TRAK® 3ntr 3D Printers

Printer & MMS Initial Set-Up & Calibration Guide

Covers Current Models:

- 3ntr A2
- 3ntr A4
- 3ntr MMS v1/v2

TRAK MACHINE TOOLS

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# Table of Contents

1  Introduction ...............................................................................1

  1.1 Initial Set-Up & Calibration Guide Scope ............................... 1

  1.2 Initial Printer Set-Up & Calibration Checklist ...................... 2

2  Safety ..................................................................................3

  2.1 Safety Precautions ................................................................ 3

3  Uncrate & Unpack Printer/MMS Unit ................................. 5

  3.1 Select & Prepare a Suitable Location for Printer & MMS Unit .... 5

    3.1.1 Site Preparation Guide .................................................. 5

    3.1.2 Lifting and Moving Printer ............................................. 7

  3.2 Uncrate & Unpack MMS Unit (If Applicable) .................... 7

  3.3 Uncrate & Unpack Printer .................................................... 8

  3.4 Locate Printer and MMS Unit/Printer Stand in Final Location ... 8

4  Printer Orientation .......................................................... 9

  4.1 Printer Identification Guide: Front, Rear, and Side Views ........ 9

  4.2 Front Panel Controls .......................................................... 11

5  Install HEPA Filter .......................................................... 12

  5.1 Install HEPA Filter (Common to MMSV2 & External Filter Unit) .... 12

  5.2 Complete HEPA Filter Installation (for MMS V2 Only) ............. 18

  5.3 Complete HEPA Filter Installation (External HEPA Filter Unit Only) . 19

6  Remove Printed Part ........................................................ 21

7  Check & Fill Coolant Level ................................................ 24

8  Electrical Connections ................................................... 25

  8.1 Verify Input Power Source Voltage/Phase ......................... 25

  8.2 MMS Unit 220V Electrical Power Connection ..................... 26

  8.3 Standard 3ntr 220V Electrical Power Connections .................. 28

  8.4 Wiring a Printer or MMS Power Cable for 220V Single Phase .... 29

  8.5 3ntr A4 printer with 120 VAC US Power Connection ............... 30
9 Power on the Printer and MMS Unit (If applicable) .................................................. 31
  9.1 Power on the MMS Unit (If applicable) ................................................................. 31
  9.2 Power on the Printer ............................................................................................. 31
10 Operate the Printer Manually Using Front Panel Controls ...................................... 33
   10.1 LCD Display and Control Menus Overview ...................................................... 33
       10.1.1 LCD Display – Idle Machine Menu ........................................................... 33
       10.1.2 LCD Display – Information Screen............................................................ 33
       10.1.3 LCD Display – Prepare Menu ................................................................... 34
   10.2 Operate the Printer Manually Using LCD and Front Panel Controls ... 35
       10.2.1 Move Axis Function ................................................................................... 35
       10.2.2 Auto Home Function .................................................................................. 37
       10.2.3 Disable Steppers ......................................................................................... 38
11 Load Filament/Materials ......................................................................................... 39
   11.1 Load Filament to Back of Printer ...................................................................... 39
   11.2 Filament Care/Storage .................................................................................... 45
12 Purge Nozzle/Filament ........................................................................................... 48
13 Clean Nozzles ......................................................................................................... 51
   13.1 Clean Nozzle Procedure Overview: ................................................................. 51
   13.2 Unload Filament Using Change Filament Function ......................................... 51
   13.3 Load Cleaning Filament .................................................................................... 55
   13.4 Nozzle Cleaning (Automated Function) ............................................................ 57
14 Calibrate Printer ..................................................................................................... 60
   14.1 Installation & Initial Set-Up Calibrations ......................................................... 60
   14.2 Z Offset ............................................................................................................ 61
       14.2.1 Z Offset Calibration Print ......................................................................... 61
       14.2.2 Z Offset – Read, Enter & Save ................................................................. 63
   14.3 XY Offset ......................................................................................................... 64
       14.3.1 XY Offset Calibration Print ...................................................................... 65
14.3.2 XY Offset – Read, Enter & Save .................................................. 67
14.4 Z Nozzle Comparison -3 Nozzles Relative Z Position Calibration ...... 71
14.5 Plate Leveling – User Procedure ....................................................... 76
14.6 Z Nozzle Leveling Check – Calibration Print ..................................... 77
14.7 Cubes - Calibration Test Print ....................................................... 78

