TRAK® 3ntr 3D Printers

Printer & MMS Operation Quick Start Guide

Covers Current Models:

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

TRAK MACHINE TOOLS

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1 Introduction

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

TRAK 3ntr 3D Printers offer:
- An open materials platform enabling selection of a wide range of materials
- Complete flexibility in tailoring/tuning process settings and part characteristics
- Temperature controlled build chambers and printer plates
  - Nozzles up to 840°F (450°C)
  - Bed Up to 320°F (160°C)
  - Chamber up to 194°F (90°C)
- Generous build capacity/volume
  - Print Parts up to 24”x13”x19” for the A2
  - Print Parts up to 12”x7.5”x8” 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 Operation Quick Start Guide Scope

This Quick Start Guide covers the basic steps required to operate your new TRAK 3ntr A2/A4 printer and MMS unit including printing. It covers a limited scope of operation for the A2/A4 printer and MMS unit, as necessary for initial familiarization and printing simple parts that do not require extensive printer or extruder reconfiguration. For procedure instructions not contained within this Quick Start Guide, please consult the Printer & MMS Guide before proceeding.

IMPORTANT – This Quick Start Guide assumes the printer has been initially set-up, calibrated and printed test parts by a qualified, factory, trained technician or otherwise in accordance with the TRAK 3ntr A2/A4 Printer & MMS Installation, Set-Up, and Calibration Guide or Printer & MMS Guide documents. If these steps have not been completed, or the printer/MMS unit are not functioning normally, STOP! Consult the printer & MMS guide or installation, set-up, and calibration guide as applicable before proceeding.

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

Figure 1.2.1 below clarifies the subset of operational procedures and instructions included within this Quick Start Guide. Click the hyper link to jump to individual procedure instructions. There are many more, not contained within this abbreviated guide. For other procedures/instructions, or additional detail, please consult the (full) Printer & MMS Guide, Maintenance Manual, or individual procedure work instruction documents.

**Procedure Name/Instruction**
- Safety Precautions
- Printer Identification Guide
- Front Panel Controls
- Check & Fill Coolant Level
- Power on Printer and MMS Unit (if applicable)
- Operate the Printer Manually with LCD/Front Panel Controls
- Load Filament/Materials to Printer/MMS Unit
- Filament Care & Storage
- Purge Nozzles/Filament
- Clean Nozzles
- Print Parts from an SD Card
- Remove a printed part from the Printer
- MMS Unit Operation
- Print Server Overview
- Maintain your Printer for Subsequent Prints

**Figure 1.2.1 List of Procedures within this QS Operations Guide**

**CAUTION** – Do not perform any operation/printer re-configuration/maintenance, or repair without consulting and following the instructions from a factory guide or work instruction document. Contact customer service for proper documentation before proceeding - Failure to do so may damage the printer, result in injury, and/or void the warranty.
2 Safety

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

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

- Always wear safety glasses 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. Wear approved safety glasses (with side shields) at all times.
4) Allow the machine to cool before reaching into it for any reason. The printer bed, printer surface plate, printed part, extruders/nozzles, and other printer interior components can reach very high temperatures and cause serious burns.
5) Don't get caught in moving parts. Before operating this machine remove all jewelry including watches and rings, neckties, and any loose-fitting clothing.
6) Keep your hair away from moving parts. Wear adequate safety headgear.
7) Protect your feet. Wear safety shoes with oil-resistant, anti-skid soles, and steel toes.
8) Take off gloves before you start the machine. Gloves are easily caught in moving parts.
9) Remove all tools (wrenches, check keys, etc.) from the machine before you start. Loose items can become dangerous flying projectiles.
10) Never operate a 3D printer after consuming alcoholic beverages, or taking strong medication, or while using non-prescription drugs.
11) Protect your hands. Stop the printer bed movement and extruder translation mechanism:
   a. Before opening the printer access door
   b. Before reaching into the machine for any reason
   c. Before changing parts
   d. Before removing the printer bed tray, printed parts, or filament debris
   e. Before you make an adjustment to the extruder, nozzles or any interior mechanism.
12) Protect your eyes and the machine as well. Don't use a compressed air hose to remove the debris or clean the machine.
13) 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 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.

