5.15.4 Printer USB Port for Print Server Cable

- 6) Turn on the 3D printer. Switch on the power to the Print Server Computer using the switch on the box power cable (or on the Printer Server itself depending on type). A light on the box should turn on as seen in Figure 15.2.2. After a short boot sequence that appears on the LCD panel, the server software should be displayed.



Figure 5.15.5 Printer Server Booting Up

- 7) Launch the browser by selecting the icon. Depending on the specific print server, it will be either a Firefox or Chrome icon shown on the upper left portion of the LCD screen. The server should launch to a pre-set server URL as shown. Two tabs should appear, one for MMS unit, and the other Repetier Server (used to connect printer). If it does not, close the window, answer any prompts, and launch it again.

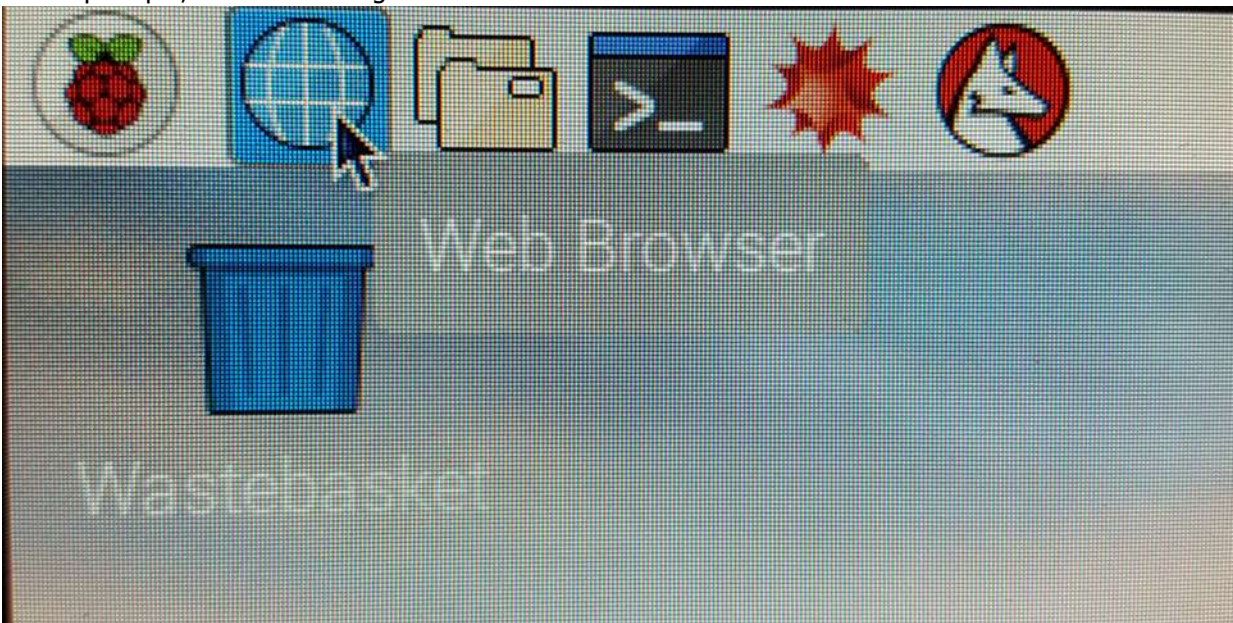


Figure 5.15.6 Launch the Browser on Web Server

- 8) Connect to the printer by clicking on the Repetier Server Window. There are two default printer windows, one for A2 one for A4. Click on the window for your printer type.
- 9) If the printer is powered on, USB is connected, and the Print Server is successful in making the connection automatically, the printer window will be green. If not connected/on, it will be red (as shown). If red, check the printer power and cable connections. If not resolved, proceed to the section 'Printer Port Configuration', If green, proceed to the section "Archive Factory Firmware Settings"

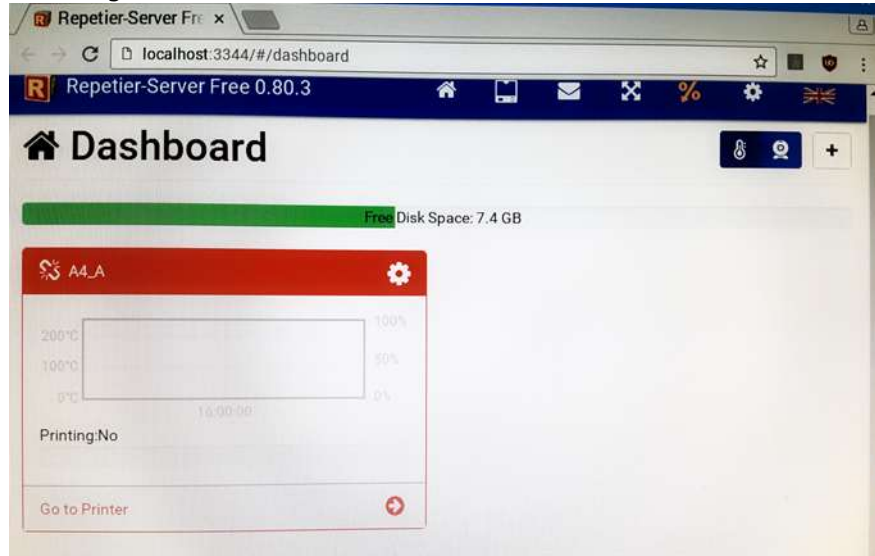


Figure 5.15.7 Repetier Server Showing Disconnected Printer

5.15.3 Configure Printer Port

Normally the printer server and printer will connect automatically. On the dashboard, connected printers shown green, disconnected ones show red. Sometimes, it's necessary to reconnect the Repetier Server to the printer USB connection. In this section, we will learn how to do that.

- 1) Find the red window for the disconnected printer you want to reconnect. Click the gear on the red printer status display shown and select "Printer Settings"

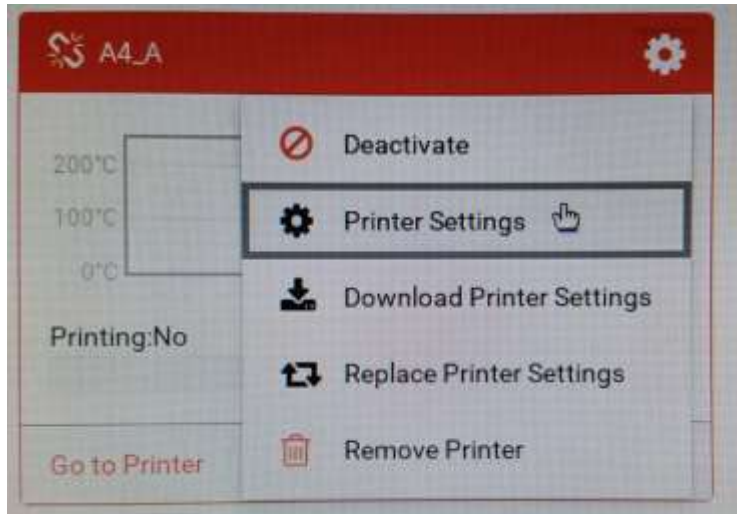


Figure 5.15.8 Access Printer Settings in Repetier Server

- 2) On the printer settings screen, you need to select "Port" under the "Connection" settings group shown.

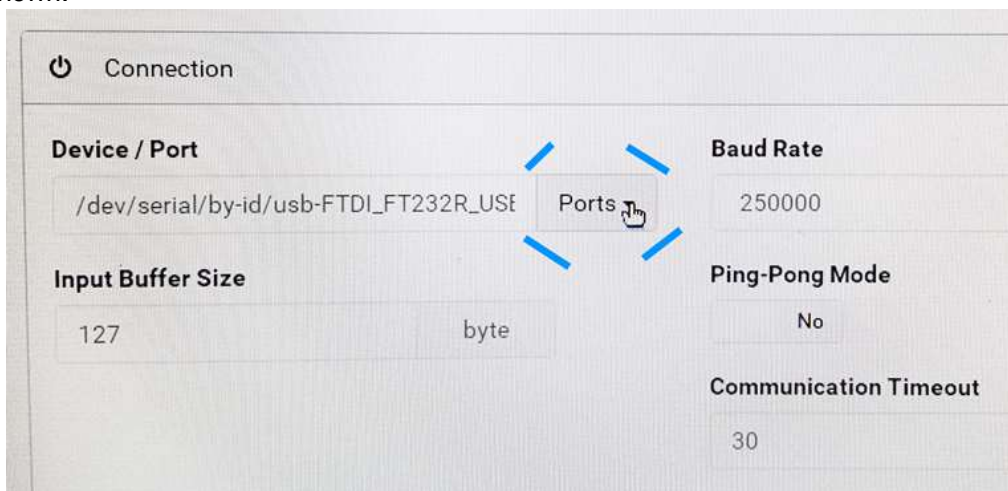


Figure 5.15.9 Browse Device/Ports in Repetier Server

- 3) Select the longer one, looking for "FTDI"

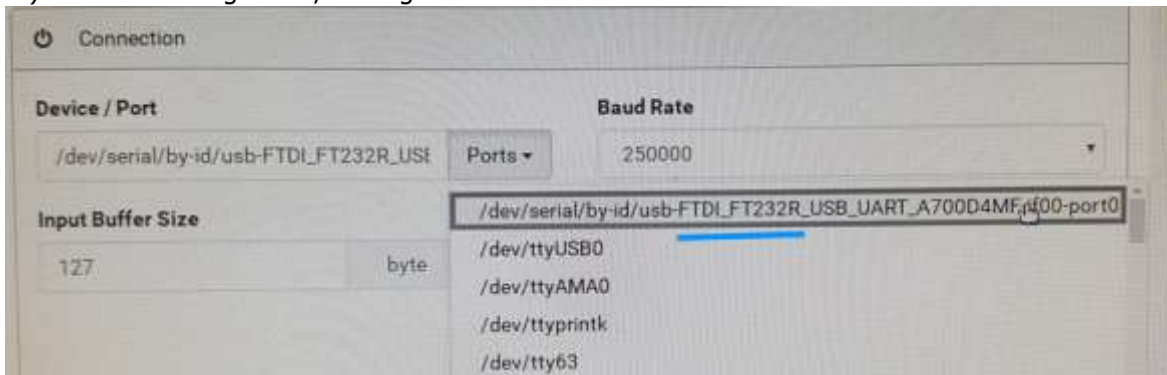


Figure 5.15.10 Identifying Device/Port from List – FTDI Identifier

- 4) Then "Save Configuration" (found at upper right)

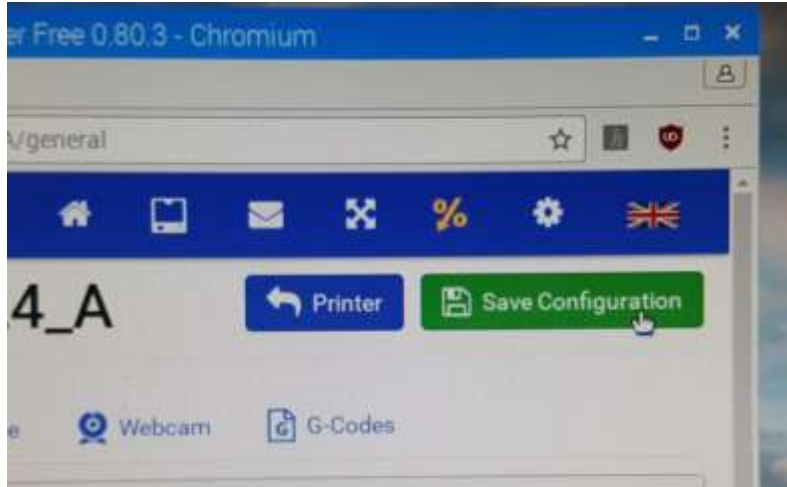


Figure 5.15.11 Save Configuration Control

- 5) Repetier will respond, "Configuration Saved" in the lower right corner.

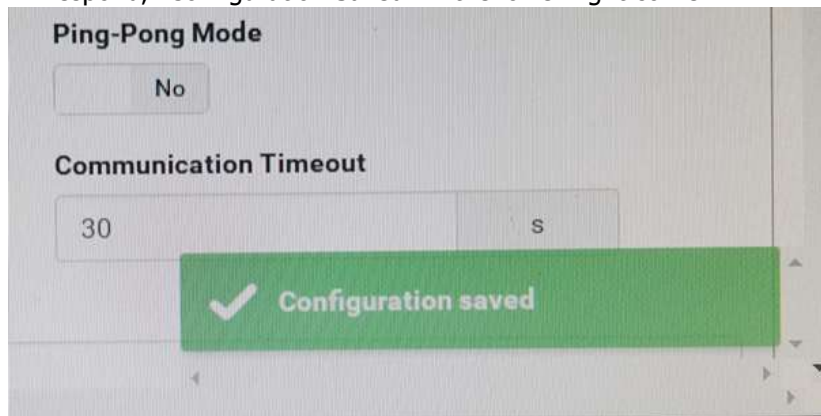


Figure 5.15.12 Saved Configuration Confirmation

- 6) Now, return to the Repetier Server home screen, using the little home icon seen near the "Save Configuration" button.

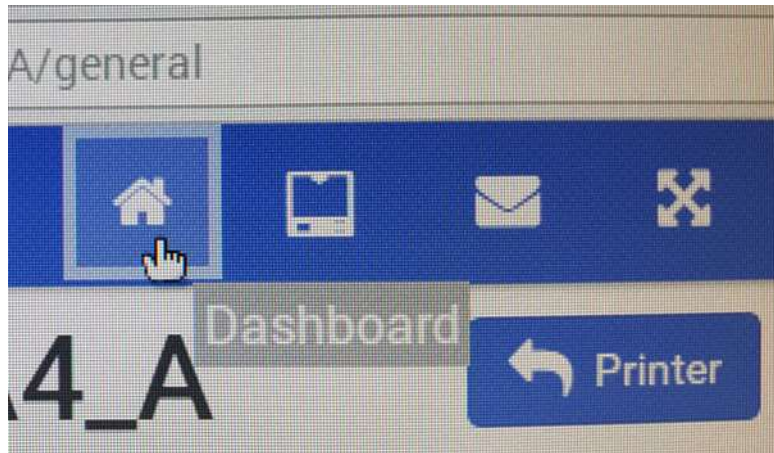


Figure 5.15.13 Repetier Server Home Screen Button

- 7) Your printer status should now be green. The printer server and printer are now correctly connected.

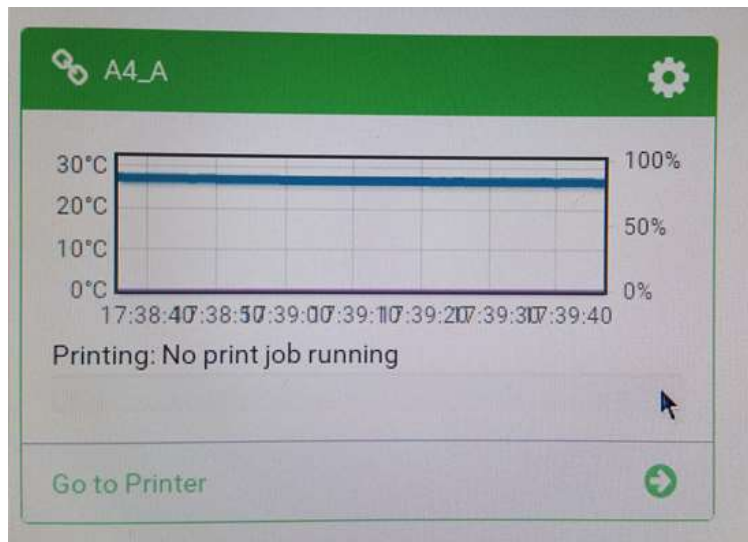


Figure 5.15.14 Repetier Server Showing Connected Printer

- 8) If the status is still red, return to step 3. Once the FTDI device/port is selected using the mouse, use the tab key to change fields. Proceed to step 4 to save the configuration.

5.15.4 Archive Factory Firmware Settings

You should collect and keep a record of your 3NTR factory default configuration. An ideal time to do this is once printer and print server have been set-up. In this section, you will collect and keep a record of your 3ntr factory defaults.

- 1) Copy the default settings. On the print server dashboard, select "Go to Printer".

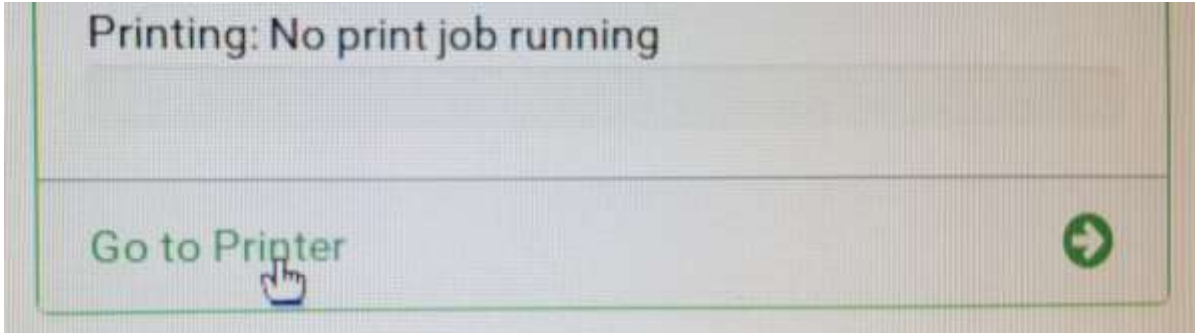


Figure 5.15.15 Go to Printer on Print Server

- 2) When the job control screen appears, select "Console"

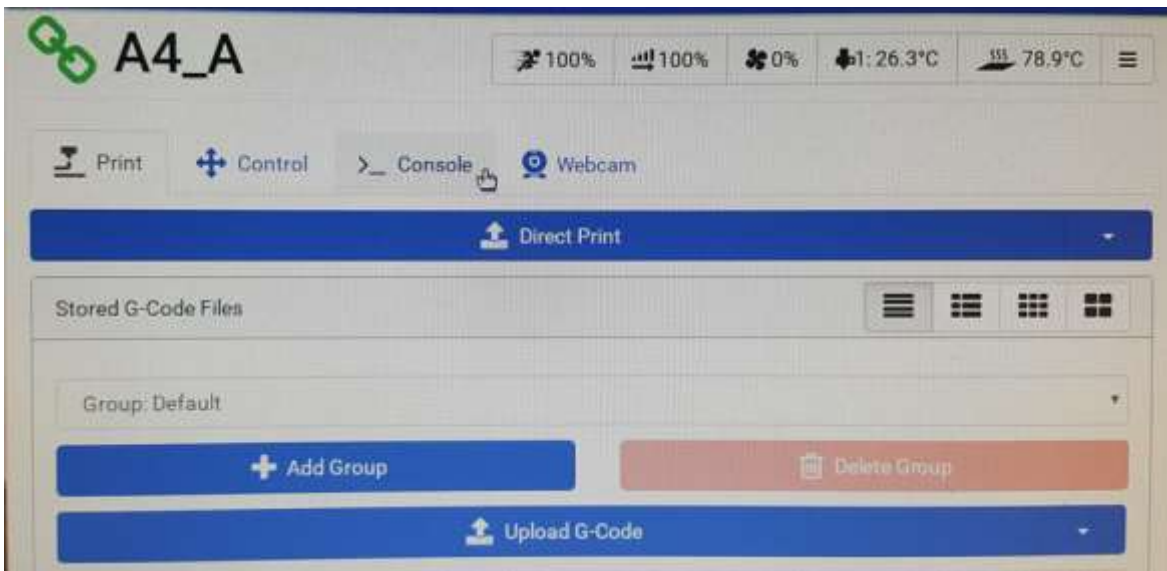


Figure 5.15.16 Print Server Console Selection

- 3) When the console screen appears, type "M503" into the input line and click the Send button.

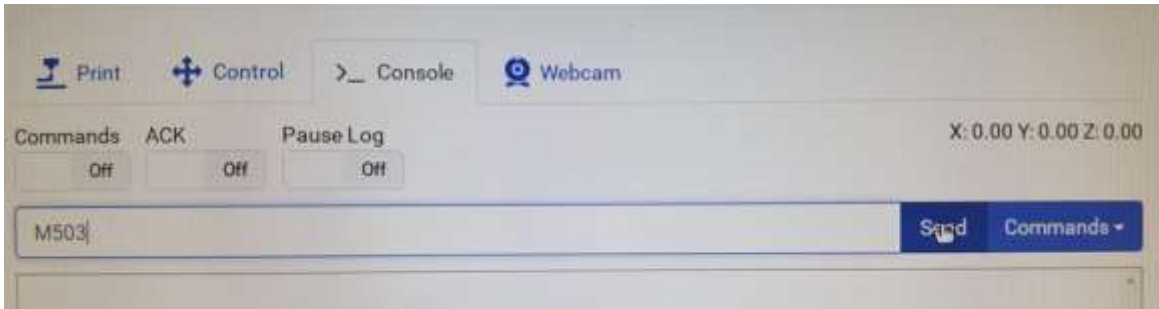


Figure 5.15.17 Sending M503 Command

- 4) In the text window, the printer will respond with its default firmware settings as shipped from the factory.



Figure 5.15.18 Printer Configuration data

- 5) Highlight and copy all the text to the Print Server clipboard.

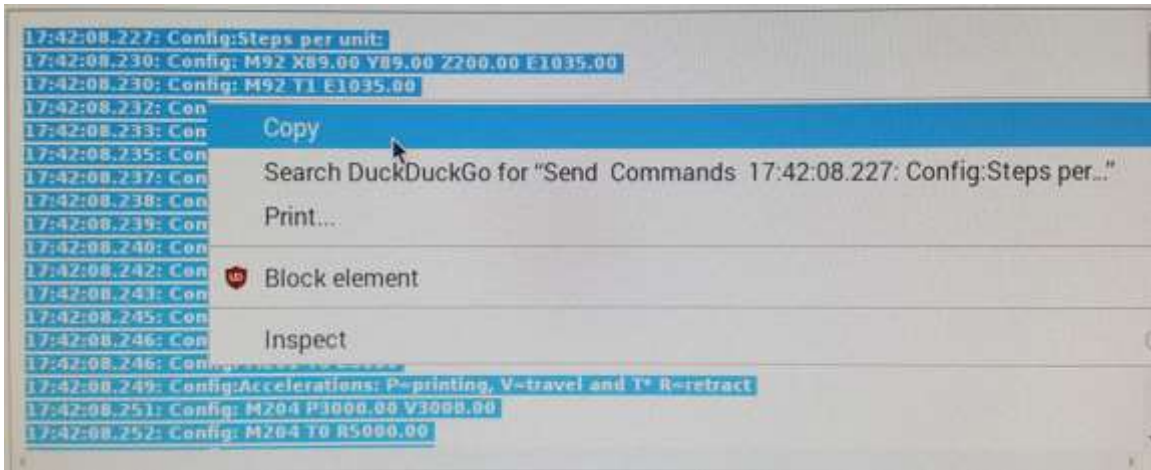


Figure 5.15.19 Copying Printer Configuration Data

6) Launch the file manager.

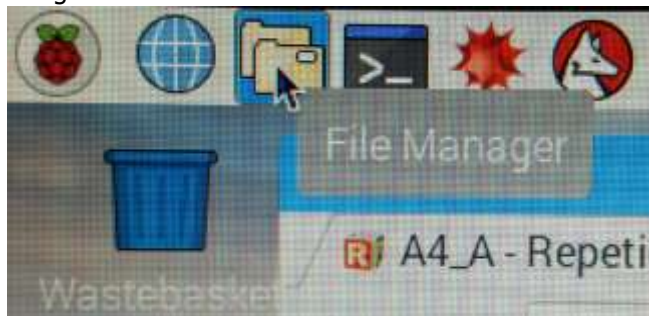


Figure 5.15.20 Launching the file manager in Print Server

7) Navigate to the USB data drive

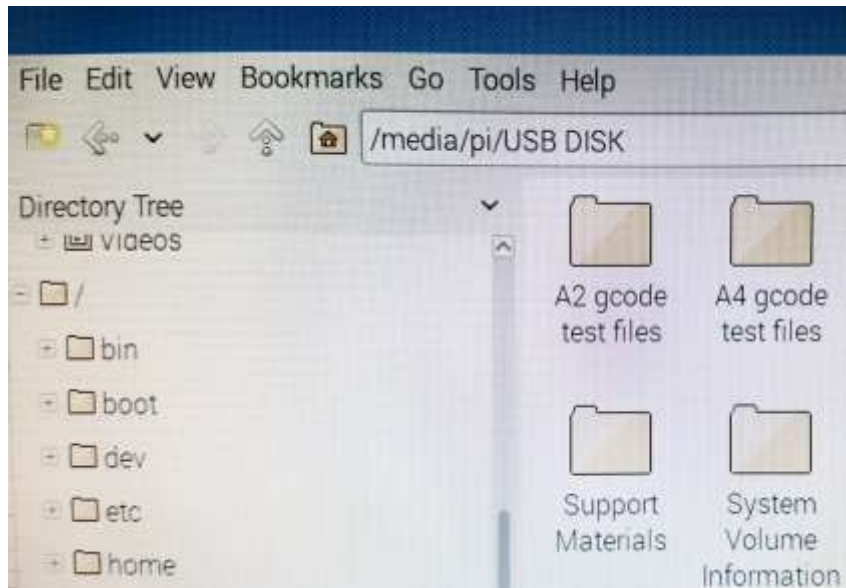


Figure 5.15.21 Navigating to connected USB data drive

8) Click Create New> Empty File.

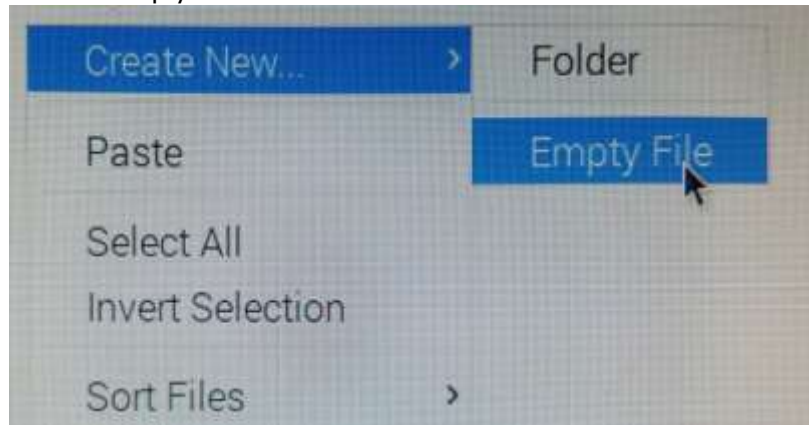


Figure 5.15.22 Creating a New File

9) Give the file a descriptive name, for example "A4 Factory Settings", click OK.

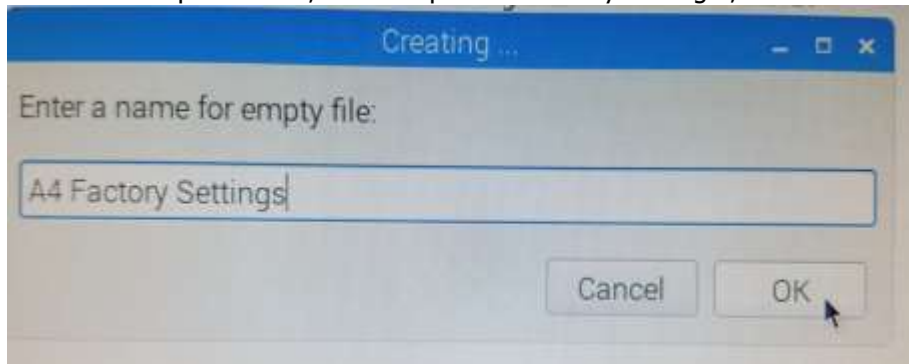


Figure 5.15.23 Naming the archive file

10) Double click the newly created file to open a text editor.

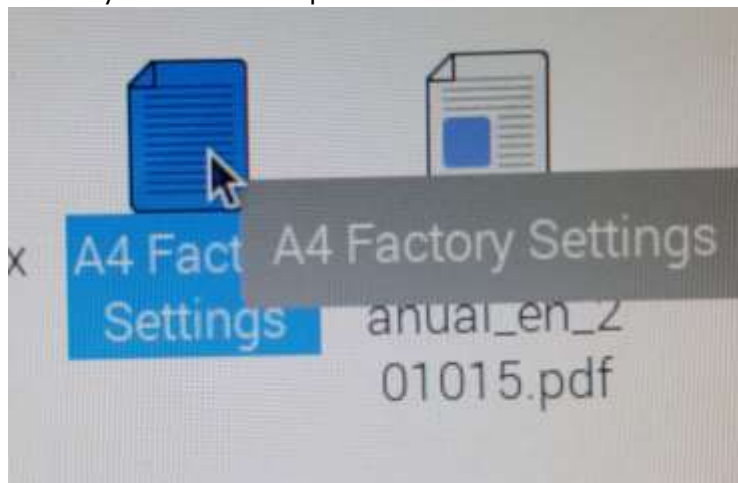


Figure 5.15.24 Opening the New File

11) In the editor, paste the copied text from the clipboard to the file.

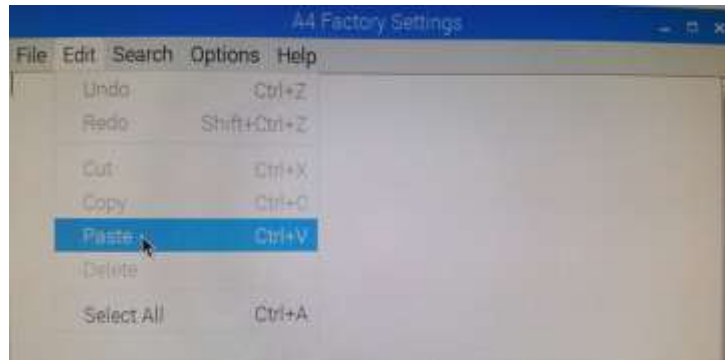


Figure 5.15.25 Pasting Printer Defaults to new USB data file

12) Save the file. Once you have worked through this start-up documentation and have a part printing, archive a separate copy of the file in a safe place.

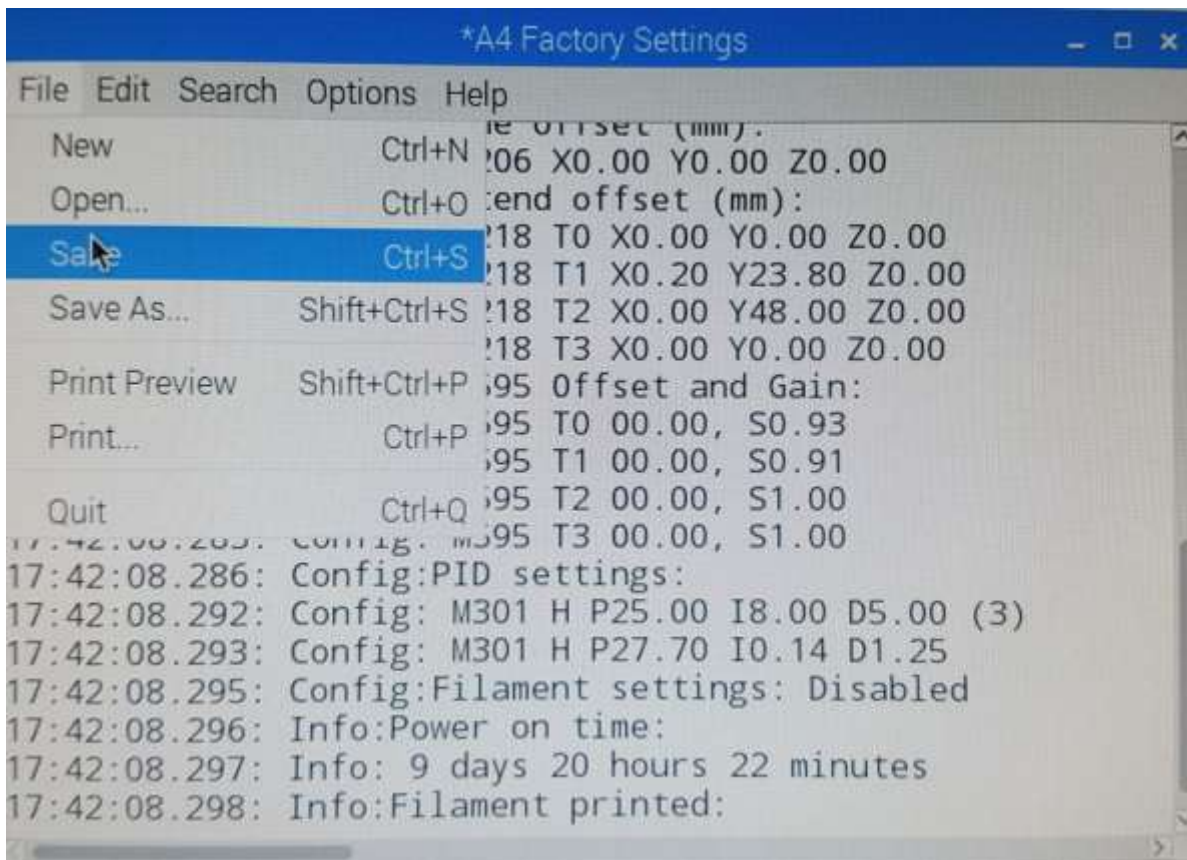


Figure 5.15.26 Saving Printer Defaults to new file after pasting

5.16 Set-Up and Calibrate MMS Unit

MMS Overview

The TRAK Plural Material Management System v2 is designed to properly store a range of materials ready for feeding or fed to the printer from a humidity-controlled environment which insures optimum print quality and part performance. With the server installed and connected to your network, both the browser-based remote dashboard and the touchscreen on the MMS will display live material quantity readouts in meters or grams for each of 6 spools of material.

Please review the information in this guide to take best advantage of the MMS and its functionality. See "Controlling the RH in the Cabinet" later in this document for details on maximizing the performance of the cabinet and desiccant.

5.16.1 MMS Unit Installation, Set-Up & Calibration

The steps necessary to install, calibrate, and operate the MMS V2 unit are detailed below:

- 1) Complete connections & power ON the MMS Unit
- 2) Install & connect server within the MMS Unit
- 3) MMS Server Set-Up
- 4) Zero the individual weigh scales for each material holder in the cabinet
- 5) Calibrate the material weigh scales in the cabinet
- 6) Install the material handling MMS PTFE tubes
- 7) Open and install the desiccant canister

5.16.2 Complete Connections & Power ON the MMS Unit

Reference Chapter 4.6 Electrical Connections for instructions to connect the MMS Unit.

Reference Chapter 4.7 Power on the printer and MMS Unit for instructions to Power on the MMS Unit.

NOTE: The MMS power switch should not be used to shut down the server. Before turning off MMS power, shut down the MMS server ("sudo shutdown now") and power off the printer using the printer's power switch or emergency stop button. (the MMS touch screen is powered by the MMS server.

5.16.3 Install & Connect Server within the MMS Unit

If an MMS unit is being used, the Print Server computer should be relocated within the MMS cabinet and cabled appropriately after starting it up externally. Otherwise, the Print Server can be left as set-up or relocated/placed on the upper shelf of the Printer stand.

NOTE – Print Server should be initially set-up external to the MMS unit as shown in the Set-Up and Install Print Server section of the QS Guide before installing within the MMS unit (this section instructions)

- 1) Shutdown the Print Server computer. Make note of the USB port (mark or use a piece of tape) where the printer cable is connected. Disconnect all the cables.



Figure 5.16.1 Print Server & Cables

- 2) Open the MMS unit and place the Print Server inside in the lower right corner.

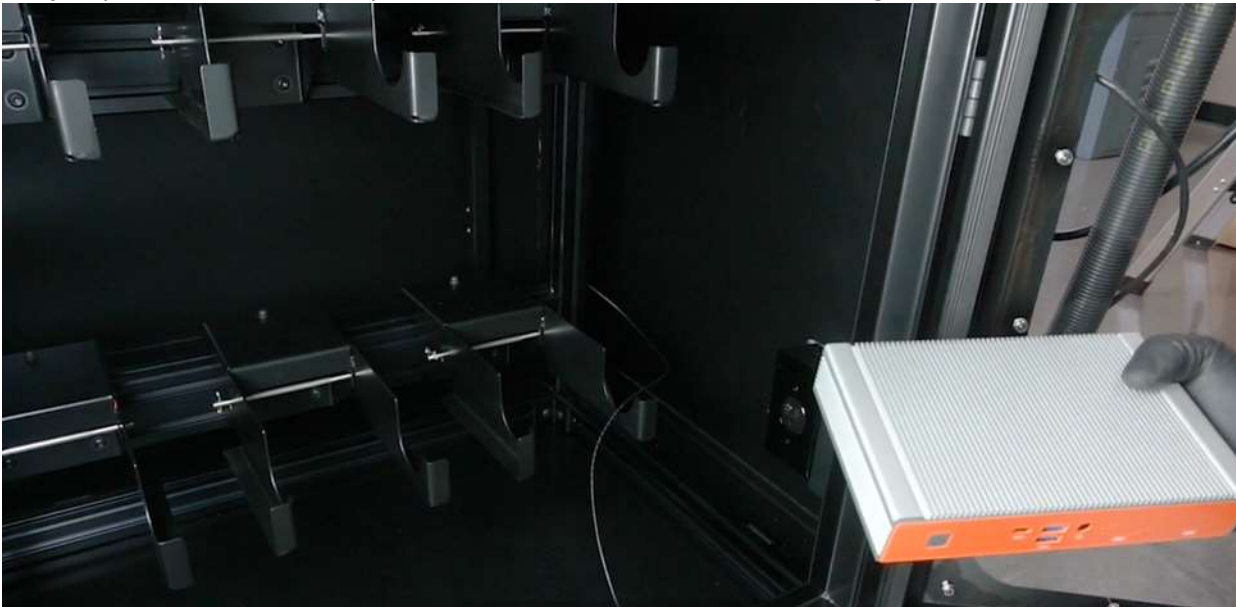


Figure 5.16.2 Placing Server into MMS Unit

- 3) Locate the USB and ethernet cable pass-through connectors on the inside and outside of the MMS unit.



Figure 5.16.3 MMS V2 Unit Pass-Through Connectors

- 4) Identify the pass-through connectors on the MMS Unit. Locate the supplied USB and ethernet cables for connection of Print Server and the interior port of the pass through-connectors.

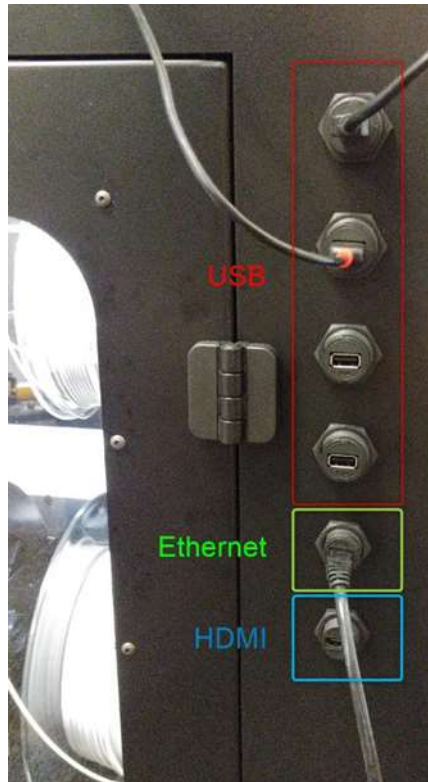


Figure 5.16.4 MMS V2 Pass-Through Connectors ID guide

- 5) Plug the USB cable to the marked (previously used) printer port on the Print Server and into the inside of the MMS Unit USB pass through connector. It is important this is the exact port initially used in print server. Plug the USB cable connected to the printer to the corresponding MMS external USB pass-through connector port (print server).
- 6) Find the world plug power receptacle on the inside lower right corner of MMS unit, and world-US adapter plug from the Printer Server box. Plug the Print Server power to the world adapter plug and into the power receptacle in the MMS unit. Power ON the Print Server.



Figure 5.16.5 World Power Adapter on Print Server Power Adapter

- 7) Connect the remaining cables except for the MMS USB cable (see next section for MMS Server Set-Up & Connection)
 - a. Plug in a USB cable for the printer webcam to the Print Server and the other end to an open USB pass through. Plug the (external to MMS) USB webcam USB cable to the outside of the corresponding USB pass-through connector.
 - b. Connect the ethernet cable to Printer server and the other end to the bottom (ethernet) pass through connector. Connect the company ethernet cable (previously connected to print server during set-up) to the MMS external ethernet pass-through connector
 - c. If a video display is to remain set-up near the printer, connect the supplied Print Server Display Port to HDMI cable to the pass-through, and an HDMI cable from the pass-through to the external LCD display.



