

True Level CNC

Practical Coolant Monitoring with Strategic Skimmer Control
Protect Your Tools, Perfect Your Production

Installation and Owners Manual

The latest manual can be downloaded from:

<https://samcontrollers.com/download/true-level-cnc-owners-manual/>

This Manual
is Version 1.2



TrulevelCNC , a product by SAM Controllers

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NOTICE: The information provided in this manual is offered as a guide only. Users are responsible for determining the suitability of this product for their specific application. While SAM Controllers has made every effort to ensure accuracy, we assume no liability for errors, omissions, or any damages resulting from the use of information contained herein. Always follow applicable safety standards and manufacturer recommendations when installing or operating this equipment.

A Word of Thanks

Thank you for choosing the True Level CNC system for your precision machining operations. Your investment in this American-made solution demonstrates your commitment to excellence in manufacturing. As you integrate this system into your daily operations, you'll discover how intelligent coolant management can dramatically improve tool life, part quality, and operational efficiency while reducing waste and maintenance costs. This manual provides everything you need to unlock the full potential of your True Level CNC system. We're proud to support your pursuit of manufacturing excellence and welcome your feedback as we continuously refine our solutions.

Your success is our success, and we're honored to be part of your machining journey.

Key Value Proposition:

- Extends coolant life by up to 300% through intelligent skimmer control
- Prevents tool damage by alerting to out-of-range conditions before failure occurs
- Reduces waste and environmental impact through optimized coolant management
- Quick installation with minimal downtime (typically under 30 minutes)
- Backed by SAM Controllers' commitment to American manufacturing excellence

A. Getting Started | Specifications

Digital Coolant Level:

Technology : Digital Solid State

Moving parts : None

Communications protocol : digital with active sensor feedback

Length: 9" (22 cm)

Temperature measurement: Top & Bottom of the coolant

Calibration : Automatic, self-calibrating operation parameters

Fluid type : Non-Flammable, machining coolant mixture at desired density and type of coolant

Life expectancy : 10 years

Material : Synthesized nylon

Coil cord Length : 7.32' (2.23m)

Maximum coolant tank depth : 9" (22 cm)

Minimum coolant tank depth : 2" (5 cm)

Mount type : clip or side bracket

Controller

Display : Liquid Crystal, 4 lines, 20 characters / Line

Power : +12V DC (optional +24V DC)

Measurement : Ambient temperature and humidity

Power consumption :

Dimensions :

Weight :

IP protection : IP20

Temperature/Humidity : working -5C..+45C at maxRH80 non condensing

Light Bar

Viewing angle : 180

Colors : Full-color RGB

Life span : 50000+ hrs

Brightness : ~450 lm

Installation : Screw with spring bracket

Skimmer control Compatibility

Recommended skimmer : 12V DC at 1 Amp

Optional : cable with NO contacts to control virtually any DC or AC skimmer

Miscellaneous

CNC machine level output compatibility: PWM, analog 0..5V

Power source : Skimmer power supply OR CNC machine controller OR external AC-DC adapter

A. Getting Started | How does it work?

Coolants play a vital role in machining processes, extending tool life, improving surface finishes, and removing contaminants from cutting areas. The True Level CNC system provides solid-state level measurement and management for CNC coolant operations. It continuously monitors both coolant level and temperature, alerting operators when either falls outside optimal parameters. Additionally, the system efficiently controls oil skimmer cycling to effectively remove contaminants, helping maintain coolant performance and machine productivity.

Key Features of the True Level CNC System

Solid State Digital Level A durable rectangular solid state sensor adapted from the reliable nuclear reactor water level monitoring technology. With no moving parts or orifices, it's impervious to clogging and jamming. Embedded top and bottom temperature sensors provide error-free, real-time measurements that accurately represent current coolant conditions.

Light Bar The intuitive RGB indicator tower displays coolant level and temperature at a glance. During normal operation, it shows steady green and blue colors. As coolant temperature rises or level drops, the light bar alerts users with pulsating colors.

AutoSkim Controller The True Level CNC controller intelligently analyzes coolant conditions to operate the skimmer at optimal times for efficient oil removal. This prevents bacteria growth, extends coolant life, maintains tool performance, and reduces maintenance costs by removing tramp oils precisely when separation is optimal. The system comes preconfigured for 12V DC skimmer motors but can be adapted to various configurations.

Values measured

True Level CNC measures critical level and temperature information that has a direct impact on the effectiveness of the coolant.