15 Print Parts.......................................................................................... 79
15.1 Print Parts from an SD Card ............................................................... 79
15.2 Stop/Pause Printing ......................................................................... 82
15.3 Tune Menu – Adjust Process Parameters Mid-Print ......................... 82
15.4 Maintain the printer for subsequent prints ....................................... 83

16 Set-Up and Install Printer Server ....................................................... 84
16.1 Introduction to Print Server ............................................................... 84
16.2 Assemble, Connect, and Start-Up Printer Server ............................ 84
16.3 Configure Printer Port .................................................................. 88
16.4 Archive Factory Firmware Settings ................................................. 92

17 MMS Unit Set-Up, Calibration, & Operation ................................. 98
17.1 MMS Overview ............................................................................. 98
17.2 MMS Unit Installation, Set-Up & Calibration ................................. 98
17.3 Complete Connections & Power ON the MMS Unit ...................... 98
17.4 Install & Connect Server within the MMS Unit ............................... 98
17.5 MMS Server Connection & Set-Up ................................................. 104
17.6 Zero the Cabinet ........................................................................... 106
17.7 Calibrate the Cabinet .................................................................. 107
17.8 MMS PTFE Tube Material Handling Installation ............................ 107
17.9 Install the Desiccant ..................................................................... 113

18 Operate, & Maintain the MMS Unit .............................................. 115
18.1 MMS Touch Screen Control ............................................................. 115
18.2 MMS Dashboard ........................................................................... 115
18.2.1 Accessing the MMS Dashboard over a network ....................... 117
18.3 Loading Filament/Material into the MMS Unit .............................. 117
18.4 Controlling Relative Humidity (RH) within MMS Cabinet .................. 119
18.5 Update the MMS Firmware ................................................................. 120
19 TRAK Warranty Policy................................................................. 122
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

1.1 Initial Set-Up & Calibration Guide Scope

This Initial Set-Up & Calibration Guide covers the basic steps required to set-up, calibrate, and operate a new TRAK 3ntr A2/A4 printer and optional MMS unit from uncrating through to printing test parts. These basic steps are outlined in the Initial Printer Set-Up & Calibration Checklist, below. Advanced set-up, printer re-configuration, and repair maintenance procedures are not included within this guide.

This guide contains instructions to operate the TRAK 3ntr A2/A4 3D printers to simplify initial set-up and calibration for factory trained technicians. It is not intended for customer use. Upon successful completion of the initial set-up, calibration, and test prints, the customer should be encouraged to use the simple and straightforward Printer & MMS Operation Quick Start Guide to get started, and the (full) Printer & MMS Guide for those topics not covered in the QS Guide.

NOTE - The completeness and level of detail for set-up, calibration, operation, and maintenance procedures within this guide is limited. Where additional information is required please consult the (full) Printer & MMS Guide, Maintenance Manual, or specific procedure/work instruction documents.

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 Initial Set-Up & Calibration Guide.
1.2 Initial Printer Set-Up & Calibration Checklist

Follow the checklist when installing a printer. Click on the Hyperlinks to jump to the procedure/instructions for an individual step in the process.

<table>
<thead>
<tr>
<th>TRAK 3NTR Initial Printer Set-up &amp; Calibration Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ 1. Safety Precautions</td>
</tr>
<tr>
<td>☐ 2. Uncrate &amp; Unpack Printer/MMS Unit</td>
</tr>
<tr>
<td>☐ 3. Printer Orientation</td>
</tr>
<tr>
<td>☐ 4. Install HEPA Filter</td>
</tr>
<tr>
<td>☐ 5. Remove Printed Part</td>
</tr>
<tr>
<td>☐ 6. Check and Fill Coolant</td>
</tr>
<tr>
<td>☐ 7. Electrical Connections</td>
</tr>
<tr>
<td>☐ 8. Power ON the Printer/MMS Unit</td>
</tr>
<tr>
<td>☐ 9. Operate the Printer Manually Using LCD and Front Panel Controls</td>
</tr>
<tr>
<td>☐ 10. Load Filament to Back of Printer</td>
</tr>
<tr>
<td>☐ 11. Purge Nozzles/Filament</td>
</tr>
<tr>
<td>☐ 12. Clean Nozzles (Not Typically Required on Initial Set-up)</td>
</tr>
<tr>
<td>☐ 13. Calibrate Printer</td>
</tr>
<tr>
<td>☐ 14. Print Parts</td>
</tr>
<tr>
<td>☐ 15. Set-Up and Install Print Server</td>
</tr>
<tr>
<td>☐ 16. Set-Up and Calibrate MMS Unit (if applicable)</td>
</tr>
<tr>
<td>☐ 17. Operate and Maintain MMS Unit (if applicable)</td>
</tr>
</tbody>
</table>
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 Initial Set-Up & Calibration Guide. Understand the printer operation and safety precautions before setting up, calibrating, or operating the 3D printer.

