# CTL3000

**Instruction Manual**
Full Extractive Probe Controller Assembly
Part Number 111989-00
30May2008

Thermo SCIENTIFIC

Specifications, terms and pricing are subject to change. Not all products are available in all countries. Please consult your local sales representative for details.

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## Claims for Damaged Shipments

A. The Thermo Fisher Scientific (TFS) CTL3000 probe controller assembly is shipped ready for operation. Immediate inspection of the TFS CTL3000 and probe controller assembly should follow upon receipt. Inventory of the container should be checked against the enclosed packing list. If there is a shortage of items, the operator should immediately contact TFS. If the contents are damaged, the carrier and TFS should be notified immediately.

B. The following documents are necessary to support claims:

1. Original freight bill and bill of lading.
2. Original invoice or photocopy of original invoice.
3. Copy of the packing list.
4. Photographs of damaged equipment and container.

## NOTICE

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TFS



| | **REVISION HISTORY** | | |
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| Revision No. | Revision Made | Pages Affected | Revision Date |
| 1.0 | Initial release | All | May 30, 2008 |
| 2.0 | Changed Company Name | All | July 10, 2009 |
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LIST OF TABLES

# 1.0 PRODUCT DESCRIPTION

## 1.1 Introduction

The installation and operation manual provides instruction for basic installation, preventive maintenance, corrective maintenance, and trouble shooting procedures for the CTL3000 extractive probe controller assembly, which provides remote control of the PRO3000. This manual contains four sections:

Section 1. Product Description: Hardware description, instrument operating parameters, and physical characteristics.

Section 2. Theory of Operation: Complete functional description.

Section 3. Installation and Operation: Instructions for installation and operation of the full extraction probe conditioning assembly.

Section 4. Maintenance: Routine inspection, trouble shooting, corrective procedures, and repair/replacement for major assemblies.

## 1.2 Probe Controller Assembly Description

The TFS CTL3000 probe controller assembly is one part of a gas analyzing system. The system includes the PRO3000 probe assembly, the CTL3000 probe controller, one or more gas analyzers and a data acquisition system. The system operation and maintenance manual will describe the other parts of the system.

The CTL3000 probe controller assembly performs 3 functions:

A) monitoring and control of the heated filter temperature in the probe conditioning assembly.

B) monitoring and control of the heat-traced tubing umbilical temperature that transports the sample.

C) connection of the extractive probe's alarm and control contact closures to the control system.

## 1.3 Probe Conditioning Assembly Hardware

The CTL3000 probe controller assembly enclosure mounts in a standard 19-inch rack and the total length of the enclosure is 15 inches. Additional inside connection clearance requires the rack to be at least 24 inches deep.

Connector #1 is used for connection to the extractive probe assembly. Connector #2 is for the connection to the rack controller. The back of the enclosure has a power entry module for a 120V AC cord connection.

The enclosure houses two temperature controllers and two solid state relays. These assemblies are discussed in Section 2.

## 1.4 Specifications

The TFS CTL3000probe controller assembly was designed to operate within the following specifications:

| | |
|---|---|
| Power Requirements: | 120V AC, 50/60 Hz, 30 Watts |
| Power Connection: | CSA/UL Approved power cord entry module |
| Operating Temperature Range: | -20°C (-4°F) to 50°C (122°F) |
| Weight: | 18 lbs. (8.3 kg) |

# 2.0 THEORY OF OPERATION

## 2.1 General

The CTL3000 probe controller assembly provides temperature control of the heated filter and tubing umbilical for the PRO400 extractive probe assembly and provides alarm contact closures to the customer's system.

### 2.1.1 Temperature Controllers

Two Watlow temperature controllers are located in the front of the CTL3000 probe controller assembly. Both of the controller readouts are in degrees Fahrenheit (°F) and can be changed to indicate degrees Celsius (°C) in the setup menu. The upper display is the actual temperature of the controlled device while the lower display is the temperature set point. On the face of each controller, located to the right of the temperature displays, are two LED's labeled "L1" and "L2." L1 indicates that power is being applied to a load. L2 indicates that the temperature has strayed past the alarm set point and an alarm will be sounding if a device is connected to the alarm output.

One of the controllers monitors and controls the probe heated filter temperature at a setpoint of 300°F by sensing the temperature of a resistance temperature device (RTD) located on the probe heated filter. The signal leads are connected directly to the temperature controller via connector CONN-1 on the rear of the chassis. The temperature controller outputs direct current to a solid state relay located in the controller. The solid state relay controls the heat cartridges mounted on the probe heated filter.

The same procedure is used for the heat-traced tubing umbilical with the exception of the solid state relay being located in the analyzer rack. The heat-traced tubing umbilical is temperature controlled to 300°F.

### 2.1.2 Solid State Relays

One solid state relay controls the band heater for the heated filter located in the probe conditioning assembly. A second solid state relay controls the purge valve located in the probe conditioning assembly.

# 3.0 INSTALLATION AND OPERATION

## 3.1 Heated Filter and Heat-traced Temperature Controller Setup Procedure

1. Remove the Watlow controllers from the front panel and check the dip switches on the rear of the controllers. Both switches should to the OFF position.

2. Reinstall the temperature controllers and apply power to the probe controller assembly via the power switch located at the rear of the chassis.