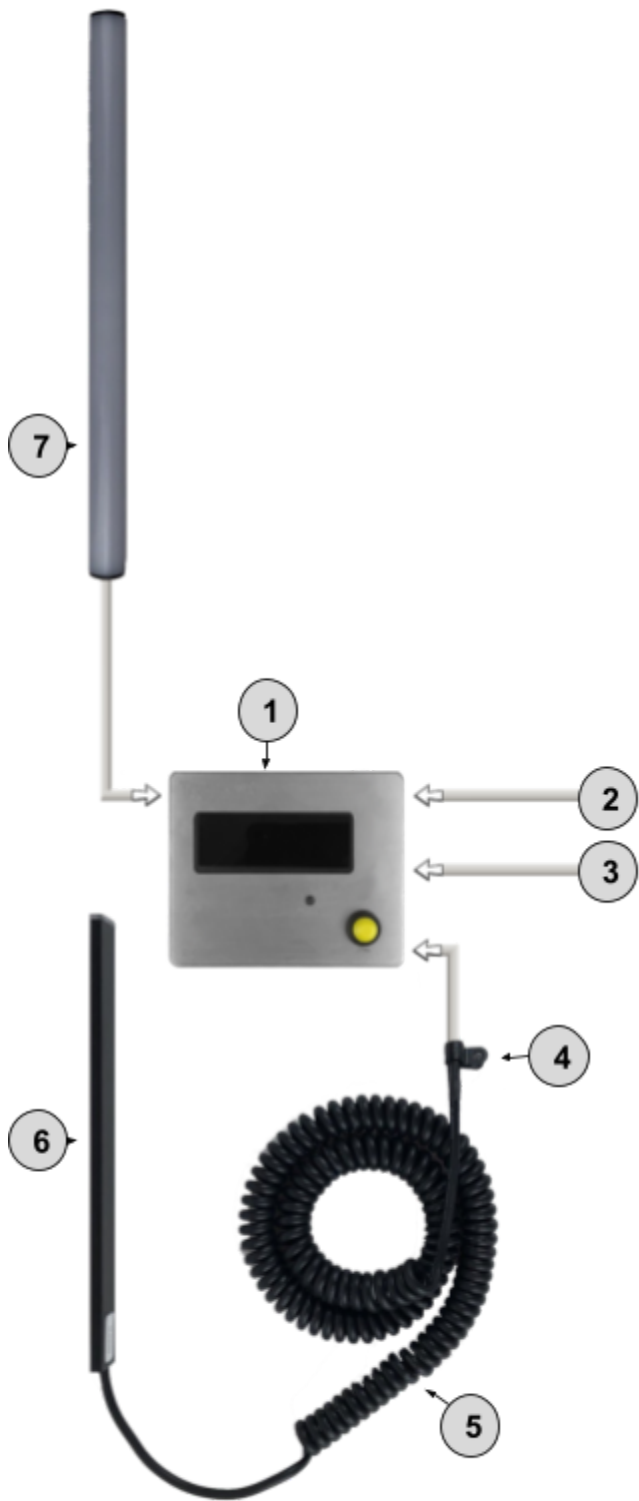
Temperature

- Upper coolant temperature
- Lower coolant temperature
- Ambient temperature/humidity

Coolant Level

- As a gauge & color light bar
- In depth (inches/ centimeters)
- As Volume (gallons / liters)

B. Setup / Components



1. **Controller** - Controller and status display, controls and displays system information, has magnets to be installed to the front of your CNC machine at a convenient place.
2. **Skimmer connection Cable** Belt type DC Powered skimmer that extracts oil skim from top of the surface of coolant, installed on top of the coolant tank. Skimmer needs to be purchased separately. See a skimmer selection suggestion in the Terminology section of this document for further details.
3. **Power and machine-level data connection** (optional)
Powering the True Level CNC system via:
 - a. Skimmer power supply (AC (110v) to DC (12V) power outlet) * Included with the skimmer option
 - b. CNC Machine Power
 - c. Power adapter
4. **Mounting Clip** - This is attached to the machine as a connection for the coil cord.
5. **Coil Cord** - Retractable cord
6. **Digital Coolant Level** - a solid-state digital level, calibrated for most types of coolant used in machining. The Digital Coolant Level will sense a liquid level, the temperature on top and the bottom of the tank, and transfer data via digital link to the controller. It is mounted vertically or semi vertically to the coolant tank.
7. **Light Bar** - a multicolored LED status light, displays coolant level, temperature, and system status, attached at the top of the machine with two spring brackets and screws.

B. Setup / Installation

Installing the True Level CNC system typically requires 30 minutes and basic tools. Before installation ensure that the CNC machine has been powered off and you carefully observe all safety instructions and rules.

1. Mount the Controller

The Controller mounted to the top edge of your CNC machine with magnets. Find a suitable location away from moving objects. We recommend mounting the controller at the most visible part of your machine, at the front, where you can access a single control button and monitor coolant status.



2. Routing Controller wires

Route and secure the wires toward the back of the machine. Maintain approximately two inches of slack in the wires near the controller to facilitate temporary access to the rear of the controller during setup and adjustments.

For machine controller integration, locate an appropriate cable gland or opening to route wires properly. Professional consultation is recommended for proper routing and connection to specific machine controllers.

Note: The True Level CNC system is designed as a universal solution and requires proper integration knowledge for specific CNC machines such as HAAS. For simplest implementation, a standalone installation using the skimmer and its dedicated power supply is recommended.



3. Digital Level sensor installation

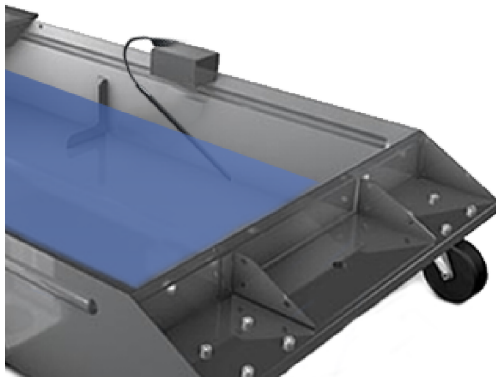
The Digital Level sensor is designed to accommodate various installation methods for different coolant tank configurations. The lightweight sensor can be installed using screw mounting or bracket holding methods. Here are recommended installation approaches:

Option 1: Side Bracket Mounting

Fabricate a simple side bracket from a 1-inch wide, 1/16" soft aluminum strip with a single mounting hole. Though the Digital Level comes fully sealed and encapsulated, a mounting nut is positioned on the top side near the cable entry point. Carefully expose this internal mounting nut using a soldering iron. Secure the bracket using a #10-32 threaded machine screw with washer and an additional nut, taking care not to overtighten.

