

HEATED LINE
AND
MODEL 530 TEMPERATURE CONTROLLER
USER MANUAL

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1 Introduction - HEATED LINE

The SIGNAL HEATED LINE was primarily developed for carrying heated diesel exhaust gas to hydrocarbon and NO_x analyzers such as the SIGNAL 3000 AND 4000 SERIES. If the temperature of the sample gas falls below the dew-point of the gas being measured, then the gas will condense and become liquid in the sample line. Since the analyzers can only measure gases it is essential to avoid such condensation.

A constant high temperature must be maintained throughout the entire line assembly, and this is achieved by the use of a braided heating element. The braiding is made from stainless steel wire, which completely surrounds an inner PTFE tube. The whole is bedded in a silicone sponge for thermal insulation, and a sleeve of wire reinforced, anti-scuff, PVC hosing completes the assembly.

This method of heating ensures a constant high temperature throughout the sample line, with no cold spots. Despite internal temperatures of up to 200/C, the efficiency of the insulation keeps the line relatively cool on the outside and therefore quite comfortable to handle.

The temperature of the braid is sensed by a type K thermocouple in thermal contact with, but electrically isolated from, the braid. The thermocouple leads and electrical terminations to the braid are brought out at one end of the line for connection to the TEMPERATURE CONTROLLER and isolating transformer.

Heating is achieved by passing a current through the braid to raise its temperature. SIGNAL has designed the heating method with safety as a major consideration and, therefore, an isolating transformer is supplied with the line. This transformer is designed and wound to suit an individual line, according to the voltage required to drive the correct current through the length of braid.

Temperature control is achieved by a solid state, purpose built controller, SIGNAL MODEL 530, which has been designed to drive the primary side of the isolating transformer. This gives a lower power loss in the CONTROLLER. Special circuit techniques are used to reduce the high inrush current normally associated with transformer loads and ensure that the DC component of the drive current is minimized.

2 Introduction - MODEL 530 TEMPERATURE CONTROLLER

The 530 TEMPERATURE CONTROLLER is designed to control the temperature of the SIGNAL HEATED SAMPLE LINE. The advantage of this unit is the ability to drive the primary side of the line transformer. The high surge current that can occur at switch-on is significantly reduced by special circuit techniques giving improved reliability and reduced line interference. This feature is not available on most standard temperature controllers.

An output is available to drive a solid state relay for loads greater than specified. The user must ensure that adequate heat sinking is provided for the relay.

The CONTROLLER can be fitted with an alarm option. This option provides two sets of changeover contacts which operate when the sample line temperature is below 150/C or above 200/C.

3 Specification

- | | | |
|-----|---|---|
| 1) | Mains supply | 100 -130 Vac 50/60 Hz, Internally selected |
| 2) | Load | |
| | a) standard unit | 1800 watts 240 Vac 900 watts 120 Vac |
| | b) with external drive unit, Part No. REL/001 (200 - 260 Vac 50/60 Hz) ¹ | 5000 watts 240 Vac 2500 watts 120 Vac |
| 3) | Temperature control range | |
| 4) | Proportional band | Screwdriver adjustable 0 -100/C (1 turn = 0.4/C) |
| 5) | Size | DIN standard 96 x 96 mm 195mm overall length 200mm required behind panel 27mm required in front of panel |
| 6) | Weight | 900 grams |
| 7) | Ambient Temperature | 5 - 40/C ambient temperature |
| 8) | Relative Humidity | 90% non-condensing |
| 9) | Fuse Rating | Depends upon length of heated line and mains supply. |
| 10) | Alarm contact rating | 0 -200/C, set by front panel control, 1A at 30Vdc or 0.3A at 150Vac, maximum current 1.25A, Maximum voltage 150V |
| 11) | Factory settings | Check the serial number plate for details. The unit is supplied with the correct fuse to suit the heated line and with the mains selector set to 240 volts. |

¹Heat-sinking is required for the external drive component. Its baseplate temperature must not exceed 90/C. Maximum power dissipation is 30 Watts.