Figure 5.16.6 Cable Connections to Print Server within MMS

- 8) Place Print Server in the lower right corner of the MMS unit. Coil and place the cables to avoid interference with filament spools that will later be installed. Use the supplied magnetic cable holders as needed to secure the cables to the printer/MMS unit.



Figure 5.16.7 Printer Server and Cables within MMS

- 9) Check Print Server function and connection status after installation within the MMS unit
 - a. Power ON the Print Server unit using the switch.
 - b. Use a network/internet connected PC to access the Print Server remotely.
 - c. After accessing the Print Server, verify the printer status is connected (indicated by the green printer window highlight). If the printer is not connected, check the cables to ensure the printer is plugged in to the original print server USB port. If not resolved, then configure the printer port following the instructions in the next section.

5.16.4 MMS Server Connection & Set-Up

In this section, you will set-up the server connection. This step can be completed before installing the server within the MMS, or after.

- 1) To get the machine's IP address, you need to connect the server to a monitor and keyboard (mouse optional) with an active LAN connection. Note: the server uses a DisplayPort connection. (the server is shipped with a DisplayPort to HDMI adapter).
- 2) Power on the server; the server should boot and login to an Ubuntu desktop (option in system security settings; may be set to require password if desired).
 - Username: plural
 - Password: printserver
- 3) Open a terminal by pressing "ctrl+alt+t"
- 4) Enter "ip addr"

```
plural@3DPrintServer:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp3s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 94:c6:91:18:43:d8 brd ff:ff:ff:ff:ff:ff
    inet 10.2.10.18/24 brd 10.2.10.255 scope global enp3s0
        valid_lft forever preferred_lft forever
    inet6 fe80::96c6:91ff:fe18:43d8/64 scope link
        valid_lft forever preferred_lft forever
3: wlp2s0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether 9c:da:3e:d9:f5:17 brd ff:ff:ff:ff:ff:ff
```

Figure 5.16.8 Print Server Terminal Window "ip addr"

For most standard/default network configurations, the ip address will be "192.168.1.#" however our office network uses "10.2.10.#" addresses ["10.2.10.18" in the example above].

- 5) Once you have the IP address recorded, type "sudo shutdown now" to shut down the server.
- 6) Use the USB cable inside the MMS to connect the cabinet to the server.
- 7) Finally, power on the server. After a minute or two it should connect automatically
- 8) Verify the MMS unit is also connected to the server and accessible remotely. Click on the MMS unit tab within the open browser window, verify the MMS unit is connected to the Print Server.

9) At this point, any computer on the same LAN as the server should be able to view the MMS and Print Server pages...

- To view the MMS page, enter the server's IP address in your web browser's URL bar followed by ":3000" ("10.2.10.18:3000" in our example)
- To view the print server page, enter the server's IP address, followed by ":3344" (ex: "10.2.10.18:3344")

NOTE - Until the MMS cabinet is initialized and connected for the first time, you will see a "empty" page. If you see this page, wait a few minutes then refresh the page (after initialization, the mms cabinet display should indicate a requested change).

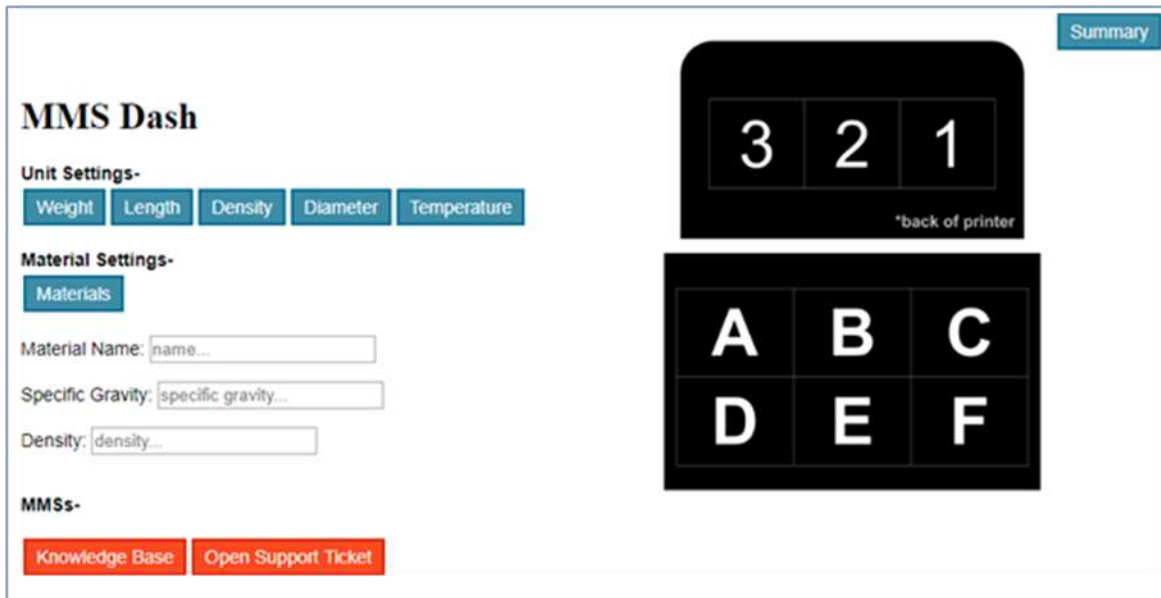


Figure 5.16.9 MMS Dash "Empty Page"

After the first connection, the server will track the cabinet state, so last known data will always be displayed; unless the MMS unit is deleted from the software by the user. The server will flag any disconnected (or non-functioning) MMS units after 90 seconds without communication (or on page refresh).

5.16.5 Zero the Cabinet

Upon initial installation, and any time the cabinet firmware is updated, the MMS will need to be zeroed.

- 1) Place all the reel holders on the arms (need to be included in the tare weight); then, on the touch screen, click the **Sys** button (figure 5); then "Zero all channels." Confirm and save the operation.



Figure 5.16.10 MMS Unit Main and "Sys" Menu Displays

- 2) Afterwards, all the displayed weight values on the touch. The screen should be very near the "negative empty reel weight" specified by the server (the default empty reel weight for a 2Kg reel is 0.960Kg; when an appropriate empty reel is installed, the value should be near zero).

5.16.6 Calibrate the Cabinet

After zeroing the cabinet, the cabinet must be calibrated.

- 1) Place a full spool of material on a known good scale (+/- ~10 to 50 grams; most shipping scales work fine) and record the value, this will be your calibration mass/reference.
- 2) Next go to the MMS touchscreen and select **Sys** on the MMS cabinets system menu, then "Calibrate all Channels" (each spool holder is a channel).



Figure 5.16.11 MMS Unit "Sys" Menu Display

- 3) You will be prompted to enter a mass in grams to use for calibration, use the weight in grams of the spool you weighed. You will then be prompted to place the calibration spool on one channel (scale) at a time for measurement.
- 4) Let the channel reading settle (should take 5-10 seconds), then press "**Commit**" to save the calibration for each channel until all channels have been calibrated.
- 5) Select "**Resume**" and "**Confirm Save**" to save the calibration.
- 6) After calibrating, remove the calibration weight (spool) and zero the cabinet again.
- 7) You can now load materials on to the arms. The MMS server data base comes with a standard list of materials and spool sizes already loaded.

5.16.7 MMS PTFE Tube Material Handling Installation

This tube kit completes the airtight passage of filament from the MMS to the print chamber, and makes the feeding and management of materials faster, easier and more convenient. The kit consists of 6 PTFE tubes, 3 upgraded bodies for the out-of-filament sensors, 3 tube plugs, and tube management magnets for the tube/filaments not fed to the printer.

- 1) Assemble PTFE tube material handling kit contents (some parts shipped in Print Server Box)



Figure 5.16.12 MMS PTFE Tube Material Handling Kit Contents

- 2) Unload filament feeders (Using the Filament Unload function from the front control panel). Power down the printer and allow extruders to cool.

CAUTION – If you don't power down the printer before unplugging the filament feeder control cable connectors, a printer error (preventing operation) may be displayed on printer start-up.

- 3) Remove the access panel to the front of the printer, as necessary to provide access to the extruders/print heads.

- 4) Remove the PTFE tubing from the print head tube adapter by holding down on the release collar with the special wrench that came with your printer or a 7mm open ended wrench, then push the pipe down then up to remove.

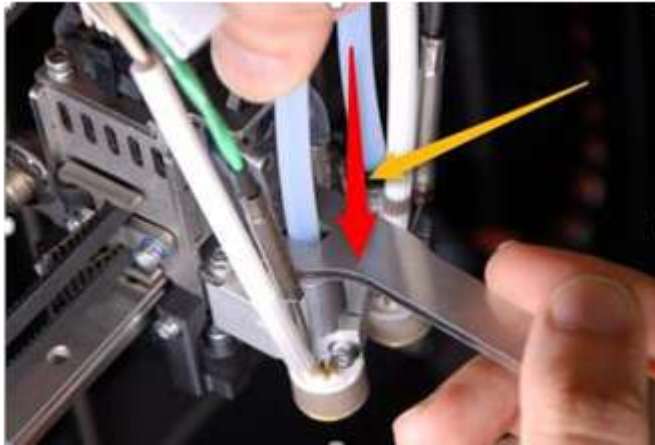


Figure 5.16.13 Remove PTFE Tubing from print head tube adapter

- 5) Remove the feeders from the printer by unplugging the out-of-filament sensor wires and stepper motor plug from the feeder unit itself.

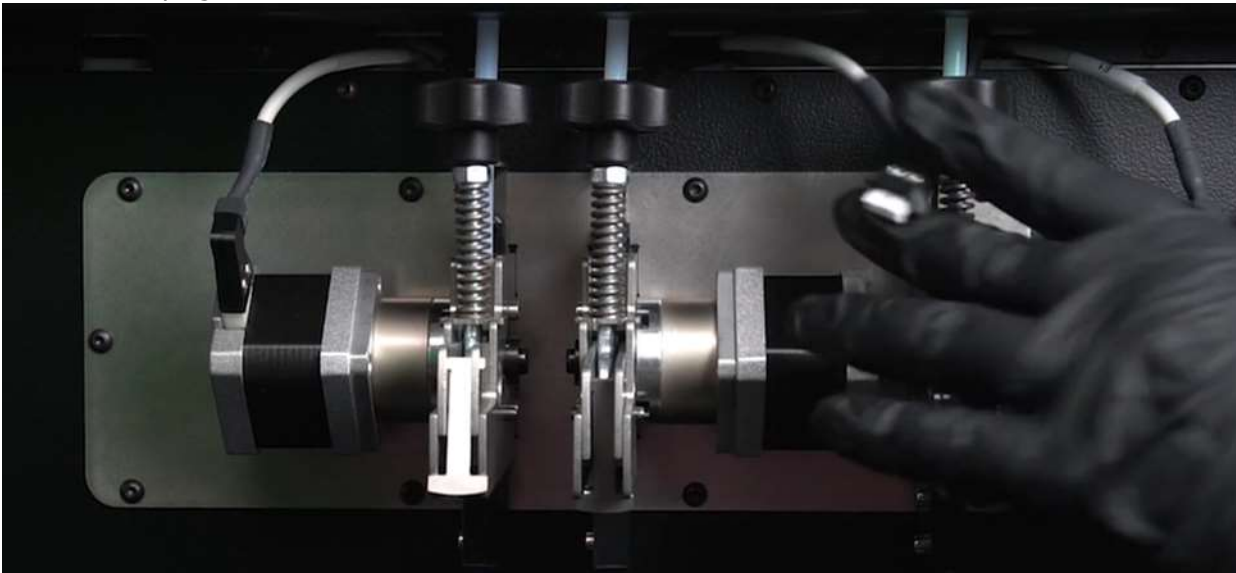


Figure 5.16.14 Feeder Stepper Motor Unplugged

- 6) Unlock the feeder unit and lift it from its mounting slots while pulling the Bowden (PTFE) tube free. Note the locked (vertical) and unlocked (flipped to the left) positions of the feeder lock mechanism as shown.



Figure 5.16.15 Feeder Unit Unlocked



Figure 5.16.16 Feeder Unit Locked

- 7) Remove out-of-filament sensor by unlatching from the top, then pulling down and out as shown below.

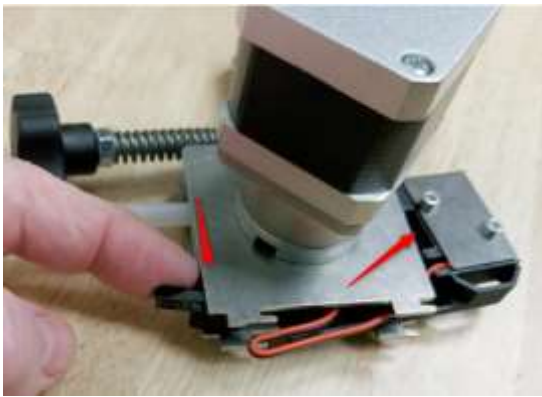


Figure 5.16.17 Unlatching OOF from Filament Feeder



Figure 5.16.18 OOF Removed from Filament Feeder

- 8) If your sensor bodies do not have a B or C as shown below in figure 14, please install spacers as shown. Parts B or C do not require the spacers.



Figure 5.16.19 Spacer Installation (Only if No B/C on Sensor Body)

- 9) Carefully remove roller and microswitch from old sensor body and move to new sensor body.

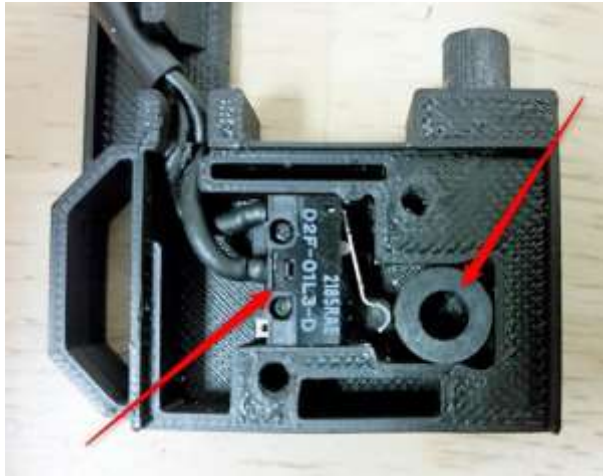


Figure 5.16.20 Roller & Microswitch on old sensor body

- 10) Repeat the entire process for each of the other extruders, filament feeders, and OOF sensors (Steps 4-8 Above).
- 11) Reinstall printer front access cover (if removed)
- 12) Reinstall filament feeders to printer, plug in feeder control cable connectors, plug in OOF sensor cable connectors.
- 13) Install PTFE tubes into MMS Unit. Remove flexible collar and loosen nut slightly if needed to insert tubes through water-tight cord grip/strain relief. Insert 2-3" into MMS, leave nut loose enough to push and pull tube as needed for material loading and tube connection to OOF sensor body.



Figure 5.16.21 PTFE Tube Connection to MMS Unit

- 14) Install PTFE Tubes into Filament Feeders

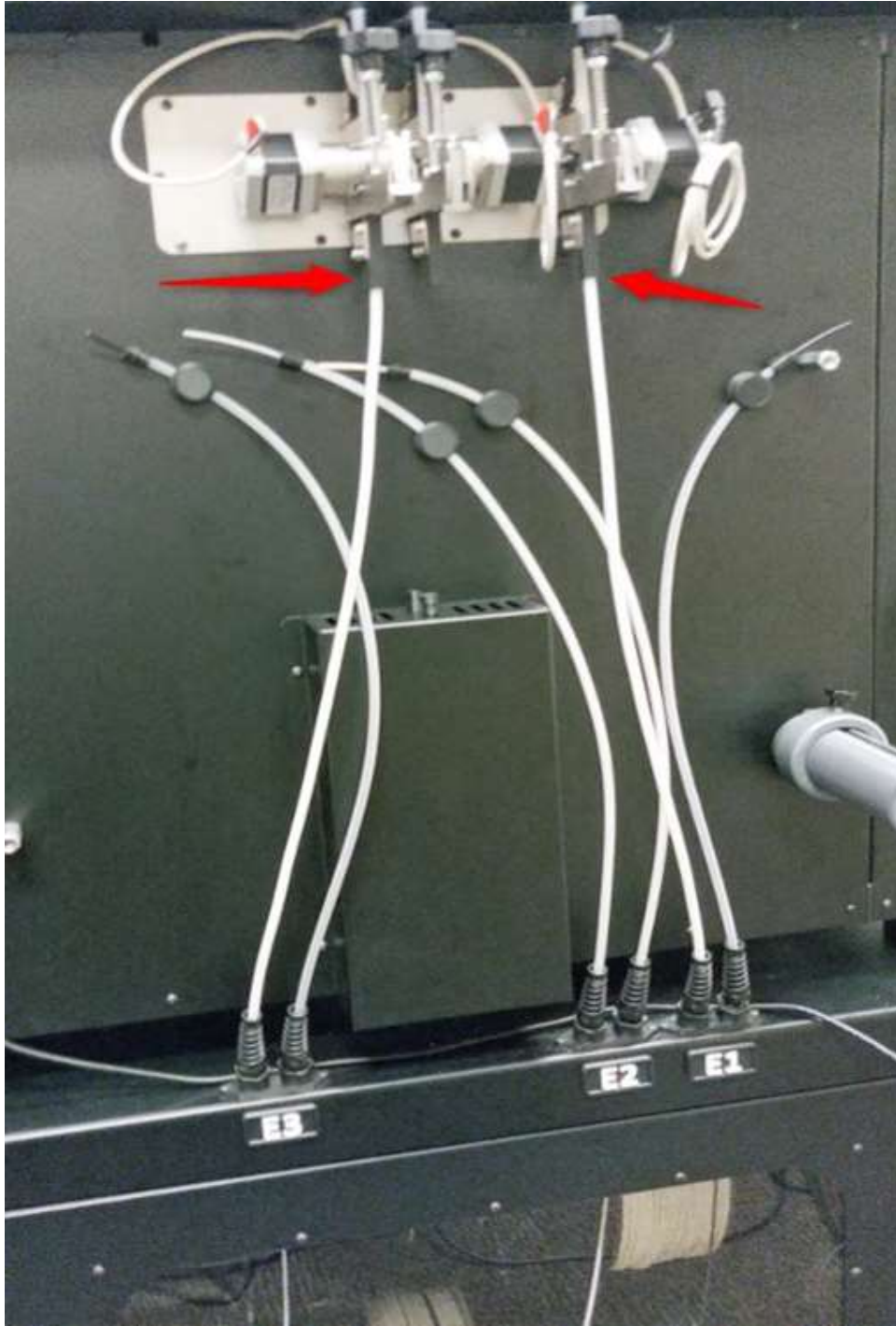


Figure 5.16.22 PTFE Tube Connection to Printer Feeder Unit

15) Secure unfed tubes and filament with tube holder magnets and TPU tube plugs.

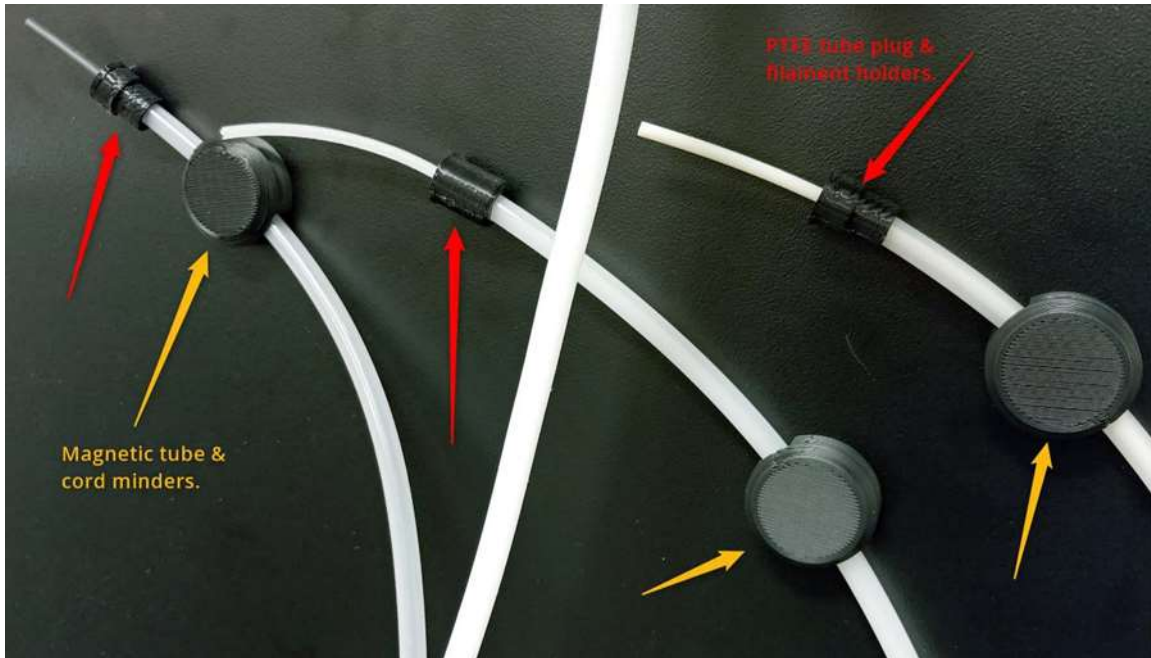


Figure 5.16.23 PTFE Tubes, Magnetic Holders, and Tube Plugs

- 16) Load desired filaments and cap unused ones with the included tube plugs that complete the seal and help keep filament from slipping back inside the MMS when not fed.

5.16.8 Install the Desiccant in the MMS

NOTE - Please complete all connections, install the server, zero the cabinet and load materials before opening and installing the desiccant cylinder.

Carefully cut the tape and remove the packaging for the desiccant cylinders.



Figure 5.16.24 Removing Desiccant Cylinder Packaging

Hang the desiccant cylinder tray inside the front door on the front of the scale structure as shown.



Figure 5.16.25 Desiccant Cylinder Placed in MMS Unit

| Printer & MMS Guide Navigational Links | | | | | |
|--|--|----------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| Complete List of Procedure/Work Instructions | | | | | |
| Printer Orientation | Initial Printer Installation, Set-Up & Calibration | Before you Print | Everyday Procedures | Maintain Printer/MMS | Calibrate Printer |

6 Operate the Printer Manually Using LCD/Front Panel Controls

In this section, you will learn more about using the front panel controls and operate the printer manually, performing some common printer preparatory functions. You will learn about controlling the printer and seeing printer status during printing communicated via the LCD display.

CAUTION – Manual operation of the printer can result in rapid movements of printer bed and extruders. Do not reach inside the printer while printing or while operating the printer manually. Close all access doors prior to printing.

6.1 LCD Display and Control Menus Overview

6.1.1 LCD Display – Idle Machine Menu

When the machine is not printing, clicking the black jog wheel button will display the Idle machine menu. Scroll the jog wheel to the desired selection, then press the black button to go to the indicated menu.

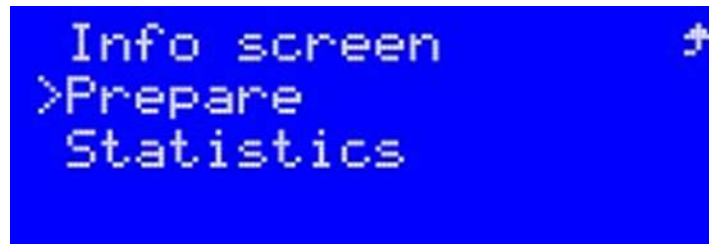


Figure 6.1.1 Printer LCD Display Idle Machine Menu

6.1.2 LCD Display – Information Screen

During printing or when executing some automated functions, the LCD will display the information screen to relay information to the operator regarding printer status. The figure below is the information display that is shown during printing.

- The first row displays ACTUAL (measured) temperatures for Extruders #1,#2,#3, Heated Chamber, and Heated Bed.
- The second row displays the TARGET (set point) temperatures for Extruders #1,#2,#3, Heated Chamber, and Heated Bed.
- The third row displays (from left to right) the current Z level of the printing plate (Z quote – distance between nozzle and plate), SPFU presence (if installed), filament sensor enabled (F), filament sensor triggered (\$), and elapsed print time of current print.
- The fourth row is the status line – shows various messages

| | EXT 1 | EXT 2 | EXT 3 | HC | HB |
|-----------------------|-------|-------|-------|-----|------|
| ACT | 240↓ | 120↓ | 120↓ | 60□ | 110% |
| SET | 240 | 120 | 120↓ | 60 | 110 |
| Z000.8 SPF F\$ 123:05 | | | | | |
| A4v3 E3 HME ready | | | | | |

Figure 6.1.2 Printer LCD Display Information Screen Detail

6.1.3 LCD Display – Prepare Menu

Most common functions necessary for printer manual control, preparation, calibration, filament change, and printing are available from the Prepare Menu. Some of the selections within the Prepare menu include automated functions.

```

Main
>Change filament
Purge filament
Unload filament

```

```

Nozzle cleaning
Preheat Bed
Preheat chamber
>Cooldown

```

```

Auto home
Move axis
Disable steppers
>Software tools

```

```

Move axis
Disable steppers
Software tools
>Hardware

```

Figure 6.1.3 Printer LCD Display: Prepare Menu Selections

6.2 Move Axis Function

The Move Z axis function allows the printer bed to be moved up or down manually in fixed increments. The Move X,Y axis functions translate the extruders over the printer bed manually in fixed increments.

CAUTION – Only initiate the Move axis function when there is enough clearance between the printer and anything (such as printed parts) on the printer surface plate. Impact of the extruders, internal printer components, and anything on the printer surface plate can result in loss or printer damage.

- 1) Press the black button once to enter the main printer menu (from the information screen)
- 2) Turn the jog wheel until the selector arrow points to Prepare. Press the black button to select.



Figure 6.2.1 LCD Displaying Main Menu

- 3) Turn the jog wheel until the selector arrow points to Move axis. Press the black button to select.



Figure 6.2.2 Selecting Move Axis from Prepare Menu

- 4) At this time, you must decide the distance to move. Turn the jog wheel till the arrow points to either 10 mm, 1mm, or 0.1 mm and press the black button to select the indicated movement distance. In this example we will select to move 10 mm per jog wheel click/index.

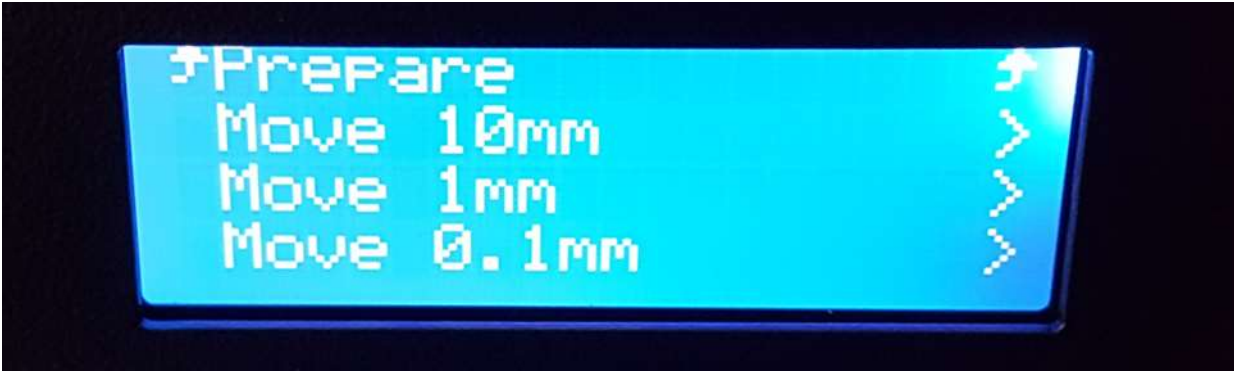


Figure 6.2.3 Selecting Step Size from Move Axis Menu



Figure 6.2.4 Selecting Move 10 mm Step

- 5) Next you must select which axis to move. For this example, we will move the Z axis. Turn the jog until the selector arrow points to Move Z. Press the black button to select.
CAUTION – After selecting Move X,Y, or Z, turning the jog wheel (each click/index) moves the selected axis (X, Y, or Z) the selected movement amount (10mm, 1mm, or 0.1 mm). Each move of the jog wheel buffers a movement and can stack up for an unexpected large movement. Until familiar with the machine response, it's best to jog the wheel a little, then observe the movement completion, the jog the wheel again until reaching your target position.

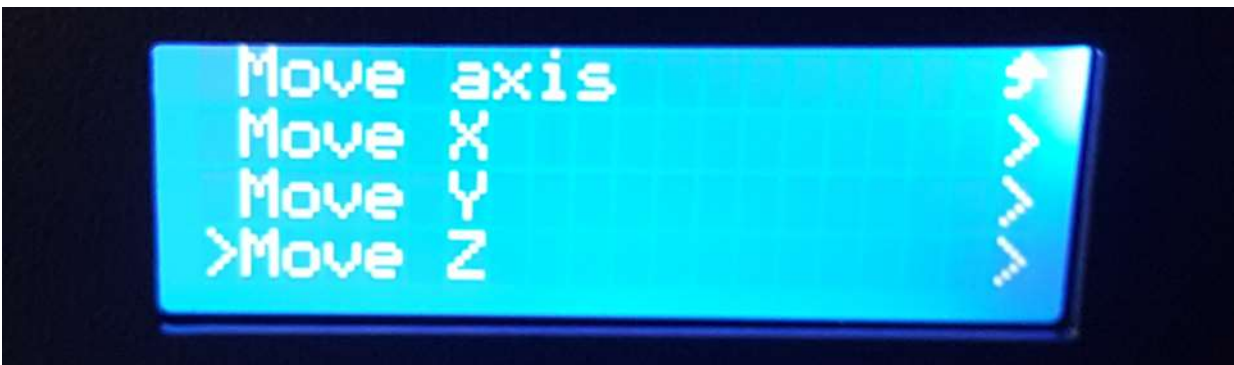


Figure 6.2.5 Selecting to Move Z Axis on LCD Display

- 6) At this point, jogging the wheel will move the selected axis. Turning the jog wheel clockwise moves in the positive direction, turning the jog wheel counter-clockwise moves the axis in the

negative direction. Start by jogging the wheel a click or two and observing the movement. Depending on the selected movement distance, several clicks or even several full turns may be required to move the axis a desired direction. Any movement overshoot can be corrected by turning the other way. The total movement amount (from starting position) is indicated on the LCD.

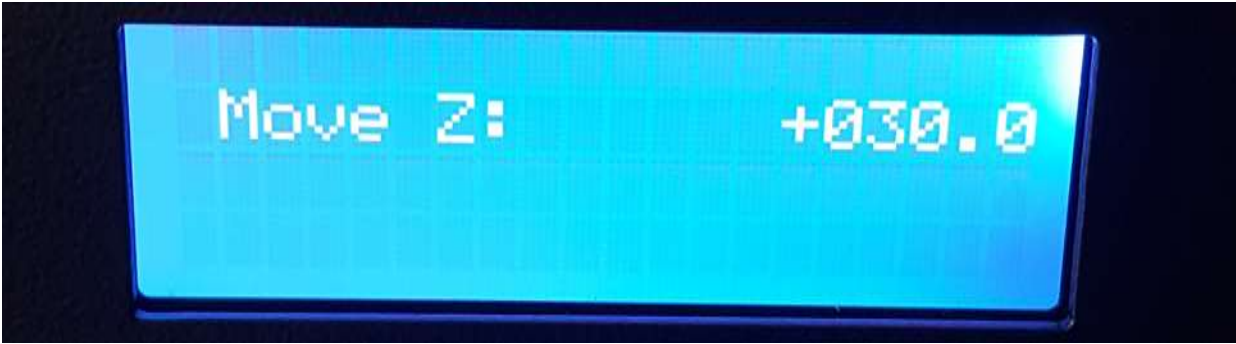


Figure 6.2.6 LCD Display Showing Move Axis result

- 7) When finished, press the black button to exit live axis movement and restore menu navigation function to the jog wheel.
- 8) Turn the jog wheel counterclockwise until the selector points to Return up arrow, then press the black button to exit the axis selection menu. Continue to navigate back to the Prepare Menu or other desired menus using the jog wheel and black button.

6.3 Auto Home Function

The auto home function returns the printer bed and nozzles to the home position. It also uses a sensor to re-establish the Z position of the top of the printer surface plate. The home Z sensor is mounted on an armature on the right side of the printer. When auto home is activated, this sensor rotates out over the print plate, then rotates back once the operation is completed.

CAUTION – Only initiate the auto home function when the printer surface plate is empty and is properly locked into place with the magnetic mounts. Use of auto home with anything on the printer plate or without the printer surface plate properly installed can result in bad prints, damage to parts, extruder, home sensor and armature.

- 1) Press the black button once to enter the main printer menu (from the information screen)

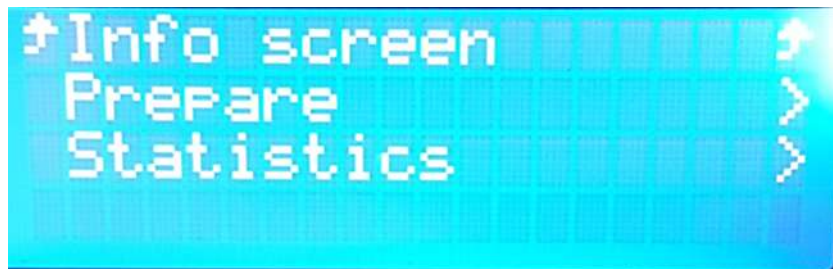


Figure 6.3.1 LCD Showing Main Menu

- 2) Turn the jog wheel until the selector arrow points to Prepare. Press the black button to enter the Prepare menu.
- 3) Turn the jog wheel until the selector arrow points to Auto home.



Figure 6.3.2 Selecting Auto Home Function

- 4) Press the black button and watch the printer return the X,Y,Z axis to their original position.
- 5) Once the Auto home function is complete, you will be returned to the printer information screen.



Figure 6.3.3 LCD Showing Info Screen

6.4 Disable Steppers

Select this command to power off all motors and allow you to move the extruder holder in XY directions by hand. Note – Z axis cannot be moved by hand – use the LCD move axis function instead.



Figure 6.4.1 Disable Steppers Selection

CAUTION – Only use this function in special circumstances. Fast manual movements may damage the electronics.

7 Everyday Printer Operational Procedures

This section contains the procedures and detailed instructions for common, everyday printer operations. Following these procedures carefully can prevent bad prints and printer problems – Please follow them carefully for best print results and printer life.

7.1 Power on the Printer and MMS Unit (If applicable)

If an MMS unit is used with the 3ntr printer, then the MMS unit must be powered ON before the printer.

7.1.1 Power on the MMS Unit (If applicable)

Turn ON the MMS unit power switch.

NOTE – The MMS power switch should not be used to shut down the server. Turn OFF the MMS Server using the “sudo shutdown now” and turn OFF the Printer using the Printer’s power rocker switch or emergency stop button before turning OFF the MMS unit or disconnecting MMS power. The MMS touch screen is powered by the MMS server.

7.1.2 Power on the Printer

- 1) Press the printer red power switch IN
- 2) Verify the printer is plugged in. If applicable, verify the MMS unit is plugged in and powered ON. Check the printer back panel power switch (next to the plug) is turned ON as shown.



Figure 7.1.1 Printer power plug and switch

- 3) Pull the printer red front panel power switch OUT, with a turn clockwise to turn power on the printer. You should see the LCD panel light up blue and display printer information.



Figure 7.1.2 LCD Display with Power ON

- 4) If there is movement within the printer, immediately press the red printer front panel power switch IN to power OFF the printer, then wait 5-10 seconds, then pull and twist clockwise to power the printer ON again.
- 5) Your printer is powered ON and ready.

7.1.3 Power OFF Sequence (Print Server/MMS/Printer)

The MMS power switch should not be used to shut down the server.

- 1) Turn OFF the MMS Server using the "sudo shutdown now"
- 2) Turn OFF the Printer using the Printer's power rocker switch or emergency stop button
- 3) Turn OFF the MMS unit or disconnect MMS power.

NOTE - The MMS touch screen is powered by the MMS server.

7.2 Remove Parts from Printer

This section details the process to remove parts from the printer bed plate after printing.

CAUTION – Failure to carefully remove parts in accordance with this process can result in damage to the printer bed plate and/or damage to printed parts.

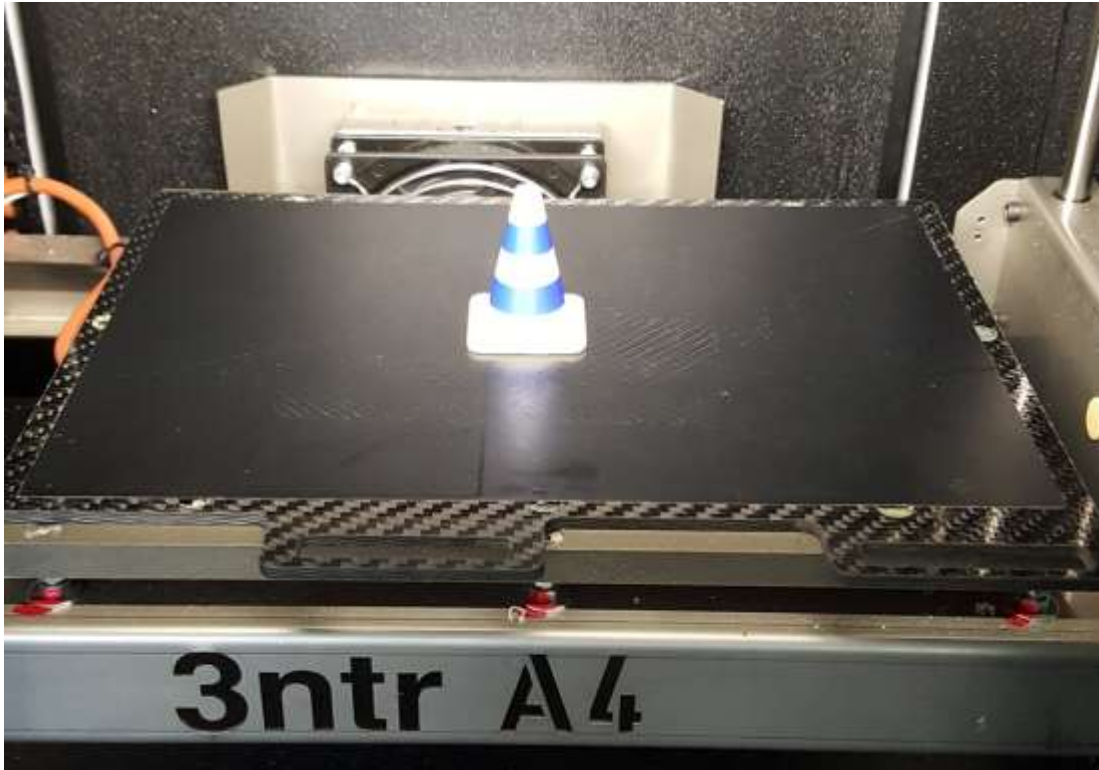


Figure 7.1 Printed Part (Cone) on Printer

- 1) Remove the Print Surface Plate. Grab the handles of the removable, carbon fiber finished print surface plate and pull horizontally toward you. A slight upward force will overcome the magnetic force holding the print plate in place.
- 2) Place the printer surface plate on a clean table.



Figure 7.2 Part on printer plate - partially removed from printer

- 3) Remove the sample cone from the print plate. Often it can be just pried up and off the print surface by hand (when cool). Otherwise remove it by prying it upward using the supplied scraper to break the raft free, then remove the cone.



Figure 7.3 Printed Part (Cone) and supplied scraper tool

- 4) Check and Clean the Printer Tray. Remove any remaining print filament. Wipe down with acetone or approved cleaner as required.

- 5) Replace the Printer Tray. Replace the printer bed into the printer with the reverse process used to remove it. Ensure it locks in place with the magnetic mounts.



Figure 7.4 Printer surface plate re-installed in printer

- 6) Close the printer access door.

7.3 Load Filament/Materials

In this section, you will load filament to the back of the 3ntr printer or into the MMS Unit.

NOTE – If only unloading filaments/materials from an extruder that will be left empty, you can select the “Unload filament” function instead, then subsequently perform a “Purge filament” function from the LCD Prepare Menu.

CAUTION – If necessary, review the datasheet or materials profiles within KISSlicer to determine acceptable filament types. If you are changing the polymer type, you must perform a nozzle cleaning procedure before starting a change filament procedure.

7.3.1 Load Filament to Back of Printer

This section details the process to load filament onto the back of the printer.