3.1 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 3.1.1 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.

Figure 3.1.2 Printer Rear View

1) VENT – Print fume extraction port. Remove plate and install HEPA filter elbow/hose here.

2) Feeder PR – Feeder pressure knob, adjusts filament feeder pressure.

3) Handle – engages or releases filament feeder (engaged position shown)


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

Figure 3.1.3 Printer Side View
3.2 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.
4 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.

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

**Figure 4.1 Proper Coolant Fill Level – ¼ Inch Below Cap Thread**
5  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.

5.1  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.

5.2  Power on the Printer

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

![Figure 5.2.1 Printer power plug and switch](image)

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 5.2.2 LCD Display with Power ON](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.
6 Manual Printer Operation via 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.

6.1 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.

6.1.1 LCD Display – Idle Machine Menu

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

![Figure 6.1.1 Printer LCD Display Idle Machine Menu]

6.1.2 LCD Display – Information Screen

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

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

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

6.2 Operate the Printer Manually with LCD/Front Panel Controls

6.2.1 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 6.2.1 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 6.2.2 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, 1 mm, or 0.1 mm and press the black button to select the indicated movement distance. In this example we will select to move 10 mm per jog wheel click/index.

![Figure 6.2.3 Selecting Step Size from Move Axis Menu](image3)
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.
7) When finished, press the black button to exit live axis movement and restore menu navigation function to the jog wheel.
8) Turn the jog wheel counterclockwise until the selector points to Return up arrow, then press the black button to exit the axis selection menu. Continue to navigate back to the Prepare Menu or other desired menus using the jog wheel and black button.

6.2.2 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)

![Figure 6.2.7 LCD Showing Main Menu](image)

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.

![Figure 6.2.8 Selecting Auto Home Function](image)

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.
6.2.3 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.
7 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.

7.1 Load Filament to Back of Printer

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

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

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

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

![Figure 7.1.1 Selecting Function Change Filament](image)

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

![Figure 7.1.2 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 with Heating... displayed]

Figure 7.1.3 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 with Change fil.#2 now displayed]

Figure 7.1.4 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 disengaged filament feeder]

Figure 7.1.5 Disengage filament feeder
7) Pull the filament from the feeder, rewinding the filament onto the spool.

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 7.1.15 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!

### 7.2 Loading Filament/Material into the MMS Unit

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

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

![Figure 7.2.1 Placing Filament Spool & Holder in MMS Unit](image)

- 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).

### 7.3 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.
### Material Drying Time Guide

<table>
<thead>
<tr>
<th>Material</th>
<th>Build Surface</th>
<th>Removal</th>
<th>Solvent</th>
<th>Compat. Mat.</th>
<th>Heated Chamber</th>
<th>Dry Temp</th>
<th>Dry Time</th>
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<tbody>
<tr>
<td>SSU01</td>
<td>Diamond/PEI</td>
<td>BreakAwy</td>
<td>None</td>
<td>ASA, ABS, PCABS</td>
<td>Yes</td>
<td>40°C</td>
<td>6 Hours</td>
</tr>
<tr>
<td>SSU02</td>
<td>Diamond/PEI</td>
<td>Soluble</td>
<td>BioSolv*</td>
<td>ASA, ABS, PCABS</td>
<td>Yes</td>
<td>60°C(140°F)</td>
<td>6 Hours</td>
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<tr>
<td>SSU03</td>
<td>Diamond/PEI</td>
<td>BreakAwy</td>
<td>None</td>
<td>nPOWER</td>
<td>Yes</td>
<td>60°C(140°F)</td>
<td>6 Hours</td>
</tr>
<tr>
<td>SSU04</td>
<td>Diamond/PEI</td>
<td>Soluble</td>
<td>Hot water*</td>
<td>TPU, PETG, PACF</td>
<td>No/Yes</td>
<td>50°C(122°F)</td>
<td>6 Hours</td>
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<tr>
<td>SSU05</td>
<td>Diamond/PEI</td>
<td>BreakAwy</td>
<td>None</td>
<td>TPU, PETG, Selected Nylons</td>
<td>No/Yes</td>
<td>50°C(122°F)</td>
<td>6 Hours</td>
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<tr>
<td>SSU06</td>
<td>PEI/RuhFDak**</td>
<td>BreakAwy</td>
<td>None</td>
<td>Nylon, GF-60 PP</td>
<td>Yes</td>
<td>65°C(158°F)</td>
<td>6 Hours</td>
</tr>
</tbody>
</table>