Option 2: Clip Mounting

Use a clip-style mounting bracket to secure the sensor to the coolant tank through an available opening on the top cover. This provides a secure grip without requiring permanent modifications. For either installation method, position the sensor at an angle so the bottom end of the Digital Level makes contact with the tank bottom. This ensures accurate level measurement throughout the tank's depth range. RetryClaude can make mistakes. Please double-check responses.



Clip-in mounting bracket onto the side of coolant tank, through available opening on top cover.

Mount at an angle so the end (bottom) of the digital coolant level just touches the bottom of the tank.

4. Install the Light Bar

Install two mounting spring brackets to the surface of the machine, aligned for vertical installation of Light Bar, by using two machine screws, predrilled holes. Snap the Light Bar using the included machine screw, by sliding the light bar into the clips.



Install two clips to the desired mounting location.



Snap-in the Light Bar into the mounting clip

5 . Connect the power adapter

The True Level CNC system operates on +12V DC (with common ground at -12V DC) and can be configured for 24V DC operation with an optional external power supply adapter. Consider the following power options:
Recommended Power Options:

Skimmer Power Supply: The simplest installation method utilizes power from the skimmer's existing power supply, making DC-powered skimmers an ideal pairing.
CNC Controller Power: For integrated installations, the system can draw power from the CNC machine's controller power supply.
Standalone Power Adapter: If neither of the above options is suitable, a standard wall adapter providing +12V DC at 1A can be used.

Select the most appropriate power source for your installation environment. For custom power configurations, consult with us before ordering.



6. Power True Level System from the CNC machine (Optional)

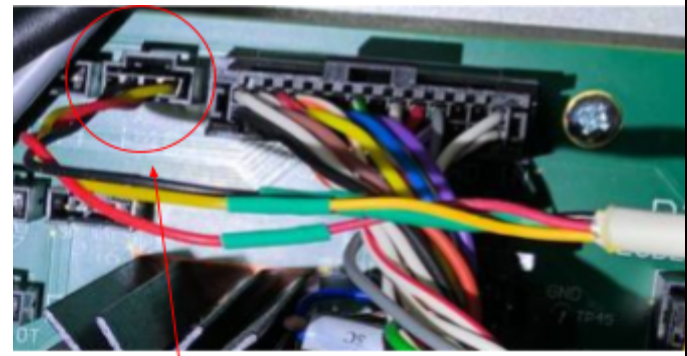
Installation options vary depending on your specific machine model and controller configuration. Below is an example of connecting to a HAAS controller:

While connecting to the CNC machine's controller is not necessarily the optimal solution when considering warranty implications and other factors, most controller power supplies can adequately support the low additional DC load required by the True Level CNC system.

This connection method offers dual benefits:

1. Coolant level data can be integrated directly into the factory controller's coolant monitoring system
2. The True Level CNC system can draw power from the same connection point

IMPORTANT: Before attempting any connection to your CNC machine's controller, thoroughly verify compatibility with this type of setup. Machine specifications vary significantly between manufacturers and models.



P43 Liquid Level Connector on Haas mainboard

7. Install skimmer

The True Level CNC system does not include a specific skimmer unit. For optimal system performance, select an appropriate skimmer based on your machining environment and requirements.

For detailed guidance on skimmer selection, refer to the Terminology section later in this document, which provides specifications and recommendations for compatible skimmer units.

When installing your selected skimmer into the coolant tank, carefully follow both the skimmer manufacturer's installation guidelines and any specific recommendations provided by your CNC machine manufacturer to ensure proper integration and operation.



8. Wire labeling and designation	Connect to control relay controlling Coolant Pump relay coil or SSR primary control circuits Coolant Pump is Running max +12V DC Analog level Output +2.5~3.5V DC, 5mA max Ground, Common of CNC controller power supply Do not connect! Option +12V -12V Yellow Skimmer control +12V ON Connect to Machine chassis Ground Route CNC cable to control box of your machine CNC POWER To CNC controller for display coolant level
9. Connection and verification	Before connecting any wire to your machine, power supply or any other connection, take time to make all voltage measurements and record them for installation purposes and confirm they are correct, especially power, control input signals, etc. After confirmation all connection points, with equipment is OFF, process with connection. Use common sense of electrical connection wiring, soldering, insulation and wire separation. If you have any uncertainty, find a specialist familiar with art and ask him to do it for you, it may save your time and our efforts to help you. After completing all your connections, please visually verify the quality of junctions, insulation, wire colors, etc., and correctness according to the connection diagram.
10. First power-up	Powering for the first time it is important to carefully observe equipment behavior and first you need power only newly installed equipment - True Level controller. Upon power up and it is 12V DC (right polarity and deviation from 12V with load is under +/-2%) , the controller will beep and screen will show a first screen. Congratulations ! You made it up !

B. Setup / Configuration

Once the System has been installed, all connections checked follow the steps outlined below to set up your True Level CNC system.

