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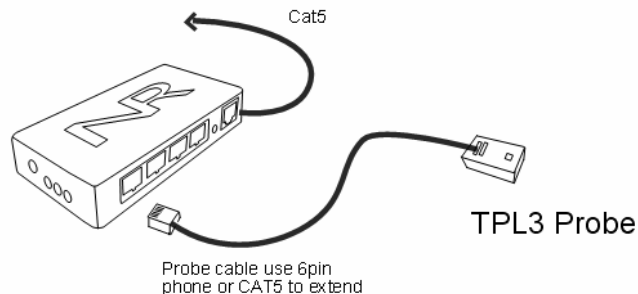
Temperature Probe, TPL3 and TPL3U (#30002 and #30012)

The Networked Robotics TPL3 temperature probe is designed to be used as part of the Tempurity System for collecting temperatures through computer networks. The probe is used in conjunction with the Networked Robotics NTMS (Network Telemetry Monitoring System) hardware and may be used with Networked Robotics' Tempurity System software. The Tempurity System is designed for data collection and monitoring in FDA-regulated environments.

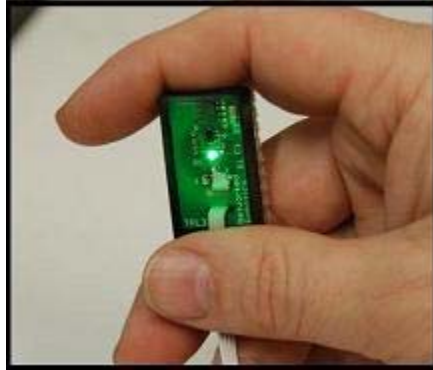
The TPL3 probe series is optimized for use in scientific and regulatory environments. The probes are waterproof and can be used in any high humidity environment between -80C and +120C. The thin wire used to connect the probe to the network hardware is optimized for installations in freezers because it minimizes any disruption of freezer door seals. Each probe contains a unique electronic ID that can be read by the Networked Robotics Probe ID Unit and transferred to a computer for metrology and calibration. The on-board LED indicates the status of the probe for network data collection. The LED both provides an instant indication of success during installation, and provides a visual at-a-glance indication to everyone that the probe is operational to the network hardware.



To ethernet switch



The TPL3 model uses industrial dual-lock for attachment and is designed for use in refrigerators, freezers, incubators, and rooms; the TPL3U model uses a suction cup for attachment and is designed for use in ultracold (-80°C) freezers and in underwater applications such as low-to-medium temperature water baths. All models of the probe are waterproof and can operate in submerged conditions.



The TPL3 contains an internal digital temperature measurement integrated circuit, an on-board processor, and an LED indicator. The processor controls the state of the LED based on its analysis of the communications traffic coming from the Networked Robotics NTMS hardware. If the communications traffic is nonexistent, or is of the wrong type of signal is sent as expected by the TPL3, the LED will not illuminate. In this way both the state of the logical configuration, that is the configuration of the monitored device type of the NTMS port, and the state of the physical connection to the NTMS are instantly viewable by anyone at the monitored site.

Packing List

This package includes the basic hardware you will need to connect the TPL3 probe to the NTMS.

- (1) TPL3 or TPL3U Temperature Probe
- (1) RJ-45 Coupler for extensions

Verify that your packaging is complete and contact us if anything is missing.

Electrical Specifications

The TPL3 probe (shown below) receives power from the regulated 9-12V DC supplied by the Networked Robotics NTMS hardware (no external power supply necessary.) Simply plug the TPL3 into the NTMS.

Physical Installation

TPL3s are designed to be used in networked environments.

Wall plates

In offices or laboratories that are well populated with network jacks you can measure temperatures through network wall plates. For example, room temperatures from every room in an entire building can be visible to anyone on the network in just a few hours. Using this method, NTMS units are mounted on rack hardware and shelves in a network closet. Each NTMS port is patched to a network wall plate as shown in this room temperature application. This method utilizes the 3-inch-long version of the TPL3.



This method can be used in scientific applications by extending the reach of the probe to the inside of a freezer. Probe connections can be easily extended with common couplers and phone or CAT5 cable.