- Always wear safety glasses 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 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. Always wear approved safety glasses (with side shields).
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) Stop and disconnect the machine before you perform maintenance and calibration operations.
14) Keep work area well lighted. Ask for additional light if needed.
15) Do not lean on the machine while it is running.
16) Prevent slippage. Keep the work area dry and clean. Remove obstacles of any kind around the machine.
17) Avoid getting pinched in places where the printer bed or extruder arm movement can cause a crush or pinch injury
18) Do not operate the printer with the printer access door open or any of the windows or service access panels removed.
3  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.

3.1  Select & Prepare a Suitable Location for Printer & MMS Unit

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

3.1.1  Site Preparation Guide

Space & Weight Requirements:

**A2 Printer**
- 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

**MMS Unit**
- 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**
- 220/230 VAC 15A power required for A2 Printer.

**A2 Printer & MMS Unit**
- 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 3.1.1 Printer & MMS Dimensions: Front View

Figure 3.1.2 Printer & MMS Dimensions: Side View with Open/Closed Doors
3.1.2 Lifting and Moving Printer

<table>
<thead>
<tr>
<th>CAUTION!</th>
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<tbody>
<tr>
<td>The A2 Printer should be moved by forklift or pallet jack ONLY when mounted on a pallet.</td>
</tr>
<tr>
<td>• The printer will be damaged if moved by forklift without the pallet attached.</td>
</tr>
<tr>
<td>• Once the pallet has been removed from the printer it must be moved by hand.</td>
</tr>
<tr>
<td>• 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</td>
</tr>
<tr>
<td>• 3 or 4 people are required move the A2 printer by hand - lifting it onto the printer stand, table, or MMS.</td>
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![Figure 3.1.3 Moving Printer with Fork Truck (Secured to Pallet)](image)

3.2 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
3.3 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.

3.4 Locate Printer and MMS Unit/Printer Stand in Final 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
4 Printer Orientation

In this section, you will meet your new TRAK 3ntr 3D printer. After uncrating, please take a moment to identify the important components of the printer before starting the set-up process.

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

1) Emergency - E-STOP Button. Powers ON and OFF the Printer

2) LCD Display – Use for printer control and printing information

3) Jog Wheel and Black Selector Button

4) Printer Door – Locking Handle

5) Tank Port – Coolant Check & Fill Location

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.


5) **Spool Holders** – Filament Spools are mounted here for Extruders #1, #2, #3.

---

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)


5) **Collar** – Filament Spools are mounted here for Extruders #1, #2, #3.
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

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.
5 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.

5.1 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 5.1.1 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
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.

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.
Proceed to remove the rear cover plate (blanking 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 5.1.5 Blanking Plate cover & screws for removal
Figure 5.1.6 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.
7) Have a helper or second person screw the plastic nut onto elbow from the inside of the printer to secure elbow in place.
8) Replace the Qty. 4 Blanking plate screws that were removed. Have your helper replace the nuts and hold them in place (from the insider) 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).
5.2 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.

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 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. Secure hose with the large hex nut as shown.

**NOTE** – Not applicable for MMS V2.

![Figure 5.3.1 External HEPA Filter Unit & hose routing on printer stand](image)
10) 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 5.3.2 External HEPA Filter Unit Power Supply & Cord

11) HEPA filter installation is now complete.
6 Remove Printed Part

The 3ntr printer was set-up, calibrated, and tested at the factory by printing a part (cone). The cone printed immediately before shipment is located on the printer bed and must be removed.

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 or simply pull it partially out of the 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.

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.

6) Close the printer access door.

Figure 6.4 Printer surface plate re-installed in printer
7 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 ¼” below cap thread fill using the extra coolant (RED color) supplied with the printer. Use only factory approved coolant. Do not dilute.

![Coolant Bottle and Printer Fill Cap](image1)

**Figure 7.1 Coolant Bottle and Printer Fill Cap**

![Proper Coolant Fill Level – ¼ Inch Below Cap Thread](image2)

**Figure 7.2 Proper Coolant Fill Level – ¼ Inch Below Cap Thread**
8 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.

8.1 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.