NOTE – If you are using an MMS unit or Humidity Controlled Container (humidity-controlled container) the process is different. If feeding material directly from a Humidity Controlled Container or equivalent container, follow the instructions as applicable (new filament spool is not mounted on printer). With an MMS unit, follow the applicable portions of the instructions below.

- 1) Check that there is enough clearance (20-30mm) between nozzle and plate before starting. If not, move printer plate following instructions for “Move Z axis function”

- 2) Navigate to the Prepare menu. From the Prepare menu select either the "Change filament" (if filament was previously loaded) or "Load filament" (if empty) function.

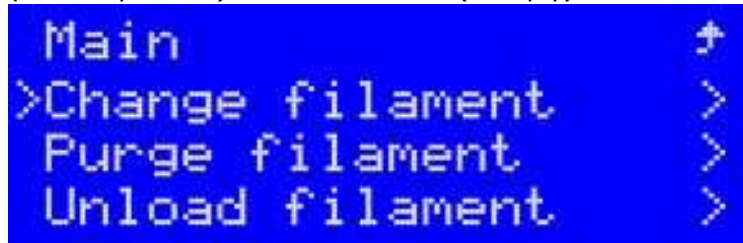


Figure 7.3.1 Selecting Function Change Filament

- 3) Assuming filament has been previously loaded, Select Change Filament "Extruder #1"

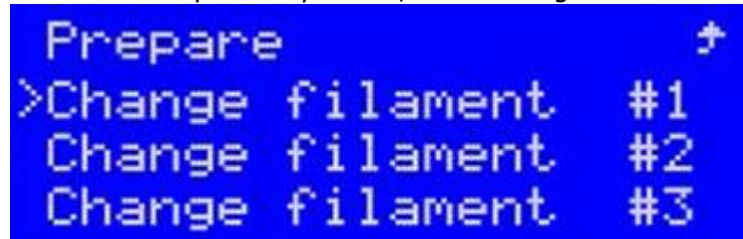


Figure 7.3.2 Selecting Extruder # for Change Filament

- 4) The selected extruder will begin heating up and the LCD will display Heating... Observe the temperature readout for the selected extruder and see it increasing.

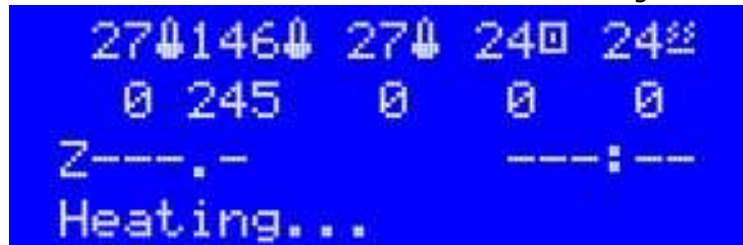


Figure 7.3.3 Confirming Selected Nozzle Temperature is Increasing

- 5) Once the set temperature is reached, the machine will purge some filament. Once this automatic purging is completed, the display will indicate "Change Filament Now". At this time, you can now reach to the back of the cabinet to begin the physical filament change.



Figure 7.3.4 Heating/Purging Completed -Ready for Physical Filament Change

- 6) Locate the feeder handle on the selected extruder. Grab the feeder handle of the selected extruder, push it down and secure it into position with the provided lock "lip" This way the feeder mechanism will be disengaged. Looking at the feeders from the rear of the printer, the rightmost is the #1 feeder, and leftmost is #3.

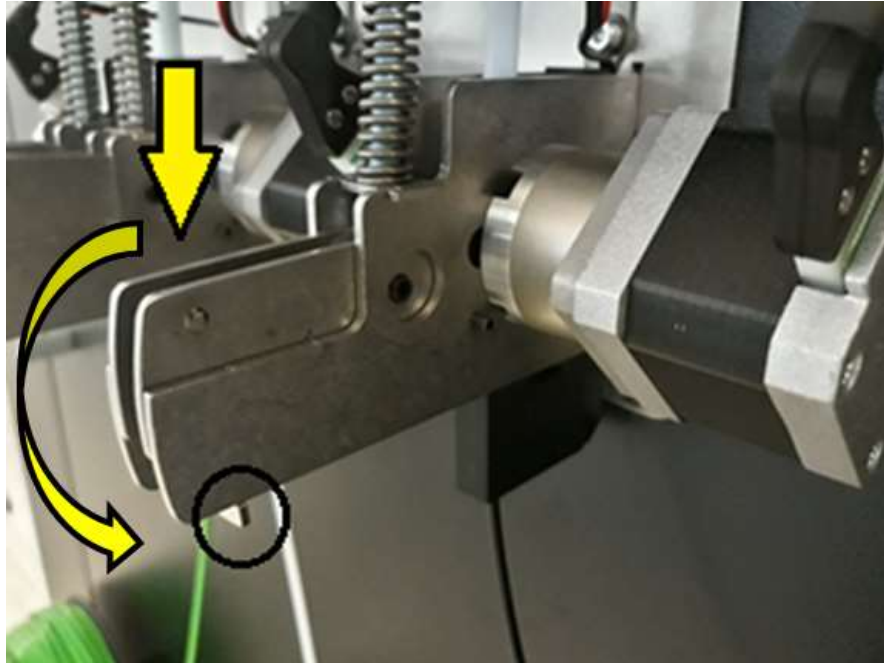


Figure 7.3.5 Disengage filament feeder

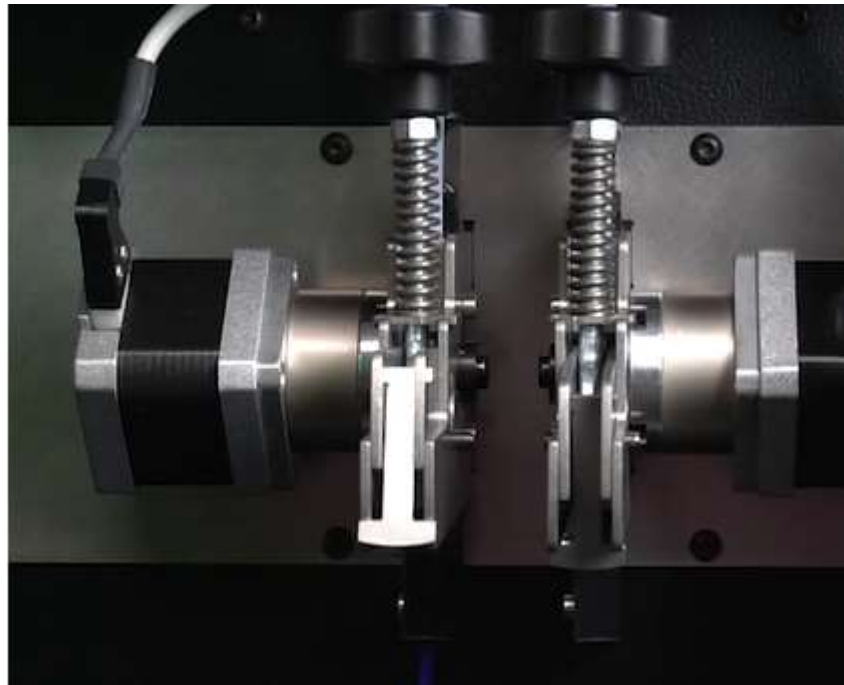


Figure 7.3.6 Latched & Unlatched Filament Feeders

- 7) Pull the filament from the feeder, rewinding the filament onto the spool.



Figure 7.3.7 Pulling old filament out of feeder unit

- 8) Thread the end through the opening on the spool to keep it from de-coiling.



Figure 7.3.8 Secure filament end to spool

- 9) Unlock and remove collar from filament spool spindle of selected extruder on back of printer. Remove filament spool and place in a dry and clean container (with desiccant package) away from heat and sunlight.



Figure 7.3.9 Securing Filament Spool with collar

10) Fit the new spool on the holder. Replace the locking collar and secure it to prevent de-coiling.



Figure 7.3.10 Install and secure a new filament spool

11) Remove the filament end from where secured to the spool. Trim off several mm to remove bends, dirt, tape, or damage.



Figure 7.3.11 Trim off the end of new filament

- 12) Use scissors, knife, or a pencil sharpener to point the filament end for easy feeding to the extruder.



Figure 7.3.12 Illustration of correct and incorrect filament tip sharpening

- 13) Feed the filament into the feeder unit and keep feeding until the end stops at the extruder. Release the feeder handle. Verify the locking "tab" is disengaged.

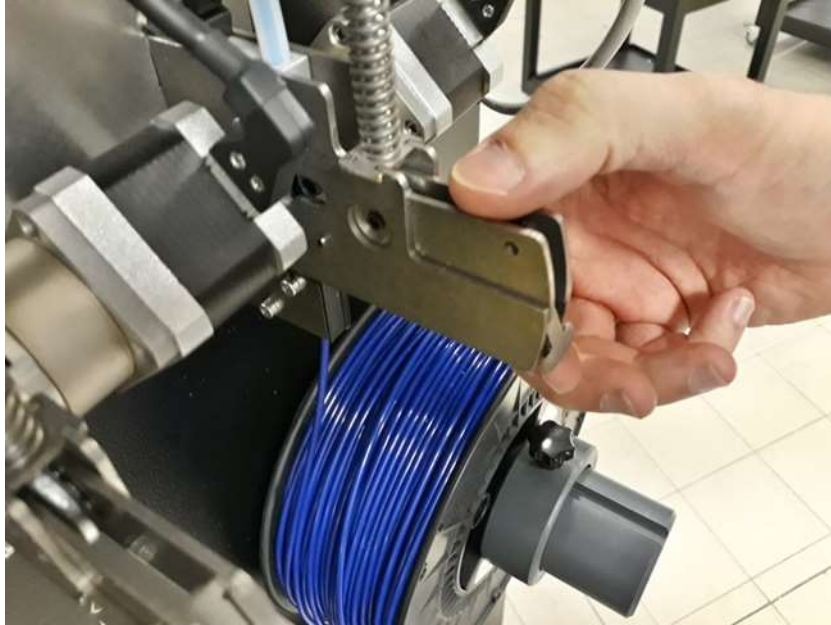


Figure 7.3.13 Engage the filament feeder

14) The locking tab is now engaged. The machine will automatically control the filament feed.

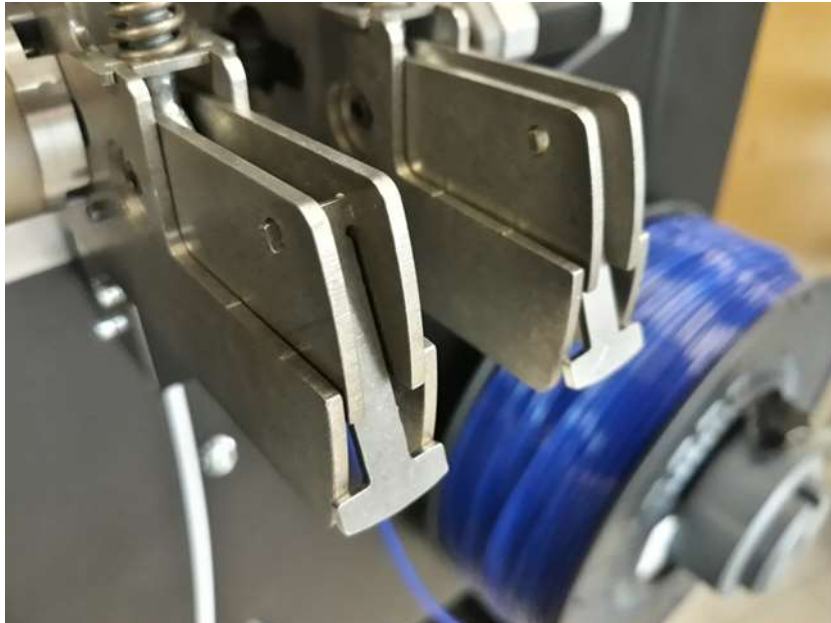


Figure 7.3.14 Filament feeder in the engaged position

15) Press the button on the jog wheel. The LCD will display "Priming #" as it purges some filament. Upon completion, the LCD will display "Change #x Complete" to indicate completion.

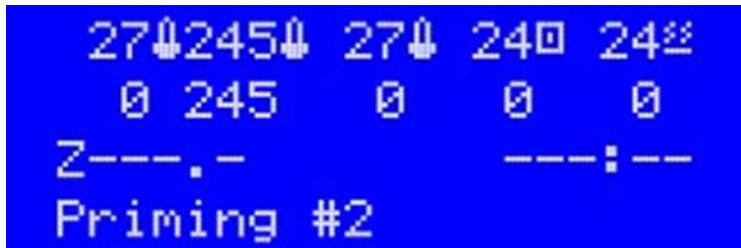


Figure 7.3.15 LCD Display while new filament is priming (A2 Printer Only)

- 16) Repeat for remaining desired filament materials/extruders.
- 17) Clean any residual element remaining. Clean the printing tray area.
- 18) Machine is now ready!

7.3.2 Loading Filament/Material into the MMS Unit

Loading Filament/Material to the MMS Unit differs only a little from the process of loading material to the back of the Printer detailed in the section: Load Filament/Materials. Please follow the instructions from that section, making the following adjustments for the MMS Unit.

Key differences are highlighted here:

- Filament spools are located within the MMS instead of the back of the printer
- The MMS spool holders (loose pieces/not attached) are threaded through filament spools and secured with a locking pin.

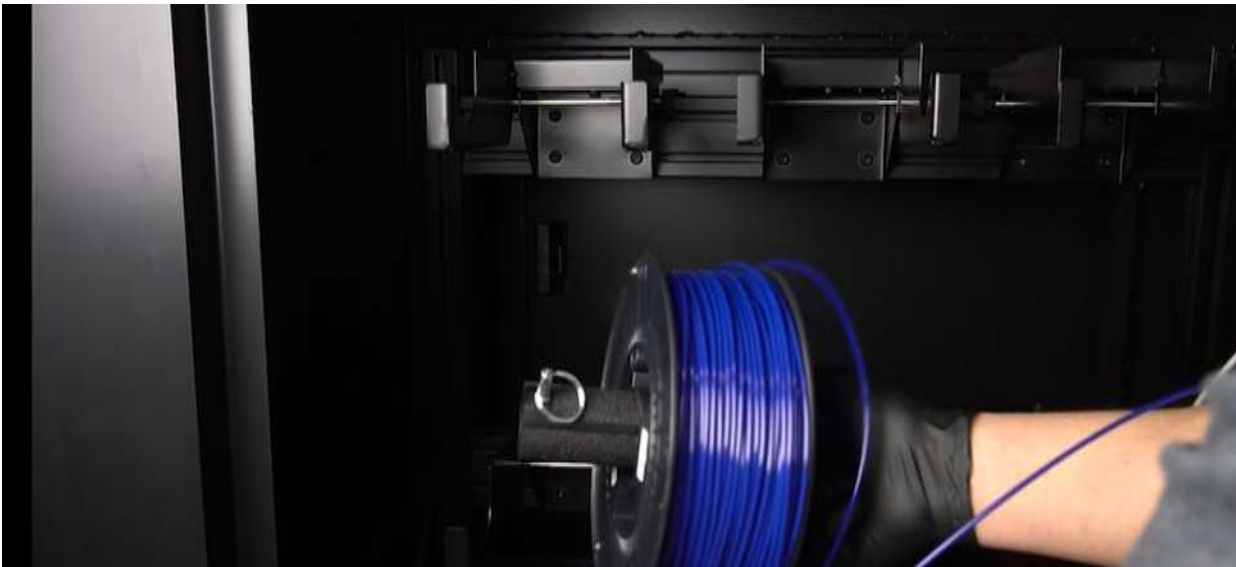


Figure 7.3.16 Placing Filament Spool & Holder in MMS Unit

- The spool holders rest on support arms (weigh scales) within the MMS
- The filament must be fed through the openings in the MMS and/or the PTFE tubing from MMS to the filament feeder.



Figure 7.3.17 Pulling Filament from MMS up to Feeder

- After loading materials into the MMS, make sure they are not tangled, and close the door quickly to avoid increasing the humidity inside.
- You must access the MMS Server and click the Dash button to add/select materials and set spool sizes for the actual material loaded in each extruder/storage position.

NOTE – This step is needed to ensure the materials loaded match what is viewable from the print server.

CAUTION – If you fail to update the MMS Server with the filament spool details after loading, bad prints may result because of insufficient filament or mistaken filament size/type (does not match g-code print file).

7.4 Filament Care/Storage

In this section, we will highlight basic 3D print materials care/storage instructions.

NOTE – 3D printing materials are vulnerable to humidity, temperature, and contamination, with some materials much more sensitive than others. The best way to care for and store 3D print materials is within the MMS unit. If you are using a Humidity Controlled Container or MMS unit, and the MMS unit is powered and maintained, no other steps are required. If no MMS is used, or materials are removed from the MMS after use, please follow these instructions to maintain the quality of subsequent prints.

- 1) Consult and follow the manufacturer’s recommendations for individual filament type care/storage.
- 2) Keep filaments within their sealed packaging until immediately before use.



Figure 7.4.1 Factory supplied filament in storage package

- 3) Immediately after use (or removal from MMS unit), return materials to a sealed container (plastic bag) containing a desiccant package or closed Humidity Controlled Container.



Figure 7.4.2 Humidity Controlled Storage Container with Protective Tubing

- 4) After several months of storage (after opening the new package), or if filament has been exposed to humidity, use a filament dryer to completely remove humidity before printing.

Material Information Sheet Material Drying Time Guide

Build Polymers

| Material | Drying Temperatures | Drying Time |
|--------------------------------------|----------------------|-------------|
| ABS | 60°C (140°F) | >2 Hours |
| ASA | 60°C (140°F) | >2 Hours |
| GF30-PP (Glass Filled Polypropylene) | 55°C (141°F) | >6 Hours |
| IGUS Iglidur | 60°C (140°F) | >6 Hours |
| nPOWER (PPS) | 70-110°C (158-230°F) | >12 Hours |
| Unfilled Nylons | 70°C (158°F) | >12 Hours |
| CF & GF Nylons | 80°C (176°F) | >12 Hours |
| Pattern Material SPM802C | 50°C (122°F) | >8 Hours |
| PCABS | 65°C (149°F) | >12 Hours |
| PEKK-A | 100°C (212°F) | >8 Hours |
| PLA | 40°C (104°F) | >6 Hours |
| PETG+/TECH-G | 65°C (149°F) | >6 Hours |
| Elasto85A | 50°C (122°F) | >4 Hours |
| Elasto95A | 50°C (122°F) | >4 Hours |
| Elasto75D | 50°C (122°F) | >4 Hours |

Support Polymers

| Material | Build Surface | Removal | Solvent | Compatible Materials | Heated Chamber | Dry Temp | Dry Time |
|----------|---------------|------------|------------|----------------------------|----------------|--------------|-------------|
| SSU00 | Diamond/PEI | Break Away | None | ASA, ABS, PCABS | Yes | 40°C (104°F) | >4 Hours |
| SSU01 | Diamond/PEI | Soluble | BioSolv* | ASA, ABS, PCABS | Yes | Do Not Dry! | Do Not Dry! |
| SSU04 | Diamond/PEI | Soluble/BA | Hot Water* | TPU, PETG, PACF | No/Yes | 60°C (140°F) | >4 Hours |
| SSU05 | Diamond/PEI | Break Away | None | nPOWER | Yes | 60°C (140°F) | >4 Hours |
| SU301 | Diamond/PEI | Soluble/BA | Hot Water* | TPU, PETG, Selected Nylons | No/Yes | 80°C (176°F) | >8 Hours |
| N1 | Diamond/PEI | Break Away | None | Nylo, GF-30 PP | Yes | 65°C (149°F) | >4 Hours |

*Removal optimized by the use of ultrasonic and flow/agitation cycles at 40-50°C.

Figure 7.4.3 Drying Times Table for Common Print Materials

- After mounting a new filament, if popping or crackling continues during the purge operation, remove the filament and dry before printing parts.

7.5 Purge Nozzle/Filament

In this section, you will complete a common operation performed BEFORE changing to a different material and when nozzle flow issues are observed. TRAK 3ntr printers are typically delivered without any filament installed/remaining in the extruder. Check and if there is filament in the extruder, you must perform a Purge #1 and Purge #2 operation as described in this section.

NOTE – The Change filament or Load filament functions automatically perform a purge operation after new materials is loaded using the automatic function. Additional purge cycles (as described in this section) may be required until the expelled material no longer contains material previously loaded.

CAUTION – Before purging nozzles, check to verify there is adequate clearance between the extruder and the printer surface plate. Use the Move Z axis function (instructions above) to jog down if necessary. If desired for the purged material to flow onto the printer surface plate, or to observe the flow, use the Move X and/or Move Y functions to position extruders over the desired location.

CAUTION – Before purging nozzles, verify the default purging temperature (245° C) is acceptable for the material in use, otherwise use a custom purging routine/temperature. The default setting is acceptable for the ABS/ASA materials that ship with the printer.

- 1) Begin by pressing the black button to enter the Main printer menu (from the information display). Turn the jog wheel until the selector points to the Prepare menu, then press the black button to select. Scroll down the menu until the selector points to the Purge filament menu and press the black button to select.

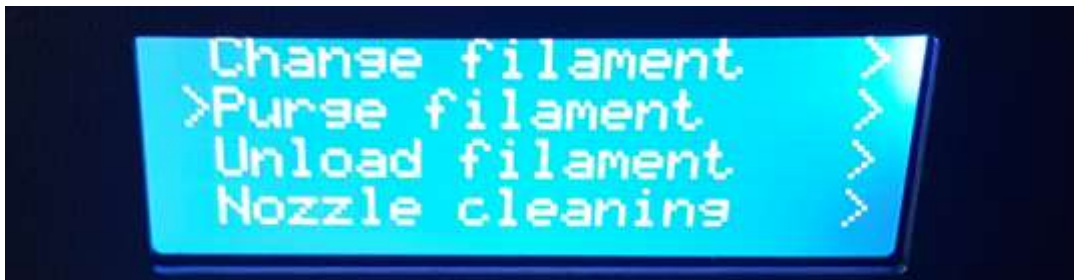


Figure 7.5.1 Selecting the Purge Function from Prepare Menu

- 2) Scroll down until the selector points to the desired extruder for purging (Purge Filament #1 in this example), then press the black button to select.



Figure 7.5.2 Selecting which Extruder to Purge

- 3) The information menu will reappear along with status information. The target temperature is displayed (245° in this example) along with the status message "Heating..." The actual temperature for the selected extruder is also displayed and should be increasing. You may hear some crackles as ambient water vapor boils off and the filament begins moving through the nozzle.



Figure 7.5.3 Info Screen While Heating Extruder

- 4) Next, when the selected extruder reaches the indicated target temperature, purging begins as indicated by 'Purging #1' status message.



Figure 7.5.4 Info Screen While Purging

- 5) Observe the flow of the purged material.

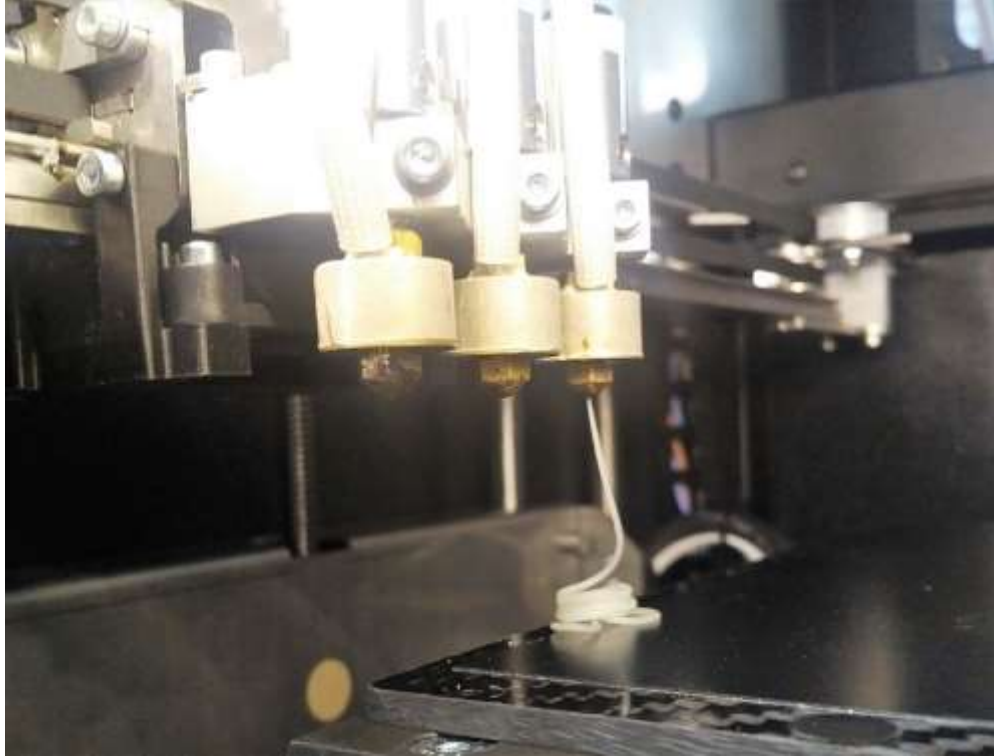


Figure 7.5.5 Extruder Purging Filament

- 6) When the purging operation is complete, the printer stops automatically and displays "Purging completed"

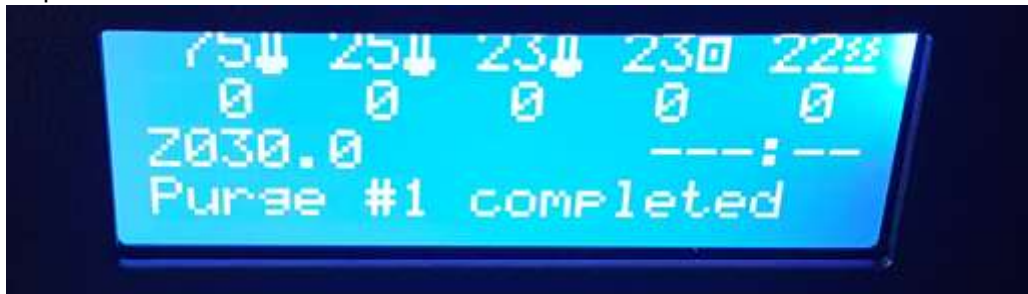


Figure 7.5.6 Info Screen Upon Purge Completion

- 7) Next, the printer returns to the info screen.
- 8) Repeat process for nozzles #2 and #3, if/as required.
- 9) Clean the purged filament and any debris from the printer. You can safely remove purged materials with either small tweezers or your hands after a brief cooling period. Standard ABS/ASA material that ships with the printer cools and solidifies rapidly.
- 10) Purging Complete.

7.6 Clean Nozzles

This section details all the steps to clean extruder nozzles. Nozzle cleaning is commonly performed when changing filaments, if undesirable flow conditions are present, or during routine printer maintenance, set-up, and/or installation activities. When required, each nozzle must be individually cleaned.

NOTE – The nozzle cleaning procedure must ALWAYS be performed BEFORE changing to a new polymer type filament. A nozzle cleaning procedure should always be performed any time there are unacceptable nozzle flow conditions that cannot be cleared with several purge cycles. Nozzle cleaning may also be required during common maintenance and print job set-up procedures such as a nozzle change, installing and SPFU, reconfiguring extruders, and more.

7.6.1 Clean Nozzle Procedure Overview:

There are three steps to cleaning nozzles;

- 1) Remove existing filament(s) using the change filament function
- 2) Feed cleaning filament (nylon) to the extruder(s)
- 3) Clean nozzle(s) using the front panel control Clean Nozzle function

CAUTION – Only load factory recommended (nylon or equivalent) filament for cleaning procedures.

NOTE – Before using the Clean Nozzle function from the front panel, you must use the Change/Load Cleaning Filament procedure to remove build/support filament and feed the nylon cleaning filament to the extruders to be cleaned.

7.6.2 Unload Filament Using Change Filament Function

In this section, you will change filament removing existing spools before installing the cleaning filament (instead of a new build/support material filament spool). It should always be performed before a nozzle cleaning procedure.

NOTE – If you are using an MMS unit or PolyBox (humidity-controlled container) the process is different. If feeding material directly from a PolyBox or equivalent container, follow the instructions as applicable

- 1) Check that there is enough clearance (20-30mm) between nozzle and plate before starting. If not, move printer plate following instructions for "Move Z axis function"
- 2) Navigate to the Prepare menu. From the Prepare menu select "Change filament"

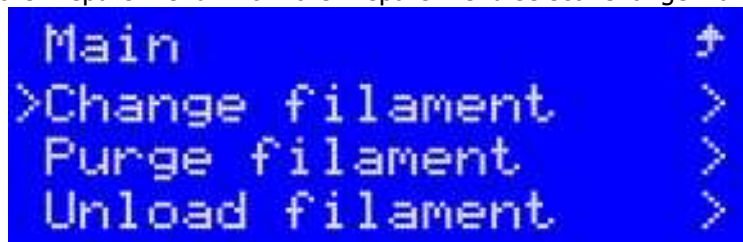


Figure 7.6.1 Selecting Change Filament from Prepare Menu

- 3) Assuming filament has been previously loaded, Select Change Filament "Extruder #1"

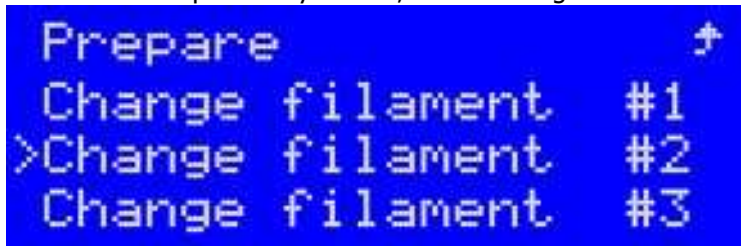


Figure 7.6.2 Selecting Extruder for Change Filament

- 4) The selected extruder will begin heating up and the LCD will display Heating... Observe the temperature readout for the selected extruder and see it increasing.

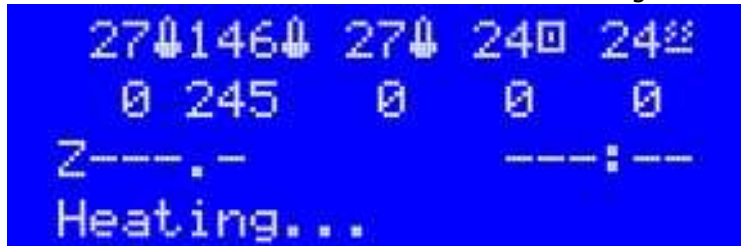


Figure 7.6.3 Info Display During Change Filament

- 5) Once the set temperature is reached, the machine will purge some filament. Once this automatic purging is completed, the display will indicate "Unload Filament Now". At this time, you can now reach to the back of the cabinet to unload the filament.

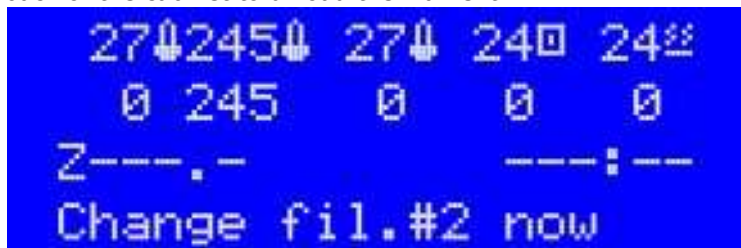


Figure 7.6.4 Printer Readiness Signal to Change Filament Spool

- 6) Locate the feeder handle on the selected extruder. Grab the feeder handle of the selected extruder, push it down and secure it into position with the provided lock "lip" This way the feeder mechanism will be disengaged. Looking at the feeders from the rear of the printer, the rightmost is the #1 feeder, and leftmost is #3.

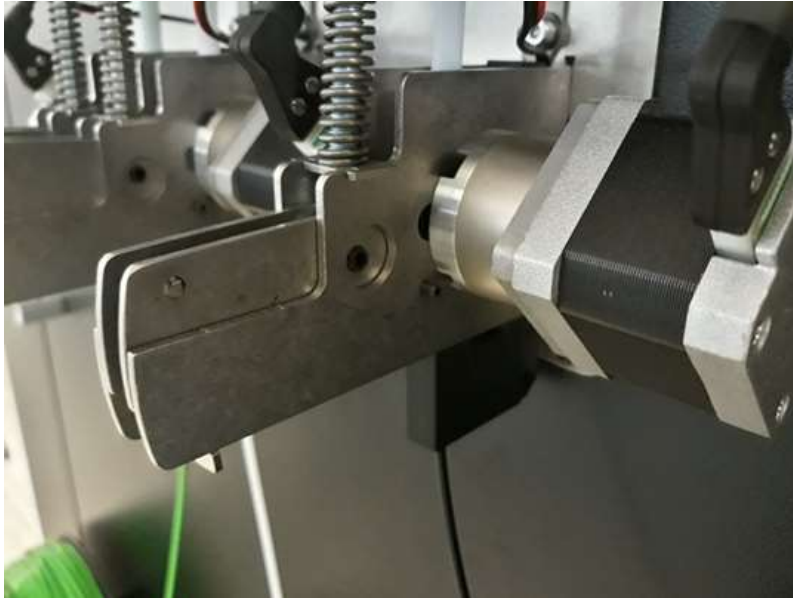


Figure 7.6.5 Disengage filament feeder

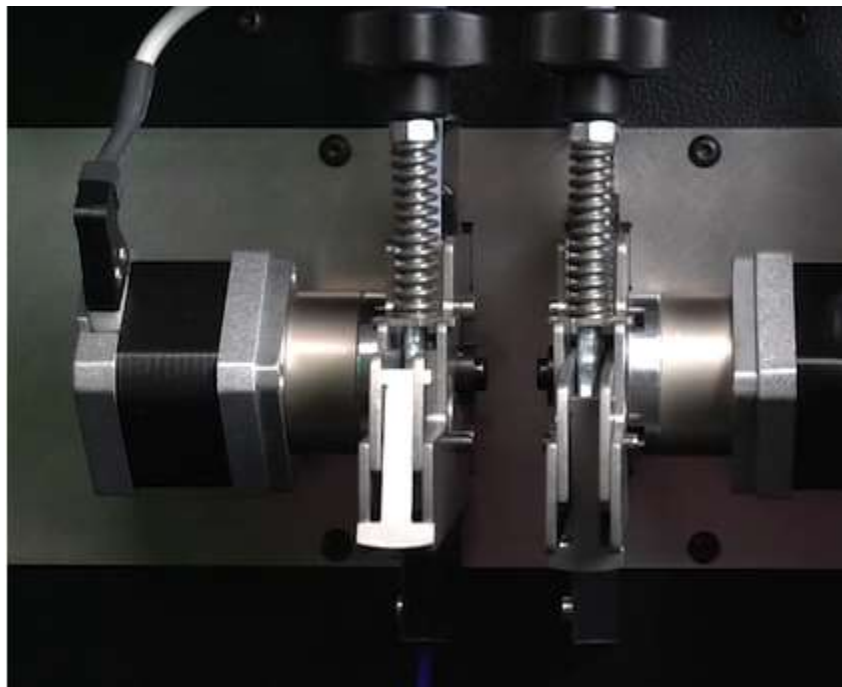


Figure 7.6.6 Latched & Unlatched Filament Feeders

- 7) Pull the filament from the feeder, rewinding the filament onto the spool.



Figure 7.6.7 Pulling old filament out of feeder unit

- 8) Thread the end through the opening on the spool to keep it from de-coiling.



Figure 7.6.8 Secure filament end to spool

- 9) Unlock and remove collar from filament spool spindle of selected extruder on back of printer. Remove filament spool and place in a dry and clean container (with desiccant package) away from heat and sunlight.

7.6.3 Load Cleaning Filament

- 1) Obtain the cleaning filament (Hollow nylon filament specially for nozzle cleaning).

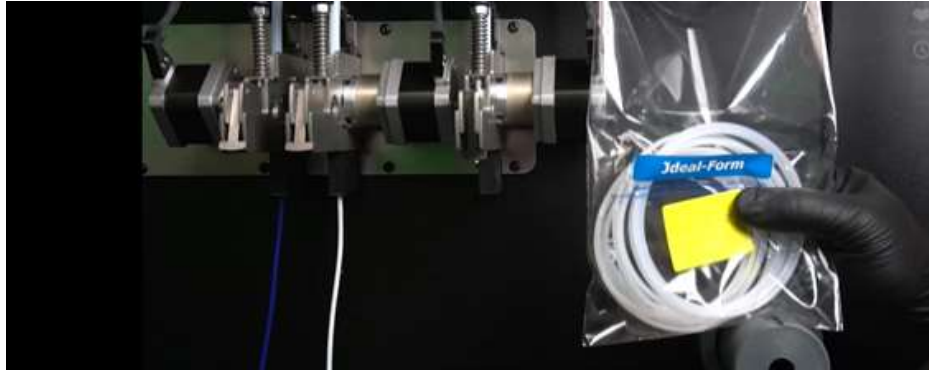


Figure 7.6.9 Nozzle Cleaning Filament (Nylon)

- 2) Trim off several mm to remove bends, dirt, tape, or damage. Straighten as needed.



Figure 7.6.10 Trim off the end of new filament

- 3) Use scissors, knife, or a pencil sharpener to point the filament end for easy feeding to the extruder.



Figure 7.6.11 Illustration of correct and incorrect filament tip sharpening

- 4) Feed the filament into the feeder unit and keep feeding until the end stops at the extruder. Release the feeder handle. Verify the locking "lip" is disengaged.

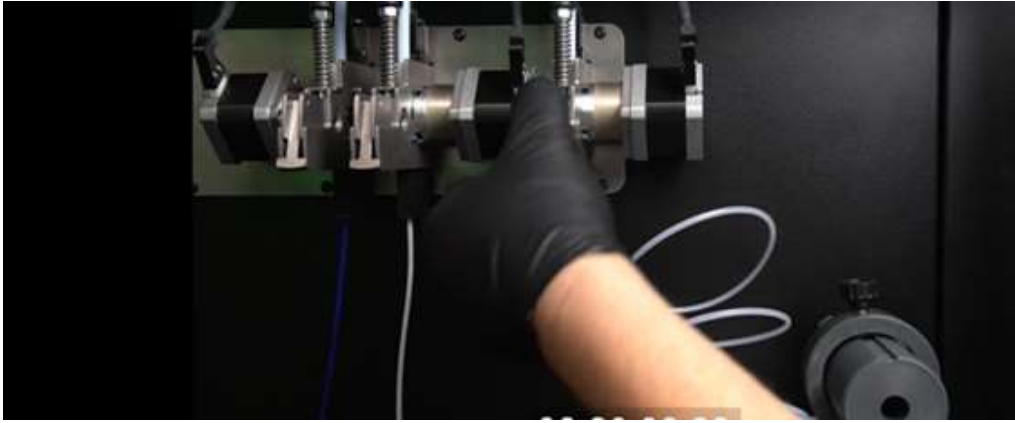


Figure 7.6.12 Engage the filament feeder

- 5) The locking lip is now engaged. The machine will automatically control the filament feed.

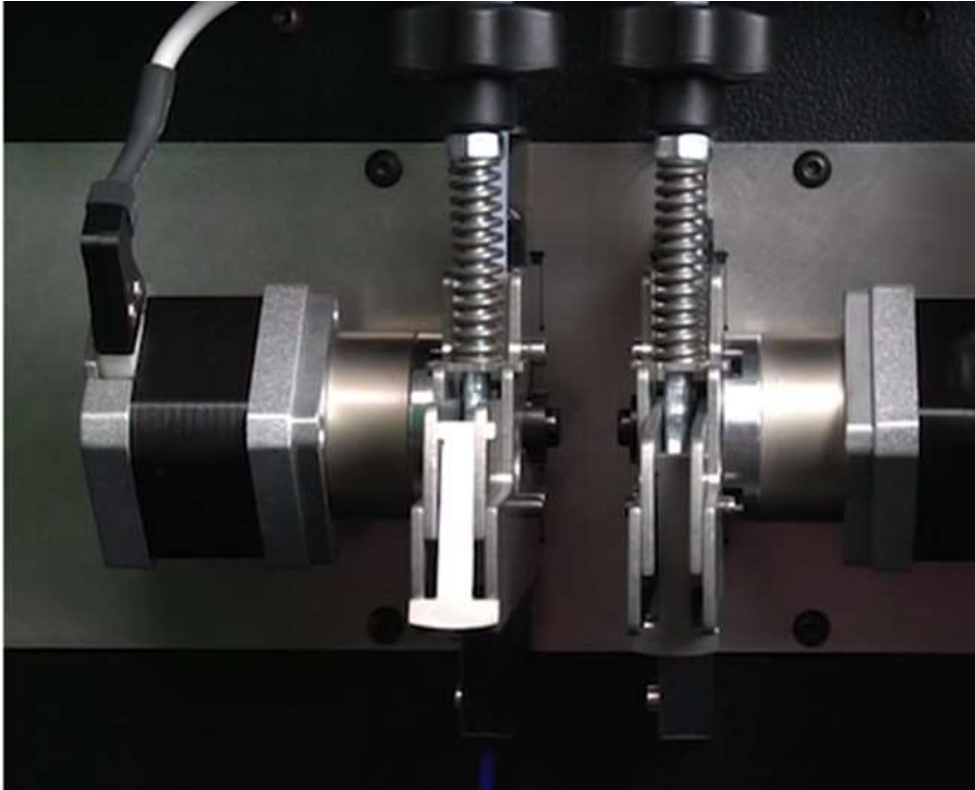


Figure 7.6.13 Latched and Unlatched Filament Feeders

- 6) Press the button on the jog wheel. The LCD will display "Priming #X" as it purges some filament. Upon completion, the LCD will display "Change #x Complete" to indicate completion.