Probe Location

The placement of the TPL3 is important. Be sure to select an appropriate position for the sensor inside the monitored device (or room) that will represent the conditions of the material that you are protecting; the probe must not be touching high mass materials such as large tissue samples. Higher placement will usually result in a warmer reading. In a standard-size refrigerator a gradient of 4 degrees C is common between the top and the bottom of the unit.

Attaching the TPL3 Probe

Secure the TPL3 to the monitored site using the “dual-lock” provided on the back. The “dual-lock” sticks best to metal or plastic surfaces. It may not adhere as well to surfaces such as drywall or wood, or to porous materials such as concrete.

You may wish to adjust the degree of overlap between the two dual-lock sections. The less overlap or the less contact between the two sections, the easier the probe will be to remove from the wall of the freezer for calibration or replacement.

Attaching the Probe to the Inside of a Standard Refrigerator or Freezer

Networked Robotics recommends that probes should be firmly attached inside freezers. Loose probes may shift positions and this could affect the reading. Unattached probes are more likely to fall out of the freezer or cause interference with the normal movement of samples in and out of the door.

To apply a Networked Robotics TPL3 digital temperature probe to the wall of your refrigerator or freezer first ensure that the freezer wall is dry. If frost or condensation has built up on the wall, use a paper towel to dry it. In some cases, except in ultracolds, you may want to briefly apply a gloved hand to the wall where the dual-lock will be affixed. This will warm the wall and increase the likelihood of a good bond. If the dual-lock backing does not adhere, ensure that the wall is as dry and as warm as possible and try again.

Combination refrigerator/freezers require the use of two TPL3 probes, one in the freezer compartment and the other in the refrigerator compartment.

See the Tempurity System Quick Connect Guide and the Tempurity System User's Guide for more information.

The temperature probe cable can be secured to the exterior wall of the freezer with white laboratory vinyl tape. You can also use clear packaging tape or cable guides. The probe cable can be easily extended as described below.

Do not use the Networked Robotics TPL3 Temperature Probes for temperatures above 120C.

Attaching the TPL3U Probe in an Ultracold Freezer

Clear off any frost at the location of attachment.



Dip the suction cup of the TPL3U probe in hydrated glycerin. You can use 80% glycerin 20% water – or allow a glycerin solution to interact with air. It will saturate to this concentration. Use gloves. It's important to ensure that your hand is not touching any glycerin during this process. Press the glycerin-soaked suction cup against the wall of the ultracold. Hold briefly, about 20 seconds, until it freezes. Do not use water for this procedure as a water-dipped probe will not adhere to the wall of the ultracold. The frozen glycerin provides a very high bond and will be difficult to remove without the application of heat. If the probe does not adhere within seconds of application in a freezer that has equilibrated to -70C or below, you may wish to dilute the glycerin solution with water and try again.

In later versions of the TPL3U the probe head can be removed from the suction cup and thus from the freezer's wall without the requirement for application of heat.

The harsher environment of an ultracold freezer puts high mechanical stress on the TPL3U probe wire. In ultracolds with both an exterior door and compartmental doors the position of the probe and lead installation should seek to minimize mechanical stress on the lead.

Attaching the TPL3U Probe Underwater

Both the TPL3 and TPL3U are waterproof and are capable of being submerged in water. Total immersion in water will not damage either probe type. The electronics of the unit are hermetically sealed from the elements. Therefore, the unit can be installed outdoors, or in areas of temperatures up to 120C. NTMS network hardware must be installed in areas not subject to water.

To install a TPL3U in water ensure that the probe is disconnected from the NTMS, place underwater and press against a smooth surface, such as glass or plastic. The probe should hold permanently in position. If not, find a smooth location and try again.

Extensions and Reductions

The reach of the probes can be as far as 400 feet away from the Networked Robotics NTMS network hardware. You can easily extend the length of any connection using the included RJ-45 coupler and either standard 6-pin phone cable or standard CAT5 network cable.

Reducing the length of the probes should only be done by IT or telecommunications staff however this is a simple process. Note the asymmetric crimp of the TPL3-series. Cut the probe wire and recrimp with a standard 6-pin RJ11 (phone-style) connector.

If the NTMS is powered up, and the CAT5E cable connection is made correctly between the TPL3 and the NTMS, the green LED on the probe will illuminate.

LED Operation in Ultracolds

TPL3U probes may blink on and off slowly in ultracold environments.

Sterilization and Cleaning

The probes may be autoclaved at temperatures up to 120C. Immersion of the probes in 100 percent bleach may also be used.