![Diagram](image-url)

*Figure 8.1.1 Printer surface plate re-installed in printer*
8.2 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 8.1.1. 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 8.2.1 Typical 3ntr A2 Printer or MMS Power Cable](image)

2) Plug power cable into MMS Unit
3) Plug cable into external power receptacle:

Figure 8.2.2 MMS Unit Power Plug and Switch

Figure 8.2.3 220 VAC Single Phase Plug and Receptacle
8.3 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 8.3.1 Printer Power Connection

3) If there is no MMS unit, plug Printer cable into appropriate wall outlet (220VAC 15A Single Phase)
4) If there is an MMS unit, plug the Printer power cable into the power outlet on the MMS Unit

Figure 8.3.2 Printer Power Plug
8.4 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.
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.

### 8.5 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.
9  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.

9.1  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.

9.2  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.

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 9.2.1 Printer power plug and switch](image)
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.
10 Operate the Printer Manually Using 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.

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.

10.1 LCD Display and Control Menus Overview

In this section, you will learn about controlling the printer and understand printer status during printing that is communicated via the LCD display.

10.1.1 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.

![Image of Printer LCD Display Idle Machine Menu]

Figure 10.1.1 Printer LCD Display Idle Machine Menu

10.1.2 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
10.1.3 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.

![Figure 10.1.3 Printer LCD Display: Prepare Menu Selections](image)
10.2 Operate the Printer Manually Using LCD and Front Panel Controls

10.2.1 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 10.2.1 LCD Displaying Main Menu](image1)

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

![Figure 10.2.2 Selecting Move Axis from Prepare Menu](image2)

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.
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.

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.

<table>
<thead>
<tr>
<th>Figure 10.2.6 LCD Display Showing Move Axis result</th>
</tr>
</thead>
</table>

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.

10.2.2 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.

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

<table>
<thead>
<tr>
<th>Figure 10.2.7 LCD Showing Main Menu</th>
</tr>
</thead>
</table>

10) Turn the jog wheel until the selector arrow points to Prepare. Press the black button to enter the
Prepare menu.
11) Turn the jog wheel until the selector arrow points to Auto home.
12) Press the black button and watch the printer return the X,Y,Z axis to their original position.
13) Once the Auto home function is complete, you will be returned to the printer information screen.

10.2.3 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.

**CAUTION** – Only use this function in special circumstances. Fast manual movements may damage the electronics.
11 Load Filament/Materials

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

**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** - Only load filament for materials suitable for the 3ntr A2/A4 printers. 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.

11.1 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 11.1.1 Selecting Function Change Filament](image)

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

![Figure 11.1.2 Selecting Extruder # for Change Filament](image)
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.

![Image of LCD showing Heating...]

**Figure 11.1.3 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.

![Image of LCD showing Change fil.#2 now]

**Figure 11.1.4 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.

![Image of filament feeder being disengaged]

**Figure 11.1.5 Disengage filament feeder**
Figure 11.1.6 Latched & Unlatched Filament Feeders

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

Figure 11.1.7 Pulling old filament out of feeder unit

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

10) Fit the new spool on the holder. Replace the locking collar and secure it to prevent de-coiling.
11) Remove the filament end from where secured to the spool. Trim off several mm to remove bends, dirt, tape, or damage.

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

14) The locking tab is now engaged. The machine will automatically control the filament feed.
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 11.14 Filament feeder in the engaged position](image)

![Figure 11.15 LCD Display while new filament is priming (A2 Printer Only)](image)

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

### 11.2 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.
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.

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.
5) After mounting a new filament, if popping or crackling continues during the purge operation, remove the filament and dry before printing parts.
12 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 12.1 Selecting the Purge Function from Prepare Menu](image)

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 12.2 Selecting which Extruder to Purge](image)
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 though the nozzle.

![Figure 12.3 Info Screen While Heating Extruder](image1)

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

![Figure 12.4 Info Screen While Purging](image2)

5) Observe the flow of the purged material.
6) When the purging operation is complete, the printer stops automatically and displays "Purging completed."

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.
13 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.

13.1 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.

13.2 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

19) 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”
20) Navigate to the Prepare menu. From the Prepare menu select “Change filament”

![Figure 13.2.1 Selecting Change Filament from Prepare Menu](image)

21) Assuming filament has been previously loaded, Select Change Filament “Extruder #1”
22) 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.

23) 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.

24) 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 13.2.5 Disengage filament feeder

Figure 13.2.6 Latched & Unlatched Filament Feeders
25) Pull the filament from the feeder, rewinding the filament onto the spool.