4 Installation

4.1 Power Connections and Fuse Selection

Power and transformer connections are made at the terminal block on the rear panel. They are labeled as follows going from left to right.

- H1 Transformer (switched neutral)
- H2 Transformer (live)
- L Power Live
- N Power Neutral
- E Earth

When the CONTROLLER is supplied together with a heated line and transformer, a suitable rated fuse is factory fitted.

4.2 Thermocouple and Other Connections

Input and output connections are made at the rear panel 8 pin DIN connector as shown below.

- 1 Thermocouple +ve
- 2 Not used
- 3 Control output return
- 4 Not used
- 5 Temperature output return
- 6 Temperature output 10 mV//C
- 7 Control output for solid state relay (+ve)
- 8 Thermocouple -ve

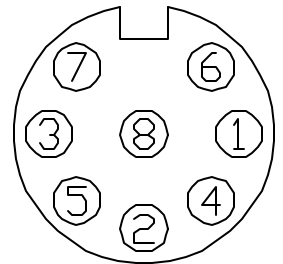


Figure 1: 530 Connector

4.3 Alarm Connections (optional)

The alarm contacts are presented on a 9-way male 'd' type connector mounted on the rear panel. Pin detail is as follows:

- | | | |
|---------|------|-------|
| Alarm 1 | COM | Pin 2 |
| | N.O. | Pin 1 |
| | N.C. | Pin 6 |
| Alarm 2 | COM | Pin 8 |
| | N.O. | Pin 7 |
| | N.C. | Pin 3 |

4.4 Voltage Setting (optional)

The CONTROLLER is factory set for the mains voltage requested. To change the operation voltage it is necessary to remove the top cover.

WARNING! Removal of the covers will expose the mains terminals and wiring. To ensure safety, always disconnect the unit from the mains supply and only allow qualified personnel to gain access.

Remove the top cover. Identify SW1 between the main connector and the transformer. Set the switch to the 120V or 240V position according to the mains supply available. Refit the cover.

Please ensure that you do not try to use a transformer on the wrong supply voltage. Changing the switch in the 530 does not alter the transformer rating.

4.5 External Solid State Relay (optional)

When extra long lines are to be driven, up to a maximum of 55 meters (28 meters for 120 Vac), a solid state relay, part No. REL/001, must be used to drive the transformer. It is important that only SIGNAL approved components are fitted to preserve the low surge current and noise features.

This component must be provided with adequate heat-sinking. The heat-sink should be chosen to keep the baseplate temperature below 90°C when dissipating 30 watts. The effect of ambient temperature must be taken into account. In some circumstances, fan assisted cooling will be necessary.

Refer to the installation drawing for wiring information.

CAUTION! Take care to avoid skin contact with the line ends while disconnecting and transporting a hot line. Tightly coiling a hot line can cause the PTFE inner tubing to kink causing restricted flow next time it is used. Switch the CONTROLLER off and allow cool air to purge through the line until it is cool (about 60/C to 70/C). If the line must be transported while still hot, only LIGHTLY coil it.

1. Set the temperature control to the required position.
2. Apply power to the unit. Confirm that the POWER light is on. Confirm that the HEATER light is on and cycles on and off when the operating temperature is reached.
3. The proportional band control has been factory set for a 40/C band. This is the range over which power is proportionally applied and is centered around the set temperature. If the temperature control accuracy needs to be improved, then the proportional band should be reduced. If the temperature overshoots the set point by an unacceptable level, then the proportional band should be increased. A small screwdriver can be used to adjust the P.BAND control, accessible from the front panel. One turn anticlockwise will reduce the proportional band by about 4/C. One turn clockwise will increase it by about 4/C. Adjust until an acceptable control is achieved.
4. If the T/C FAULT light is on then a fault exists in the line thermocouple, or in its connections to the CONTROLLER. Check for a low resistance between the thermocouple leads, and for a high resistance between the thermocouple leads and the heater leads. Trace the leads through to the CONTROLLER and transformer and confirm that they are correctly wired.