*NOTE* - After mounting a new filament, if popping or crackling continues during the purge operation, remove the filament and dry before printing parts.
8  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 8.1 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 8.2 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 8.3 Info Screen While Heating Extruder](image)

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

![Figure 8.4 Info Screen While Purging](image)

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.
9 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.

9.1 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.

9.2 Unload Filament Using Change Filament Function

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

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

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

![Figure 9.2.1 Selecting Change Filament from Prepare Menu]
3) Assuming filament has been previously loaded, Select Change Filament “Extruder #1”

![Selecting Extruder for Change Filament](image1)

**Figure 9.2.2 Selecting Extruder for Change Filament**

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

![Info Display During Change Filament](image2)

**Figure 9.2.3 Info Display During Change Filament**

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

![Printer Readiness Signal to Change Filament Spool](image3)

**Figure 9.2.4 Printer Readiness Signal to Change Filament Spool**

6) Locate the feeder handle on the selected extruder. Grab the feeder handle of the selected extruder, push it down and secure it into position with the provided lock “lip”. This way the feeder mechanism will be disengaged. Looking at the feeders from the rear of the printer, the rightmost is the #1 feeder, and leftmost is #3.
Figure 9.2.5 Disengage filament feeder

Figure 9.2.6 Latched & Unlatched Filament Feeders
7) Pull the filament from the feeder, rewinding the filament onto the spool.

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.
9.3 Load Cleaning Filament

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

![Figure 9.3.1 Nozzle Cleaning Filament (Nylon)](image)

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

![Figure 9.3.2 Trim off the end of new filament](image)

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

![Figure 9.3.3 Illustration of correct and incorrect filament tip sharpening](image)

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!
9.4 Nozzle Cleaning (Automated Function)

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

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

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

   ![Figure 9.4.1 Change Filament Function](image)

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

   ![Figure 9.4.2 Prepare Menu: Nozzle Cleaning Selected](image)

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

   ![Figure 9.4.3 Select Extruder for Cleaning](image)

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.
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)

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

12) Nozzle cleaning function complete!
10 MMS Unit Operation

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

10.1 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.

10.2 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 touchscreen is powered by the MMS server.

10.3 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).

10.4 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.
NOTE - The material positions and feeder numbers are as viewed from the back of the printer and are labeled as indicated by the graphic on the MMS page.

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

Figure 10.4.3 MMS Dash "Summary View"

10.4.1 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.
11 Print Parts from an SD Card

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

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

![Figure 11.1 PC adapter for SD Card](image1)

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

![Figure 11.2 Inserting SD Card into Printer](image2)

**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 meting 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.

11.1 Stop/Pause Printing

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

![Figure 11.1 Printing Menu Selections](image)

11.2 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 11.1 Selecting Tune from Info Screen Menu](image)

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

![Figure 11.2 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.
12 Remove a Printed Part from the Printer

This section details the process to remove a printed part from the printer.

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

2) Place the printer surface plate on a clean table 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.

![Figure 12.3 Printed Part (Cone) and supplied scraper tool](image)

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

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

![Figure 12.4 Printer surface plate re-installed in printer](image)

6) Close the printer access door.
13 Print Server Overview

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.

**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.
14 Maintain your 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.

NOTE – Please refer to Printer & MMS Guide for a complete list of calibration procedures and detailed instructions.
15 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.