The probes may be washed in a standard dishwasher.

LED Indicator

The green light of the probe indicates that the right type of connection is made to the Networked Robotics network hardware such that data collection may occur, but does not guarantee that such data collection is currently operational. LED activation is determined by the on-board processor on the probe. Its function is to watch the communications traffic between the Networked Robotics NTMS network device and the probe, and enable or disable the green LED based on its analysis. The conclusion is based on configuration and is not based on temperature. The table below shows conditions where the green indicator LED of the probe is either on or off.

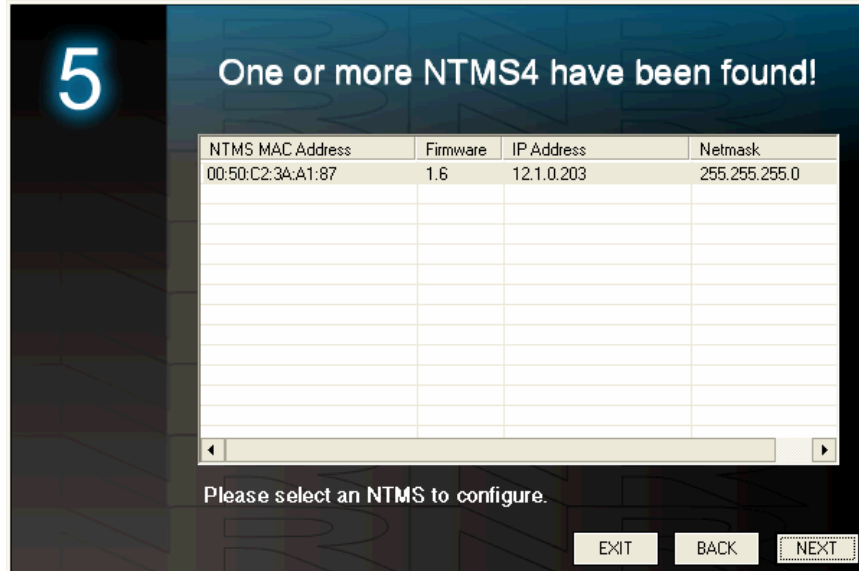
NTMS network hardware is unplugged	OFF
Probe is not connected to the NTMS	OFF
NTMS temperature port is set to monitored device types other than TPL3	OFF
Probe plugged into wrong NTMS measurement port	(Probably On -depends on wrong port setting)
Bad probe	(Unknown - depends on probe problem)
Tempurity Server or Monitor down	ON
Temperature out-of-range	ON



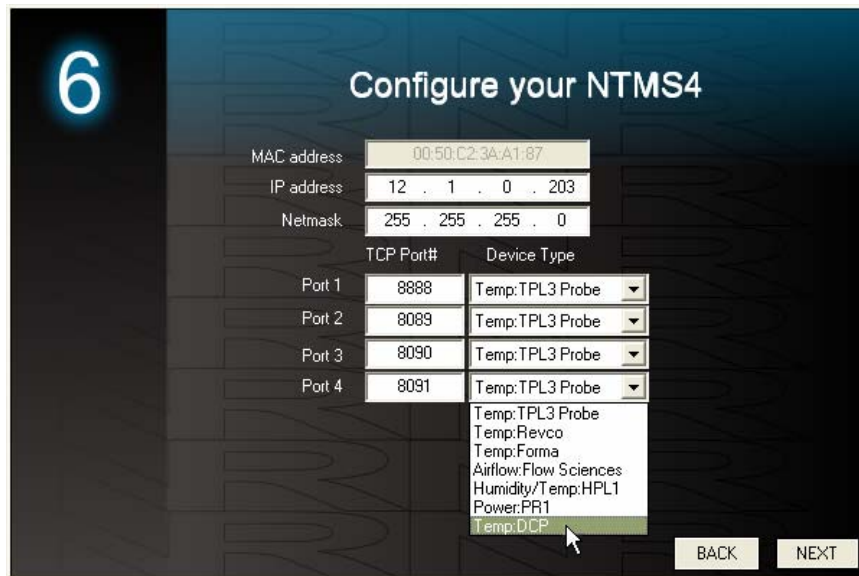
Configure the NTMS

Finally, configure the NTMS port for the new probe type. This is done by running the latest version of the NTMS Configuration Wizard (the program is indicated by a tape measure icon) from any PC on the same subnet as the NTMS to be configured. You can obtain the configuration wizard from the download section of the Networked Robotics web page. New probe types are being added periodically to the wizard and the screens below may change. Run the wizard from the same local area network as the NTMS and verify that the NTMS is discovered

NTMS hardware must be running firmware revision 1.6 or higher. If it is not, stop the installation and upgrade your NTMS hardware's firmware with the NTMS Upgrade Wizard available from the Networked Robotics download page (not shown).