![Figure 13.2.7 Pulling old filament out of feeder unit](image1)

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

![Figure 13.2.8 Secure filament end to spool](image2)

27) 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.
13.3 Load Cleaning Filament

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

![Figure 13.3.1 Nozzle Cleaning Filament (Nylon)]

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

![Figure 13.3.2 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 13.3.3 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.
5) The locking lip is now engaged. The machine will automatically control the filament feed.

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.
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!

13.4 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.

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

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

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.

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)
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 13.4.7 Cleaning Filament Tip Color after multiple Cleaning Cycles](image1)

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 13.4.8 Bad Tips after Filament Cleaning: Requires Troubleshooting](image2)

11) Repeat entire cleaning process for other extruders (as required/needed)

12) Nozzle cleaning function complete!
14 Calibrate Printer

This section contains the calibration procedures for your TRAK 3ntr printer and indicates which of these procedures should be performed after installation & initial set-up.

14.1 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. These procedures 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
2) Z Offset – Calibration Print, Read Result, Enter & Save
3) XY Offset – Calibration Print, Read Result, Enter & Save

Additional calibration procedures should only need be performed if indicated by specific printing issues or periodically where noted. If calibration and test prints indicate additional calibration steps are required, please contact your dealer or consult the printer manual before performing these additional procedures.

Optional Additional Calibrations to Perform:
1) Plate Leveling – User Procedure
2) Z Nozzles Leving Check – Calibration Procedure
3) 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.
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)
14.2 Z Offset

14.2.1 Z Offset Calibration Print

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. 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 14.2.1 Selecting Calibration from Hardware Menu](image)

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

![Figure 14.2.2 Selecting Offset Z from Calibration Menu](image)

**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.
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 14.2.3 Selecting the Correct Nozzle Size Folder](image)

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

![Figure 14.2.4 Selecting the Z offset Calibration Print Program](image)

![Figure 14.2.5 Z offset Print](image)
14.2.2 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 is 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).

![Illustration for Reading Z Offset Correction Amount/Direction](image1)

![Diagram for Reading Z Offset Correction Amount/Direction](image2)

2) Enter the indicated value for Z offset.
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

14.3 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.
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.

### 14.3.1 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.

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

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.

6) The printer prints the XY Calibration Test Print Pattern(s). Wait for the printer to complete printing then remove from printer.
14.3.2 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 14.3.8 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 14.3.9 Bad alignment on Y axis - Value to enter is -2

Figure 14.3.10 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.
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.

5) Enter the X and Y offset values.
6) Save the results.

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.
14.4 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 (Using Clean Nozzle Procedure)
3) Remove ALL the PTFE piping (push on collar with the key to easily remove PTFE pipe)

   Figure 14.4.1 Remove PTFE Piping from Extruders

4) Set Z offset to zero
5) Do a XYZ home
6) Bring the extruders at the center of printing area using the LCD “move” function
7) Release #1 #2 #3 setting screws

   Figure 14.4.2 Set Screws – Loosen to Release
8) 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

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

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

![Figure 14.4.6 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 14.4.7 Hardware Menu: Save]

15) Move the plate at Z = 150

![Figure 14.4.8 Printer Plate Moving Down]

16) Place gauge dial 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.

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

21) Remove gauge dial

22) Put back on the PTFE piping.
23) Feed filaments
24) Do a Z levelling test print for nozzle #2 and #3 (if available)

25) Test XY Alignment

14.5 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 14.5.1 Using a Business Card to Assess Levelling](image)

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.

14.6 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.
14.7 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.
15 Print Parts

This section of the manual details printing parts, using some of the print menu controls, and maintaining the printer for subsequent prints.

15.1 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)

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.

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

14) 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.

15) 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.

16) Remove the part following the same instructions for the test cone. Avoid using sharp blades or spatulas, they risk damaging the tray surface.
15.2 Stop/Pause Printing

During Printing, if you need to stop or pause printing, simply select the appropriate menu item from the printing menu.

![Figure 15.1 Printing Menu Selections](image)

15.3 Tune Menu – Adjust Process Parameters Mid-Print

The Tune menu becomes available on the Info screen during printing and offers options to change nozzle, bed, and/or chamber temperatures, as well as program running (printing) speed.

**CAUTION** – Only experienced print operators should use the Tune menu during printing

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

![Figure 15.1 Selecting Tune from Info Screen Menu](image)

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

![Figure 15.2 Tune Menu, Screen 1](image)
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.

15.4 Maintain the printer for subsequent prints

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.
16 Set-Up and Install Printer Server

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

16.1 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.