1. Fill Coolant tank

Fill the coolant tank to the normal operating level



True Level
Digital Coolant Level



+Skimmer



SAM
CONTROLLERS

Figure: Front of the Controller

1. **Display** - 4 lines, displaying coolant level, temperature, and other information.
2. **Button** - when pressed flipping through screens, used to enter setup mode
3. **Skimmer indicator** - reflect skimmer status. Skimmer control is determined by the True Level controller automatically and is optimized for the best effectiveness of oil removal, environment, coolant stage, operation mode, etc.

2. True Level CNC Setup mode

Hold down the button on the controller while powering it on and continue to hold the button until the controller beeps (about 10 seconds.)

Note: The Buzzer setting must be enabled (fg. Controller Back 10.) for the setup mode beep confirmation to occur.

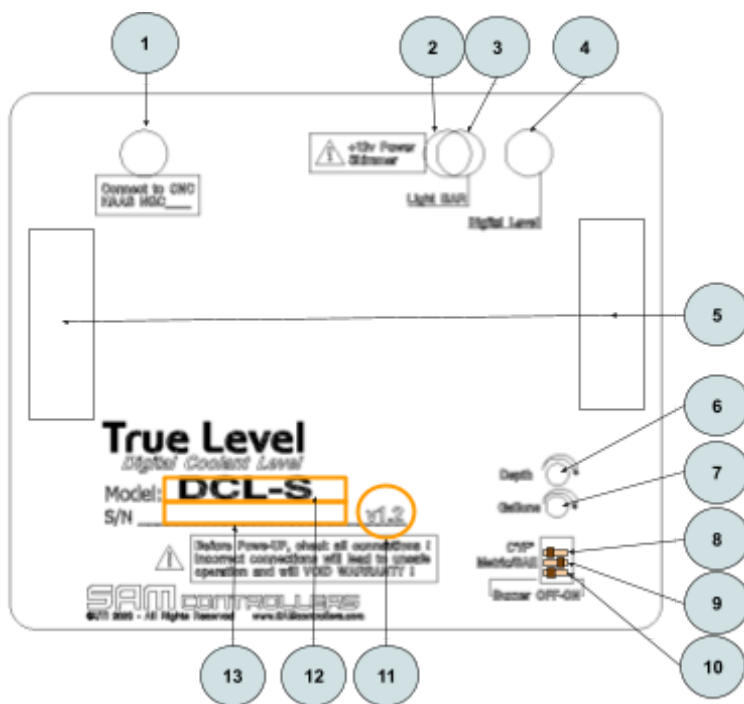


Figure: Controller Back

1. **CNC Machine controller level input & power cable** - *Optional* integration with CNC machine's liquid level float input.
2. **Skimmer & power cable** - *Optional* control for a skimmer together with a 12V power adapter.
3. **Light Bar cable**
4. **Digital Coolant Level cable**
5. **Magnet attachment**
6. **Tank Depth adjustment** - Adjustment for the depth of the coolant tank (CM / Inches)
7. **Coolant volume adjustment** - Adjustment for the volume of the coolant tank (gallons/liters)
8. **Temperature setting** - C° / F°
9. **Measurement setting** - Metric (mm) / SAE (Inches)
10. **Buzzer setting** - OFF / ON
11. **Version Number** - hardware version
12. **Model Number** - Model Name - Options equipped
13. **Serial Number** - Device serial number

3. Configure switches

Using a small flathead screwdriver configuration can be changed as showing on Right

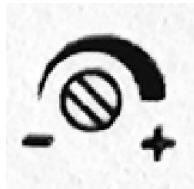
	Description	Left position	Right position
SW1	Metric / Imperial Temperature Display (C° / F°)	Metric (C°)	Imperial (F°) (default)
SW2	Metric / SAE units for liquid rate measurement	Metric (Liters)	SAE Units (Gallons) (default)
SW3	Buzzer / Alarm	Audio Alarm Off (Silent)	Audio Alarm On (default)

4. Adjust coolant tank Depth & Volume setting

Adjust with a flat screwdriver :
#6 - to adjusts coolant liquid height in the coolant tank (cm / inches)

#7 - to adjusts total coolant tank volume in gallons/liters

System used this as an initial setting for a proper algorithm calculation base for precision skimmer operation.



After completing all adjustments, restart the True Level controller by cycling the power.

Your True Level CNC system is now calibrated and ready to revolutionize your coolant management!