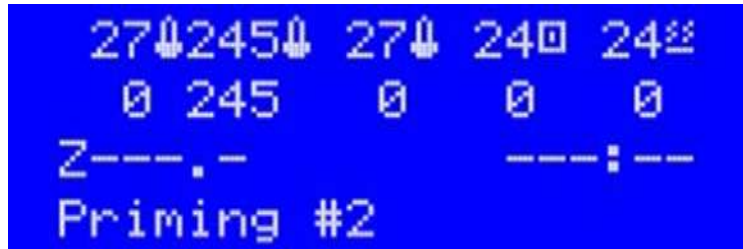


Figure 7.6.14 LCD Display while new filament is priming

- 7) Repeat filament change/load cleaning filament procedure for extruder #2 (as necessary)
- 8) Repeat filament change/load cleaning filament procedure for extruder #3 (as necessary)
- 9) Procedure complete!

7.6.4 Nozzle Cleaning (Automated Function)

This section details the nozzle cleaning procedure. The nozzle cleaning procedure must ALWAYS be performed BEFORE changing to a new polymer type filament. A nozzle cleaning procedure should always be performed any time there are unacceptable nozzle flow conditions that cannot be cleared with several purge cycles.

NOTE – Before using the Clean Nozzle function from the front panel, you must use the Change Filament procedure to remove build/support filament and feed the nylon cleaning filament to the extruders to be cleaned.

- 1) Use CHANGE FILAMENT/Load Cleaning Filament procedure (see appropriate guide section for instructions) to remove filament in use and to load cleaner filament to the machine.

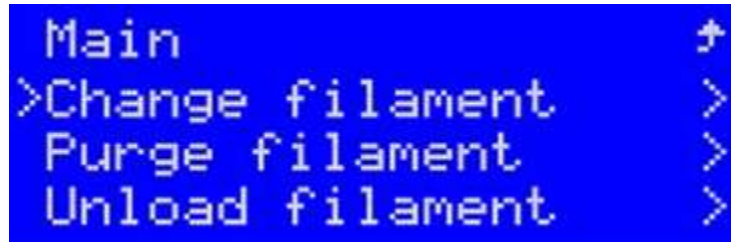


Figure 7.6.15 Change Filament Function

- 2) Select the nozzle cleaning function from the printer control panel Prepare Menu

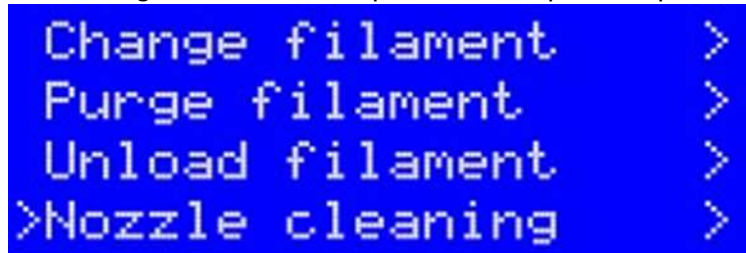


Figure 7.6.16 Prepare Menu: Nozzle Cleaning Selected

- 3) Choose the nozzle to be cleaned (Nozzle #2 in this example)

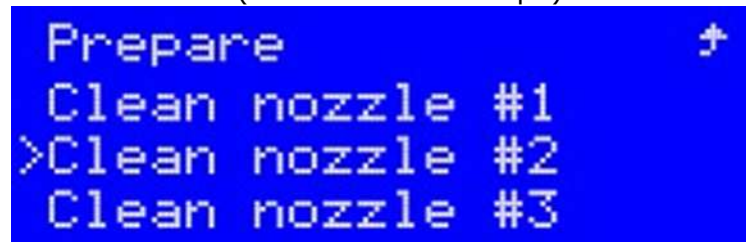


Figure 7.6.17 Select Extruder for Cleaning

- 4) After verifying the nylon cleaning filament is properly loaded into the extruder, press the black jog wheel button to start the automatic cleaning procedure.

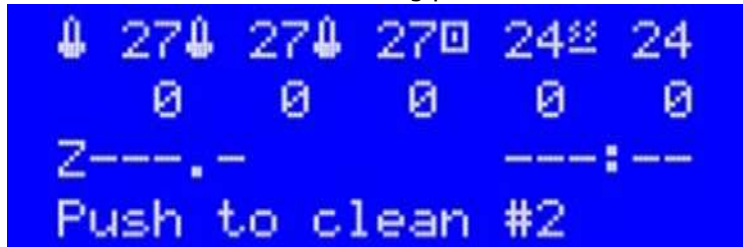


Figure 7.6.18 Printer indication – Ready to Clean

- 5) The printer will now heat the chosen extruder, clean the nozzle, then cool it down to a preset value and pulls out the filament (from the heated nozzle) for you to check it.

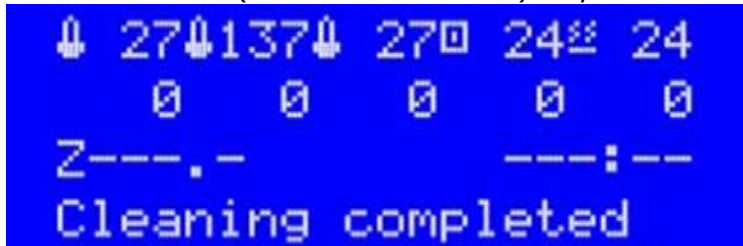


Figure 7.6.19 LCD Indicating Cleaning Complete

- 6) Inspect the cleaning filament tip after the cleaning cycle.
7) If the filament tip appears with the proper shape and no traces of color, then the cleaning process can be concluded, if not, additional steps are required (below)



Figure 7.6.20 Ideal Cleaning Filament Tip (after cleaning)

- 8) If the filament tip after cleaning has any traces of color on it (as below), repeat the cleaning process for additional cycles, until no traces of color remain.



Figure 7.6.21 Cleaning Filament Tip Color after multiple Cleaning Cycles

- 9) If the shape of the extruded cleaning filament tip after the cleaning cycle is not ideal (as pictured above), repeat the cleaning cycle a couple times.
- 10) If an ideal cleaning filament tip is not obtained after a couple cycles (bad tips shown below), perform the following extruder troubleshooting steps:
 - a. Check/Fill coolant liquid level
 - b. Verify coolant fluid flow to extruder
 - c. Check extruder thermal gain setting (correct if necessary)
 - d. Perform a Feeder roller cleaning procedure
 - e. Nozzle change (may be required)



Figure 7.6.22 Bad Tips after Filament Cleaning: Requires Troubleshooting

- 11) Repeat entire cleaning process for other extruders (as required/needed)
- 12) Nozzle cleaning function complete!

7.7 Operate the MMS Unit

This section provides information regarding the use, operation, and ongoing care of the MMS Unit after initial set-up.

7.7.1 MMS Touch Screen Control

The touchscreen displays live readouts from the MMS's 6 material feed storage positions, and configuration data of the printer's 3 nozzles, and prompts you when printer configuration or material changes need to be made on the printer (as entered into the MMS dashboard application).



Figure 7.7.1 MMS – Update Required



Figure 7.7.2 MMS Touch Screen

7.7.2 MMS Dashboard

Click the Dash button if needed to switch to the data entry mode to add materials, set spools sizes and store nozzle configuration information.



Figure 7.7.3 Locating the MMS Dash Button

On the Dash page you can enter additional materials and edit any existing information. Remember that you'll need to know the specific gravity or density of each material entered to get reasonably accurate material remaining estimations.

Remaining filament on each spool is calculated by using the empty weight of the spool along with the live weight and material information entered for that spool. The server keeps a running average of the empty spool weight, so if you know an empty spool weight has changed enter it into the field for the spool, otherwise no entry will use the default average empty spool weight for that spool size.

After you make changes on the Dash page, the cabinet's touchscreen will prompt you to confirm that the changes have been made on the printer to ensure that the actual setup matches the MMS Server's data.

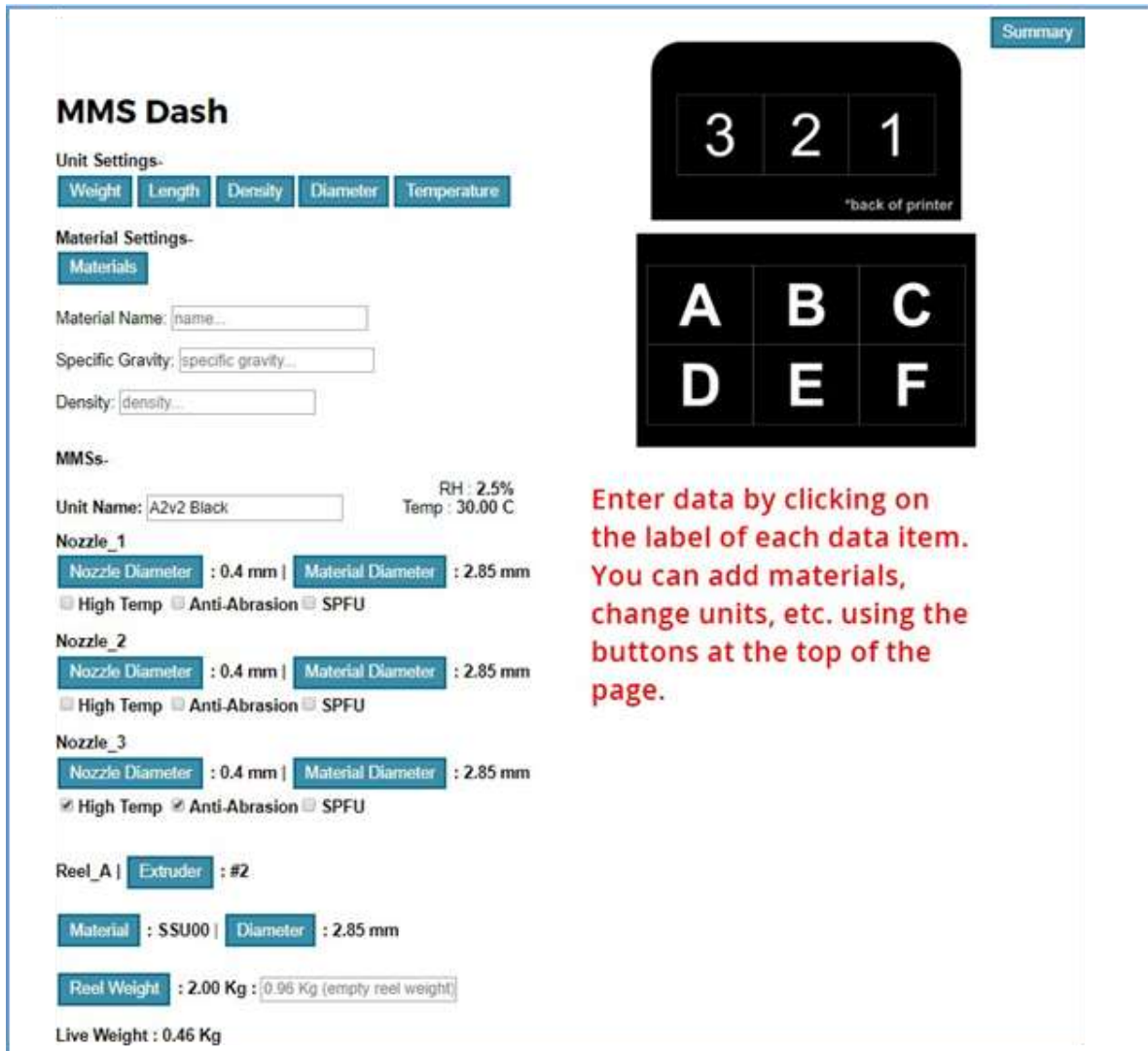


Figure 7.7.4 MMS Dash

NOTE – The material positions and feeder numbers are as viewed from the back of the printer and are labeled as indicated by the graphic on the MMS page.

The "Summary View" of the MMS Dash gives you an overview of the current configuration.

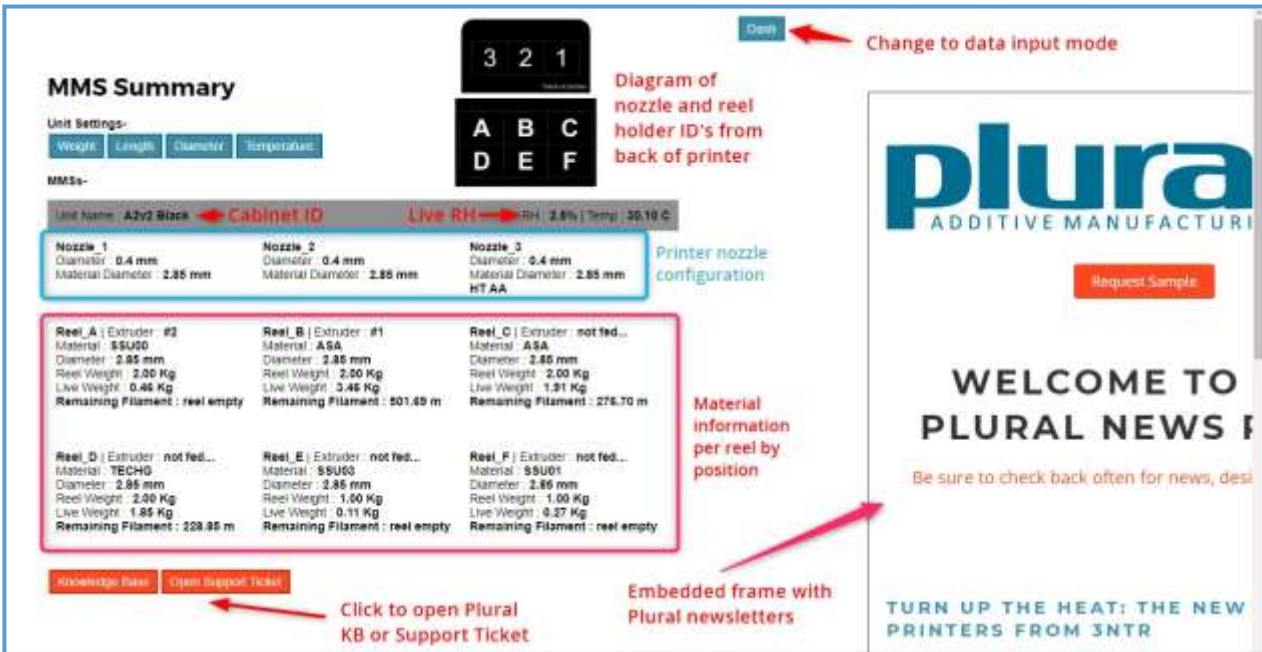


Figure 7.7.5 MMS Dash "Summary View"

7.7.3 Accessing the MMS Dashboard over a network

The dashboard is a server application that can be accessed over the network with standard web browsers. To access the MMS Dashboard, enter the print server's IP address followed by :3000, for example: 100.1.100.85:3000. If the MMS server has not been set-up or connected properly, or to find the printer server IP address, refer to the section: MMS Server Connection and Set-Up.

| Printer & MMS Guide Navigational Links | | | | | |
|--|--|----------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| Complete List of Procedure/Work Instructions | | | | | |
| Printer Orientation | Initial Printer Installation, Set-Up & Calibration | Before you Print | Everyday Procedures | Maintain Printer/MMS | Calibrate Printer |

8 Before You Print

Printing parts with your new TRAK 3ntr A2/A4 3D Printer is simple and easy - once the printer has been properly set-up for the print job. This section details the printer preparation, set-up, and materials loading process that must be performed in advance of printing to ensure great part results. It assumes a print program (G-code file) has been properly prepared and is available on SD card.

Printing Process Overview

- 1) Complete printer maintenance as detailed in [Periodic Maintenance & Calibration Schedule](#)
- 2) Review the G-Code File for Print Job Set-Up & Materials Requirements
- 3) Perform the Printer Print Job Set-Up & Load Materials Process
 - Change nozzle size(s) and type(s) if required
 - Clean Nozzles if a different polymer is to be used
 - Reconfigure extruder for Normal/Hi TEMP if required
 - Install or Remove SPFU depending on materials to be printed
 - Load filament/material(s)
 - Purge Nozzles to verify acceptable flow
 - Pre-heat Chamber and/or Bed as required
- 4) Print Parts
- 5) Tune the Printing Process (Advanced Users Only)
- 6) Filament Change During Printing (Avoid, if possible)

8.1 Print Job Set-Up/Printer Configuration

3D Printing parts with your new TRAK 3ntr A2/A4 printer is easy; however, since these are industrial grade printers using an open materials platform, there are a few steps that must be completed in advance to ensure the printer is configured/set-up properly for the print job.

The print program (G-code file) for each 3D print job makes specific assumptions regarding the configuration and set-up of the printer. In order to print successfully, the printer must be set-up consistently with the programming (G-Code) file. Other parameters of the print process are controlled automatically and require no advance set-up.

Variables within a 3D Print Job Set-Up

- Material Type and Filament Size Installed in Extruder #1, #2, #3
- Nozzle Size, Nozzle Input Filament Diameter, Nozzle Material #1,#2, #3
- Normal or HI TEMP Extruder/Control Configuration
- SPFU Installed on Extruder 1,3, 1 & 3, or None
- Printer Plate Type (Material)
- Pre-Heat Bed (If not programmed)
- Pre-Heat Chamber (If not programmed)

CAUTION – Printing a part with wrong materials loaded or an incorrect printer configuration/set-up can result in bad prints, clogged nozzles/filament feed, release of toxic fumes, and/or extruder damage. Always review the G-code file or print job set-up form (if available) to verify the materials to be loaded and printer configuration.

8.1.1 Print Job Set-Up and Materials Loading Process Flowchart

This section details a start-to-finish process for printer set-up/configuration and materials loading for a new print job. It assumes that all the initial installation, set-up, and calibration steps (outline within this or the Quick Start Guide) have been completed as well as a few successful test prints using the supplied materials and default printer set-up/configuration.

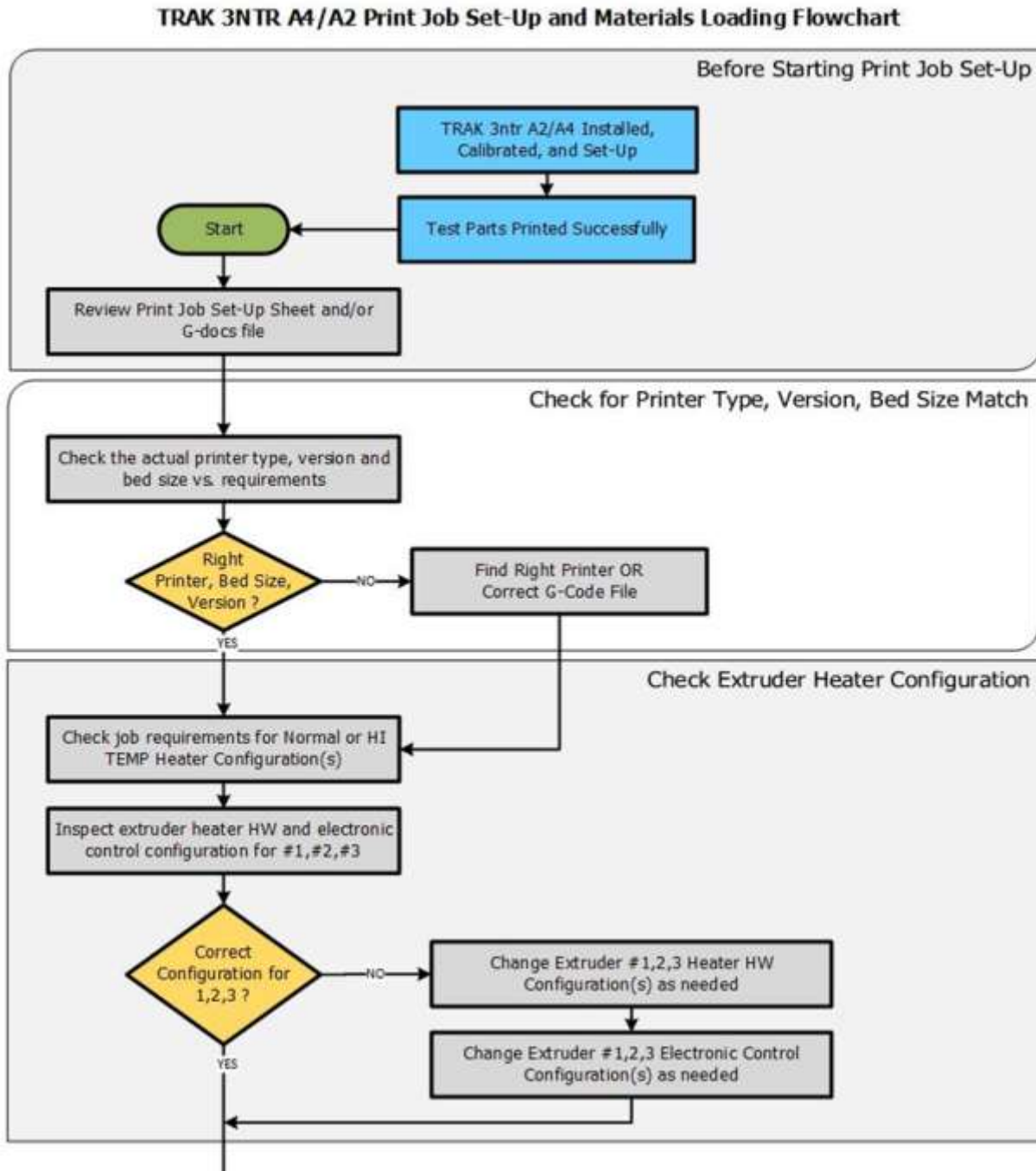


Figure 8.1.1 Print Job Set-Up & Materials Loading Flowchart Page 1 of 3

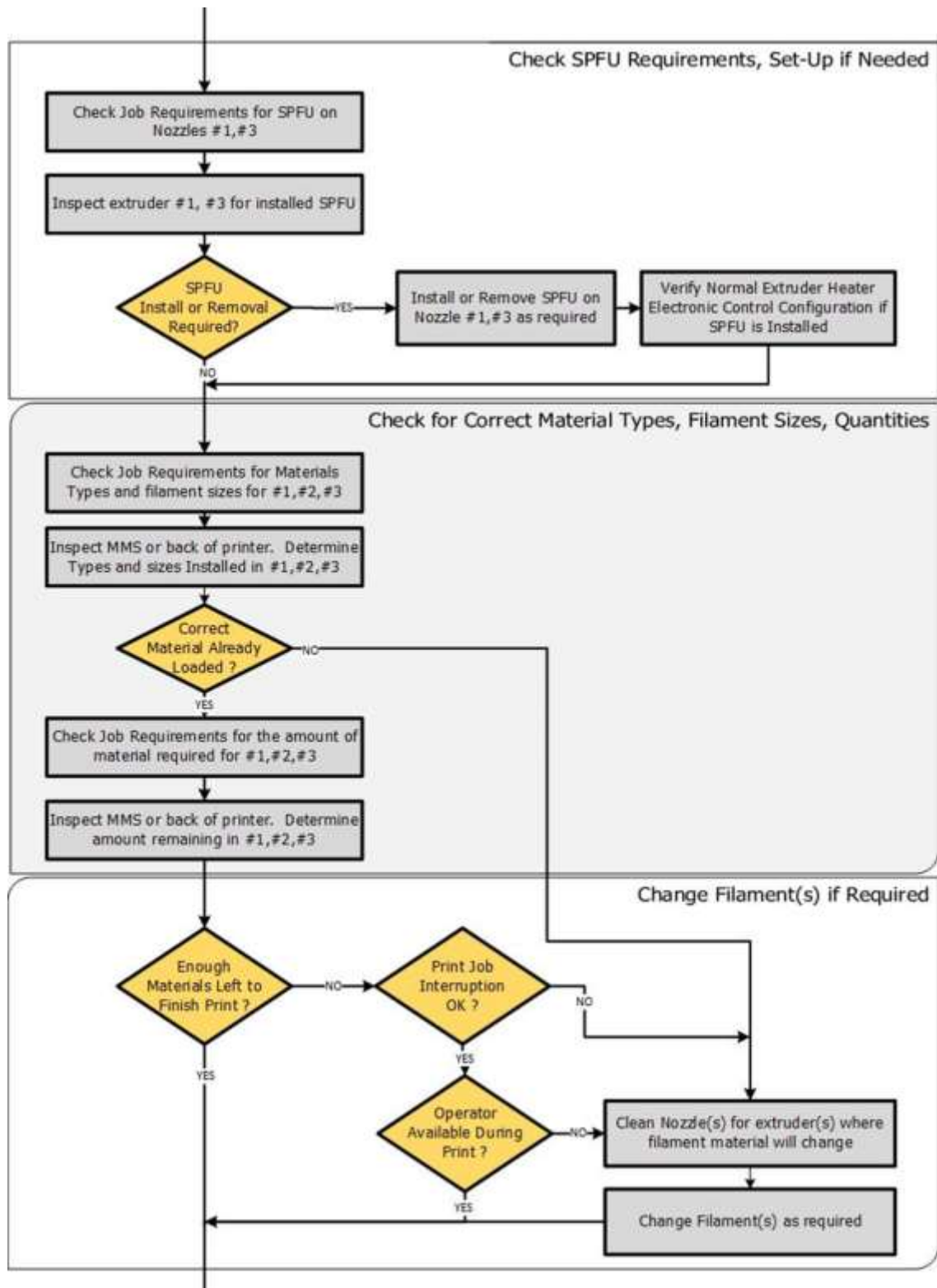


Figure 8.1.2 Print Job Set-Up & Materials Loading Flowchart Page 2 of 3

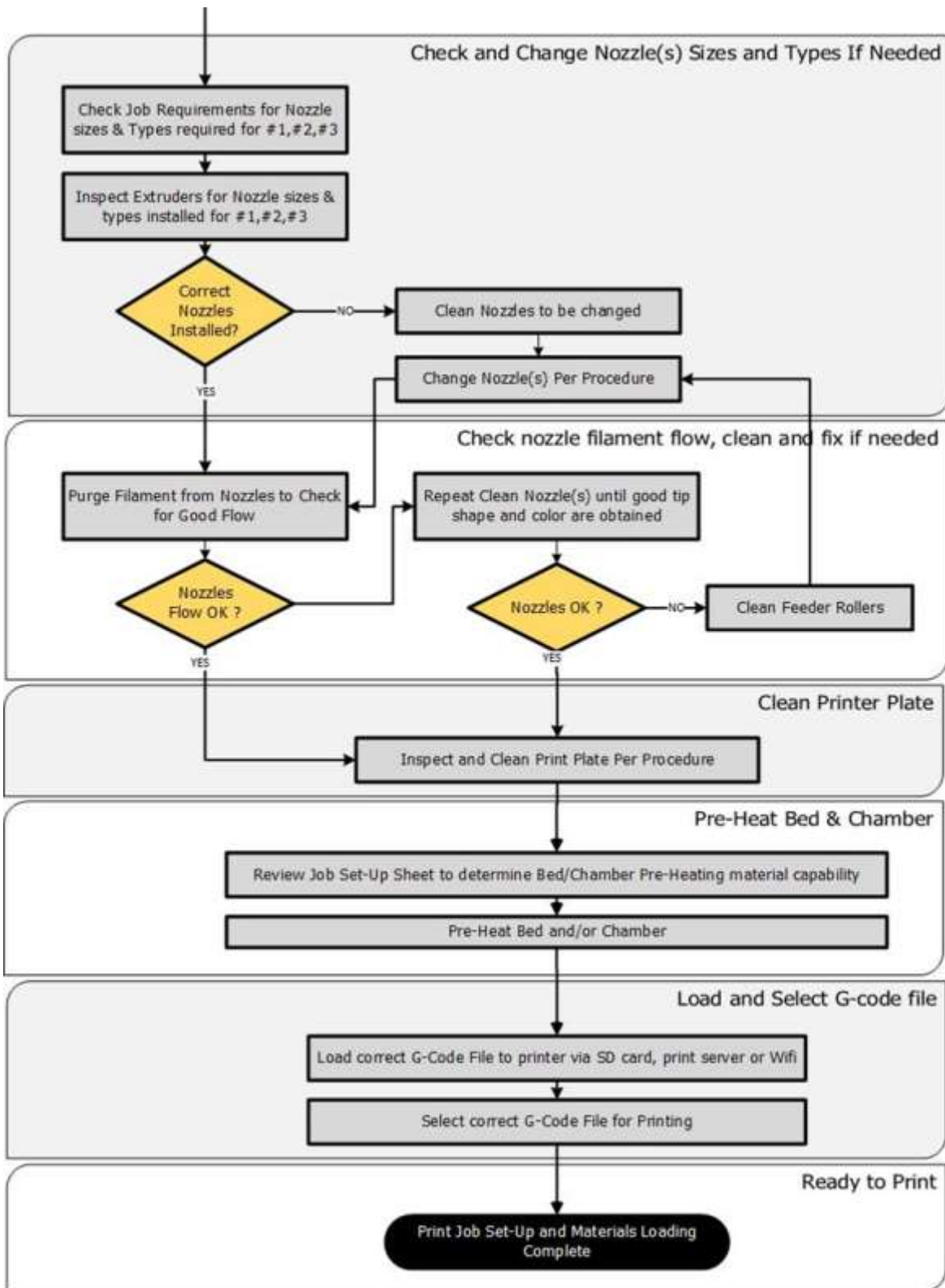


Figure 8.1.3 Print Job Set-Up & Materials Loading Flowchart Page 3 of 3

8.1.2 Print Job Set-Up and Materials Loading Checklist

Use this checklist to ensure the 3NTR A2/A4 3D printer is properly configured/set-up, loaded with filament/material, and prepared for a specific 3D Print Job. Refer to the appropriate guide chapter/section for full and complete procedure instructions.

| | |
|--------------------------|--|
| <input type="checkbox"/> | <p>Before beginning the set-up/loading process, verify the following:</p> <ul style="list-style-type: none"> <input type="checkbox"/> The TRAK 3NRT A2/A4 printer was installed and set-up properly for the first time. <input type="checkbox"/> The TRAK 3NTR A2/A4 successfully printed a test part after installation. <input type="checkbox"/> The print operator has read and understands the printer operating manual and all safety precautions for set-up, configuration, maintenance, and operation of the printer. |
| <input type="checkbox"/> | <p>1. Review Print Job Set-up form and/or G-docs file information. Obtain & review print job set-up form, G-Docs file, and material requirements information</p> |
| <input type="checkbox"/> | <p>2. Inspect the Printer to determine if the printer type, bed size, and version match the G-docs file specification. Determine the type of printer (A2 or A4), printer version (V2, V3, or V4), and print bed dimensions specified within the print job set-up form or G-Docs file. Inspect the printer to verify the actual printer being used matches the G-Docs files. If there is a discrepancy – find the right printer or correct the G-Docs file prior to proceeding</p> |
| <input type="checkbox"/> | <p>3. Determine the extruder configuration(s) required for the print job.</p> <p>3.1 Review the print job set-up form or G-Docs file to determine if the materials used in nozzles #1, #2, #3 require the NORMAL or HIGH TEMP extruder configuration</p> <p>3.2 If unspecified, check the material properties: A normally configured extruder is limited to 260°C maximum temperature. HI TEMP configuration is limited to 320°C maximum temperature. VERY HI TEMP printer modification is required for 320°C to 425°C extrusion temperatures.</p> <p>3.3 Filled abrasive polymers (i.e. glass or carbon fiber filled) typically use HI TEMP.</p> <p>3.4 If the print job requires VERY HIGH TEMP printer modification: STOP, unless already installed. Factory trained personnel must follow the process from the service manual to update internal machine hardware and firmware.</p> |
| <input type="checkbox"/> | <p>4. Inspect printer to determine current extruder configurations. Inspect both extruder hardware assembly and the electronic control settings to determine the actual extruder configurations for extruders #1,#2,#3.</p> <p>4.1 Orientation of the stainless-steel heat bridge within the assembly determines “normal” or “HI TEMP” extruder configuration. Extruder(s) assembled for “HI TEMP” temperatures will have the shaft relief (smaller ID section) nearest the nozzle (down).</p> <p>4.2 Control configurations for “HI TEMP” are identified within the Hardware menu>Extruders Config>Extruder X >HI TEMP= 1. Normal control configuration is denoted with HI TEMP = 0.</p> |
| <input type="checkbox"/> | <p>5. If Required, re-configure extruders hardware assembly configurations, as needed to match print job setup/G-doc file. If the print job requirements differ from current configuration, re-configure each of extruder 1,2,3 as required following the instructions within the manual.</p> <p>5.1 Reconfigure extruders #1,#2, #3 as needed per the procedure from the manual.</p> <p>5.2 If the print job set-up requirements will also require nozzle changes, install the new nozzle(s) while changing the extruder assembly configuration.</p> <p>NOTE – The total process requires removal from the printer, extruder disassembly, re-assembly, replacement on the printer, a z nozzle calibration, and an XY alignment test.</p> |

| | |
|---|--|
| □ | <p>6. Change extruder(s) electronic control configuration via LCD. Verify that each assembled extruders configurations and control configurations match.</p> <p>6.1 From the "Hardware" menu, select "Extruders config"</p> <p>6.2 Choose the extruder you want to modify, then enable HITEMP by selecting "1", disable by selecting "0" and save configuration. Repeat as required.</p> <p>6.3 Confirm matching HW assembly and electronic control configuration for all extruders by comparing LCD screen and extruder assemblies installed in machine. Extruders with electronic control configuration set to "HI TEMP" will have two (2) thermometer icons displayed, one above another. Extruder(s) assembled for "HI TEMP" will have the shaft relief (smaller ID section) nearest the nozzle (down).</p> <p>CAUTION – Using control settings for "HI TEMP" with an extruder HW configured/assembled for "Normal" can damage the heat bridge/printer. Using control settings for "Normal" with an extruder assembled for "HI TEMP" can result in low nozzle temps/bad prints</p> |
| □ | <p>7. Determine if the print job requires the Soft Polymer Feeder Unit and inspect the current extruder configuration. Review the print job set-up form or G-Docs file to determine if the materials used in nozzles #1 and/or #3 are soft polymers that cannot be handled with the standard extruder feed configuration.</p> |
| □ | <p>8. As required for the print job, install or remove SPFU on Extruder #1 & #2. Verify normal extruder configurations and electronic control settings if SPFU is installed. Follow complete maintenance procedures for SPFU installation or removal.</p> <p>8.1 Remove filaments and clean nozzle per procedure before installing SPFU</p> <p>8.2 Verify "normal" extruder HW assembly and electronic control configuration</p> <p>8.3 Install SPFU per maintenance procedure</p> <p>8.4 Enable SPFU within LCD control</p> |
| □ | <p>9. Check the print job requirements sheet/G-docs file for material types and filament sizes specified. Review the print job set-up form or G-Docs file to determine the material type and filament size of each of the materials to be used in nozzles 1,2, and/or 3.</p> |
| □ | <p>10. Inspect the material types and filament sizes on the printer/in the MMS unit for #1,#2,#3. Compare to print job set-up form/G-docs file requirements.</p> |
| □ | <p>11. If the correct filament types and sizes are already installed, determine if enough materials remain to complete the print or if new filament(s) must be loaded anyway.</p> <p>11.1 If enough materials are remaining on #1,#2,#3 , Skip forward as applicable.</p> <p>11.2 If enough materials are not remaining on any of #1,#2,#3, determine if the print job will allow a mid-print filament spool replacement or not and if an operator will be readily available to do it. If so, stage additional filament spools and skip forward as applicable.</p> <p>11.3 If the print job does not allow an interruption or if insufficient materials are remaining, new filament must be loaded as described in the next step.</p> |

| | |
|---|--|
| □ | <p>12. If new filament must be loaded, load filament into the back of the printer or into the MMS unit for each of the extruder(s) as required</p> <p>12.1 From the “Prepare menu” use the “Change filament” (if previously loaded) or “Load filament” (if empty) functions and follow the procedure in the manual to add material to the back of the printer or MMS unit.</p> <p>12.2 Repeat process for the other extruder(s) as applicable.</p> <p>12.3 Clean any residual element remaining. Clean the printing tray area.</p> <p>CAUTION – If you are changing the polymer type, you must perform a nozzle cleaning procedure before starting a change filament procedure.</p> |
| □ | <p>13. Clean Nozzle(s) per procedure. A nozzle cleaning is required before a new polymer filament is to be installed or any time the nozzle does not flow smoothly. Repeat for other nozzles as required</p> |
| □ | <p>14. Purge Nozzle Per Procedure if required. Do this before printing and any time you need to assess nozzle flow conditions.</p> |
| □ | <p>15. Inspect and identify the nozzle size(s) and type(s) currently installed in the printer.</p> <p>15.1 Open the printer and inspect the nozzles and/or consult the last print set-up documentation to determine what nozzles are installed in the printer. Determine nozzle material by color: bronze nozzles appear bronze; tungsten carbide nozzles appear silver. Determine the nozzle diameter by the number of dots on the nozzle: None=0.3mm, 1=0.4mm, 2= 0.6mm, 3 = 0.8mm.</p> <p>15.2 Repeat for the other nozzle(s)</p> <p>NOTE – The nozzles used for each print job must match the filament size of the materials used, abrasiveness of the filament material used, and nozzle diameter specified within the G-docs file used/machine configuration. Failure to install the correct nozzle sizes and types will result in a bad print and could cause damage.</p> |
| □ | <p>16. Change the nozzles (extruders on-machine) as required for the print job or to remedy nozzle flow/print problems.</p> <p>16.1 Perform a nozzle cleaning procedure. If the nozzle is jammed/blocked, heat the nozzle up to 245°C using the first portion of the filament change procedure.</p> <p>16.2 Change the nozzle per the procedure in the manual</p> <p>16.3 Repeat the nozzle cleaning and nozzle change procedure for the other nozzle as required for the print job.</p> <p>16.4 Perform a Z nozzle leveling check per the procedure in the manual. This procedure involves printing specific test patterns using g-code files. Interpret the printed patterns to determine if the extruder Z alignment is acceptable.</p> <p>16.5 If printed test patterns indicate issues, perform a Z nozzle calibration per the procedure in the manual, using dial gages, then repeat the Z nozzle leveling check (test prints)</p> <p>16.6 Perform a Z offset test pattern print on each nozzle as required</p> |
| □ | <p>17. Check and Clean Printer Tray.</p> <p>Remove any remaining print filament. Wipe down with acetone or approved cleaner as required. Verify print tray is properly positioned and secured with magnets to printer bed. Close the printer access door prior to chamber/bed pre-heating.</p> |
| □ | <p>18. Pre-Heat the Printer Bed (if desired to save time). If necessary, use printer controls to adjust/set a different printer bed pre-heating temperature.</p> |

| | |
|---|---|
| <input type="checkbox"/> | 19. Pre-Heat the printer chamber (if desired to save time). Caution: DO NOT use this function if the printer is loaded with low melting point polymers such as PLA, filament may swell making it impossible to remove from piping and/or extruders. If necessary, use printer controls to adjust chamber pre-heating temperature suitable for materials in use. |
| <input type="checkbox"/> | 20. Load G-Docs file via SD card or print server. Select correct file for printing. |
| Print Job Set-Up and Materials Loading Process Completed | |
| Figure 8.1.4 Print Job Set-Up & Materials Checklist | |

8.2 Review the G-Code File for Printer Print Job Set-Up Information

Ideally, the individual that used the KISSlicer software to prepare the G-code file has created a Print Job Printer Set-Up and Materials loading sheet that contains all the necessary information to properly configure your printer and load materials prior to printing. If so review this information, then it is not necessary to look at the G-code file itself for this information.