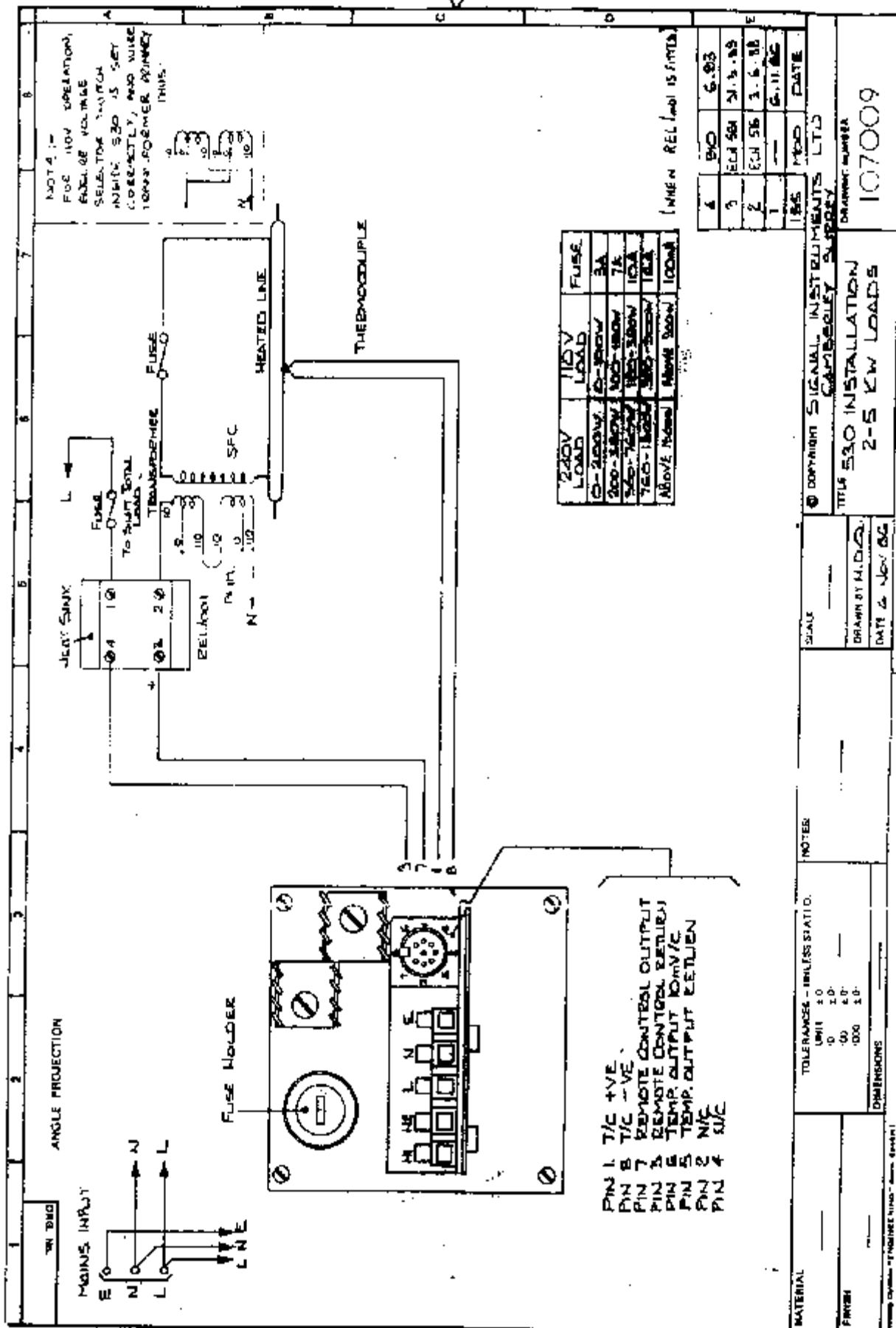


Figure 2: 530 Installation (2-5 kW Loads)