3. Refer to Table 3.1-1 (below) for parameter set points for each controller. Enter the setup menu by pressing and holding the up and down arrows on the controller for three seconds. The controller will enter the setup menu when "LOC" is displayed on the lower window. To proceed to the next parameter, press the ↻ (advance) key. *NOTE: all outputs will be switched off while in the setup menu.*

**Table 3.1-1 Setup Menu Parameters**

| Parameter | Function | Heated Filter Settings | Heat Trace Settings |
|---|---|---|---|
| LOC | Lockout Security Level | 0 | 0 |
| In | Input Type | rtd | rtd |
| C_F | Centigrade/Fahrenheit | F | F |
| dEC | Decimal Point Placement | 0 | 0 |
| rL | Low Temperature Range | 32 | 32 |
| rH | High Temperature Range | 572 | 400 |
| Ot1 | Output Type #1 | Ht | Ht |
| HSC | Hysterisis Control | 3.0 | 3.0 |
| Ot2 | Output Type #2 | dEA | DEA |
| HSA | Alarm Hysterisis (Dead Band) | 2 | .2 |
| LAt | Alarm Latching | NLA | NLA |
| rtd | RTD curve selection | din | din |
| rP | Ramping (not used) | OFF | OFF |
| PL | Power Limiting | 100 | 100 |
| dSP | Display Windows | NOr | Nor |

4. Please refer to Table 3.1-2, below, for parameter set points for the controller. Enter the operation menu by pressing the ↻ (advance) key. The controller is in the operation menu when "Pb1" is displayed on the lower window. To proceed to the next parameter, press the ↻ (advance) key. These parameters will be automatically entered after the Auto-tune is complete..

**Table 3.1-2 Operation Setup Menu**

| Parameter | Function | Heated Filter Settings | Heat Trace Settings |
|---|---|---|---|
| Pb1 | Power Band #1 | None* | None |
| rE1/dE1 | Reset #1 | None* | None* |
| Ra1/dE1 | Rate #1 | None* | None* |
| Ct1 | Cycle Time #1 | 1.0 | 1.0 |
| ALO | Low Alarm Setpoint | -10.0 | -10.0 |
| AHI | High Alarm Setpoint | +10.0 | +10.0 |
| CAL | Calibration Offset | 0.0 | 0.0 |
| Aut | AutoTune Function* | 2 to Tune<br>0 for Off | 2 to Tune<br>0 for Off |

***** Auto tune will be engaged when a value other than 0 is entered into the Aut parameter. When the Auto tune is complete, the value will automatically revert back to 0.

5. Verify that the sample pump is not energized. This will keep moisture from contaminating the system until temperature set points are reached.

7. Apply power to the extractive probe assembly by turning on the rotary power switch. Using a digital thermometer, check the temperature of the heated filter assembly. Ensure that the temperature is approaching the set point. When the temperature has stabilized, return to the probe controller assembly for the next step.

8. Ensure that both temperature controllers show a temperature within 10°F of the set point. Push the ↻ (advance) key until "Aut" is on the display and use the "up" key to enter a "2." The controller will begin an autotune and the heated filter temperature will cycle up and down until the controller has set autotune parameters. Perform the same function for the umbilical temperature controller.

9. Using a digital thermometer, verify the heated filter temperature is 300° F ± 5° F. Note that the thermal mass of the heated filter is large and may require 30-60 minutes to reach final temperature.

10. Verify that the sample pump is energized and running. Initiate a purge cycle on the extractive probe assembly.

## 3.2 General Installation

### 3.2.1 Power

A standard 120V AC, single-phase service is required to operate the CTL3000 probe controller assembly. Service is supplied using a #18 AWG power cord.

### 3.2.2 Control and Data Lines

Connect control lines from CONN-2 to the analyzer rack terminal strip using the specified shielded cable (refer to specific installation drawings for each application).

# 4.0 MAINTENANCE

## 4.1 General

The CTL3000 was designed to permit module replacement of failed assemblies. Other than replacement of failed assemblies or fuses, no maintenance is required. Failed controller boards may be returned to the factory for repair. To return a failed component to the factory, see Section 5.

## 4.2 Required Maintenance Equipment

To perform maintenance on the sample system, the following equipment is required.

A. Normal hand tools.

## 5.0 RETURNING ASSEMBLIES FOR REPAIR

Should it become necessary to return any assembly, sub-assembly, or component for repair or replacement, contact the factory prior to shipment for specific information such as: return authorization number, shipping instructions, price, time to repair, etc. Also include pertinent facts describing the nature of the problem. Ship all components to the following address:

**TFS**

### 5.1 Obtaining Replacement Parts

The following information must be included in all purchase orders for parts:

A. TFS Model and S/N of major assembly
B. Part Number (found in parts tables)
C. Description of part

### 5.2 Spare Parts List, CTL3000

| TFS Part Number | Description | Recommended Quantity |
|---|---|---|
| 22110019 | CONTROLLER, TEMP., 93 | 1* |
| 43005014 | FUSE, 1/2 AMP DELAY MDL | 1* |
| 43003023 | FUSE, 3 AMP DELAY MDL | 1* |
| 43002025 | FUSE, 4 AMP DELAY MDL | 1* |

* THESE PARTS ARE RECOMMENDED AS A MINIMUM FROM THE TFS SERVICE DEPARTMENT TO AID IN ACQUIRING 98% UP TIME.

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## 6.0 APPENDIX A

| Drawing # | Rev | Sheet | Description |
|---|---|---|---|
| XXXX7141 | 0 | 1 of 2 | SOURCE PROBE CONTROLLER |
| XXXX7141 | 0 | 2 of 2 | SOURCE PROBE CONTROLLER |

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