- 1) Open the G-Code File in KISSlicer.
- 2) Go to the Profile Settings>Printer> Hardware tab. Check to see that printer profile, printer type, # extruders, and bed size all match the printer to be set-up.

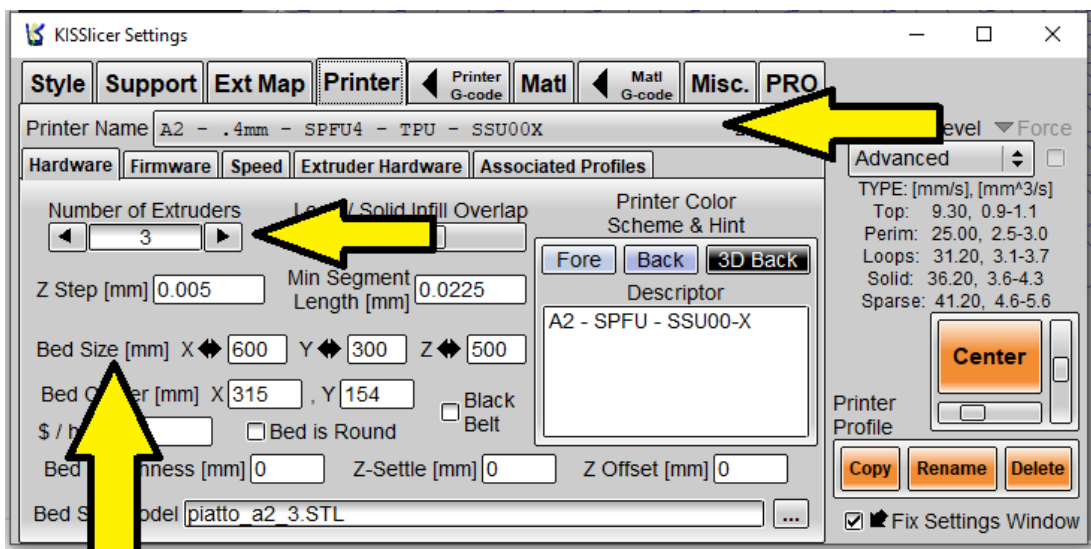


Figure 8.2.1 KISSlicer Profile Settings>Hardware – Printer Type & Characteristics

- 3) Go to the Profile Settings>Printer> Extruder Hardware tab. Check to see that nozzle diameters required for the printer set-up process.

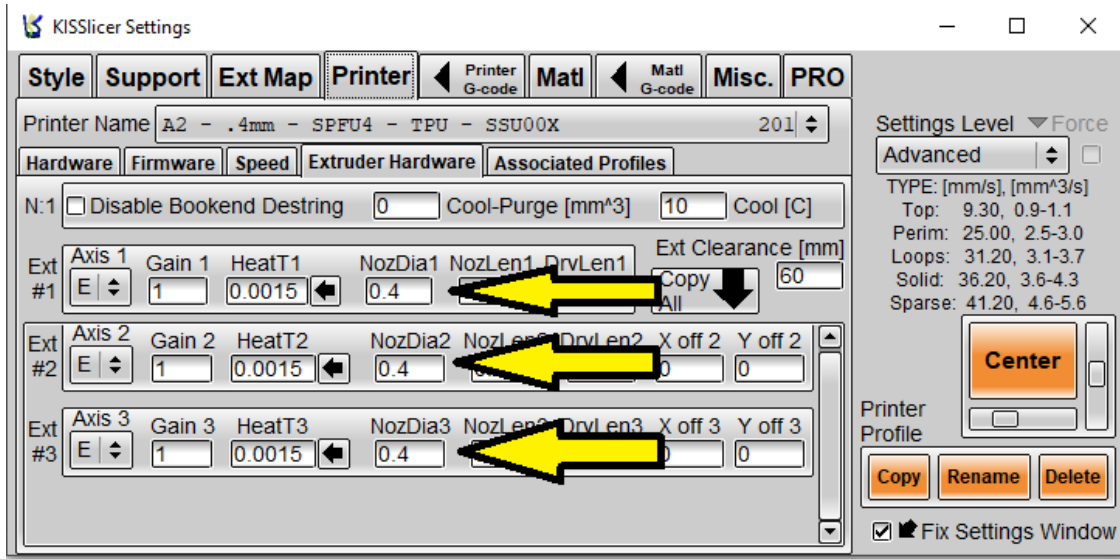


Figure 8.2.2 KISSlicer Profile Settings>Printer Profile Finding Nozzle Diameters

- 4) Press the Ext Matl Button in KISSlicer or the Profile Settings>Ext Map to check the material types mapped to the different extruders. Certain material types will require certain nozzle types (Bronze or Tungsten Carbide). Check if the materials specified require the hardened nozzle material.

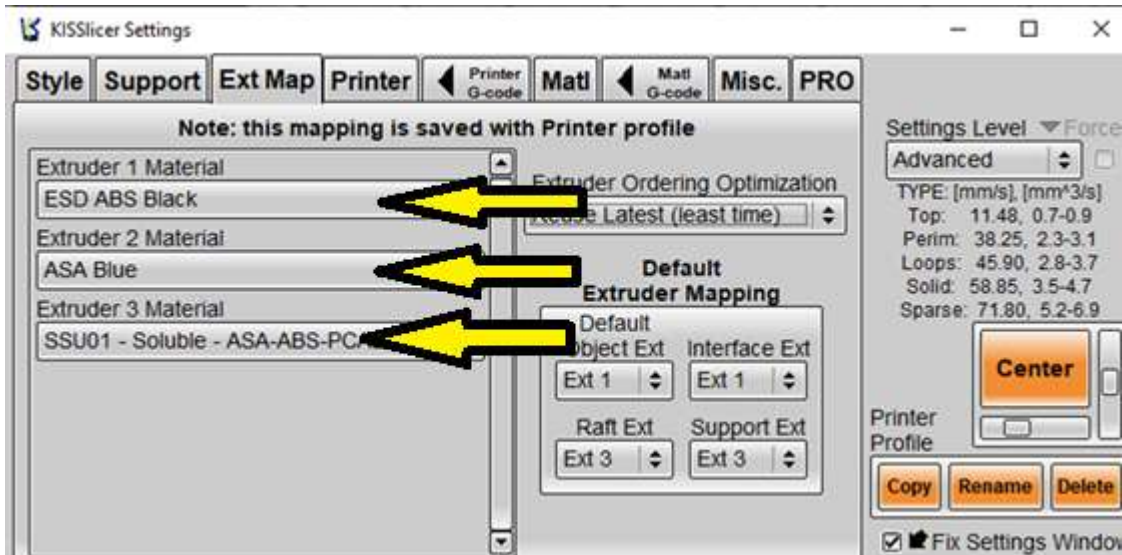


Figure 8.2.3 Extruder Map Showing Materials for #1,#2,#3

- 5) Go to Profile Settings>Matl tab to check the details of the individual material types to be used for your print. You should check the filament diameter (for nozzle compatibility) and extrusion temperature (for use of Normal/HI TEMP configuration. You should also check the Material Name to determine if it requires the use of SPFU.

NOTE – You must select the correct material profiles from the extruder map (prior step) to pull up the material profile and inspect the filament diameter.

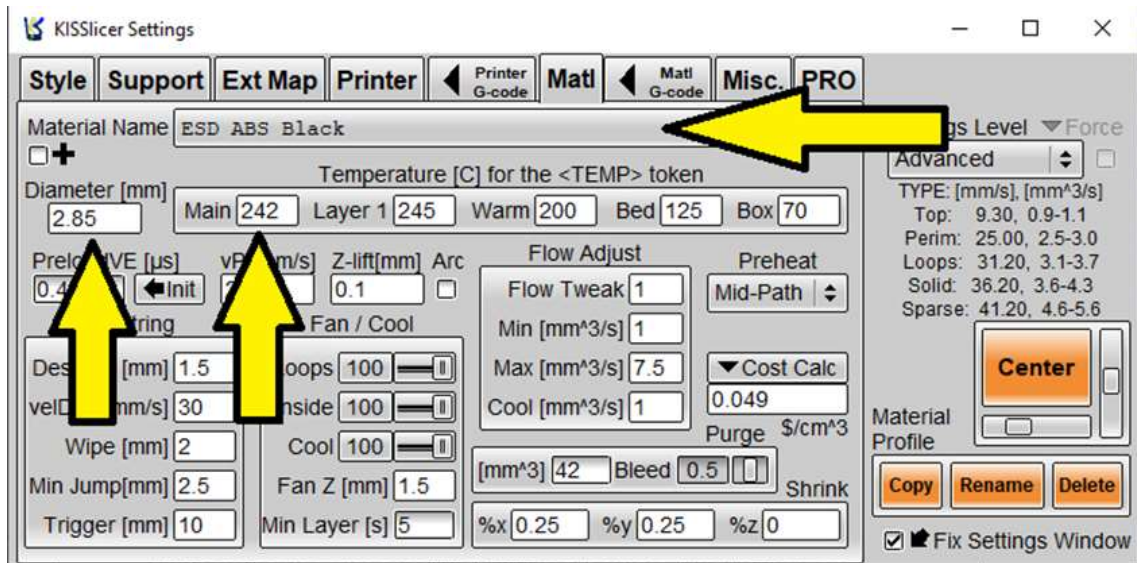


Figure 8.2.4 Material Profile Selection and Filament Diameter

8.3 Nozzle Change

This section provides an overview of extruder nozzles and details the procedure for a nozzle change. A Nozzle Change may be necessary if a different nozzle type is required for a print job, a filament change, the nozzle is clogged/damaged, or if after nozzle cleaning, flow conditions are still unacceptable.

8.3.1 Nozzle Overview

Selection of a nozzle for a 3D print project typically requires a review of the material type, filament diameter, definition required, and printing speed – all typically contained within the print program (g-code file). Nozzles are available in two different materials, two filament sizes, four nozzle diameters.

Nozzle Materials

The standard material is bronze. Not expensive, fast and dependable.

The new development is based on Tungsten Carbide. Very hard, fast as well, but a bit more expensive. Often required for abrasive (filled) materials. Probably will outlast many other printer parts.

Filament Sizes

You must choose the nozzle according to the filament used: 1.75 or 2.85mm

Nozzle Diameters

Several dimensions, to meet different printing requirements:

| Dots on nozzle | Size/type | Definition | Speed |
|----------------|-----------|------------|-------|
| None | 0.3 | **** | * |

| | | | |
|---|-----|-----|------|
| 1 | 0.4 | *** | ** |
| 2 | 0.6 | ** | *** |
| 3 | 0.8 | * | **** |

Figure 8.3.1 Nozzle Identification, Size and Print Characteristics Table



Figure 8.3.2 Bronze Extruder Nozzle

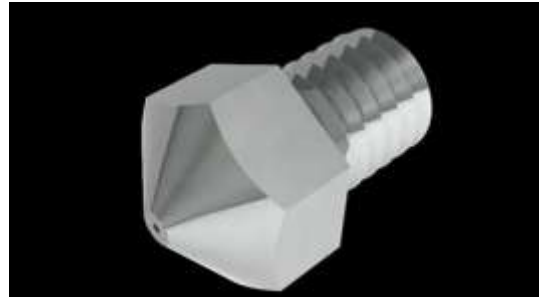


Figure 8.3.3 Tungsten Carbide Extruder Nozzle

8.3.2 Nozzle Change – On Machine

This section details the procedure for a nozzle change when the extruder is mounted on the machine.

Before undertaking a nozzle change, be sure to review all the instruction regarding handling extruders. See Section [Extruder Overview, Handling, & Service](#) for details before proceeding.

IMPORTANT – When printing, you must install the correct nozzle size and type based upon the print program (g-code file), filament material type, and filament sizes. Failure to install the correct nozzle size and type may result in bad prints, clogged nozzles, rapid nozzle wear, and machine downtime.

CAUTION - NEVER, EVER bend wire and thermo couple probe entering the heater You may permanently damage the heater. If you pull or bend too much you may kill thermocouple or short power leads. In any case you are PERMANENTLY damaging the heater!

- 1) 1 Do a Z homing then move printing plate to Z = 190
- 2) Clean the nozzle using the Nozzle Clean Procedure. See Section [Clean Nozzles](#) for Procedure.
- 3) If cleaning is not possible (jammed nozzle), heat up the nozzle at 245°C (i.e.: perform a filament change and let it on hold). If you are inexperienced, seek expert advice.
- 4) Hold the heater with the specific tool

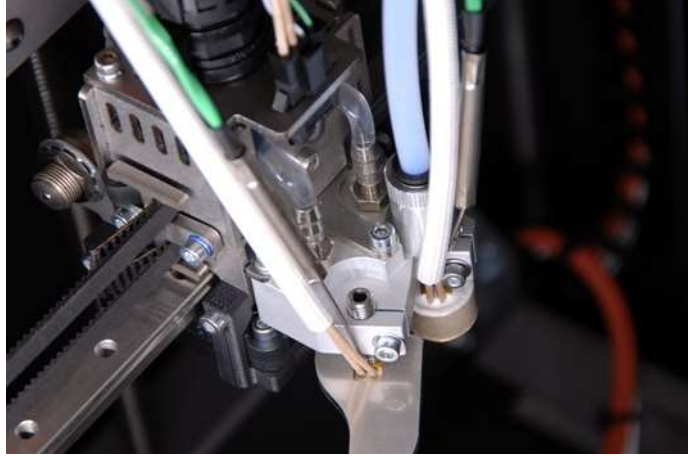


Figure 8.3.4 Saving Thermal Calibration

- 5) Unscrew nozzle as shown.

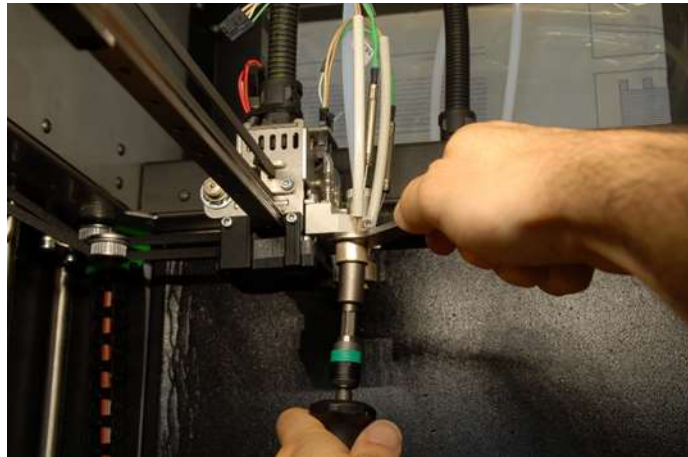


Figure 8.3.5 Saving Thermal Calibration

- 6) Mount new nozzle. Tighten the new nozzle using the dynamometric screwdriver(1.3Nm)
- 7) Check Z nozzle alignment, if needed perform a Z nozzle alignment.
See Section [Z Nozzle Comparison -3 Nozzles Relative Z Position Calibration](#) for Procedure.
- 8) Do an XY alignment print test and enter the updated XY Offset values.
See Section [XY Offset](#) for Procedure.

8.4 Extruder Configuration Change

This section explains the different extruder configurations, why an extruder change may be necessary, and the procedure to change the extruder configuration. Before changing to a new polymer filament, it's a good idea to review the print job set-up sheet or gcode file settings to determine the extrusion temperature settings to verify if normal or HI TEMP configuration is required.

Before undertaking an Extruder Configuration Change, be sure to review all the instruction regarding handling extruders. See Section [Extruder Overview, Handling, & Service](#) for details before proceeding.

IMPORTANT – Extruder configuration change requires a physical (hardware) reconfiguration of the heat bridge orientation on the extruder AND a printer (electronic control) reconfiguration. The physical (hardware) and printer control (electronic) configurations must both be updated and match.

IMPORTANT- 3D print programs (g-code files) contain specific extruder temperature settings for printing that are based on the material profile/requirements. Extruders must be configured for HI TEMP (as detailed in this procedure) in order to achieve temperatures between 260°C and 410°C as may called for within the Gcode program. If not configured for HI TEMP, extruder temperatures will be limited to 260°C, potentially causing bad print results.

CAUTION – Failure to update the printer electronic control configuration after an extruder configuration change can result in printer damage and/or bad prints.

CAUTION – Using a normal extruder hardware configuration setting with HITEMP electronic control settings can result in heating the heat bridge PTFE coating over 260°C, destroying it.

8.4.1 Extruder Configuration Overview

As already said before, the heat bridge (See Figure 6.7.12 below) can be mounted in two different ways:

NORMAL This is the standard configuration, for 260°C maximum extrusion temperatures – good for a large number of polymers: the part touching the heater contains PTFE (better known with commercial name TEFLON™) to improve printing process and minimize the polymer adhesion to the inner extruder parts.

HITEMP This configuration lets you obtain higher printing temperatures, up to 410°C. When using filled abrasive polymers (ie: glass or carbon fiber) extruder must be used in HITEMP configuration.

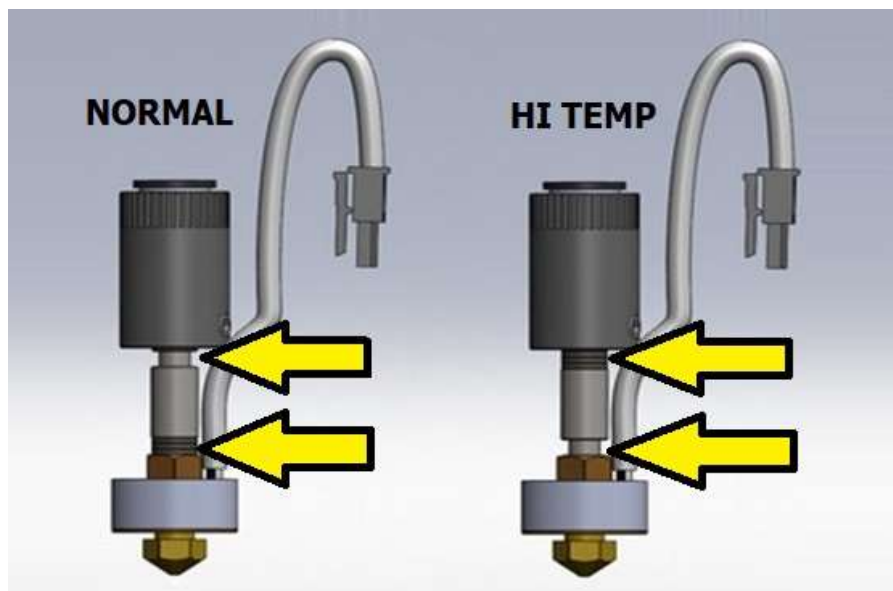


Figure 8.4.1 Extruder Configuration ID Guide: Normal and HI TEMP

8.5 Install SPFU Unit

This section outlines the process to install the Soft Polymer Feeder Unit (SPFU) on Nozzle #1. The SPFU is required for certain soft polymer materials.

IMPORTANT – You must complete the Nozzle Cleaning procedure before proceeding with SPFU installation on any nozzle.

NOTE – Before undertaking an SPFU Installation, be sure to review all the instruction regarding handling extruders. See Section [Extruder Overview, Handling, & Service](#) for details before proceeding.

- 1) Clean the selected nozzle. See Section [Clean Nozzles](#) for Procedure.
- 2) Move print bed away from extruders (for access) using Move Axis function.
- 3) Use a 2.5mm hex key to remove the screws holding the printer upper front panel cover (#1 in drawing below). There are 8 screws on an A2, 4 screws on an A4.
- 4) Remove printer front access cover to provide access for installation.



Figure 8.5.1 Removing Printer Front Access Cover

- 5) Inspect the extruder #1 configuration visually within the printer. Verify extruder #1 is mounted in the Normal position (see illustration below)

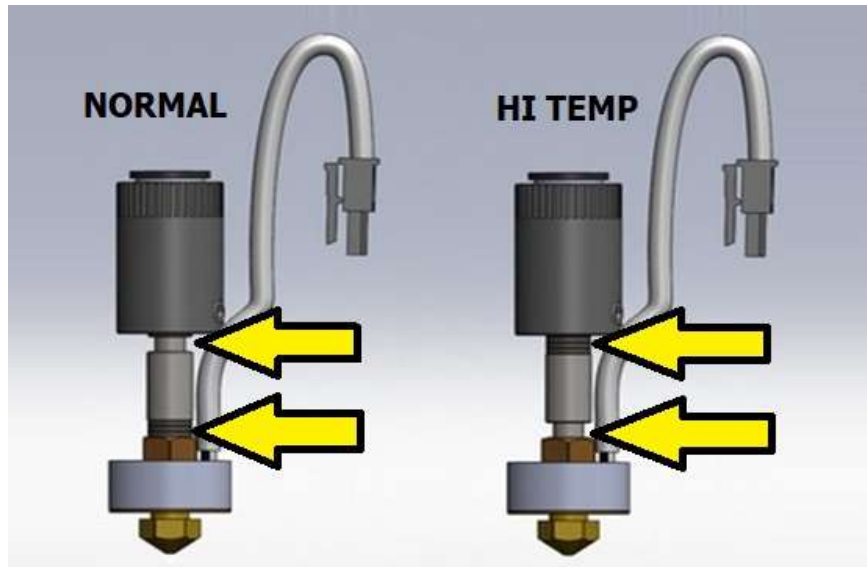


Figure 8.5.2 Extruder Configuration ID Guide: Normal and HI TEMP

- 6) Verify extruder #1 is set for NORMAL (not HI TEMP) control setting. Use the printer control panel to go to Hardware>Extruder Configuration. Normal setting is indicated with HITEMP = 0 (Required for SPFU).



Figure 8.5.3 Extruder #1 in Normal Control Setting

- 7) Follow the Clean Nozzle procedure (See the appropriate guide section for instructions) to remove current filament, feed cleaning material to extruder(s), and perform the automatic cleaning function.

CAUTION – You must complete the Clean Nozzle procedure before continuing with the SPFU fitment procedure. A Nozzle Cleaning procedure must be completed for each nozzle before SPFU can be fitted.

- 8) Turn OFF Printer
- 9) Remove PTFE piping from #1 & #2.
- 10) Fit the 25mm PTFE pipe on #1 tube adapter

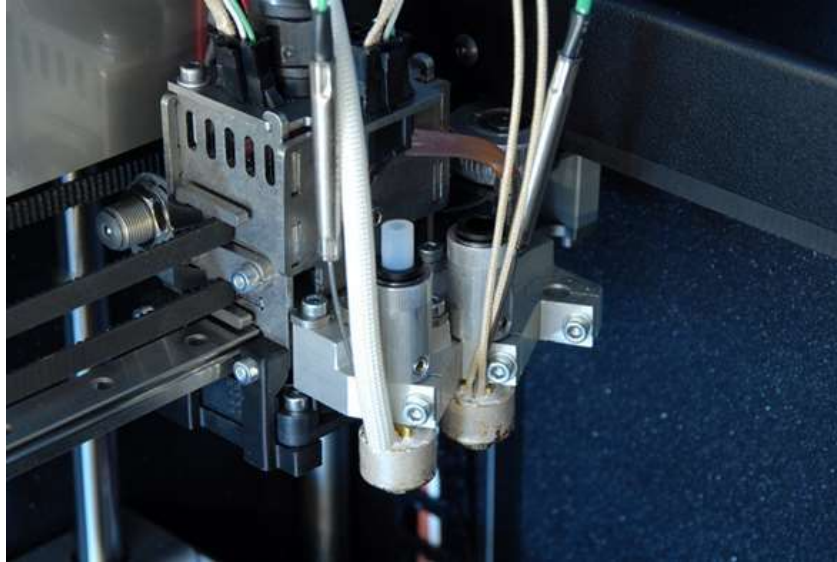


Figure 8.5.4 PTFE Piping for SPFU on Extruder

- 11) Remove the feeder for Extruder #1
- 12) Feed the flexible shaft of the SPFU motor assembly through the passage of #1 piping



Figure 8.5.5 Shaft for SPFU

- 13) Put the motor assembly in place. Magnet will hold the part securely against the machine.



Figure 8.5.6 SPFU Motor Placement

14) Verify the printer power is OFF

NOTE – Never plug in stepper motor cables with power ON.

15) Connect stepper motor

16) Connect filament sensor



Figure 8.5.7 Connect Stepper Motor and Filament Sensor

17) Fit the PTFE piping into motor assembly as shown



Figure 8.5.8 Fitting PTFE piping into motor assembly as shown

18) Place SPFU on Extruder #1

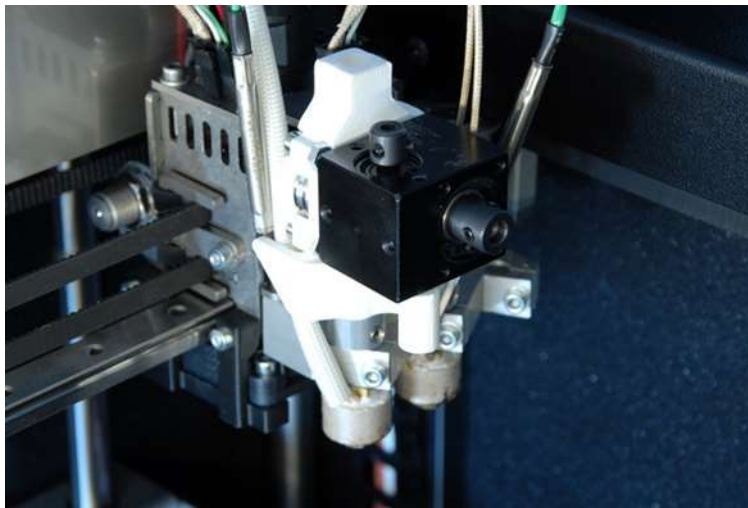


Figure 8.5.9 SPFU Mounted on Extruder #1

19) Tighten the locking screw on the SPFU assembly with an Allen wrench. Do not overtighten, snug is acceptable. User should encounter resistance when lifting up on the SPFU.

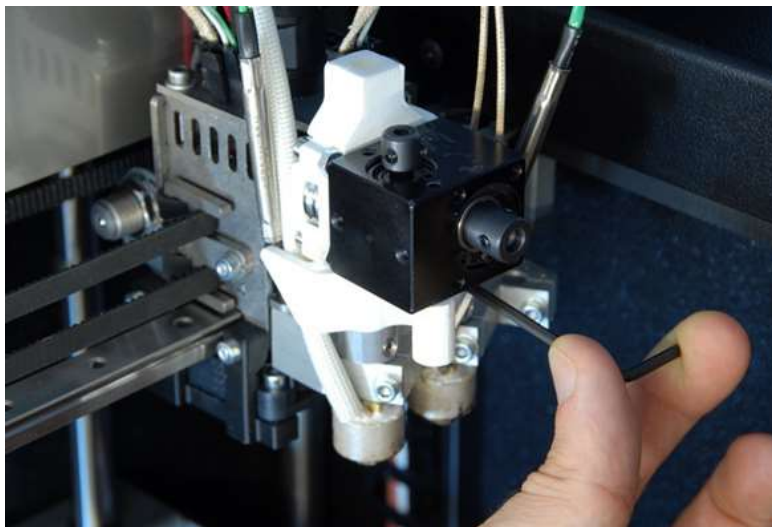


Figure 8.5.10 Tighten Locking Screw on SPFU Assembly



Figure 8.5.11 View of SPFU Locking Screw from below

20) Place Flexible shaft as shown. Tighten the three set screws. Do not overtighten, snug is acceptable.

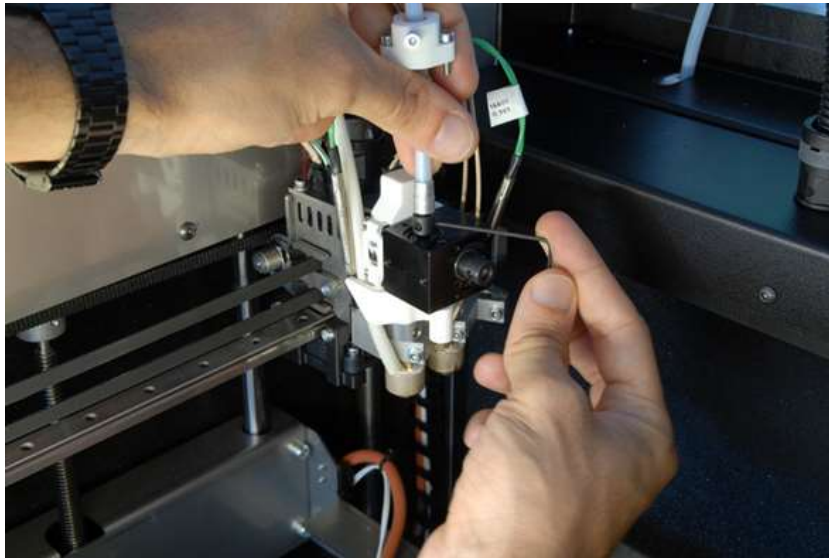


Figure 8.5.12 SPFU Flexible Shaft Placement & Tightening

21) Tighten the shaft holder screws. Do not overtighten, snug is acceptable.

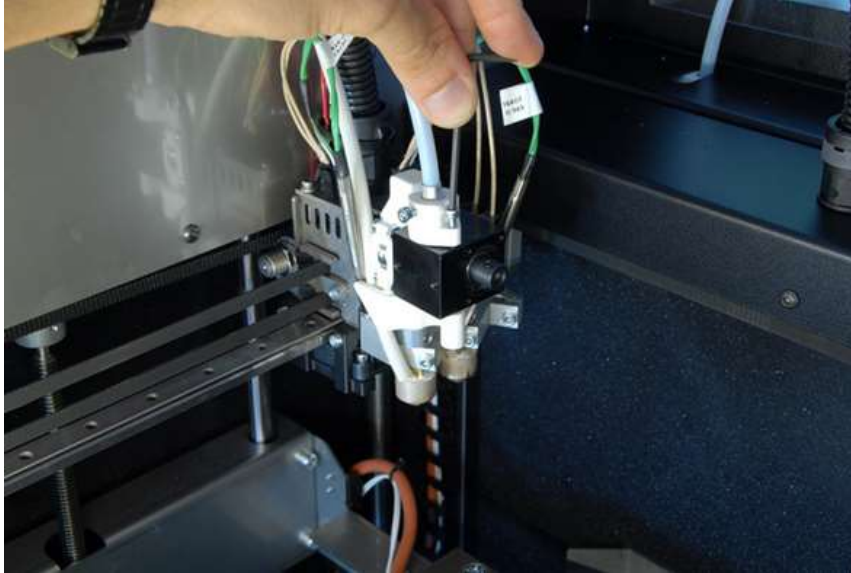


Figure 8.5.13 SPFU Shaft Holder Screw Tightening

22) Lock the flexible shaft. Tighten until driveshaft tube is snug.

NOTE – Be sure the shaft is fully seated, and screw is acting against end of the shaft piping. There may not be an aluminum component on the end of the shaft (as in illustration).

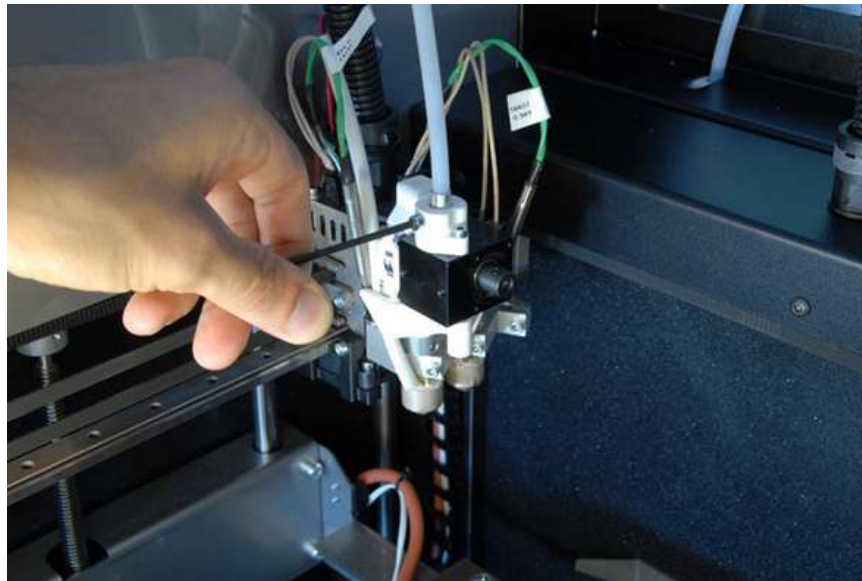


Figure 8.5.14 Locking SPFU Flexible Shaft

23) Power ON the Printer. See Section [Power on the Printer](#) for Procedure.

NOTE – Printer can be powered ON once the feeder disconnect and SPFU feeder connect are done. This will provide chamber lighting.

24) Determine the desired SPFU enablement mode for your installation based on the table below. The mode selected depends on the location of the SPFU installation (Front/Extruder #1 or Rear/Extruder #3) and if Chamber Heating is to be enabled or disabled.

NOTE – Chamber Heating is often disabled with an SPFU installation to avoid accidentally melting the polymer within the feeder tube/SPFU unit. If you choose one of the SPFU modes with enabled chamber heating, be sure to set chamber heating temperatures to an acceptable (lower) temperature.

| SPFU Mode Setting | SPFU Installation Location | Chamber Heater Enablement |
|-------------------|----------------------------|---------------------------|
| 1 | Front – Extruder #1 | Disabled |
| 2 | Rear – Extruder #3 | Disabled |
| 3 | Front – Extruder #1 | Enabled |
| 4 | Rear – Extruder #3 | Enabled |

NOTE – For a front/Extruder #1 SPFU install, SPFU Mode Setting 3 is most typical.

- 25) Navigate from the Printer LCD display. Go to Hardware >SPFU. Enable the SPFU from the front control panel using the desired SPFU mode selection (from chart Above). Save.



Figure 8.5.15 Enabling SPFU from Hardware Menu

- 26) Verify SPFU is enabled by info screen display indicating "SPF"



Figure 8.5.16 Info Screen Indicating SPFU Enabled

- 27) Feed filament into filament feeder until it appears at the SPFU filament feed tube end.
NOTE – When feeding soft filament, it can be useful to ensure there is extra filament available for feeding it into the SPFU/extruder.
- 28) Feed filament directly through the PTFE piping and into the SPFU unit until the pinch roller grabs it. Carefully pull excess slack from the back of printer to set filament feeder tube properly.

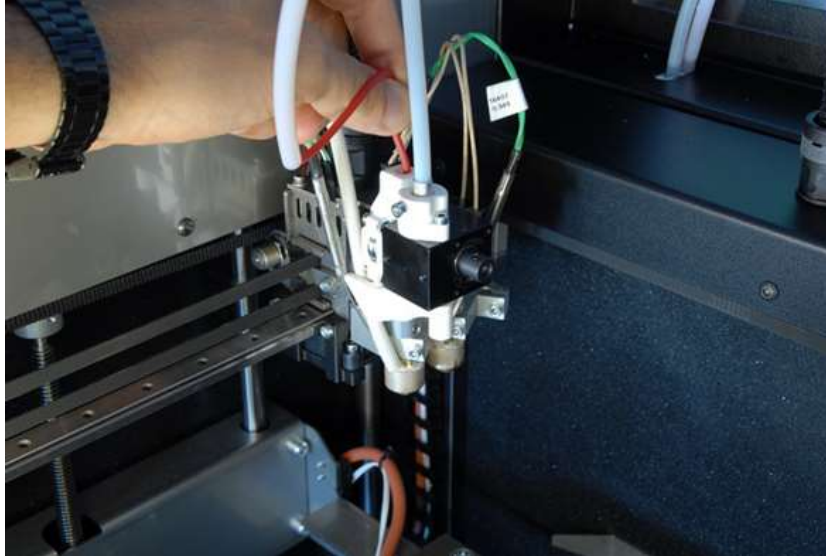


Figure 8.5.17 Feeding Filament through PTFE piping

- 29) Perform the Filament Change function from the printer front panel and follow the on-screen instructions to complete the process.

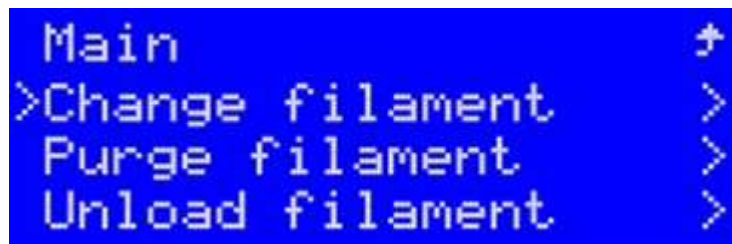


Figure 8.5.18 Change Filament Function

- 30) Connect the other end of the PTFE piping. Make sure it is firmly seated into SPFU
 31) Replace Printer front upper access cover. Re-install and tighten screws with 2.5mm hex key.
 There are 8 screws on an A2, 4 screws on an A4.

CAUTION – Never use printer without front access panel (or any access cover) removed.

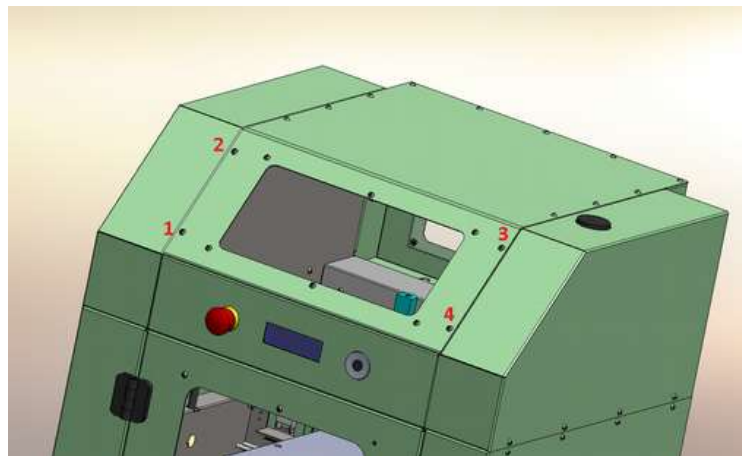


Figure 8.5.19 Printer Front Access Cover and Screws

32) SPFU Installation process complete!

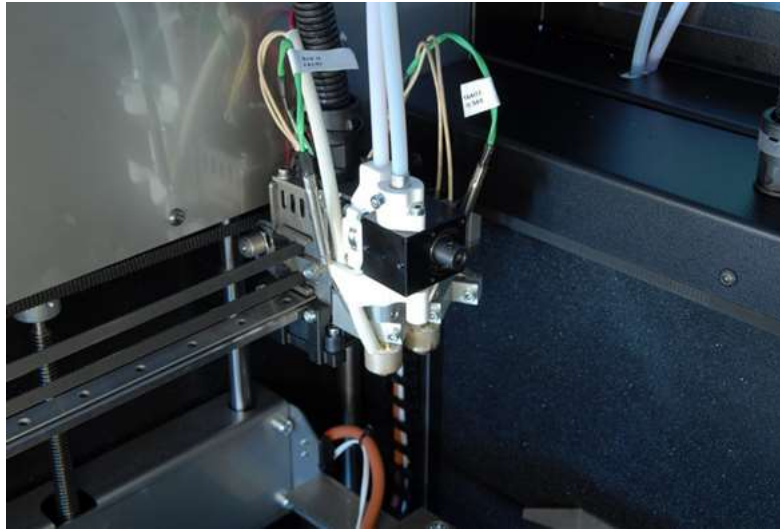


Figure 8.5.20 Completed SPFU Installation on Extruder #1

9 Print Parts

This section details the process to print parts with your TRAK 3ntr A2/A4 Printer as well as other procedures that may be necessary during printing including tuning the print process, stop/pause during printing, and a filament change during printing.

NOTE – This section assumes the printer has been previously set-up/configured and had materials loaded per the procedures outlined within the guide prior to printing. If unfamiliar with these procedures, see the appropriate Chapters for instructions.

9.1 Print Parts from an SD Card

In this section, we will print a test part from the SD Card. The same process will apply for printing other parts from the SD card.

- 1) Remove the SD Card from the PC adapter (if applicable)



Figure 9.1.1 PC adapter for SD Card

- 2) Insert an SD Card containing the desired g-code files into the SD card port in the rear of the printer. Feel for the card alignment slots in the center. Insert the card carefully until you feel the spring resistance. Push it in till it clicks securely.



Figure 9.1.2 Inserting SD Card into Printer

CAUTION: Insert the SD card carefully. It can easily miss the engagement slots and fall into the printer. If the SD card falls into the printer, you will have to remove the side sheet metal cover to retrieve it. To remove the side sheet metal cover, you must remove all the fasteners on the outside as well as two screws in the inside of the printer.