C. Using | Light Bar

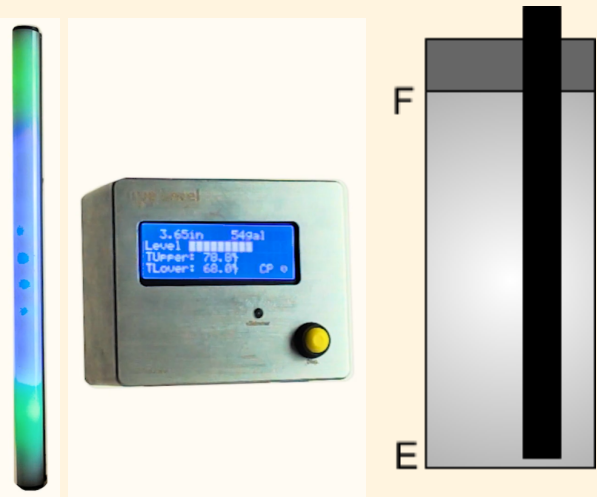
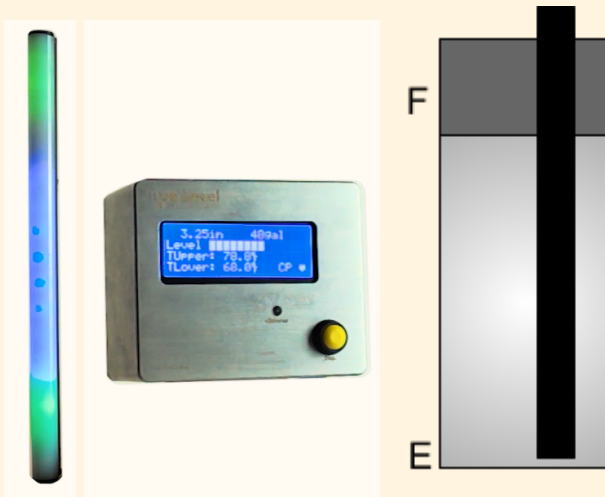
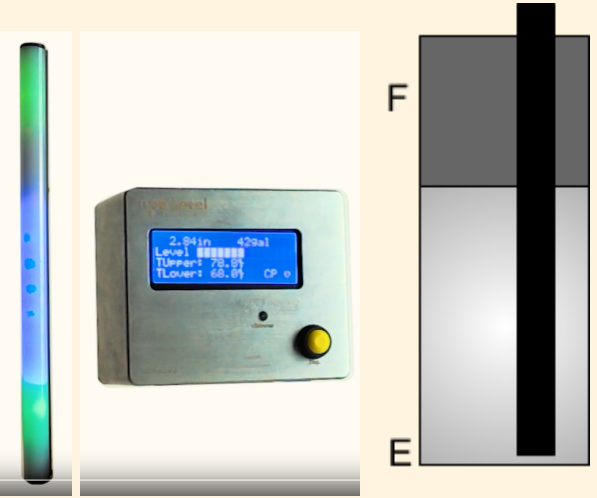
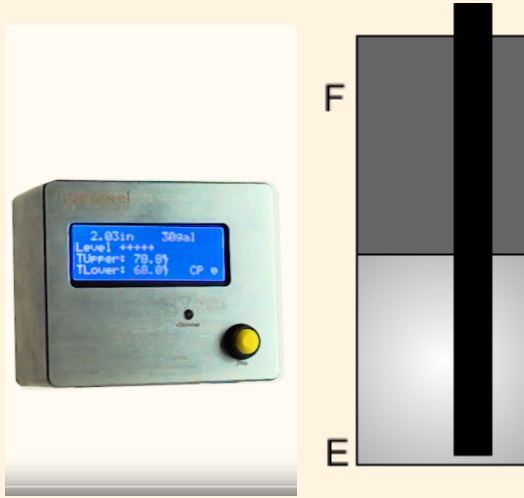
The Light Bar is a coolant status indicator light with a 180° viewable angle, providing an intuitive color display. In normal operating conditions it shows the coolant liquid level and coolant upper and lower tank temperatures. When adverse conditions are detected, such as low coolant level, over-temperature, or freezing conditions the Light Bar will dynamically flash in orange/red color.

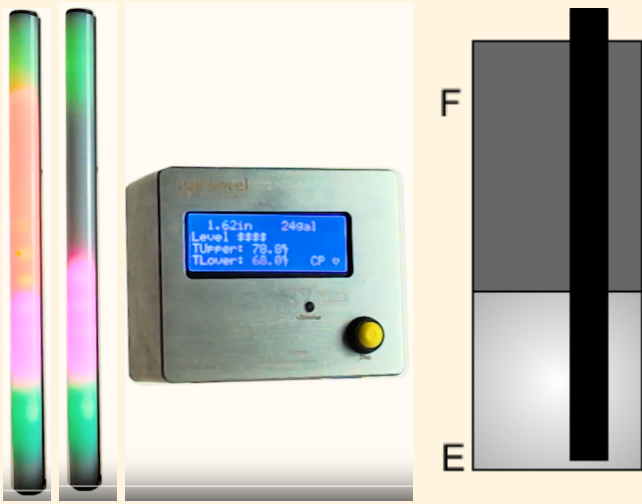
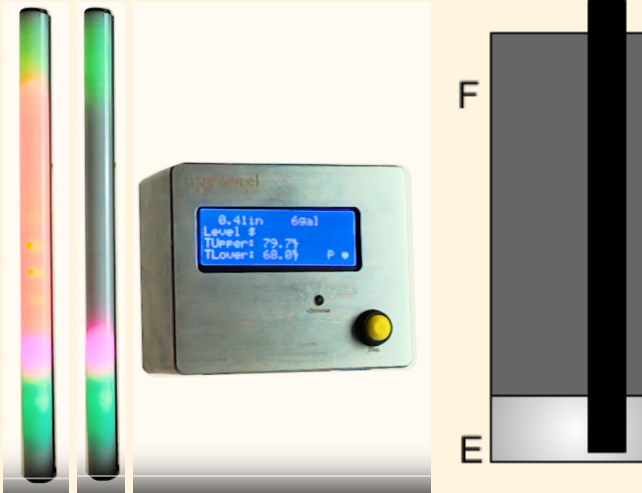
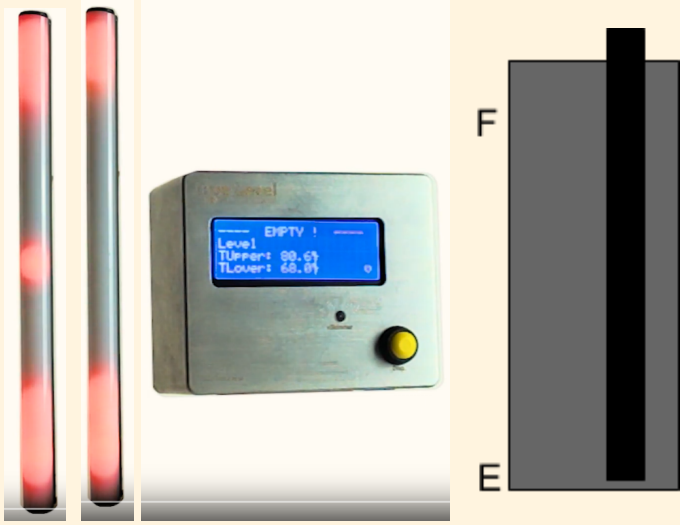
Coolant Indicator Sections	
1. 2. 3. 	1. Top of coolant tank temperature The topmost portion of the Light Bar indicates the temperature at the top of the coolant tank. <i>Refer to the temperature color scale figure below for the corresponding temperature and condition.</i> 2. Coolant level The middle portion of the Light Bar indicates the coolant liquid level. When the coolant level is ~70% or higher the color is blue, when the level drops below the color will change to fuchsia Indicating a low level of coolant. <i>Refer to the coolant level example below for the corresponding coolant level and condition.</i> 3. Bottom of tank coolant temperature The bottom portion of the Light Bar indicates the temperature at the bottom of the coolant tank. <i>Refer to the Temperature Color Scale figure below for the corresponding temperature and condition.</i>