16.2 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)
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.

**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.
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.

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 16.2.5 Printer Server Booting Up](image)

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 16.2.6 Launch the Browser on Web Server](image)
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 16.2.7 Repetier Server Showing Disconnected Printer](image)

16.3 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 16.3.1 Access Printer Settings in Repetier Server](image)
2) On the printer settings screen, you need to select “Port” under the “Connection” settings group shown.

![Figure 16.3.2 Browse Device/Ports in Repetier Server](image)

3) Select the longer one, looking for “FTDI”

![Figure 16.3.3 Identifying Device/Port from List – FTDI Identifier](image)

4) Then “Save Configuration” (found at upper right)

![Figure 16.3.4 Save Configuration Control](image)
5) Repetier will respond, “Configuration Saved” in the lower right corner.

![Saved Configuration Confirmation](image)

**Figure 16.3.5 Saved Configuration Confirmation**

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

![Repetier Server Home Screen Button](image)

**Figure 16.3.6 Repetier Server Home Screen Button**

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

Figure 16.3.7 Repetier Server Showing Connected Printer
16.4 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 16.4.1 Go to Printer on Print Server](image1)

2) When the job control screen appears, select “Console”.

![Figure 16.4.2 Print Server Console Selection](image2)

3) When the console screen appears, type “M503” into the input line and click the Send button.
4) In the text window, the printer will respond with its default firmware settings as shipped from the factory.

5) Highlight and copy all the text to the Print Server clipboard.
6) Launch the file manager.

7) Navigate to the USB data drive
8) Click Create New > Empty File.

9) Give the file a descriptive name, for example “A4 Factory Settings”, click OK.
10) Double click the newly created file to open a text editor.

11) In the editor, paste the copied text from the clipboard to the 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.
17 MMS Unit Set-Up, Calibration, & Operation

17.1 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.

17.2 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

17.3 Complete Connections & Power ON the MMS Unit

Reference Sections 8 and 9 in this QS guide for instructions to connect and 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.

17.4 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.
2) Open the MMS unit and place the Print Server inside in the lower right corner.
3) Locate the USB and ethernet cable pass-through connectors on the inside and outside of the MMS unit.
Figure 17.4.4 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.

![MMS V2 Pass-Through Connectors ID guide](image)

**Figure 17.4.5 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.
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.

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.
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.

17.5 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”
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).
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).

17.6 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.

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).
17.7 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).

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.

17.8 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)
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.

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

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

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

![PTFE Tube Connection to MMS Unit](image)

**Figure 17.8.10 PTFE Tube Connection to MMS Unit**

14) Install PTFE Tubes into Filament Feeders
15) Secure unfed tubes and filament with tube holder magnets and TPU 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.

17.9 Install the Desiccant

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 17.9.1 Removing Desiccant Cylinder Packaging

Hang the desiccant cylinder tray inside the front door on the front of the scale structure as shown.
Figure 17.9.2 Desiccant Cylinder Placed in MMS Unit
18 Operate, & Maintain the MMS Unit

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

18.1 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).

18.2 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.

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 18.2.2  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.
18.2.1 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.

18.3 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.
• 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.

• 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).

### 18.4 Controlling Relative Humidity (RH) within MMS Cabinet

We have found 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 18.4.1 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).
18.5 Update the MMS Firmware

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

1) Download the Propeller tool here:

2) Download the correct MMS v1 or v2 firmware from these locations:
   V1 MMS: https://drive.google.com/open?id=1pUx5JCG_5_Vx98I3TrFBbVnrjC76bYL
   V2 MMS: https://drive.google.com/open?id=1mn5Nnocrs5_OovshFR7_KruPsclqozIG

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 18.5.1  Updating MMS Firmware](image)
5) Locate and copy the serial number from inside the cabinet (near the server power outlet)

![Figure 18.5.2 MMS Unit Serial Number](image)

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

![Figure 18.5.3 Sys button on MMS](image)

![Figure 18.5.4 Set Machine ID](image)
TRAK Warranty Policy
Southwestern Industries, Inc

Warranty

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

<table>
<thead>
<tr>
<th>Product</th>
<th>Warranty Period</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Materials</td>
</tr>
<tr>
<td>New TRAK/ProtoTRAK</td>
<td>1 Year</td>
</tr>
<tr>
<td>Any EXCHANGE Unit</td>
<td>90 Days</td>
</tr>
</tbody>
</table>

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 under warranty fails, 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.

Disclaimers of Warranties

- 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.

- 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.

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