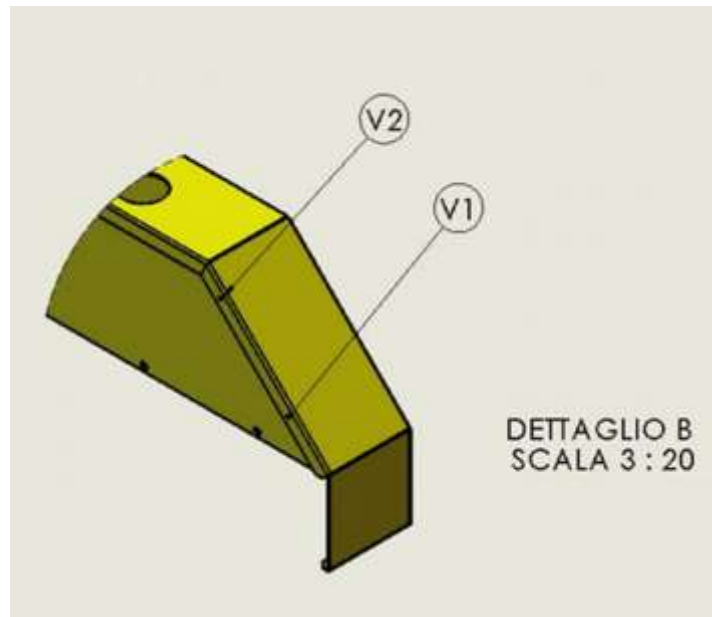


Figure 9.1.3 Side Cover Inner Screw Locations

- 3) Load the filament for the material specified in the g-code file of the program being printed. (ABS/ASA material supplied with the new printer matches for calibration and test part prints)
- 4) Verify there is enough filament on the spools to complete the print. If not, change the spool before starting, or prepare a back-up spool for a change during printing using the Print Pause function.
- 5) Verify the nozzle sizes installed in the printer match those specified within the g-code (print program) file. New printers are delivered with 0.4 mm nozzles that are compatible with calibration and supplied test part prints.
- 6) Check that the filament feeder handles are in the engaged position.
- 7) Purge the nozzles before printing. Verify nozzle flow is acceptable. If not, perform cleaning procedure using nylon material and the cleaning function from the Prepare menu. Replace nozzles or perform other troubleshooting, as required.
- 8) Check and Clean printer tray. Remove any remaining print filament. Wipe down the printer surface plate with acetone or approved cleaner as required. Verify the printer tray is properly positioned and secured in place with magnets.
- 9) Close the printer access door.
- 10) Pre-Heat the Printer Bed (if desired to save time). If necessary, use the printer controls to adjust/set a different temperature for specific materials.
- 11) Pre-Heat the Printer Chamber (if desired to save time) If necessary, use printer controls to adjust chamber pre-heating temperature.

CAUTION: DO NOT use this function if the printer is loaded with low melting point polymers (such as PLA) filament may swell making it impossible to remove from piping and/or extruders.

12) Use the front panel to navigate to: Prepare > Software Tools menu,



Figure 9.1.4 Selecting Software Tools from Prepare Menu

13) Browse and select the directory for the current nozzle size installed in the machine.

NOTE - TRAK 3ntr printers are delivered from the factory with 0.4mm nozzles installed.

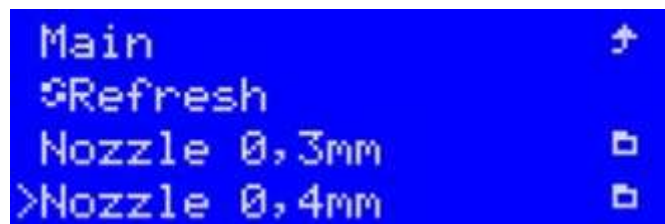


Figure 9.1.5 Selecting the Nozzle Size Directory

14) Browse until you find the desired g-code file. Select to begin printing.



Figure 9.1.6 Browsing g-code files in Software Tools Menu

15) Monitor the print from the info screen and by observing the print in process. Experienced print operators may choose to make print process adjustments mid-print using the Tune Menu.

16) Let the part cool within the printer if possible. If necessary, remove the print tray and allow it to cool outside the printer. If you remove the print tray while hot, be sure to support it correct to avoid deforming the part/tray.



Figure 9.1.7 Printer Tray Cooling Support

17) Remove the part following the same instructions for the test cone. Avoid using sharp blades or spatulas, they risk damaging the tray surface.

9.2 Printing Machine Menu

When machine is running, clicking on jog wheel button will get you following command list:

- Info screen – go back to main screen
- Tune– change some printing parameters
- Statistics – show total ON time and filament usage

If the print is being performed thru SDCARD, two more commands are added to the Printing Machine Menu:

- PAUSE: printer will pause and park extruder (this option will change then in RESUME PRINT)
- STOP PRINT: print process will stop the print and extruder will be parked

9.2.1 Stop/Pause Printing

During Printing, if you need to stop or pause printing, simply choose it from the printing menu.



Figure 9.2.1 Printing Menu Selections – Pause Print Selected

9.2.2 Tune Menu – Adjust Process Parameters Mid-Print

The Tune menu becomes available on the Info screen during printing and offers options to alter selected printing process parameters. You can change the speed of the printing process, temperatures, and fan speed.

- Print Speed: 0-100% (Default is 100% of set print speed)
- Nozzle (1 / 2 / 3) : 155° - 410° (Above 260°C also requires HI TEMP Extruder Configuration)
- Printing bed : 0° - 130°
- Heated chamber : 0° - 75°
- Fan: 0 -100%

CAUTION – Only experienced print operators should use the Tune menu during printing. Changing slicing software (KISSlicer) presets may get unpredictable results or even damage printer. If you don't have full understanding of machine and printing processes, please don't alter parameters.

- 1) Scroll down the Info screen, select the Tune, and press the black jogwheel button to Tune

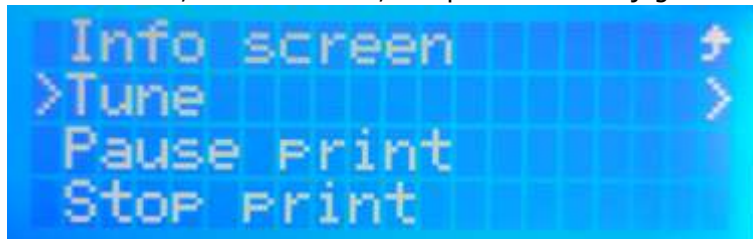


Figure 9.2.2 Selecting Tune from Info Screen Menu

- 2) Scroll down the Tune menu and then select the tuning parameter desired.

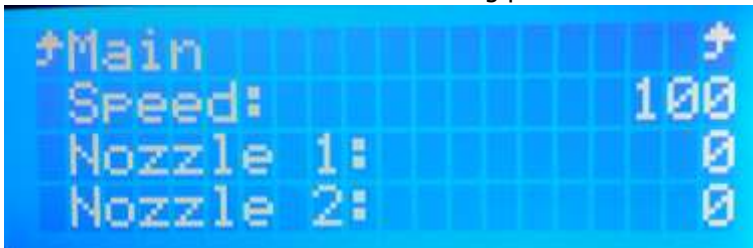


Figure 9.2.3 Tune Menu, Screen 1



Figure 9.2.4 Tune Menu: Screen 2

NOTE: Global printing parameters are directly available in the Tune menu. To adjust nozzle temperatures, you must individually select the nozzles one by one, then tune.

- 3) Select the desired Tuning parameter, then enter/adjust as desired. Repeat for additional parameters as required.

NOTE - Extruders can be used on two configurations, normal and HI TEMP. Know the current printer configuration and maximum working temperatures before changing nozzle temperatures. Be sure to read about "extruder configuration" for complete information, otherwise bad prints, or extruder damage may result.

9.2.3 Statistics

Statistics are available from the Idle and Printing machine menus.

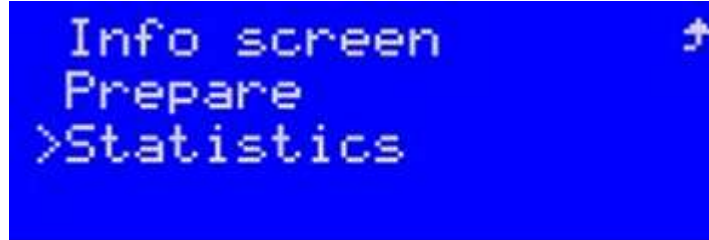


Figure 9.2.5 Selecting Statistics Display from Main Menu

Selecting Statistics will show total ON time and filament usage.

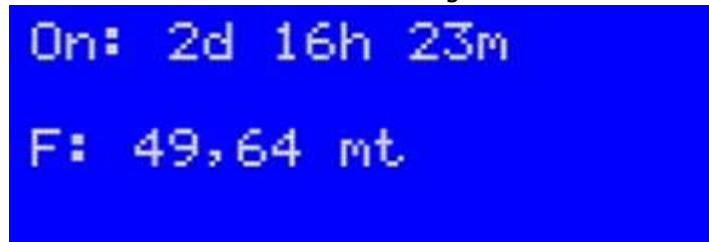


Figure 9.2.6 Statistics Display – On Time and Filament Usage

9.3 Filament Change – During Printing

This function can be used during printing process to feed a new spool to the machine, in place of a depleted one. This procedure will start on the nozzle active at time of change request. Therefore, if printer is using more than one extruder, be careful to request filament change when desired extruder is currently printing.

- 1) If machine is fitted with filament sensors, this function will be automatically started when end of filament will be detected during the printing process.
NOTE – To enable filament sensors you must insert "M11" command at beginning of GCODE. Remember to add a M12 at the end of GCODE to disable them.
- 2) Extruders will be parked in a safe position; current filament will be ejected then machine will beep to ask for user intervention.
- 3) Locate the feeder handle on the selected extruder. Grab the feeder handle of the selected extruder, push it down and secure it into position with the provided lock "lip" This way the feeder mechanism will be disengaged. Looking at the feeders from the rear of the printer, the rightmost is the #1 feeder, and leftmost is #3.

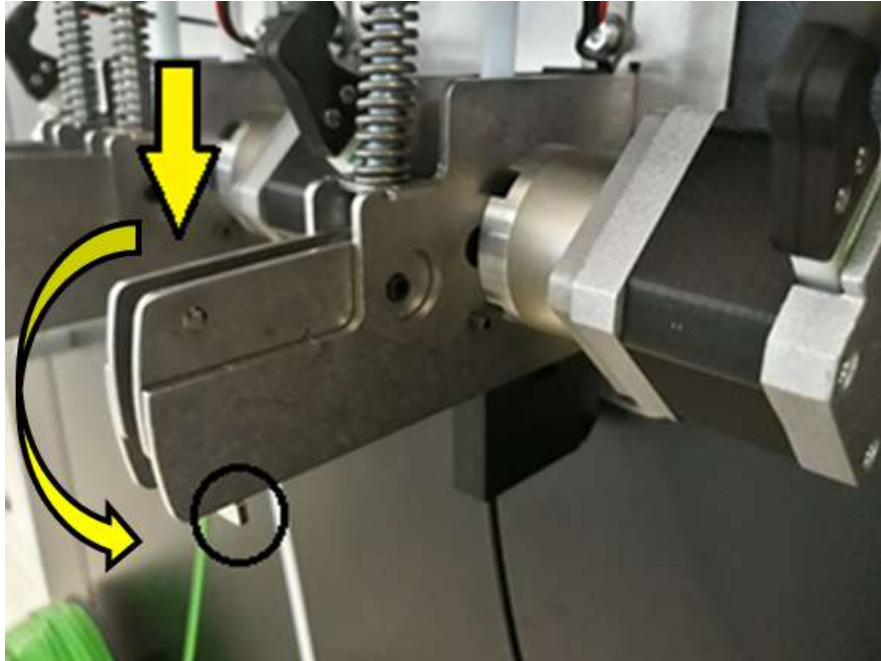


Figure 9.3.1 Disengage filament feeder

- 4) Pull any remaining filament from the feeder
- 5) Unlock and remove collar from filament spool spindle of selected extruder on back of printer. Remove filament spool and discard.



Figure 9.3.2 Securing Filament Spool with collar

- 6) Fit the new spool on the holder. Replace the locking collar and secure it to prevent de-coiling.
CAUTION – Be sure to replace spool with a new one with same polymer – feeding wrong polymer may compromise you printing process or even damage the printer.



Figure 9.3.3 Install and secure a new filament spool

- 7) Remove the filament end from where secured to the spool. Trim off several mm to remove bends, dirt, tape, or damage.



Figure 9.3.4 Trim off the end of new filament

- 8) Use scissors, knife, or a pencil sharpener to point the filament end for easy feeding to the extruder.



Figure 9.3.5 Illustration of correct and incorrect filament tip sharpening

- 9) Feed the filament into the feeder unit and keep feeding until the end stops at the extruder. Release the feeder handle. Verify the locking “tab” is disengaged.

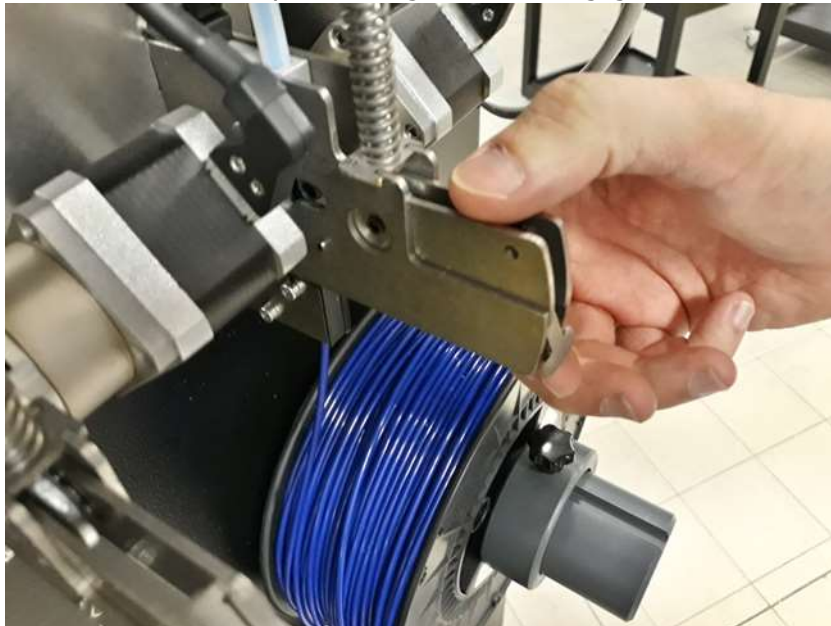


Figure 9.3.6 Engage the filament feeder

- 10) The locking tab is now engaged. The machine will automatically control the filament feed.

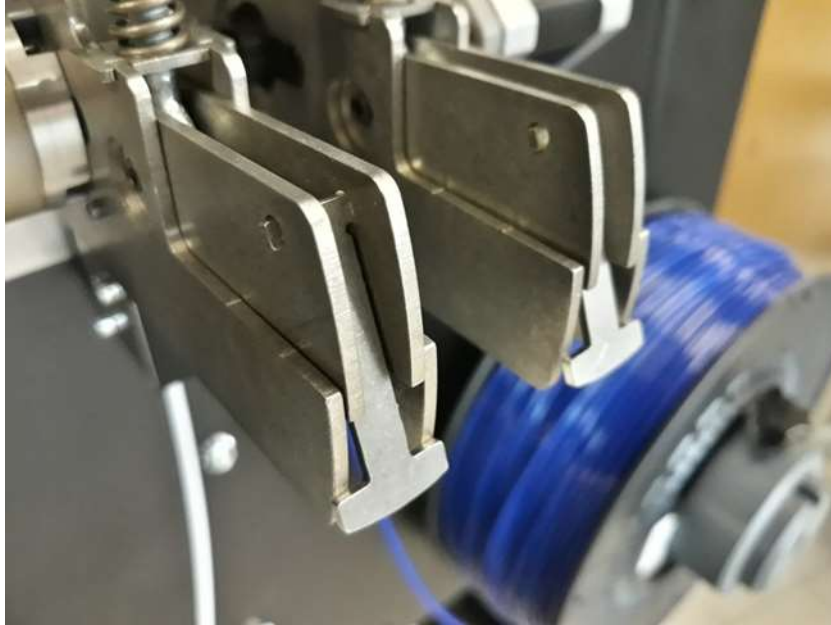


Figure 9.3.7 Filament feeder in the engaged position

- 11) Press the button on the jog wheel. The LCD will display "Priming #" as it purges some filament. Upon completion, the LCD will display "Change #x Complete" to indicate completion.

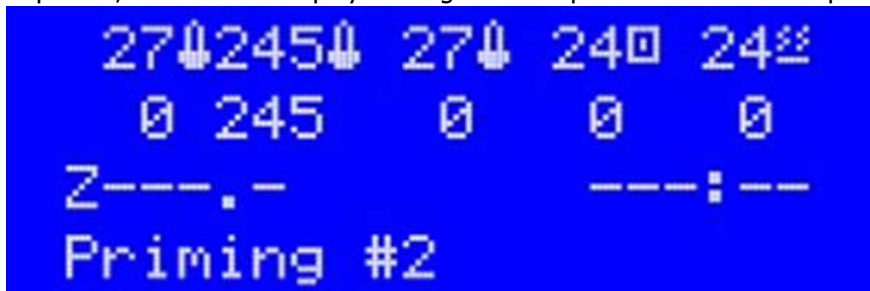


Figure 9.3.8 LCD Display while new filament is priming (A2 Printer Only)

- 12) When priming process will be over, remove the extruded filament.
NOTE - Minimize the time the door is open: excessive cooling may cause part delamination and ultimately waste a good amount of energy.
- 13) Push again on black button to restart printing.

| Printer & MMS Guide Navigational Links | | | | | |
|--|--|----------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| Complete List of Procedure/Work Instructions | | | | | |
| Printer Orientation | Initial Printer Installation, Set-Up & Calibration | Before you Print | Everyday Procedures | Maintain Printer/MMS | Calibrate Printer |

10 Calibrate Printer

This section contains the calibration procedures for your TRAK 3ntr printer. Your printer requires proper calibration to provide superior print performance.

- For the list of initial installation & set-up calibrations (also required when the printer has been moved from its base), see Section [Installation & Initial Set-Up Calibrations](#).
- For specific instructions regarding when to perform calibrations during normal operation and use, see Section [Periodic Maintenance & Calibration Schedule](#)

NOTE – Any time there has been a printer configuration change (such as a nozzle change, extruder heat bridge swap, or extruder disassembly), the printer should be re-calibrated to ensure proper print performance. Individual maintenance and repair procedures within this guide indicate what calibrations must be performed as part of other service/repair/configuration procedures.

10.1 Z Offset

This procedure lets you set the optimal distance between nozzles and printing surface. If you carefully followed the Z nozzle alignment procedure (especially if you used the gauge dial) machine will be already set to optimal conditions.

10.1.1 Z Offset Calibration Print

Following instructions will let you get a perfectly set machine, that will deliver constant quality prints!

This option lets you get a very precise Z offset control (the distance between nozzles and plate)

- 1) Be sure the ABS/ASA spool is loaded on nozzle #1
- 2) From the Prepare Menu, select the Hardware menu and press the black jogwheel button
- 3) From the Hardware Menu, select Calibration and press the black jogwheel button

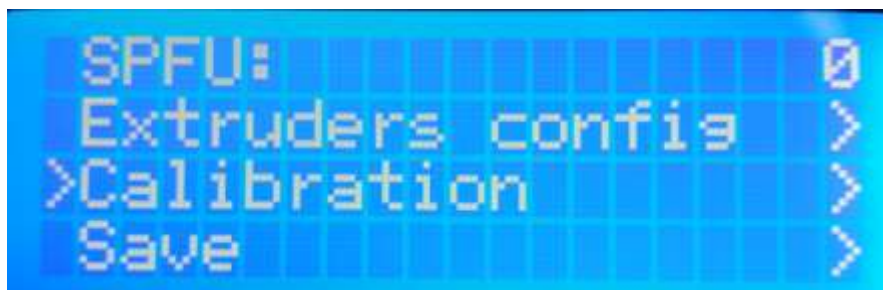


Figure 10.1.1 Selecting Calibration from Hardware Menu

- 4) Scroll down the Hardware Menu, select Offset Z and press the black jogwheel button

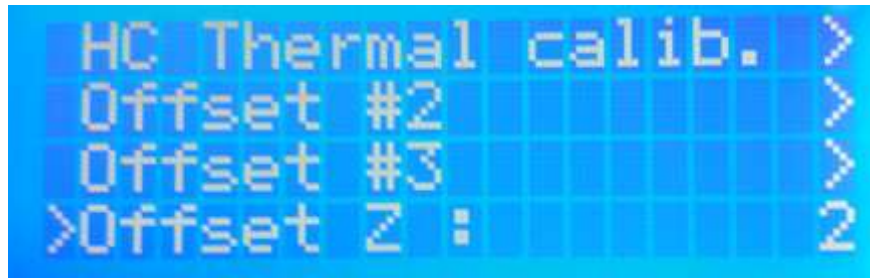


Figure 10.1.2 Selecting Offset Z from Calibration Menu

NOTE – The current Z offset setting is displayed on the Hardware Menu

- 5) Browse the nozzle size directories and select the one for the nozzles currently installed. The 3ntr printers are shipped with 0.4mm nozzles installed, thus select this to find the correct print program.

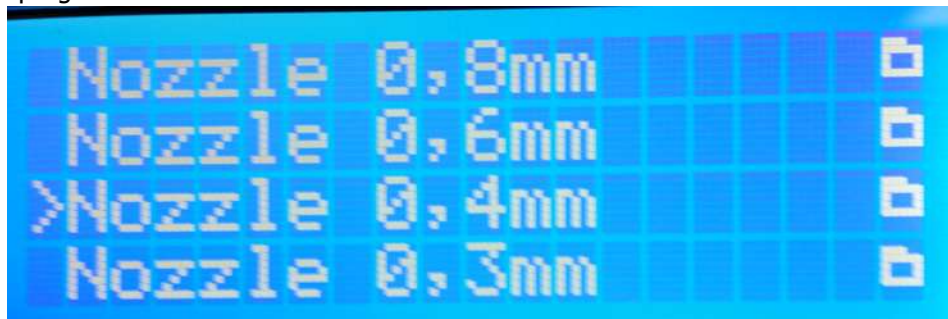


Figure 10.1.3 Selecting the Correct Nozzle Size Folder

- 6) Locate, select, and run the Z offset print program within the directory under the nozzle size.

NOTE – Use the TEST_2_EXTR file (if you have a two nozzle machine) or TEST_3_EXTR file (if you have a three nozzle machine) on the SD card (be sure to have ABS spools on all nozzles)

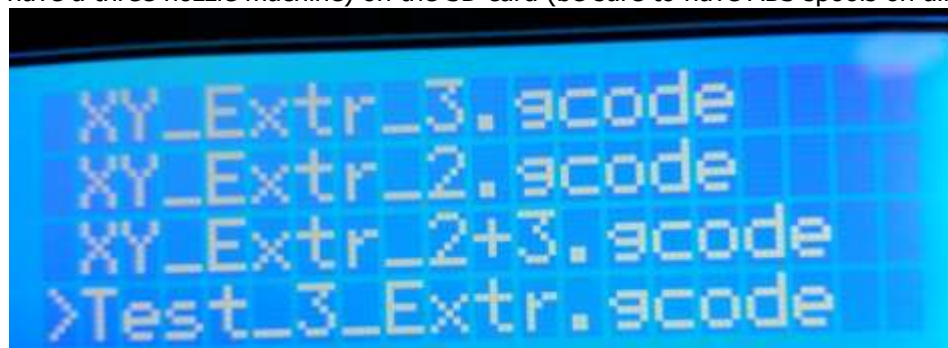


Figure 10.1.4 Selecting the Z offset Calibration Print Program

- 7) The machine will print a Z calibration pattern as shown below.

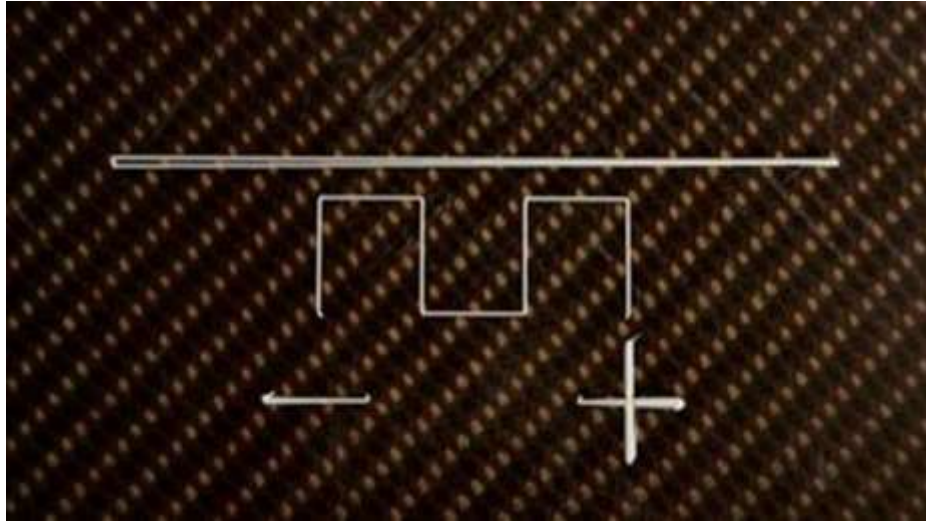


Figure 10.1.5 Z offset Print

10.1.2 Z Offset – Read, Enter & Save

- 1) Read the printed pattern using the diagram below to determine the correct Z offset value.
 - If the lines are starting to touch in the green area, the machine is already set to an optimal condition and no change in Z offset is needed.
 - If lines are touching into the yellow area, the Z offset value will need to be decreased as much as the steps from the green area.
 - If lines are touching into the pink area, the Z offset value needs to be increased as much as the steps from the green area.
 - In the test print above (not the diagram), we will need to decrease the Z offset value by two units (the area where lines are starting to touch is a two-step distance from the middle of the green area).

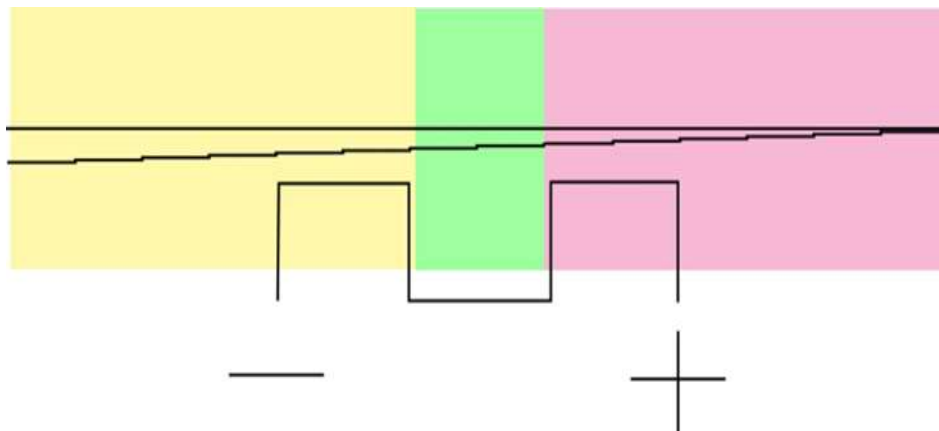


Figure 10.1.6 Illustration for Reading Z Offset Correction Amount/Direction

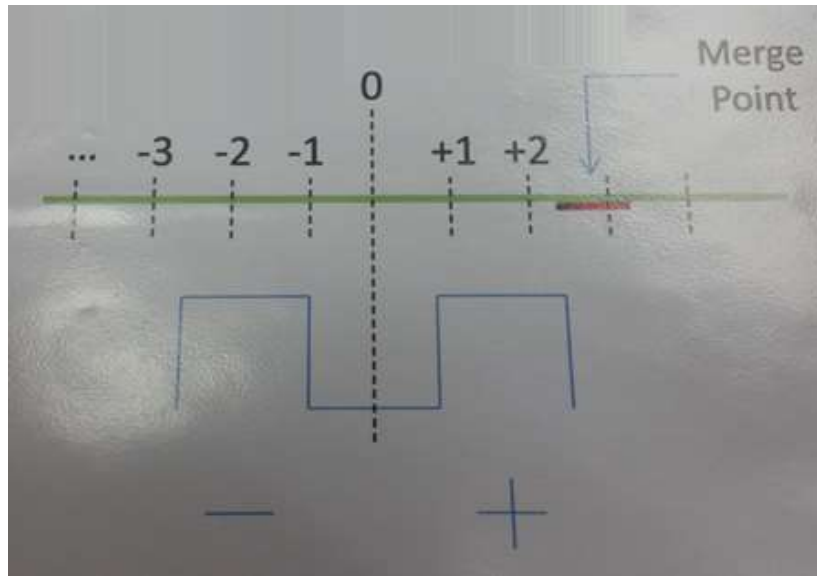


Figure 10.1.7 Diagram for Reading Z Offset Correction Amount/Direction

- 2) Enter the indicated value for Z offset.

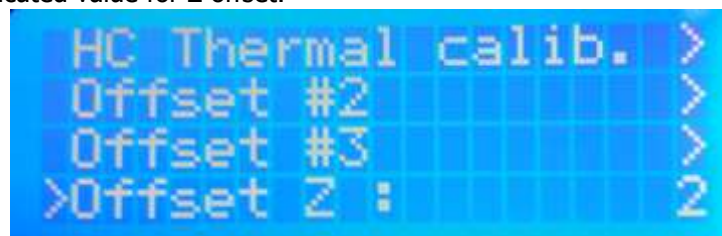


Figure 10.1.8 Entering Z Offset Correction Amount/Direction

NOTE – When entering the Z offset, the value is saved in two places as you move up the menu. The value for Z offset displayed on the selection menu will incrementally change as you enter and save the updated Z offset values.

- 3) Save the Z offset value



Figure 10.1.9 Hardware Menu: Save

10.2 XY Offset

To get perfect multi-extruder prints, you must ensure your nozzles are correctly calibrated. The XY calibration was set properly at the factory, and should be OK, but it's best to run calibration prints to make sure. Once set, the calibration will be valid until the printer hardware configuration is changed (such as a nozzle change).

In case of bad XY calibration, you could get interference areas between the object printed and support structure, this can be remedied with the XY offset process described in a subsequent section.



Figure 10.2.1 Print with Good XY Calibration



Figure 10.2.2 Print showing build and support material interference

There are several XY Calibration prints that must be completed to verify acceptable XY Calibration: Nozzle 1 to 2, Nozzle 1 to 3, and Nozzle 1 to Nozzle 2 and 3 simultaneously.

NOTE – The Current XY offset values saved in the printer are not displayed (as in the case for Z) in different places. You must move through the menus to determine the currently saved XY offsets and change them.

10.2.1 XY Offset Calibration Print

- 1) Load a dark (i.e. red or black) color on #1 and some contracting colors (white, yellow, green) on #2 and #3 using the load materials/filament instructions.
- 2) From the Prepare Menu, Select Hardware and press the black jog wheel button.

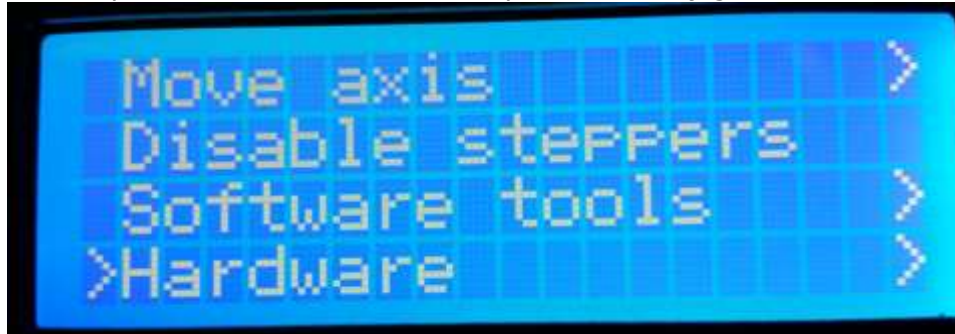


Figure 10.2.3 Hardware Selection from Prepare Menu

- 3) From the Hardware Menu, Select Calibration and press the black jog wheel button.



Figure 10.2.4 Calibration Selection from Hardware Menu

- 4) Next, Browse the nozzle size folders (XY calibration test print programs are within the folders) Select the nozzle size currently installed in the extruders (0.4mm nozzles are installed from the factory) and press the black jog wheel button.

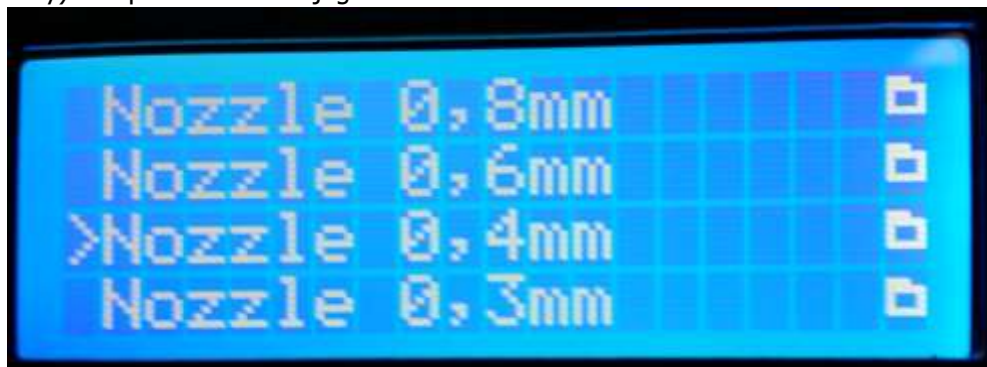


Figure 10.2.5 Selecting the 0.4mm Nozzle Folder for Calibration Prints

- 5) Next you must choose and select the correct g-code program for the desired nozzles for the calibration print. Select the desired program from the list and press the black jog wheel button.



Figure 10.2.6 Selecting Extruder Calibration Print G-code File

- 6) The printer prints the XY Calibration Test Print Pattern(s). Wait for the printer to complete printing then remove from printer.

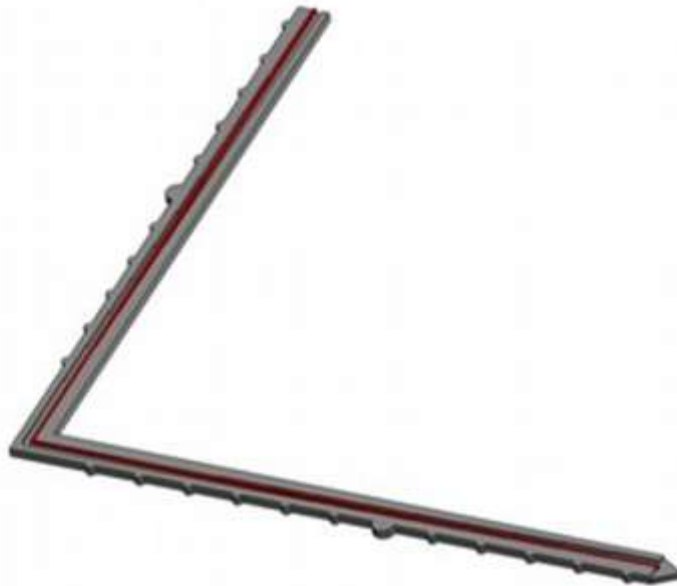


Figure 10.2.7 XY Calibration Printed Part

10.2.2 XY Offset – Read, Enter & Save

After performing the XY Offset Calibration Prints, you must look at the printed parts and use the XY offset illustration to determine the correct value to enter for XY offset correction.

- The procedure prints an “L” shape figure (shown above) with a reference notch on the middle of each arm and several smaller notches.

- The lower (reference) part should always be printed with the nozzle #1 (foremost) while the alignment line should be printed with the nozzle to be aligned.
- Looking closely, you will see that the reference part has a sort of “zig-zag canyon” on the upper face where the alignment is printed.
- Once printed, the part indicates the numerical values for adjustment in order to get optimal alignment of printer nozzles.

A XY calibration test print will indicate misalignment of the two nozzles used for the print. Perfect alignment (in one direction) is indicated in the illustration below. The material in the center channel (RED) is centered between the zig-zag canyon precisely at the location of the large notch in the center of the arm. In the case of misalignment, the number of notches (away from center) and the direction indicate the XY offset correction to be entered.

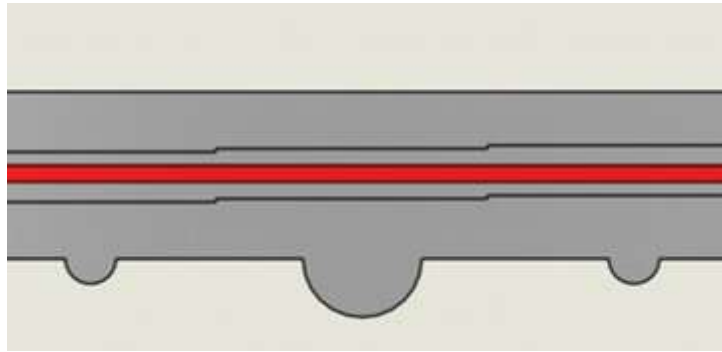


Figure 10.2.8 Perfect Alignment of XY Calibration Test Print

- 1) Obtain the XY Calibration test print (#1 and #2, for example) Find the location within the test print on the X axis where the RED bead is centered within the zig-zag canyon.

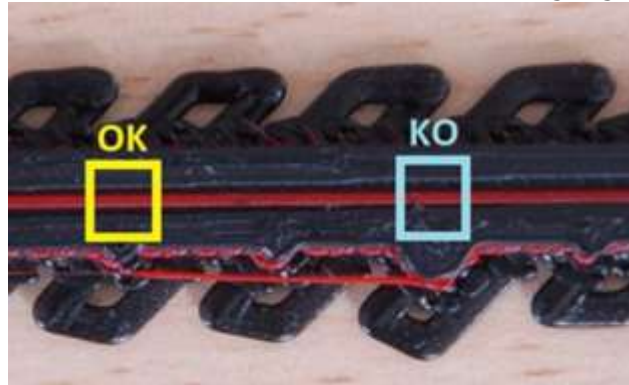


Figure 10.2.9 Bad alignment on Y axis – Value to enter is -2

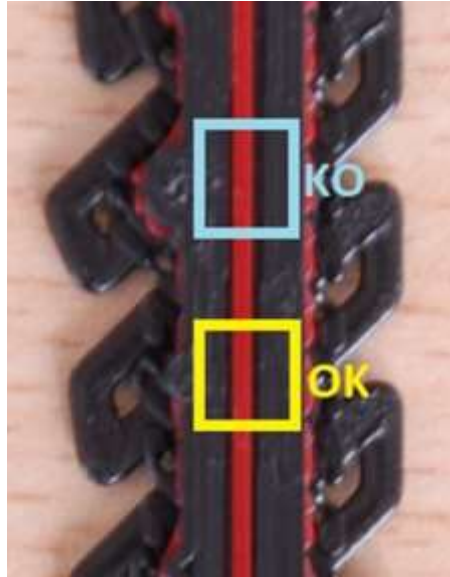


Figure 10.2.10 Bad alignment on X axis Value to enter is -1

- 2) Use the chart (or count the notches) and determine the direction (+/-) to find the numerical value for X.