Condition	Normal, operating temperature	Freezing or approaching temperature	Alert Condition coolant empty or over temperature
Color of Light Bar			
Approximate temperature	~ 40-75° F	~ >35° F	~ 85-100° F

Figure: Temperature Color Scale (at top and bottom of Light Level)

Liquid level from full to empty:

Light Bar Controller Coolant Tank	Light Bar Controller Coolant Tank
	
1. Tank level Full, coolant temperature normal	2. Tank level 80%, coolant temperature normal
	

3. Tank level 70%, coolant temperature normal	4. Tank level 50%, coolant temperature normal, controller recommends adding coolant to prevent tool wear
	
5. Tank level 40%, coolant temperature normal, system alarm triggered (audio buzzer, and orange flashing light bar) as tool life may be affected	6. Tank level 30%, coolant temperature normal, system alarm triggered (audio buzzer, and orange flashing light bar) as tool life likely affected
	
7. Tank level 10-20%, coolant temperature normal, system alarm triggered (audio buzzer, and orange flashing light bar) as tool life likely affected	8. Tank level empty, system alarm triggered (audio buzzer, and red wig-wag light bar)

C. Using | Coolant Temperature Indication

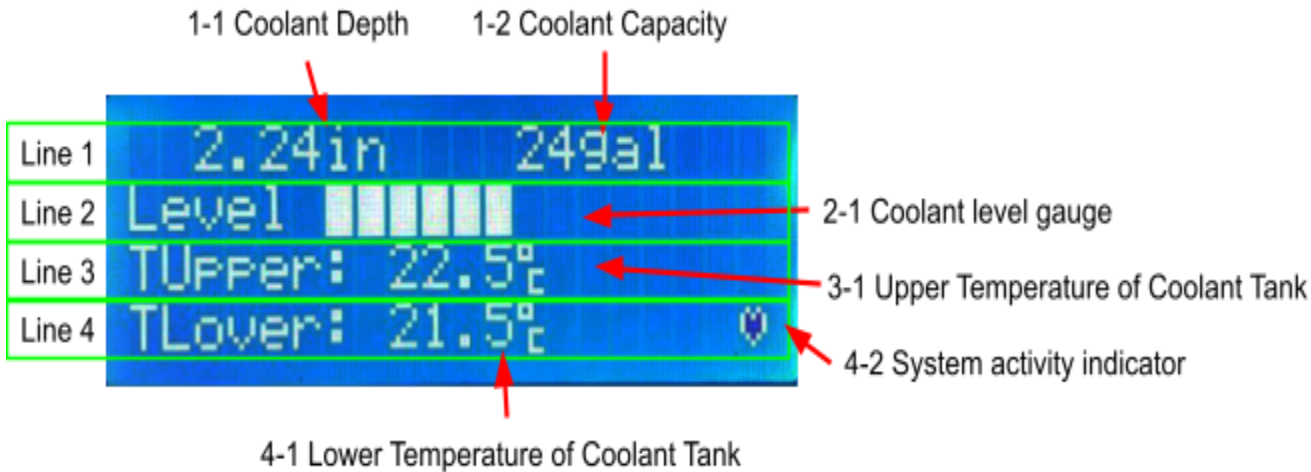
True Level CNC monitors the lower and upper temperature of the coolant

Light Bar Status						
Upper Tank Temp.	83° F	84° F	86° F	88° F	91° F	95+° F
Lower Tank Temp.	75° F	83° F	85° F	87° F	90° F	95+° F