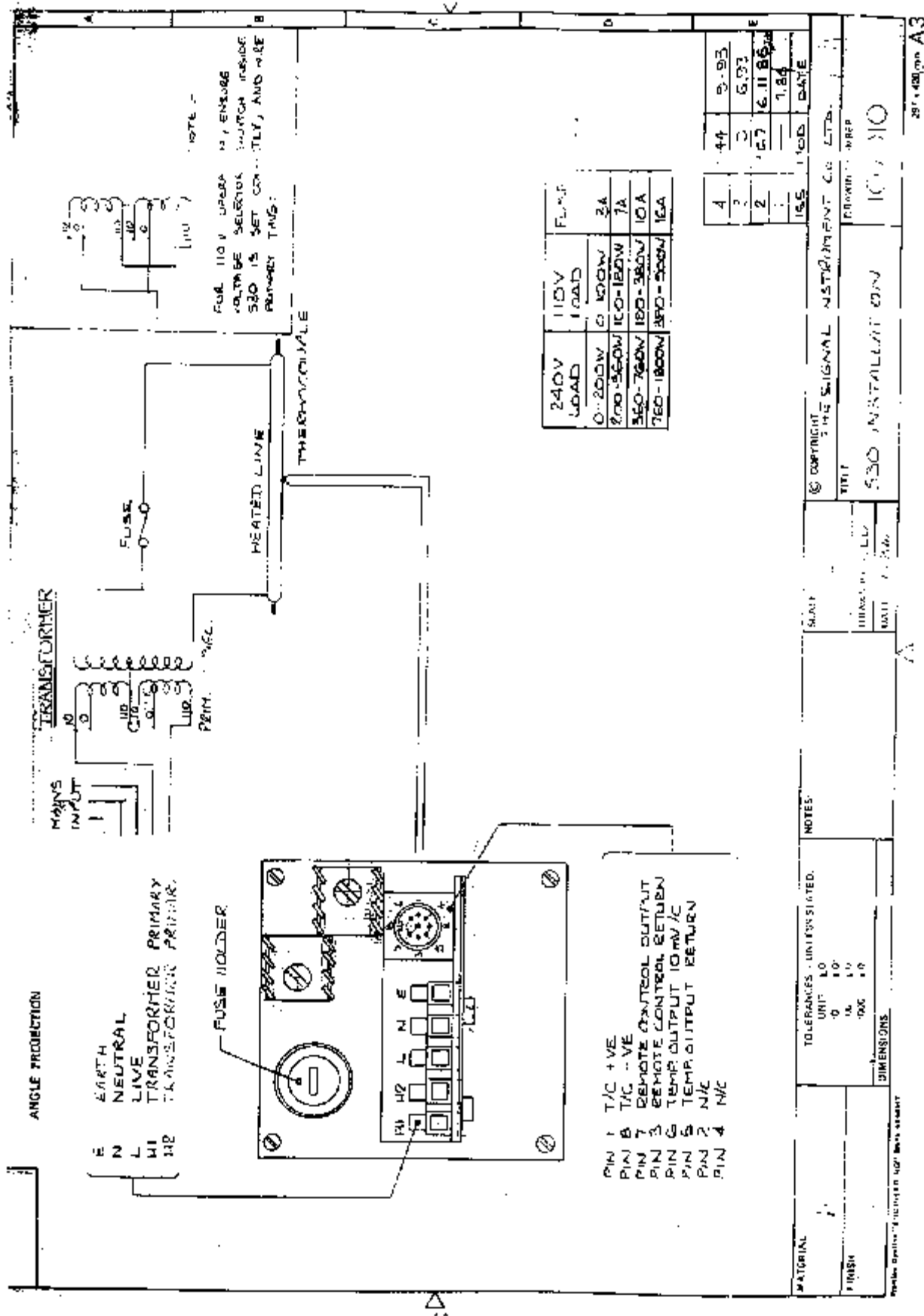


Figure 3: 530 Installation (standard)