Select the NTMS, and proceed to the “NEXT” screen. We will assume the IP address information is already set for your NTMS; if not, see the NTMS installation guide. To proceed, go to NTMS port where the probe is connected, and under the “Device Type” drop down, select “Temp TPL3” as shown.



Click “NEXT” to complete the NTMS configuration.

Testing Data Collection through the Network

Once the configuration is complete we recommend testing the ability to make network temperature measurements by using the “Telnet” utility from any PC. This commonly-used network utility sends simple network commands that will elicit a temperature reading from the TPL3. From Windows choose “START”, then “RUN”, and then type “CMD” and return. At the black screen type “Telnet” *IP Port*, where *IP* is the IP address and *Port* is the network port address as selected by your use of the NTMS Configuration Wizard as described above. If you are successfully connected through the network you will see a blank screen. Type a capital “T”. A temperature and the associated checksum value should be returned. For more about

debugging network connections to probes see the appendix of the Tempurity System User's Guide.

For use with the Tempurity System, you will need to add the new device to the Tempurity Server configuration. See the Tempurity System User's Guide and the section on server configuration for more information.

Operation

When first connected, the TPL3 LED will blink once on and off. This indicates that the probe has recognized that it is configured properly and is communicating properly with NTMS network hardware.

The NTMS port must be connected properly, and configured for the correct device type (TPL3) in order for the LED to light. If the wrong configuration type (e.g. Temperature of Revco Compatible devices) is selected the probe LED will not be on.

The NTMS network hardware continually reads temperatures from the TPL3. The most recent values are available for network requests by the Tempurity System. Because each reading takes about 3 seconds,

Unique IDs

All Networked Robotics hardware holds electronic globally unique IDs. TPL3 probe IDs are of the format:

08:0000:0000:0002

The number "8" indicates the product number, and the other characters indicate the electronic ID of the unit. Electronic IDs can be read through a Windows computer using the "Probe ID Unit" (part number #30010) hardware through a USB connection.

Communications Specifications

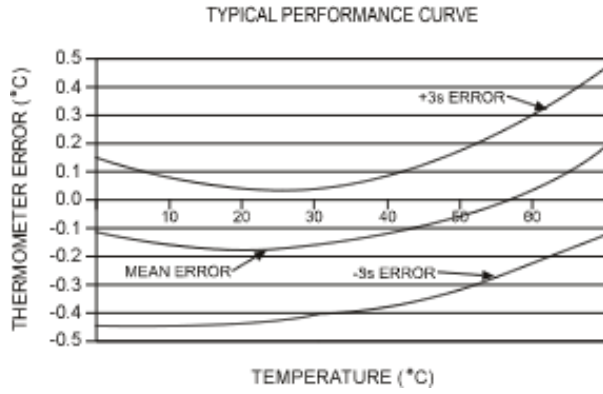
The TPL3 Temperature probe communicates to the NTMS via a one-wire protocol specific to the Dallas DS18B20Z integrated circuit. For more information see the datasheet for this Dallas/Maxim part number.

Physical Specifications

Weight:	8 grams (with dual lock)
Length:	3.17 cm
Width:	1.90 cm
Height:	0.70 cm

Performance and Accuracy

The probe's digital temperature measurement capability is built around the Dallas/Maxim DS18B20Z integrated circuit. The DS18B20Z chip reports to .1 degrees Celsius and has a distribution of accuracies based on the temperature. The chip has an accuracy of about .1 degrees C at 37C, and an accuracy of about 3 degrees C at -80C.



Support

If you need assistance with your TPL3 probe or other products, contact Networked Robotics by phone at 877-FRZ-TEMP (877-379-8367) or by email at support@networkedrobotics.com



Networked Robotics' hardware is designed and assembled in the United States.