C. Using / Display

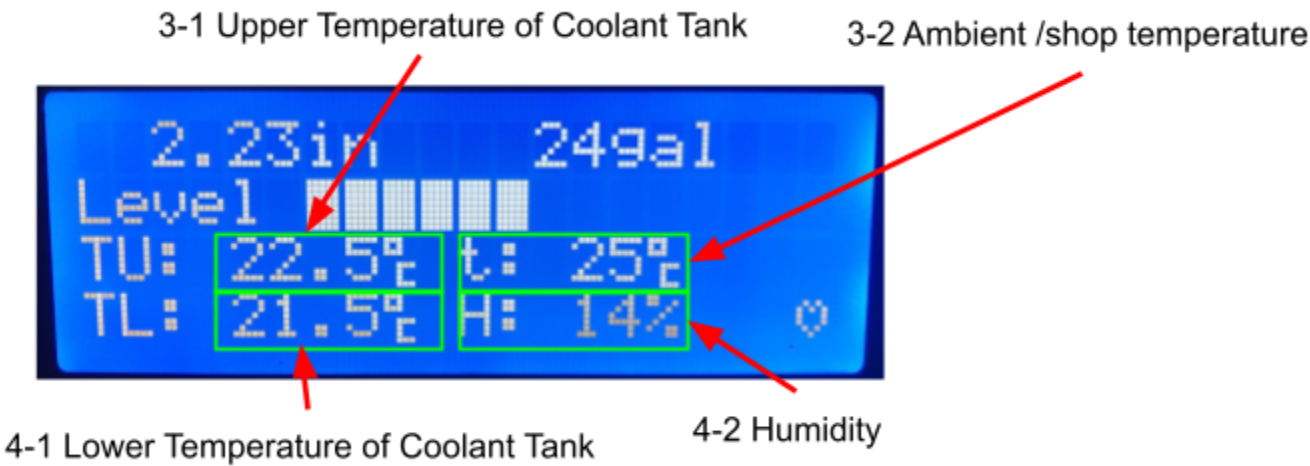
The display is a 4 line, 20 character display. The display screens can be rotated by pressing the **button**.

Default/ Main screen



Line #					
1	Coolant Depth (inches/mm), This parameter can be configured while in Setup Mode	Coolant Capacity (gallons/liters) This parameter can be configured while in Setup Mode			
2	Coolant Level Gauge shows the level of coolant, this level of coolant is as well expressed by the <i>coolant light indicator</i> . The possible conditions of the coolant level gauge; <table><tr><td>Coolant needs to be added: LEVEL + + +</td><td>Coolant Level Low: LEVEL \$\$\$\$</td><td>When coolant level is normal: LEVEL II III</td></tr></table>		Coolant needs to be added: LEVEL + + +	Coolant Level Low: LEVEL \$\$\$\$	When coolant level is normal: LEVEL II III
Coolant needs to be added: LEVEL + + +	Coolant Level Low: LEVEL \$\$\$\$	When coolant level is normal: LEVEL II III			
3	Upper coolant Temperature				
4	Lower coolant Temperature	Acquisition activity indicator			

Shop Screen



Line #			
1.. 2	Same as Default / Main Display		
3	3-1. Upper Temperature of the coolant tank	3-2. Shop temperature	
4	4-1. Lower Temperature of the coolant tank	4-2. Shop humidity	4-3. System activity indicator

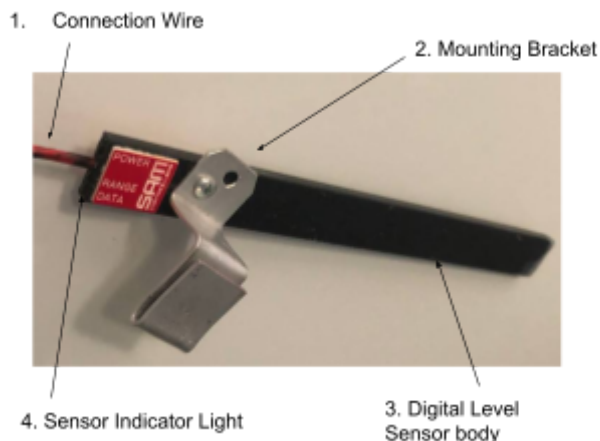
System Screen



Line #		
1.. 2	Same as Default / Main Display	
3	3-1. Software Version	3-2. Device Serial Number

D. Information / Terminology & Acronyms

DIGITAL COOLANT LEVEL - a solid state digital level , calibrated for most coolant used in the CNC and other machining. This Digital Coolant Level will sense liquid level, the temperature on top and the bottom of the tank, and transfer data via digital link to the controller.



1. **Connection Wire** - Connected to Controller
2. **Mounting Bracket** - Stainless steel bracket for attaching the sensor to the side of the coolant tank, mounted vertically or at a diagonal angle. See installation instructions for further information.
3. **Digital Level Sensor Body**
4. **Sensor Status LED** - status lights and corresponding sensor status:
 - A. Green LED (steady on): Powered on
 - B. Red LED (active in the alert state): Liquid level low or empty
 - C. Blue LED (blinks) Measurement in progress

Skimmer Selection and Integration

A skimmer is an essential component for any CNC machine with coolant circulation. Over time, machining operations cause oil and grease contaminants to accumulate in the coolant, significantly degrading machine performance, cooling efficiency, and component longevity.

Selecting the Right Skimmer

Choosing an appropriate skimmer for your operation is a critical step in machine



setup. Consider these factors when selecting a skimmer:

- **Skimmer Type:** Belt-driven skimmers in various sizes are a good starting point for most operations. Disk skimmers offer an advanced alternative for specific applications.
- **Space Requirements:** Evaluate whether the skimmer will fit on your coolant tank, under the machine, or require additional space in your shop.
- **Contaminant Removal Efficiency:** Different skimmers vary in their ability to remove oils at specific temperatures and operating conditions.