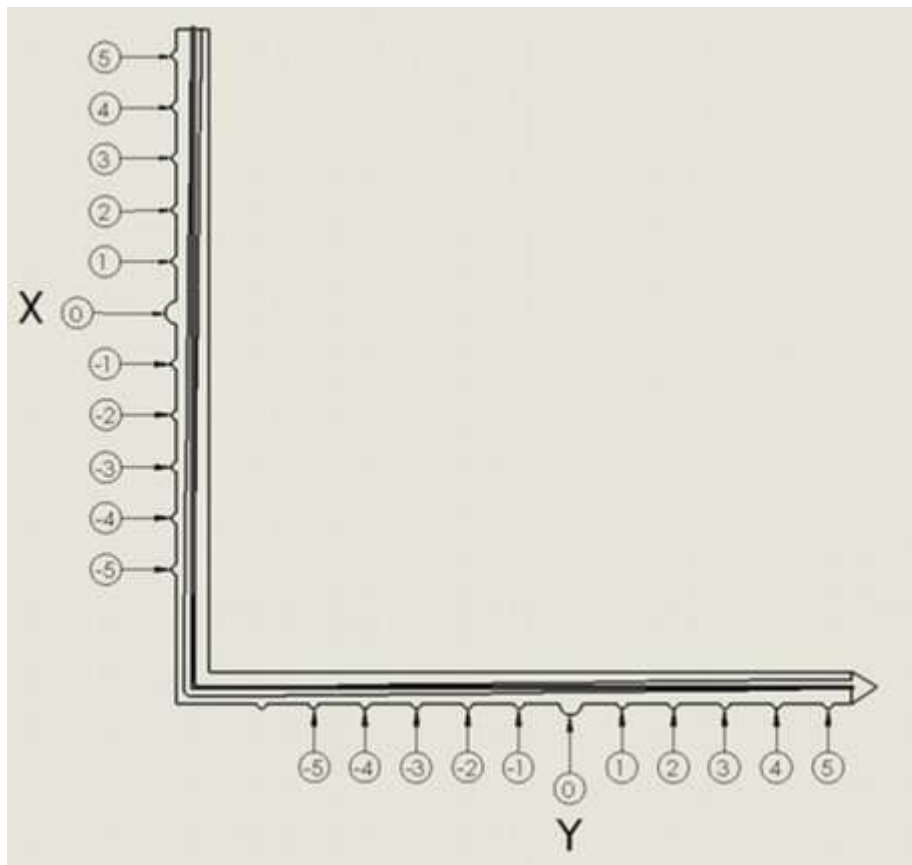


Figure 10.2.11 Alignment Notches on XY Calibration Printed Part

- 3) Repeat the process to find the numerical value for the Y axis.
- 4) Navigate the control menus to enter the offset values. Prepare > Hardware > Calibrate. Select the extruder (used for the test print) to be aligned.



Figure 10.2.12 Selecting Extruder #3 to Enter X,Y Offset Values

- 5) Enter the X and Y offset values.



Figure 10.2.13 Entering X and Y Offset Values (#3 Shown)

- 6) Save the results.



Figure 10.2.14 Hardware Menu: Save

- 7) Obtain the other nozzle XY Calibration test print (#1 and #3, for example).
- 8) Repeat the process to determine, enter, and save the XY offset values.

10.3 Z Nozzle Comparison -3 Nozzles Relative Z Position Calibration

This procedure will measure and adjust the relative Z (vertical) position of the three nozzles relative to each other. It is typically required after a nozzle change, extruder service maintenance, or other procedures that involve removing and replacing extruders/nozzles on the machine. To get optimal result, we recommend using the measure/maintenance kit, enabling you to achieve good relative position (usually better than 0.01 mm)

CAUTION – NEVER, EVER bend wire and thermo couple probe entering the heater You may permanently damage the heater. If you pull or bend too much you may kill thermocouple or short power leads.

In any case you are PERMANENTLY damaging the heater!"

- 1) Remove front panel and remove printing tray.
IMPORTANT - older machines (white paint, metallic Z arm) you must leave the tray in the printer
- 2) Clean ALL nozzles. For instructions, see Section 7.6 Clean Nozzles
- 3) Remove ALL the PTFE piping (push on collar with the key to easily remove PTFE pipe)



Figure 10.3.1 Remove PTFE Piping from Extruders

- 4) Set Z offset to zero
- 5) Do a XYZ home. For instructions, see Section 6.3 Auto Home Function
- 6) Bring the extruders at the center of printing area using the LCD "move" function
- 7) Release #1 #2 #3 setting screws

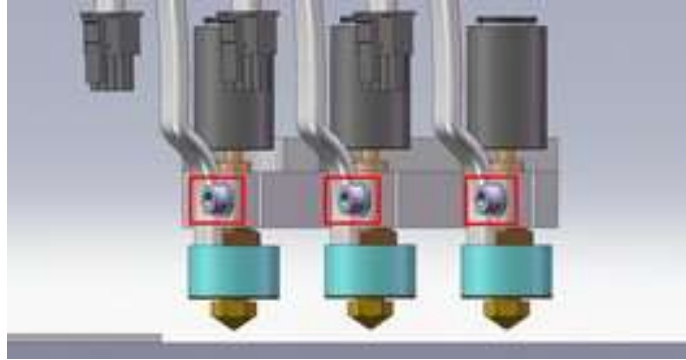


Figure 10.3.2 Set Screws – Loosen to Release

- 8) Release #1 pipe adapter screw



Figure 10.3.3 Release #1 Pipe Adapter Screw

- 9) Lift #2 and #3 nozzles, lock them into position with their setting screws
10) Move down extruder #1 to touch printing plate

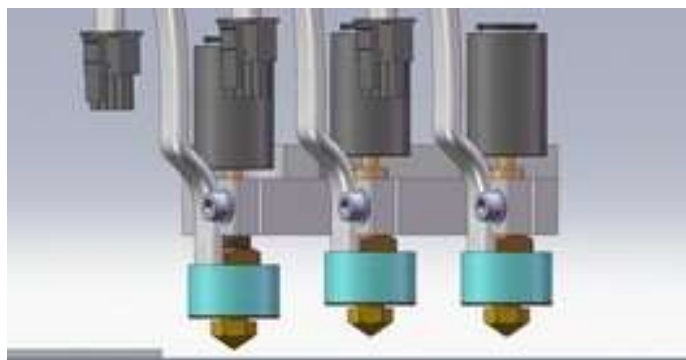


Figure 10.3.4 Extruder #1 touching Print Plate, #2 & #3 locked into Up position

- 11) Lock extruder #1 setting screw at 1.3 Nm with dynamometric screw driver



Figure 10.3.5 Locking Extruder #1 Set Screw to 1.3 Nm

- 12) Move plate at Z=1
- 13) Release #2 #3 setting screws.
 - a. Release #2 #3 tube adapter screws.

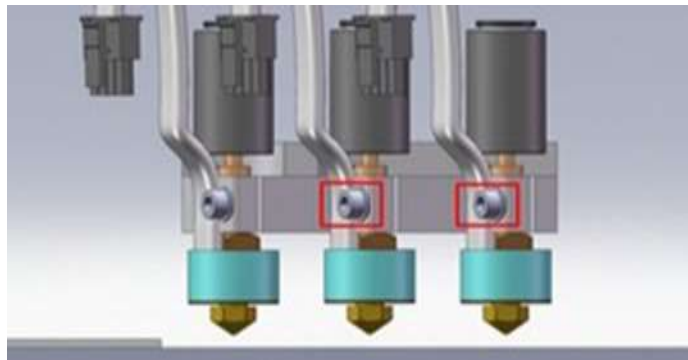


Figure 10.3.6 Release #2 & #3 Set Screws

- 14) Move down #2 #3 nozzles until touching the plate (you may need to unscrew a bit the tube adapters). If needed, gently tighten the setting screw (extruders must not be lifted by the gauge dial spring action)

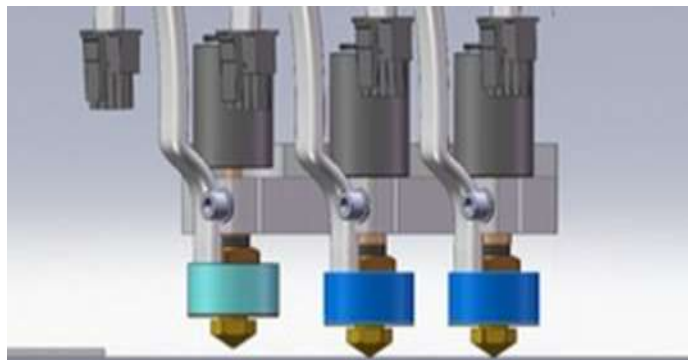


Figure 10.3.7 Hardware Menu: Save

15) Move the plate at Z = 150

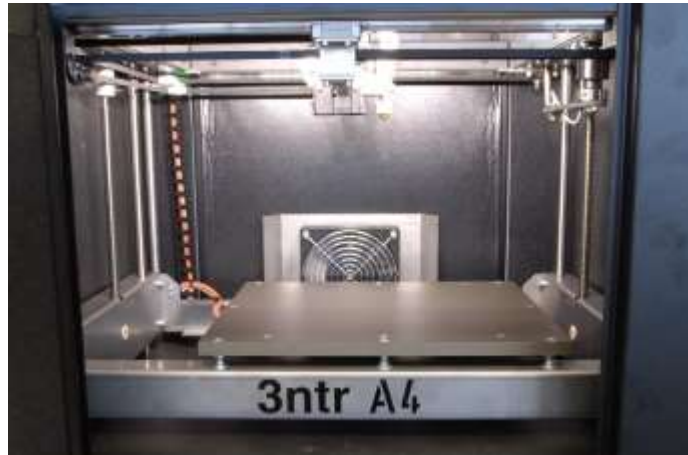


Figure 10.3.8 Printer Plate Moving Down

16) Place gauge dial assembly under nozzle #1

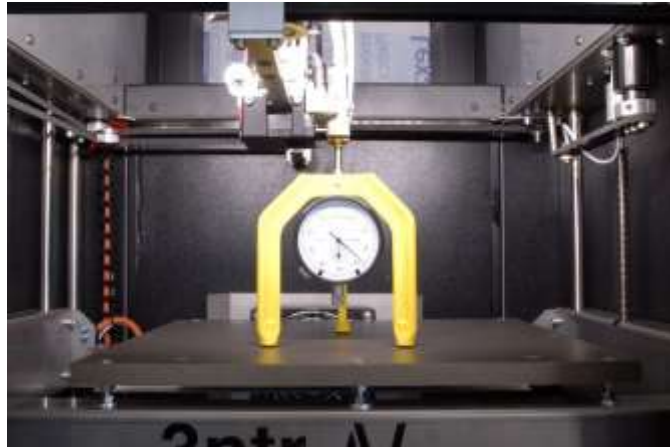


Figure 10.3.9 Dial Gauge Assembly under Nozzle #1

- 17) Using the Z move axis function (0,1mm) lift the printing plate until the long arm of the dial performs two full turns. Use the Z move axis function (0,01mm) to precisely set the long arm at 0 and short arm halfway between 2 and 3
- 18) Run Z_COMPARATION.GCODE: each time you will be pushing the black button (PUSH TO CYCLE) the printer will automatically be placing the next extruder on dial tip – you can use this loop indefinitely



Figure 10.3.10 Dial Tip on Extruder #1 for Z Comparison

- 19) Turn the tube adapter to lift nozzle #2 or #3 (if fitted) at same position of #1 (long dial arm on zero, short arm halfway between 2 and 3). GENTLY turn tube adapter to get best precision!



Figure 10.3.11 Dial Gauge Tip Under Extruder #2

- 20) Lock extruder setting screws.
Move tube adapter to expose screws.
Gently lock (0.5 Nm) the tube adapter screws.

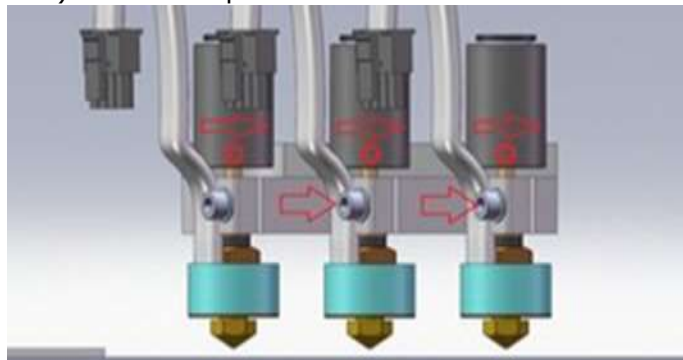


Figure 10.3.12 Lock Extruder Set Screws

21) Remove gauge dial

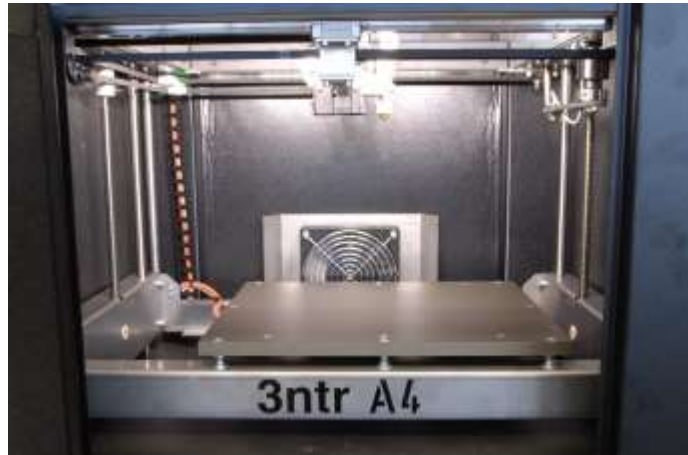


Figure 10.3.13 Empty Print Chamber

22) Put back on the PTFE piping.



Figure 10.3.14 Hardware Menu: Save

23) Feed filaments

24) Do a Z levelling test print for nozzle #2 and #3 (if available). For instructions, see Section 10.1 Z Offset

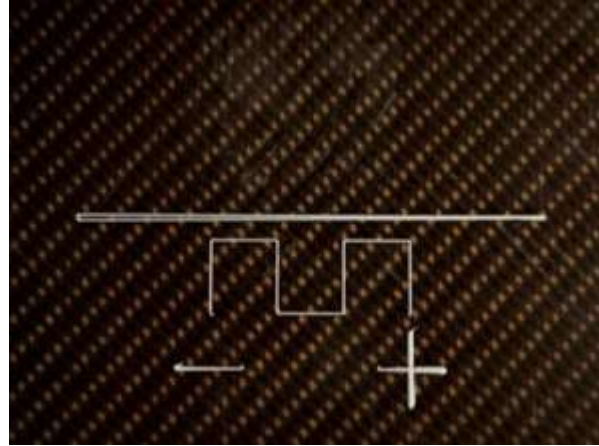


Figure 10.3.15 Z Level Test Print

25) Test XY Alignment. For instructions, see Section 10.2 XY Offset

10.4 Plate Leveling – User Procedure

You will need just a business card and a 8mm wrench:

- 1) Gain access to the print area, removing the upper/front cover
- 2) Remove all filament and PTFE piping (you can use the filament change function to help yourself)
- 3) Clean nozzle tips from any kind of residual
- 4) Slide out the printing plate
- 5) Run the "plate_lev_1.gcode" program from "Software Tools" menu
- 6) Machine will bring extruder at the first check point. Control will be given back to the user.
- 7) Move Z axis until you will be able to slide a business card between nozzle and print plate with little friction
- 8) Run the "plate_lev_2.gcode" program from "Software Tools" menu
- 9) Click on the jogwheel button to move nozzle around the check points, for three consecutive times.
- 10) You should be able to pass a business card under nozzles with little force. We are not seeking extreme precision here: small differences are OK. To lift or lower the plate use the threaded pillars under heated plate.



Figure 10.4.1 Using a Business Card to Assess Levelling

- 11) Click on the Jogwheel to move around checking points (at each point perform step #5)
- 12) When you find that situation is assessed OK, click on the jogwheel button to finish the job then tighten any loosened nut. If program terminates without reaching a satisfactory situation, run program again.

10.5 Z Nozzle Leveling Check – Calibration Print

To verify good Z alignment there are two programs available in every nozzle folder (at software tools command you will find several folders, one for each nozzle size available):

"Z_Extr_2.gcode" to verify alignment between nozzle #1 and #2

"Z_Extr_3.gcode" to verify alignment between nozzle #1 and #3

The above programs are meant to verify actual situation – no numerical indication will be returned. If you find that result is not acceptable you need to repeat the the Z nozzle alignment.

Below, find three types of print results from the indicated gcode programs. The following examples are done with white ABS on #1 and orange on #2.



Figure 10.5.1 Extruder too High/Up: Redo Z Nozzle Leveling

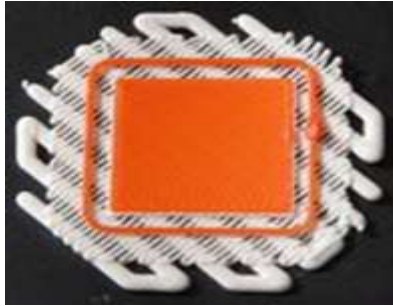


Figure 10.5.2 Perfect Extruder Alignment: Print at Correct Definition

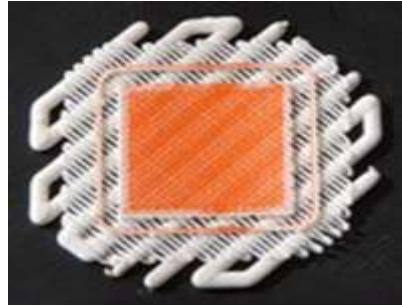


Figure 10.5.3 Extruder too Low/Down: Redo Z Nozzle Leveling

10.6 Cubes - Calibration Test Print

Print the CUBES file on the SD card, into "04" folder (be sure to have ABS spool on nozzle #1). If the small cubes are correctly printed (optimal plate adhesion, no cube has detached from tray during print) you can pass to next phase – otherwise you must re-check plate levelling.

10.7 Thermal Calibration

This section details the process to set the correction values (gain) of each extruder available on your printer. This process must be used any time there is an extruder/heater change and may need to be performed as part of a firmware change. Gain factors are written on delivery note and on each spare extruder.

CAUTION – Failing to update the thermal calibration for each extruder or setting wrong gains will possibly prevent the correct functioning of the printer. Be sure to doublecheck correct settings being saved in machine memory!

- 1) From the HARDWARE menu, choose the THERMAL CALIB option

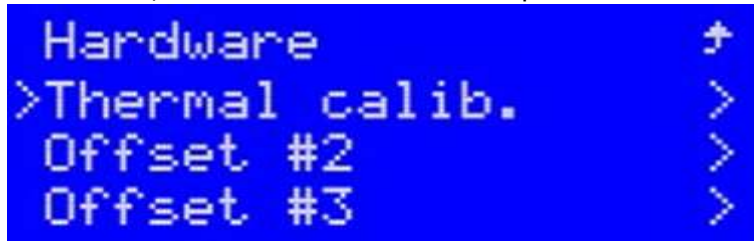


Figure 10.7.1 Selecting Thermal Calibration from Hardware Menu

- 2) You will be given the choice of which extruder to modify gain

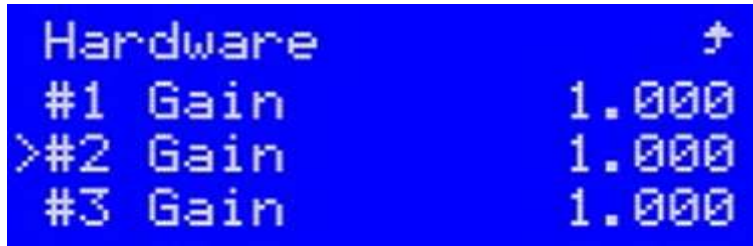


Figure 10.7.2 Choosing Extruder for Thermal Calibration

- 3) Use the jogwheel to modify selected extruder gain



Figure 10.7.3 Modifying Extruder Gain

- 4) Save the gain settings



Figure 10.7.4 Saving Thermal Calibration

| Printer & MMS Guide Navigational Links | | | | | |
|--|--|----------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| Complete List of Procedure/Work Instructions | | | | | |
| Printer Orientation | Initial Printer Installation, Set-Up & Calibration | Before you Print | Everyday Procedures | Maintain Printer/MMS | Calibrate Printer |

11 Maintain Your Printer & MMS Unit

11.1 Periodic Maintenance & Calibration Schedule

Before Each Print:

- Clean the printer tray and ensure it is secured in the correct location
- Verify the filaments loaded matches the material profiles specified during slicing
- Determine if enough filament remains to complete the print
- Make sure the feeder handles are in the engaged position for all extruders
- Purge nozzles and verify acceptable flow conditions

Each Month:

- Check cooling liquid levels. Refill if needed using only supplied (RED) coolant. Do not dilute.
- Nozzle Check – Clean with Nylon and Cleaning function from LCD/Replace nozzles if needed.
- Clean all the feeder rollers

Every 6 Months OR If Printed Part Quality Degrades:

- Z calibration
- XY calibration
- Heat Exchanger cleaning
- Firmware version check
- By Factory Trainer Personnel: Rail lubrication, Belt tensioning, Screw/Bolt tightening, Feeder roller pressure check, Heater temperature.

11.2 Check & Fill Coolant Level

The 3ntr printer is shipped with the coolant reservoir filled; however, check the coolant level before performing any calibration or test prints.

CAUTION – Printing with insufficient coolant will result in bad prints and in some cases may result in nozzle and/or extruder damage. Check and replace coolant on a weekly basis.

- 1) Locate the coolant filler cap on the top of the 3ntr printer.
- 2) Unscrew and inspect the coolant level. If lower $\frac{1}{4}$ " below cap thread fill using the extra coolant (RED color) supplied with the printer. Use only factory approved coolant. Do not dilute.



Figure 11.2.1 Coolant Bottle and Printer Fill Cap



Figure 11.2.2 Proper Coolant Fill Level – $\frac{1}{4}$ Inch Below Cap Thread

11.3 Extruder Handling & Service

This section provides an overview of the Extruder assembly, provides detail instructions regarding handling the extruders, and provides instructions for assembling/disassembling the extruder as may be required for service or repair.

11.3.1 Extruder Overview

When looking at Figure 6.7.1 below we can find four main parts:

Tube adapter (2): is the round aluminum part that is used to hold the PTFE pipe that bring filament to the extruder. Pushing on collar (1) you can detach the PTFE piping. Set Screw (3) is used to secure the tube adapter on extruder – slightly tighten it (0.5Nm maximum)

Heat bridge (4): it's a carefully machined stainless-steel pipe that may be mounted upside down to get different thermal performances. Smooth outer surface must never be grabbed by vices or pincers.

Ceramic heater (6): the extruder heart, where the action is. We spent a lot of time improving it- use part (5) when assembling/disassembling an extruder

Nozzle (7): available on 0.3 / 0.4 / 0.6 / 0.8mm. Don't confuse our nozzle with cheap imports – ours have been engineered bot hat geometry and finish level to get you the maximum possible performances. Available also on anti-abrasion metal (0.4mm).

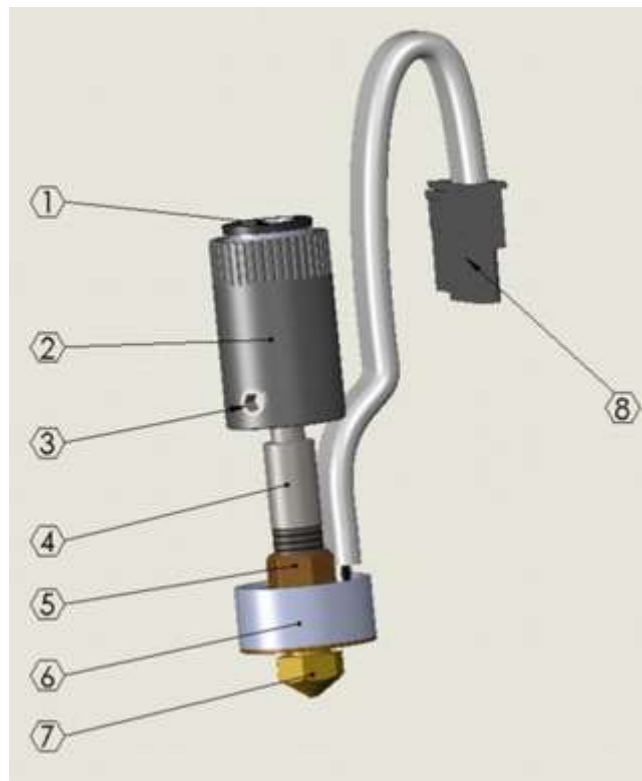


Figure 11.3.1 Extruder Components

11.3.2 Extruder Assembly Breakdown



Assembly Breakdown

An extruder assembly consists of:

1. Print Head Connector
2. Thermocouple
3. Heater Wires
4. Bowden Tube Adapter
5. Heat Bridge
6. Ceramic Heater Assembly
7. Nozzle

Figure 11.3.2 Extruder Component Identification Guide

11.3.3 Extruder Configurations – Normal/HI TEMP

When disassembling an extruder assembly, pay close attention to the heat bridge orientation.

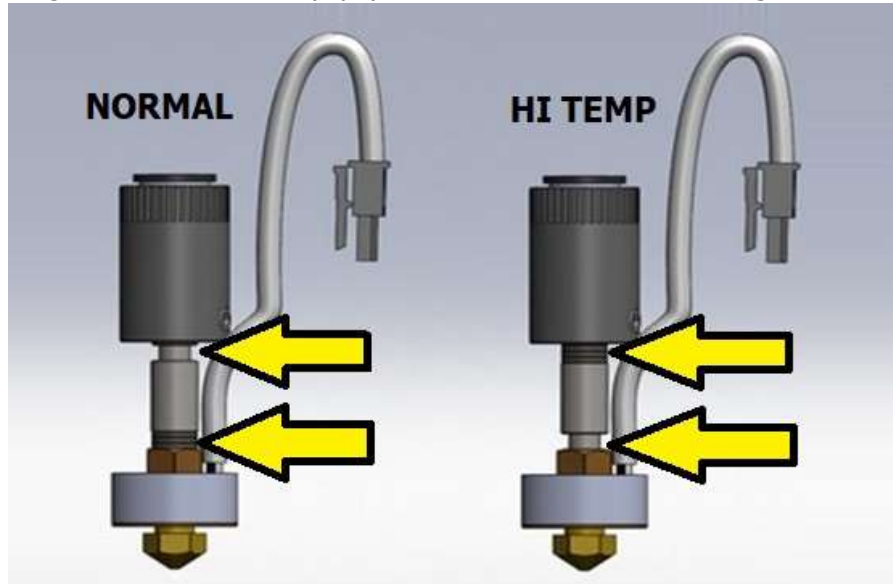


Figure 11.3.3 Extruder Configuration ID Guide: Normal and HI TEMP

11.3.4 Handling Extruder Assemblies – Best Practices

Your 3NTR extruder assemblies do require some attention to handling to ensure a long service life.

This section provides guidance for handling extruders as applicable to nozzle changes, extruder disassembly, and any other maintenance service operation that requires handling the extruders.

11.3.5 Tools Required for Extruder Service



Recommended tools:

- 2.5mm hex driver (Set included with printer)
- Stainless Steel wrench (Supplied with printer)
- 7 mm deep Socket (optional in Spares and Special Tools Kit)
- 0.5 mm feeler gauge (optional in Spares and Special Tools Kit, not shown)
- Dynamometric screwdriver with a setting of 1.3Nm (optional in Spares & Special Tools Kit, 2.5mm ¼" bit not shown)

Figure 11.3.4 Tools for Extruder Service

11.3.6 Avoid Damaging the Ceramic Heater Assembly

IMPORTANT – At no time should there be clamping or twisting force on the ceramic heater assembly, thermocouple, and heater wires. Doing this will damage the ceramic heater assembly beyond repair and void your warranty.



Figure 11.3.5 Damaged Ceramic Heater from Applied Force

NOTE – In the photo of the Damaged Ceramic Heater, the ceramic is brittle, and once cracked, will loosen and further break down on each nozzle heat-up/ cool down cycle leading to rapid failure. To avoid this, the assembly is held together by opposing force that happens as the heat bridge is screwed into the nozzle, both into the ceramic heater assembly using the torque screwdriver.

11.3.7 Tool for Nozzle and Heat Bridge Service

Your printer comes supplied with a small, stainless steel wrench suitable for gripping the square surface provided. A 7mm deep socket is (included in the optional Tools & Spare Parts Kit) used to grip and secure the nozzle against the heat bridge at the correct torque value. 1.3Nm

Use opposing force only to secure assembly for use in the printer.

IMPORTANT - These are the only surfaces you should use force on when servicing an extruder.



Figure 11.3.6 Custom Factory Supplied Tool for Gripping Square Surface

11.3.8 Nozzle and Ceramic Heater Assembly/Disassembly

A small .5 mm gap is needed between nozzle face and surface of ceramic heater assembly.

In addition, there is an order we find works best to avoid stress on the ceramic heater assembly.

- 1) Make sure assembly is cooled to room temperature to insure easy handling and disassembly.
- 2) For disassembly, use wrench on square surface of ceramic heater assembly and use socket on nozzle. Apply opposing force to loosen the two. Once free, both should be free to remove by hand. Never use pliers on the heat bridge.
- 3) For assembly, hand thread the nozzle close to .5mm gap. Follow that by hand threading the heat bridge until it stops against the nozzle. This gap is not critical. Just make sure it is there. Fit both wrench and socket on torque screwdriver, apply opposing force to secure them to one another at 1.3 Nm.

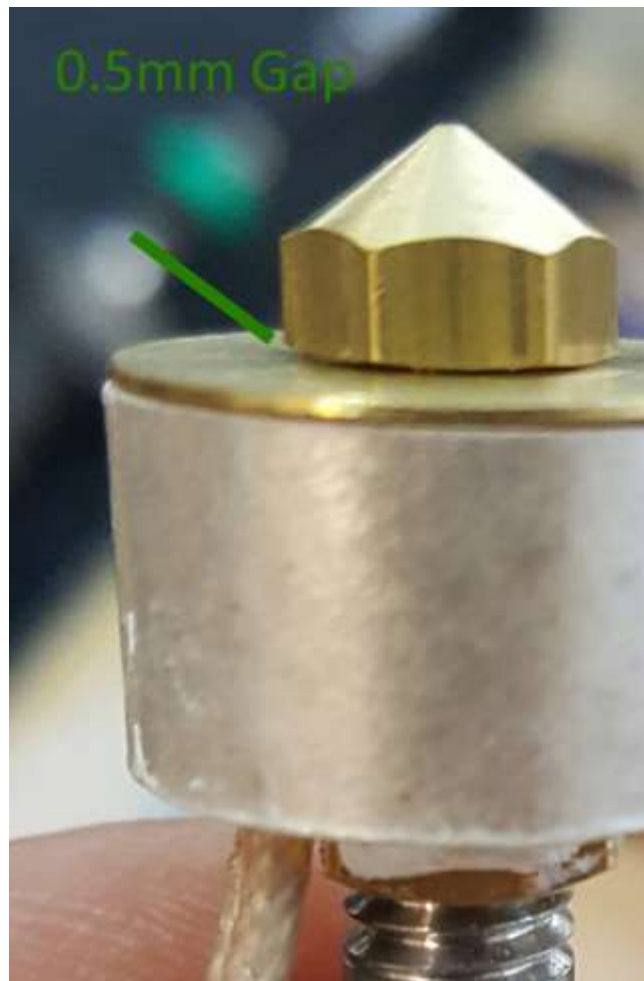


Figure 11.3.7 Gap Between Extruder Heater and Nozzle Shoulder

11.3.9 Other Extruder Handling Considerations

The most common cause of failure is excessive movement and or rough handling of thermocouple wiring and end connector. When assembling, avoid excessive forces on all wires and thermocouple. This is also true when mounting an extruder back into the printer head for printing.

One way to avoid excessive wire movement is to secure Bowden Tube Adapter into place with set screw exposed for easy access should a future service be required.



Figure 11.3.8 Using Set Screw to Secure Bowden Tube Adapter

Set Screw Positions must be reachable, but as close to aluminum block as position will allow without touching.



Figure 11.3.9 Set Screw Location

IMPORTANT – Avoid direct stress on thermocouple wire leading into ceramic heater. Sometimes a full disassembly of an extruder is required to clean trapped material. Before doing this, consider attempting both the short and long high heat clean procedure first.

11.4 Extruder Disassembly

This sections details disassembly of the extruder that may be required to remedy extruder performance issues, to replace a heater, or for nozzle service (off-machine)

Before undertaking an Extruder Disassembly, be sure to review all the instruction regarding handling extruders. See Section [Extruder Overview, Handling, & Service](#) for details before proceeding.

CAUTION - NEVER, EVER bend wire and thermo couple probe entering the heater You may permanently damage the heater. If you pull or bend too much you may kill thermocouple or short power leads. In any case you are PERMANENTLY damaging the heater!

- 1) Do a Z homing then move plate to Z=190
- 2) Run a nozzle cleaning and leave the nozzle empty.
See Section [Clean Nozzles](#) for Procedure.
- 3) Remove PTFE piping: push on collar with the supplied tool (or a 7mm key) while pushing in the pipe then pulling it away



Figure 11.4.1 PTFE Tubing Removal

- 4) Remove tube adapter: release the screw using a 2mm hex key

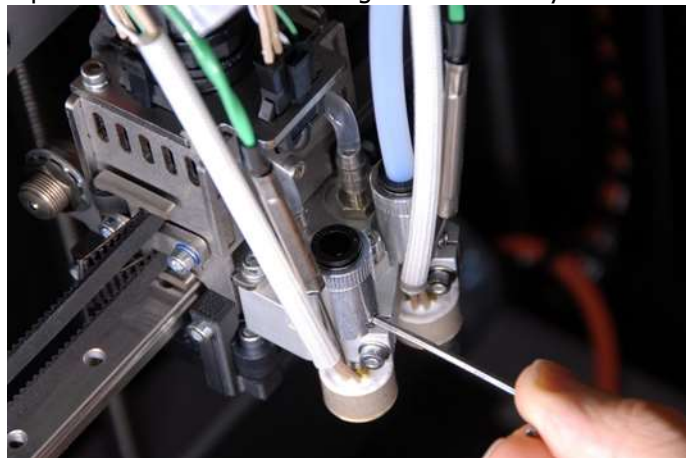


Figure 11.4.2 Release Tube Adapter Set Screw

- 5) Hold the heater with the specific tool.

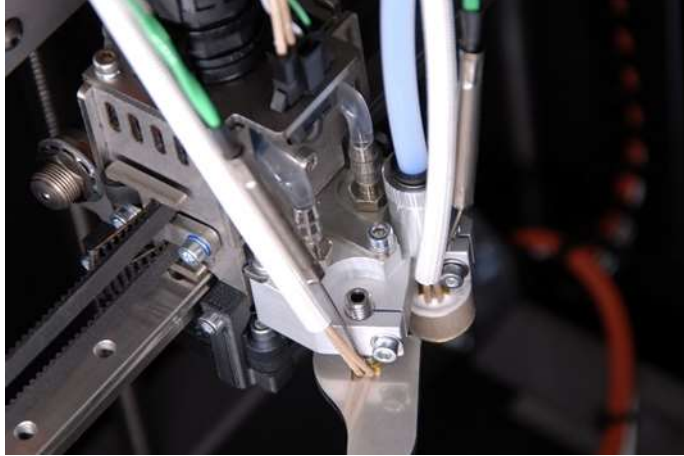


Figure 11.4.3 Holding Heater with Specific Tool

- 6) Remove nozzle (you can use dynamometric screwdriver)

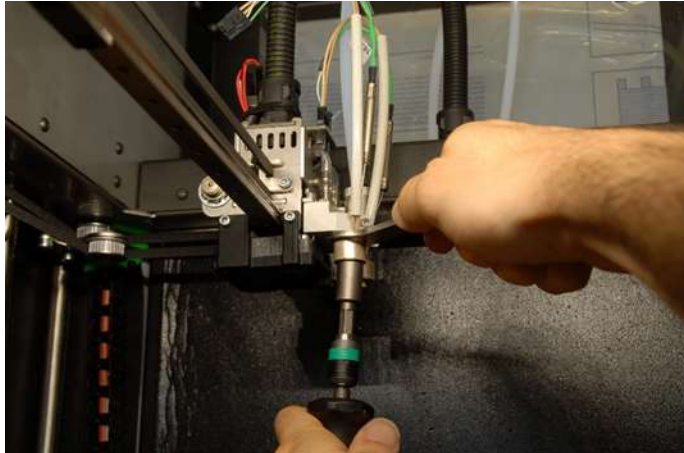


Figure 11.4.4 Nozzle Removal and Tools

- 7) **IMPORTANT** – if nozzle should be locked on heater:
- run a filament change to heat up the extruder.
 - wear protective gloves
 - remove nozzle
 - press emergency button to stop heating.
 - Turn ON printer and WAIT for extruder to cool down before going on
- 8) Unplug heater connector (push on small clip before pulling)

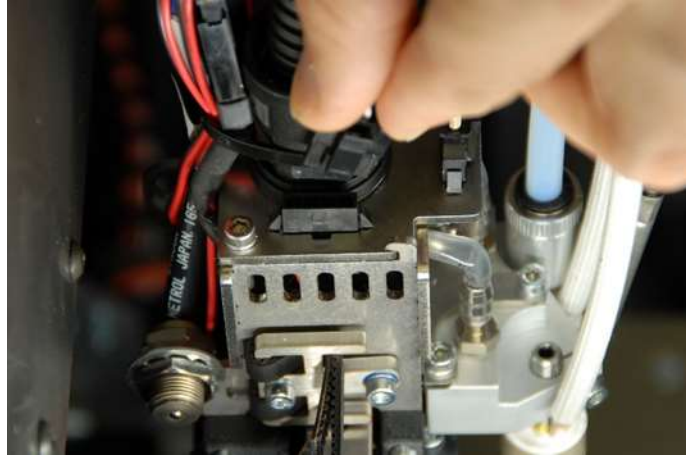


Figure 11.4.5 Unplug Heater Connector – Push on Clip Before Pulling Connector

- 9) Release set screw, remove extruder

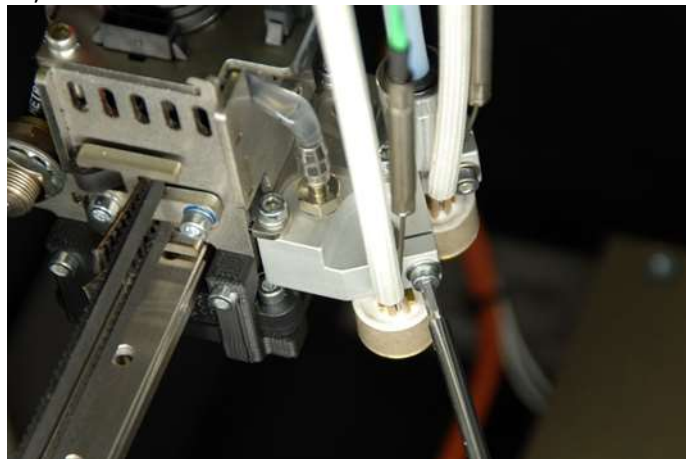


Figure 11.4.6 Release Extruder Set Screw

- 10) Remove steel pipe (heat bridge)

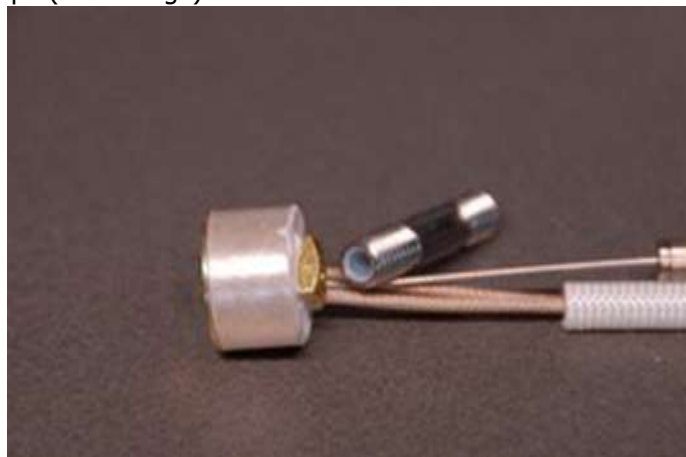


Figure 11.4.7 Heat Bridge Removed

11) Mount the nozzle, leaving about one mm clearance as shown

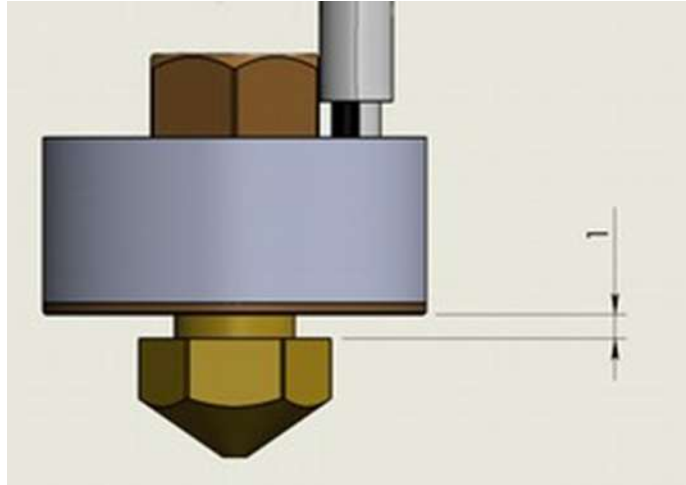


Figure 11.4.8 Nozzle Clearance Illustration

12) Mount the heat bridge with desired configuration (Normal or HI TEMP)



Figure 11.4.9 Extruder Heat Bridge

13) Lock the extruder with the setting screw using the dynamometric screwdriver (1.3 Nm)

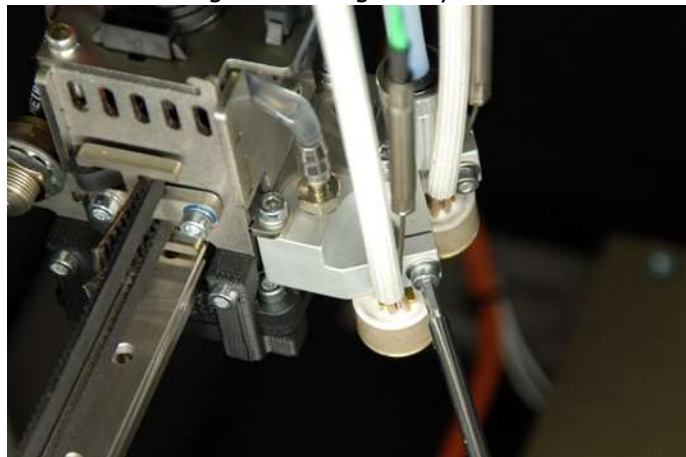


Figure 11.4.10 Lock the Extruder Set Screw

14) Mount the tube adapter. Holding the heater with specific tool, lock the nozzle using the dynamometric screwdriver (1.3Nm)

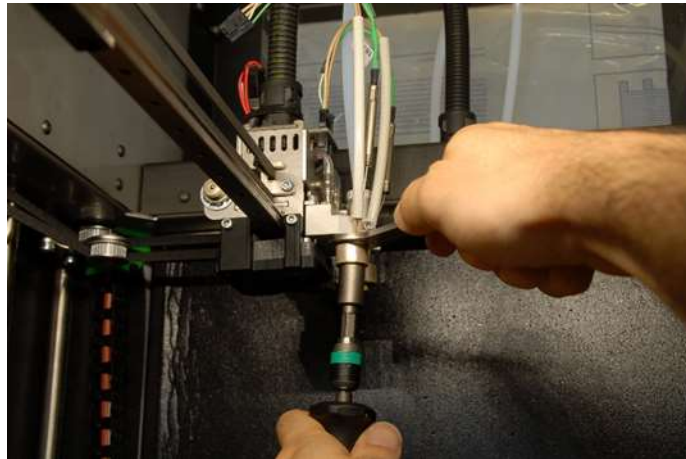


Figure 11.4.11 Holding Heater & Locking the Nozzle

- 15) Perform a Z nozzle alignment.
See Section [Z Nozzle Comparison -3 Nozzles Relative Z Position Calibration](#) for Procedure
- 16) Plug in the PTFE piping, feed the filament.
- 17) Check XY alignment.
See Section [XY Offset](#) for Procedure.