True Level CNC Integration

While most skimmers operate on a simple On/Off function, the True Level CNC system significantly enhances their effectiveness. The system intelligently controls your skimmer's operation timing and duration to maximize contaminant removal efficiency, while also providing comprehensive coolant status monitoring.

To ensure proper integration with the True Level CNC system, please provide the model and electrical connection details of your selected skimmer when ordering.



D. *Information / Troubleshooting & Maintenance*

True Level CNC does not require maintenance for troubleshooting information please fill out a ticket request at: <http://samcontrollers.com/support>

D. *Information / Safety*

THIS PRODUCT CAN CAUSE INJURY IF NOT USED IN ACCORDANCE WITH THE FOLLOWING SAFETY INSTRUCTIONS. THIS MANUAL CAN NOT ANTICIPATE EVERY POSSIBLE CIRCUMSTANCE THAT MIGHT INVOLVE A POTENTIAL HAZARD. THE WARNINGS, CAUTIONS, DANGERS, AND SAFETY SUGGESTIONS ARE THEREFORE NOT INCLUSIVE. AS THE OWNER YOU ARE RESPONSIBLE FOR THE SAFE OPERATION OF THIS EQUIPMENT. ALWAYS MAKE SURE THAT ANYONE USING THIS EQUIPMENT HAS READ THIS MANUAL AND FOLLOWS THE SAFETY WARNINGS TO HELP PREVENT THE POSSIBILITY OF PERSONAL INJURY TO THE OPERATOR OR ANYONE ELSE. IF ANY OPERATING PROCEDURE, INSTALLATION, MAINTENANCE, OR WORK METHOD NOT SPECIFICALLY RECOMMENDED IS USED, YOU MUST SATISFY YOURSELF THAT IT IS SAFE FOR YOU AND OTHER PERSONS. YOU MUST ALSO ENSURE THAT THE PRODUCT WILL NOT BE DAMAGED OR MADE UNSAFE BY THE PROCEDURE YOU CHOSE.

Use proper electrical power. Connect the unit to a dedicated circuit of the proper voltage, proper rated circuit breaker, and wired with the proper wire size and number of conductors. Use supply Wires suitable for above 110°C Ensure that all connections are properly tightened. Improper connections could result, causing damage, injury, or death of the equipment operator. This machine must be connected in accordance with the National Electric Code (NEC) Article 422-4 - Ed-31, Except as provided for in NEC 90-4. This machine must be properly grounded to avoid fatal electrical shock in the event of an electrical malfunction. A ground connector screw should be fastened into the chassis to facilitate supplemental grounding as permitted by NEC 250-91.

! DANGER Do not connect any other equipment to the electrical circuit serving this unit. Do not replace a fuse or circuit breaker with one of a higher rating without being certain the wire size is adequate to handle the increased electrical load. Keep all electrical connections dry and off of the ground. Observe all local and national codes for the installation and use of this type of equipment. If the wire size being used is too small, the voltage drop will be high, and this will cause the motor to draw excessive current and overheat or fail. If there are any questions or problems with the electrical system being used please, do not hesitate in calling a local qualified electrician. Wear proper protective clothing and equipment. Wear full eye protection (preferably a face shield) while operating this product.

Do not operate with protective covers or guards removed. The unit may start and stop accessories automatically. Do not operate with any electrical panels or covers opened. Do not operate this unit with any of the safety controls bypassed. This unit was designed with safety in mind. Never allow anyone to bypass, modify, or alter anything on this unit. If any parts appear to be dysfunctional, do not operate the unit and immediately contact a qualified technician.

Unplug or disconnect unit before cleaning or servicing. To help prevent the risk of injury or death as a result of shock or electrocution or entanglement while this product is being cleaned, serviced, or repaired, electrical power must be removed. Unplug or disconnect the power cord or “lock out” the switch box that supplies power. For more details, please refer to U.S. Department of Labor, Occupational Safety and Health Administration, Regulation 29 CFR 1910.147, Control of Hazardous Energy Source (lockout/tagout).

Only qualified personnel should attempt any electrical repairs or troubleshooting on the equipment. Serious injury or death could result from improper repairs and/or troubleshooting.

Never modify or alter this unit. For your own safety as well as others, never allow this unit to be altered or modified. Modifying or altering equipment to operate in a fashion other than its original design may cause serious injury or death. Always check the connection hose, control hoses, fittings, clamps, and spuds before operation. Replace all damaged or worn items with one which meets or exceeds the specifications of the original equipment. The use of an improper hose, fitting, clamp, or spud may cause the hose, fitting, clamp, or spud to rupture which could result in serious injury or death or damage to property.

Do not operate near flammable or combustible materials. This product is not intended for use in locations where fire or explosion hazards may exist due to the presence of flammable vapors, liquids or gases, or combustible dusts or fibers.

Do not permit untrained personnel to maintain or make repairs on this unit. Only factory personnel should be permitted to make any type of repairs to this unit. Improper repairs may cause this unit to malfunction which could result in serious injury or death to the operator, repair person, or bystander.

Never allow children or any unauthorized persons to operate the unit. Allow only personnel trained in the use of the equipment to operate the unit. Keep all persons at a safe distance when the machine is being operated.

D. *Information* / **Contact Information**

Phone: (919) 442-8787

Hours: 9-6 Monday-Sat : EST

WEB: <http://samcontrollers.com>

For Product support: <http://samcontrollers.com/support>