11.5 Filament Feeder Installation

This section details the process to install the filament feeders to the printer. Each feeder has a specific position: refer to the illustrations applicable to your printer (below). If machine has three extruders, the longest pipe must go on the #1 feeder (the right most one, when looking from rear side).

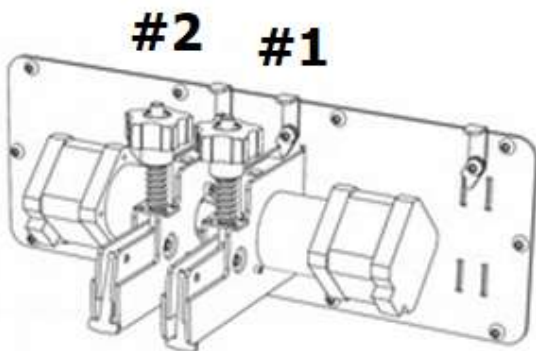


Figure 11.5.1 Two Nozzle Feeder (A4)

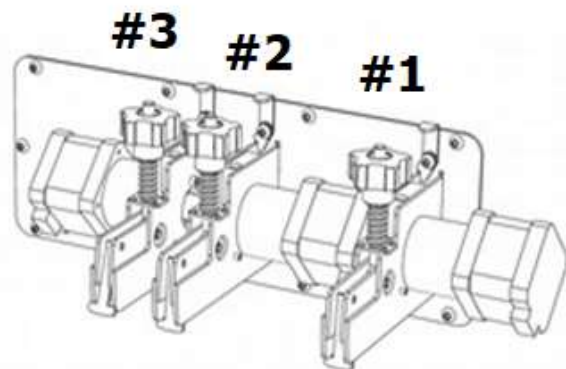


Figure 11.5.2 Three Nozzle Feeder (A2)

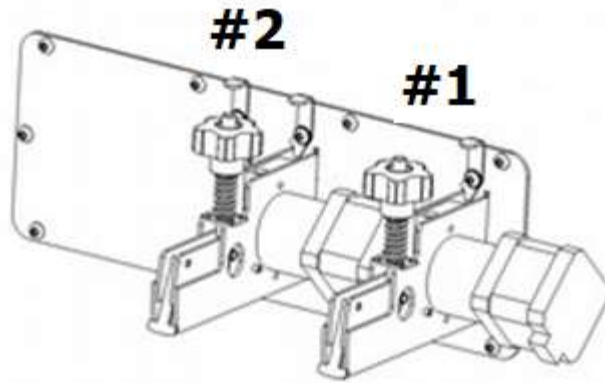


Figure 11.5.3 Two Nozzle Feeder (A2)

NOTE – Before fitting it on the printer, each filament feeder assembly must have its PTFE pipe fitted



Figure 11.5.4 Feeder Without PTFE Pipe

- 1) For each filament feeder: screw PTFE pipe on without forcing, until you can't turn it anymore, unscrew for half a turn to avoid excessive pressure on threads.



Figure 11.5.5 Fitting PTFE Pipe on Feeder

- 2) After fitting the PTFE pipe on each feeder, you can proceed to mount feeder on the machine routing the piping thru the ports just above each feeder.



Figure 11.5.6 Route Pipe Through Each Passage

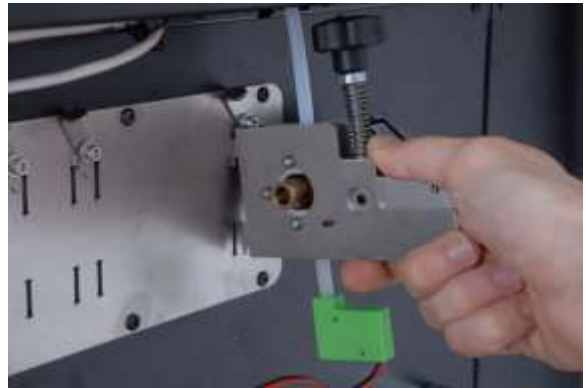


Figure 11.5.7 Engage Feeder Securely in Each Location

- 3) Mount all feeders, be sure that each feeder is fully engaged, pushing it downwards.
- 4) Secure each feeder with lock lever.



Figure 11.5.8 Feeder Lock Lever in Unlocked Position



Figure 11.5.9 Feeder Lock Lever in Locked Position

- 5) Plug the electrical connectors. Feeder #1 (the rightmost one, when looking at the rear side). Its cable is longer as it can be used to drive the optional elastomer filament (SPFU) feeder

NOTE – Make sure the printer power is OFF before connecting the steppers and out of filament sensors



Figure 11.5.10 Stepper Motor Connector



Figure 11.5.11 End of Spool Sensor Connector

- 6) Plug all extruder pipes, taking care not to tangle them.
 - When looking at machine LCD panel, forefront extruder is the #1, therefore must be connected with leftmost PTFE pipe.
 - To get full access to extruders you may want to lower the printing plate – see “LCD functions” manual section –and gently move the extruder holder assembly to a suitable position
 - Connection is simply obtained plugging the pipe and pushing fully inside into the pipe holder.

NOTE – PTFE piping must not come off unless pushing on the small plastic collar. Be sure to have PTFE pushed all the way inside the holder.

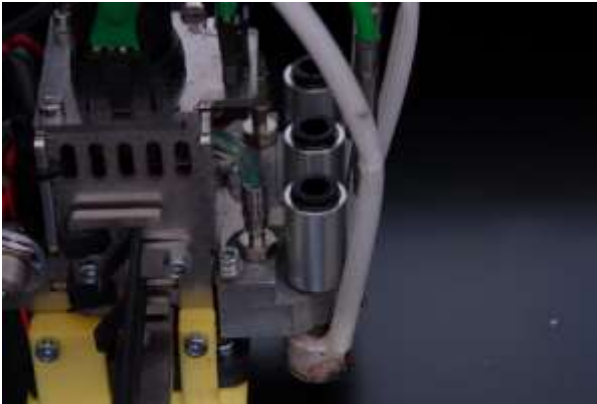


Figure 11.5.12 Before plugging PTFE



Figure 11.5.13 PTFE tubing plugged into #1

11.6 Feeder Roller Cleaning

Routine cleaning may be performed simply blowing compressed air on the roller – use a compressed air can (you can find them at any general store, on office supplies shelves)

- 1) Remove filament from selected extruder using the Unload Filament Procedure
- 2) Turn off machine
- 3) Detach PTFE piping from extruder
- 4) Disconnect stepper cable (grab connector NOT the cable)



Figure 11.6.1 Disconnect Stepper Cable

- 5) Detach feeder assembly from printer
- 6) Unscrew the three bolts (as from picture) and detach gearbox

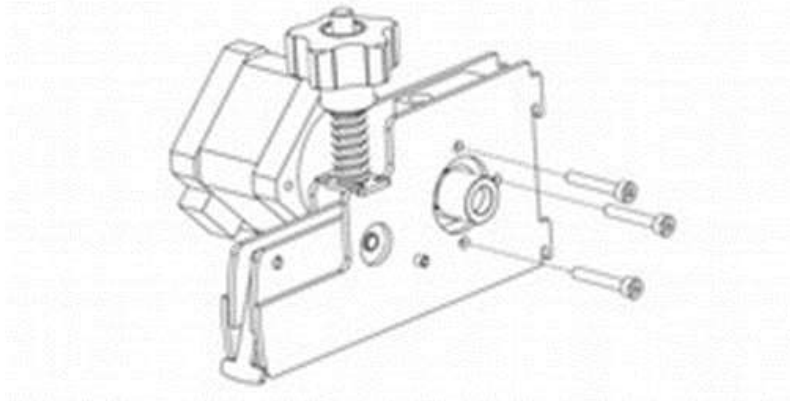


Figure 11.6.2 Filament Feeder Bolt Removal

- 7) Use a needle or a sharp pointed object to remove residual plastic from feeder roller – you may help yourself with compressed air



Figure 11.6.3 Saving Thermal Calibration

- 8) Rebuild everything and put the assembly back on printer.
- 9) Print a test part to verify.

11.7 Printer Firmware Update

This section details the process to update firmware for your printer. New firmware updates for your machine may improve performance or even add new features. Keep in touch with your TRAK 3ntr partner to keep your printer firmware up to date.

11.7.1 Check Firmware Version

To know what firmware version and machine type is running on your printer:

- 1) Connect to your printer, either directly (PC) or via print server.

- 2) Enable display of the communication log (PC) or use the console (print server)
- 3) Send the "M505" command to the printer
- 4) The machine will reply with a string like the following one:
44321 29-3-16 Marlin KIMBRA – A.Cotronei – 3ntr
- 5) Meaning that your machine is type 44321 and firmware release date is march 29th,2016.

You will need the following files:

44321_EN.hex if you want an English-speaking LCD interface

44321_FR.hex if you want it in French

44321_IT.hex if you want it in Italian

NOTE - If your firmware is not responding at the M505 command, chances are that you are running a version that is way too old. Get in touch with your TRAK 3ntr partner or directly with TRAK customer service to learn about your machine upgrade policy.

11.7.2 Firmware Upgrade Process

Whatever is your preferred connection method (via PC or Print Server), you must follow few but fundamental steps:

- 1) Send M505 command to learn your machine firmware type
- 2) Send M218 command to get the XY offset of extruders – you may get different output according to firmware version

```
[...]
Send: M218
Recv: echo: Hotend offsets: 0.00,0.00 0.20,24.10 0.00,48.00 0.00,0.00
Recv: ok
[...]
```

Figure 11.7.1 M218 Output Example (XY Version)

```
20:52:07.237: Echo:Hotend offsets: 0.00,0.00,0.00 0.30,24.00,0.00 0.50,48.00,0.00 0.00,0.00,0.00
```

Figure 11.7.2 M218 Output Example XYZ Version

- 3) Send M518 command to get the thermal gain values of installed extruders

```
20:47:56.200: Echo:AD595 Offset & Gain
20:47:56.201: Echo:T0 Offset: 0.00, Gain: 0.96
20:47:56.203: Echo:T1 Offset: 0.00, Gain: 0.96
20:47:56.204: Echo:T2 Offset: 0.00, Gain: 0.96
20:47:56.206: Echo:T3 Offset: 0.00, Gain: 1.00
```

Figure 11.7.3 M518 Command Output Example

- 4) Load CLEANER firmware (whatever is your preferred method: PC or PRINT SERVER)
- 5) After one minute, load the required firmware version
- 6) Reload XY alignment parameters
(in case of fig.58) M218T1X0,2 Y24,1 M218T2X0 Y48
(in case of fig.59) M218T1 X0.3 Y24 M218T2 X0.5
- 7) Reload thermal gain values
M518T0 G0,96
M518T1 G0,96
M518T2 G0,96
- 8) Permanently save the parameter settings
M500

11.7.3 Firmware update – PC procedure

To perform any firmware update with your PC, you must have available

- The XLOADER package, that can be easily obtained from many websites
- The CLEANER firmware
- The latest release of the firmware for your machine. The name must be equal to the first part of the M505 command result(see previous chapter) Be sure to have received the correct version for your machine and the cleaning program. Before starting the upgrade procedure, be sure to write down the output of the following commands:
- M218 (extruder offsets):to keep trace of nozzle displacements
- M518 (thermal gains): to get precise heating performances

Now you can start cleaning the machine memory:

- 1) Run XLOADER - Configuration should be automatically set at XLOADER start, except for the COM port on your PC –use the one you are already using to connect to printer.
- 2) Select the CLEANER.hex file to be loaded. Upload it to the printer clicking on the UPLOAD button. When done, power off printer, wait a few seconds then turn it on again.
- 3) Wait one minute for machine memory cleaning – no user intervention needed
- 4) Now use XLOADER again to load the desired firmware.
- 5) Quit XLOADER once firmware is uploaded.
- 6) Connect to the printer and re-write the M218 and M518 parameter THEN send an M500 to store them in the machine memory.
- 7) Now machine is ready to print!



Figure 11.7.4 Xloader Tool

11.7.4 Firmware update – Print server procedure

When using the print server, the firmware update procedure is faster and easier: just select the .HEX code to be uploaded. No software to install. Therefore, you can follow same procedure as for PC firmware upgrade, just using your browser instead of XLOADER.

Remember save configuration with M500, after restoring M218 and M518 parameters!

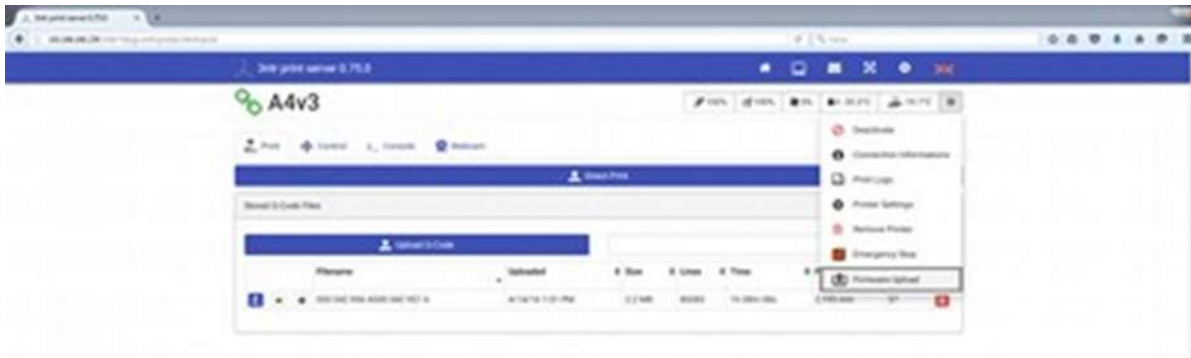


Figure 11.7.5 Firmware Upgrade Command



Figure 11.7.6 Flashing Firmware

11.8 MMS Firmware Update

The MMS unit may require a firmware update. If needed, follow these instructions:

- 1) Download the Propeller tool here:
<https://www.parallax.com/downloads/propeller-tool-software-windows-spin-assembly>
- 2) Download the correct MMS v1 or v2 firmware from these locations:
 V1 MMS: https://drive.google.com/open?id=1pUxs9JCG_5_Vx98I3TcFBbVnjrC76bYL
 V2 MMS: https://drive.google.com/open?id=1mn5ngnrCs-OovshFR7_KruPscIqoziG
- 3) Connect the computer to the cabinet display via the USB cable inside the MMS (very short, may need a USB male-female extension cable).
NOTE – You should see the cabinet’s touchscreen power up when connected.
- 4) After installing the propeller tool and downloading the firmware, start the propeller tool, then click “open” under the file menu and select the binary firmware image (you may need to set file selection filter to “all”); then click the “Load EEPROM” button on the object info window that appears (middle button).

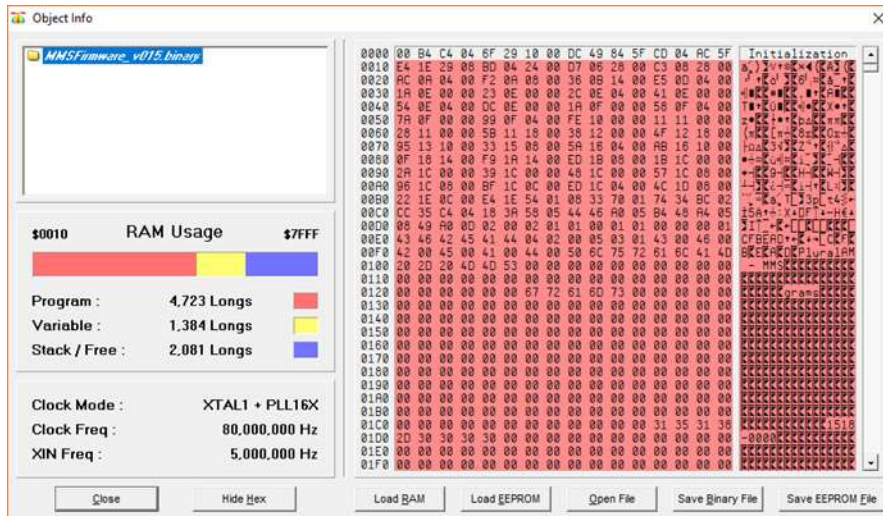


Figure 11.8.1 Updating MMS Firmware

- 5) Locate and copy the serial number from inside the cabinet (near the server power outlet)



Figure 11.8.2 MMS Unit Serial Number

- 6) Update the system id from the system menu on the touch screen (necessary to connect multiple mms cabinets to the same server).

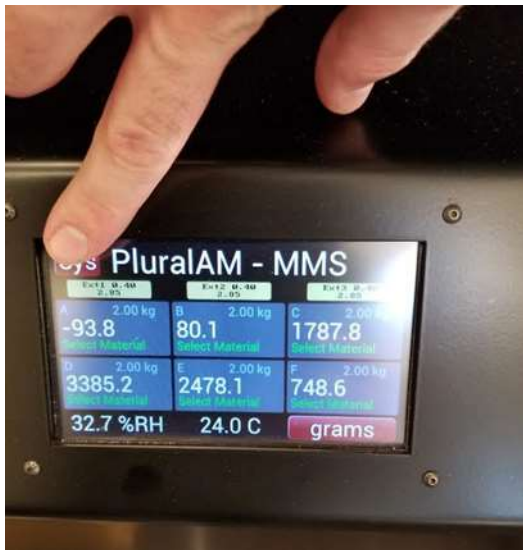


Figure 11.8.3 Sys button on MMS



Figure 11.8.4 Set Machine ID

11.9 Controlling Relative Humidity (RH) within MMS Cabinet

We have found that that with minimal cabinet openings the RH can be kept below 10% for one or more weeks at a time. You can choose how dry you want to keep the cabinet by determining when you exchange and dry the desiccant cylinders. Experience so far indicates that changing and drying the cylinders about once a month should keep the RH below 20% unless there are an unusual frequency and/or extended duration of cabinet opens.



Figure 11.9.1 Drying Desiccant Canister in Oven

The desiccant cannisters are renewable. Put a wet cannister in a conventional oven at 425° for 2.5 hours to renew it. A completely dried cylinder holds about 1 pound of water.

We dry ours in a home oven on layers of aluminum foil, then use multiple layers of foil to wrap the cylinder tightly to keep it dry until use (figure 23).

| Printer & MMS Guide Navigational Links | | | | | |
|--|--|----------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| Complete List of Procedure/Work Instructions | | | | | |
| Printer Orientation | Initial Printer Installation, Set-Up & Calibration | Before you Print | Everyday Procedures | Maintain Printer/MMS | Calibrate Printer |

12 Troubleshooting

This section provides troubleshooting assistance for commonly encountered problems. Browse the list to locate the specific problem/symptom, then review potential causes and perform the diagnostic/remedy actions as indicated. Use of the troubleshooting tables can save time and effort!

12.1 Troubleshooting Tables

| Problem/Symptom: Little or No Extrusion | |
|---|---|
| Potential Cause | Diagnostic/Remedy Actions |
| Filament has quality issues (diameter is bigger than 3.1mm or smaller than 2.6mm, polymer purity problems, filament is contaminated with powder/dust) | Check filament diameter, if needed discard the spool Check that filament is correctly wound on spool |
| Nozzle partially jammed | Clean nozzle with LCD function Replace Nozzle if cleaning unsuccessful |
| Dusty Contamination | Check that printer is not working into an excessively dusty environment |
| Wrong slicer settings for the filament (usually: extruder not hot enough, printing speed too fast) | Check your slicing setting, be sure to use right ones for current polymer |
| Dirty feeding roller | Clean the feeding roller |
| Insufficient feeding pressure | Increase feeding pressure (using the knob) |
| Extruder has electrical issues | Check the connector to be fully seated Check cable integrity You may want to change extruder for a new one Check M518 value |
| Feeding roller setting screw is loose | Tighten it using a 2mm hex key |
| Cooling system fault | Check liquid level Check radiator fans Wrong thermal calibration Check that recorded values are correctly matching the installed heaters |
| Nozzle is too close to plate | Perform Z calibration |

| Problem/Symptom: Part Won't Stick to the Plate | |
|---|--|
| Potential Cause | Diagnostic/Remedy Actions |
| Plate is dirty | Clean the plate using Acetone (when printing ABS) or alcohol-based cleaners (PLA) or just with warm water and soap (PA) to remove fingerprints, glue leftovers and other adhesion improvement substances |
| Z offset is too big. | Decrease Z offset setting in your slicer |
| First layer speed is too high. | Decrease first layer speed in your slicer settings |
| Polymer in use is not compatible with printing bed surface. | Change surface or use an adhesion improvement product (hairspray or any other product) |
| Printing plate is too cold. | Increase thermal settings (plate and heated chamber) |
| Part has very small "foot area" compared to height. | Decrease printing speed Increase layer thickness Enlarge support / use brim Check alternative part orientation |
| Be sure that door is closed | Close Door - if not, part may detach from plate and/or delaminate" |

| Problem/Symptom: Part Contamination – Lacks Color Separation | |
|---|--|
| Potential Cause | Diagnostic/Remedy Actions |
| Plate is dirty | Clean the plate using Acetone (when printing ABS) or alcohol-based cleaners (PLA) or just with warm water and soap (PA) to remove fingerprints, glue leftovers and other adhesion improvement substances |
| Extrusion temp is too high | When an extruder is deselected, if temperature is too high makes for longer liquid polymer state (aka: oozing) than flows out of nozzle due to gravity. Decrease printing and/or preheating temperature. |
| Print speed is too high | Residual nozzle pressure isn't neutralized with retraction. Slow down printing speed |
| No nozzle priming strategy enabled | Use one of the possible slicing solutions (prime pillar, wall, ...) that let you keep a cleaner part |
| Bad Z nozzle leveling | Be sure to correctly perform the calibration of Z nozzle alignment |
| Bad XY nozzle alignment | Be sure to correctly perform the XY nozzle alignment |

| Problem/Symptom: Part Dimensional Issues – Big or Small | |
|--|---|
| Potential Cause | Diagnostic/Remedy Actions |
| Polymer has higher than expected shrinkage ratio | Increase your part size in slicing software Change polymer Lower printing temperature (if possible) Use part ventilation Use heated chamber |

| Problem/Symptom: Incomplete Print | |
|---|--|
| Potential Cause | Diagnostic/Remedy Actions |
| There is a vertical gap between part and nozzles | Nozzle jam: See Problem/Symptom Little or No Extrusion: Nozzle Jam. |
| Part is at nozzle level – If printing as a PC peripheral | Problem with USB connection (cable near electrical noise sources such as motors, power transformers...): change cable routing or buy a shielded one |
| system rebooted (i.e. OS or anti-virus update) or wrong power saving settings | Update/Correct |
| AC power interruption | Use an UPS suited for the printer power rating |
| Part is OK just up a certain quote then got a “hairball” | Part is too tall and thin – vibrates during printing process and breaks. Part detached from plate - Change part orientation in slicer software to make it steadier. Design some custom support into the 3d part mode |

| Problem/Symptom: Collision During Homing Axis: Doesn't Stop | |
|--|--|
| Potential Cause | Diagnostic/Remedy Actions |
| Problem with homing sensor (end stop) cabling | Be sure that end stops are not engaged. Send the M119 command: printer will answer with end stop status. Now push on each sensor, while sending the M119 command: the sensor status must correctly tell the status (ENGAGED). If not true, check sensor cabling and connectors (Y sensor has also a connector on the print head) on the motherboard. |
| Damaged endstop | If previous step doesn't give any result, the end stop may be faulty giving erratic output: replace it. |
| Firmware problem | If you just upgraded firmware, you may have loaded the wrong version for your printer. Get in touch with tech support. |
| Damaged motherboard | Motherboard may have a defective part (i.e.: cold solder joint). Needs to be replaced. |

| Problem/Symptom: Cold Nozzle with High Temp Readout (378°C) | |
|--|----------------------------------|
| Potential Cause | Diagnostic/Remedy Actions |
| Defective thermocouple | Replace heater assembly |
| Bad connector | Replace heater assembly |

| Problem/Symptom: Machine is Stopped – MAXTEMP Displayed | |
|--|--|
| Potential Cause | Diagnostic/Remedy Actions |
| Defective electrical connection | Check connector integrity |
| Defective heater | Replace heater (or set thermal gain to 0.9 to temporary disable the error message – YOU CAN'T USE THIS EXTRUDER ANYWAY)" |

| Problem/Symptom: Molten Part/Falling Sides | |
|---|---|
| Potential Cause | Diagnostic/Remedy Actions |
| Problem with part cooling fan | Check fan connection. See if there is anything trapped inside fan. If needed, change fan. |
| Print speed is too low | Increase print speed |
| Extrusion temperature is too high | Decrease extrusion temperatures |

| Problem/Symptom: Can't Find Files on SD Card | |
|---|---|
| Potential Cause | Diagnostic/Remedy Actions |
| Printer SD Card hasn't been correctly seated in | Push the SD inside its socket |
| Defective SD card | Replace SD card – contact customer service to learn about the GCODE files that must be saved on SD card |

| Problem/Symptom: Squashed Printed Part/Jerky Z Movement | |
|--|------------------------------------|
| Potential Cause | Diagnostic/Remedy Actions |
| Motherboard cooling fan is dead | Replace fan |
| Connector of one of z stepper is faulty or unplugged | Restore connection or change cable |
| Stepper / Gearbox moving z axis is faulty | Replace it |

| Problem/Symptom: Part Looks Shifted | |
|--|----------------------------------|
| Potential Cause | Diagnostic/Remedy Actions |
| See Problem/Symptom Squashed Part/Jerky Z Plate Movement | |
| Wrong Z nozzle leveling | Do Z nozzle leveling |

| Problem/Symptom: No USB Connection, LCD not Lit | |
|---|---|
| Potential Cause | Diagnostic/Remedy Actions |
| The LED lights inside printer are on | Motherboard problem – probably a short on a fan or on an extruder |
| The LED lights inside the printer are off: Problem with main 24V power. | Contact tech support |
| The LED lights inside the printer are off: Tripped 220V fuse. | Contact tech support |

| Problem/Symptom: Sketchy Movement/ Axis won't Reverse Direction | |
|--|----------------------------------|
| Potential Cause | Diagnostic/Remedy Actions |
| See Problem/Symptom Squashed Part/Jerky Z Plate Movement | |

| Problem/Symptom: Filament is Stuck into Bowden | | |
|---|-----------------|---|
| Potential Cause | Scenario | Diagnostic/Remedy Actions |
| Filament diameter is too big | ANY POLYMER | change spool |
| Excessive pressure on feeding roller: filament is squeezed | ANY POLYMER | relieve pressure |
| Using heated chamber: PLA will "inflate" when exposed to temps over 50-55°C | PLA | DON'T use heated chamber when using PLA |

| Printer & MMS Guide Navigational Links | | | | | |
|--|--|----------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| Complete List of Procedure/Work Instructions | | | | | |
| Printer Orientation | Initial Printer Installation, Set-Up & Calibration | Before you Print | Everyday Procedures | Maintain Printer/MMS | Calibrate Printer |

13 Appendix

13.1 Appendix 1 – Useful Gcode Commands

| Command | Printer Execution/What it Does |
|----------------------------|---|
| G1 X100 Y100 F9000 | Move to X100 Y100 at 9000mm/min |
| G90 | Absolute coordinate system |
| G91 | Relative coordinate system |
| G92 E0 | Set current axis position (in this case current extruder feeder filament position is set to zero) |
| M11 | Enable/Disable filament sensor |
| M75 | Start print timer |
| M77 | Stop print timer |
| M104 T0 S215 | Set extruder 0 temperature at 215°C , don't wait to reach it. If T0 is omitted, it's meant applied to current extruder |
| M106 Snnn | Set fan speed (nnn = 0..255). If no S option, then run at full speed. |
| M107 | Turn off fan |
| M109 Sn M109 Rn | Set current extruder temperature, wait until you reach it S works while heating, R works for heating AND cooling. |
| M112 | Emergency stop |
| M115 | main parameters list (via USB) |
| M117 MESSAGE"xxxxx" | Display "xxxxxx" MESSAGE on LCD panel |
| M119 | Show end stop status (via USB) |
| M140 S100 | Set heated bed temp |
| M190 S100 | Set heated bed temp and wait to reach it |
| M201 Xn Yn Zn En | Set max acceleration during print WARNING causes machine restart (if used to change extruder accel, is meant to current extruder, previously selected wit Tn) |
| M203 Xn Yn Zn En | Set maximum speed for selected axis |
| M206=& Xn Yn Zn | Set homing offset (default is zero) |
| M218 Tn Xn Yn | Sets nozzles offsets relative to extruder #1 Default distance (x,y) both for A2 e A4 is : 0,24 (T1) 0,48(T2) |
| M300 Sn Pn | Play a sound at S frequency and P duration (milliseconds) |
| M301 Tn Pn In Dn | Sets extruder (Tn) PID. |
| M302 Sn | Sets minimum extrusion temperature |
| M303 Tn Cn Sn | PID auto tuning for extruder E at Temperature S, taking C trials. |
| M400 | Found values will not be stored. Use M500 to save them |
| M500 | Finish all pending instructions |
| | Save parameters into EEPROM |
| M502 | Reload default parameters from EEPROM |
| M503" " | Reload parameters saved from EEPROM |
| M518 T0 G0.95 | Set extruder T0 gain |
| M600 | Start filament change |
| M601 | Save current position and park extruders |
| M602 | Move extruders back to saved position |
| T0/T1/T2 | Select extruder" |

Figure 13.1.1 Table of Useful Gcode Commands

13.2 Appendix 2 – 3ntr Printable Materials

The TRAK 3ntr A2 & A4 Printers feature an open materials platform that enables selection and printing with the broadest range of FFF process 3D printing materials. A selection of the most common print materials is listed below, along with their selection attributes. Standard (reference) materials profiles are provided within the slicing software for easy specification and use for 3D print projects.

| Material | Attributes |
|--|---|
| NPower (PPS) | High performance polymer, 210° C max operating temperature, impervious to most chemicals and self-extinguishing (UL94 V0). High interlayer adhesion and good tensile strength. Clear brown color. |
| ABS (Acrylonitrile butadiene styrene) | It's the most widely used polymer: should be your first choice for functional parts. Printed objects are strong a lasting, good to be used at usual working temperatures. Can be easily glued, milled, sanded, painted – you can also electroplate it, but it is not up to industrial standards. Available in various colors |
| PCABS (Polycarbonate + ABS) | It's used when you need higher thermal and mechanical strengths than ABS. Can be printed faster, but requires higher printing temps. It's the first choice when you need to electroplate your parts (gold / chrome / nickel/...) Available in raw (natural) color |
| PETG (Polyethylene terephthalate – glycol modified) | This polymer offers good mechanical resistance and low shrink ratio. Chosen for good chemical resistance and transparency. Available in clear and black. |
| PLA (Polylactic acid) | Basic use and cheap polymer: prints have the typical glossy finish. Dry hand and quite rigid. Low thermal resistance. Many colors available. |
| TPU (Thermoplastic polyurethane) | Extremely flexible polymer (88 Shore A) and very resistant. Must be printed with SPFU option. Various colors available. |
| Elasto95 (Thermoplastic polyurethane) | Flexible polymer (95 Shore A) and very resistant. Can be printed without SPFU and with heated chamber. Various colors available. |
| Nylon carbon (Polyamide 12+carbon fibers) | Good strength and easy to print. Black color. |
| Nylon Glass (Polyamide 12 + glass fiber) | Good thermal and mechanical resistance, commonly used for automotive applications |
| SSU00 | Breakaway support for ABS, PC ABS, PC. Based on HIPS polymer. |
| SSU01 | Soluble support for ABS, to be used with ultrasonic tanks, at 55°C with a solution of water and caustic soda, 20% volume. |
| SSU02 | Soluble support for nylons, vinyl based. Softens when dipped into water. Keep dry, use Ziploc bags to store it. |
| SSU03 | Soluble support for TPU and PLA. Completely dissolves in cold water (many hours). Warm water and ultrasonic speed up the process. Don't use with heated chamber. Highly hygroscopic filament: keep dry, use Ziploc bags to store it. |
| SSU05 | Breakaway support for nPower |

Figure 13.2.1 Table of Printable Materials

13.3 Appendix 3 – Compatible Material Combinations

Due to the nature of 3D printing processes and various materials properties, there are some restrictions on the materials combinations that can be simultaneously printed on a TRAK 3ntr 2 or 3 extruder 3D printer. The materials used must have compatibility across the part, raft, interface, support, and printer plate as shown in the following table.

| Loaded on printer | | | Part | Raft | Interface | Support | Plate | Support profile |
|-------------------|-------|------|----------|-------|-----------|---------|---------|-----------------|
| ABS/ASA | | | ABS | ABS | ABS | ABS | ULTEM | Support ABS |
| ABS/ASA | SSU00 | | ABS | ABS | SSU00 | SSU00 | ULTEM | Support SSU00 |
| ABS/ASA | SSU01 | | ABS | ABS | SSU01 | SSU01 | ULTEM | Support SSU01 |
| ABS/ASA | SSU00 | IGUS | ABS | ABS | SSU00 | SSU00 | ULTEM | Support SSU00 |
| ABS/ASA | SSU01 | IGUS | ABS | ABS | SSU01 | SSU01 | ULTEM | Support SSU01 |
| ABS/ASA | SSU00 | | ABS | SSU00 | SSU00 | SSU00 | DIAMOND | Support SSU00 |
| | | | | | | | | |
| PLA | | | PLA | PLA | PLA | PLA | ULTEM | Support PLA |
| PLA | SSU03 | | PLA | SSU03 | SSU03 | SSU03 | ULTEM | Support SSU03 |
| | | | | | | | | |
| PETG | | | PETG | PETG | PETG | PETG | ULTEM | Support PETG |
| PETG | SSU03 | | PETG | SSU03 | SSU03 | SSU03 | ULTEM | Support SSU03 |
| | | | | | | | | |
| PCABS | | | PCABS | PCABS | PCABS | PCABS | ULTEM | Support PCABS |
| PCABS | SSU00 | | PCABS | PCABS | SSU00 | PCABS | ULTEM | Support SSU00 |
| PCABS | SSU00 | | PCABS | SSU00 | SSU00 | PCABS | DIAMOND | Support SSU00 |
| | | | | | | | | |
| Elasto95 | SSU03 | | Elasto95 | SSU03 | SSU03 | SSU03 | ULTEM | Support SSU03 |
| Elasto95 | SSU03 | PETG | Elasto95 | SSU03 | SSU03 | SSU03 | ULTEM | Support SSU03 |
| | | | | | | | | |
| NYLON | SSU02 | | NYLON | SSU02 | SSU02 | SSU02 | ULTEM | Support SSU02 |
| | | | | | | | | |
| NPOWER | SSU05 | | NPOWER | SSU05 | SSU05 | SSU05 | ULTEM | Support SSU05 |

Figure 13.3.1 Table of Compatible Materials & Printer Plate Types

13.4 Appendix 4 – Print Envelope (Per Model/Version/Configuration)



Print envelopes using KS profiles V2.2

A2v2 – three nozzle

| | |
|--|---------------------|
| Three nozzle prints (#1 + #2 + #3) | 600 x 300mm h=500mm |
| Two nozzle prints (#1 + #2 or #2 + #3) | 600 x 325mm h=500mm |
| One nozzle print (#2) | 600 x 350mm h=500mm |

A2v2 – two nozzle

| | |
|-----------------------------|---------------------|
| Two nozzle prints (#1 + #2) | 600 x 335mm h=495mm |
| One nozzle print (#2) | 600 x 360mm h=495mm |

A4v3 – three nozzle

| | |
|------------------------------------|----------------------|
| Three nozzle prints (#1 + #2 + #3) | 295* x 156mm h=200mm |
| Two nozzle prints (#1 + #2) | 295* x 180mm h=200mm |
| One nozzle print (#2) | 295* x 204mm h=200mm |

A4v3 – two nozzle

| | |
|-----------------------------|----------------------|
| Two nozzle prints (#1 + #2) | 295* x 195mm h=200mm |
| One nozzle print (#2) | 295* x 210mm h=200mm |

*= 290 with SPFU

Figure 13.4.1 3ntr 3D Printer Print Envelope – Per Model/Version/Configuration

| Printer & MMS Guide Navigational Links | | | | | |
|--|--|----------------------------------|-------------------------------------|--------------------------------------|-----------------------------------|
| Complete List of Procedure/Work Instructions | | | | | |
| Printer Orientation | Initial Printer Installation, Set-Up & Calibration | Before you Print | Everyday Procedures | Maintain Printer/MMS | Calibrate Printer |

TRAK Warranty Policy

Warranty

TRAK products are warranted to the original purchaser to be free from defects in workmanship and materials for the following periods:

| Product | Warranty Period | |
|--------------------|-----------------|---------------|
| | Materials | Factory Labor |
| New TRAK/ProtoTRAK | 1 Year | 1 Year |
| Any EXCHANGE Unit | 90 Days | 90 Days |

The warranty period starts on the date of the invoice to the original purchaser from Southwestern Industries, Inc. (SWI) or their authorized distributor.

If a product, subsystem or component proves to be defective in workmanship and fails within the warranty period, it will be repaired or exchanged at our option for a properly functioning unit in similar or better condition. Such repairs or exchanges will be made FOB Factory/Los Angeles or the location of our nearest factory representative or authorized distributor.

Warranty Disclaimers

- This warranty is expressly in lieu of any other warranties, express or implied, including any implied warranty of merchantability or fitness for a particular purpose, and of any other obligations or liability on the part of SWI (or any producing entity, if different).
- Warranty repairs/exchanges do not cover incidental costs such as installation, labor, freight, etc.
- SWI is not responsible for consequential damages from use or misuse of any of its products.
- TRAK products are precision mechanical/electromechanical/electronic systems and must be given the reasonable care that these types of products require. Evidence that the product does not receive adequate Preventative Maintenance may invalidate the warranty. Excessive chips built up around ballscrews and way surfaces is an example of this evidence.
- Accidental damage, beyond the control of SWI, is not covered by the warranty. Thus, the warranty does not apply if a product has been abused, dropped, hit or disassembled.
- Improper installation by or at the direction of the customer in such a way that the product consequently fails, is considered to be beyond the control of the manufacturer and outside the scope of the warranty.
- Warranty does not cover wear items that are consumed under normal use of the product. These items include, but are not limited to: windows, bellows, wipers, filters, drawbars and belts.