INSTRUCTION MANUAL

TECSYSTEMS S r. I.

T154

P4 V3 1.2C

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Introduction

The T154 Temperature Monitor will monitor and control up to four, three-wire RTD inputs. All input channels may be user programmed for two separate outputs with a range of 0 to 240°C (32 to 464°F). The set points are common to all channels. The unit is microprocessor based which offers application flexibility, and easy integration to a variety of applications including electric motors; electric and diesel generators; all types of transformers; electric cables; and industrial and chemical processes. ANSI 49 covers the thermal protection provided.
The unit is intended for semi-flush mounting with hardware provided. Installation and set-up is simple using the universal power supply 24 to 240V AC or DC and functional user controls and display.

Mounting

T154 is designed for semi-flush panel mounting. Mounting hardware is included with each unit. The panel cutout dimension is 92 x 92mm (3.62 in. x 3.62 in.).

Dimensions Ref Figure 1
96 x 96 x 127 mm (3.78 x 3.78 x 5.51 in.)

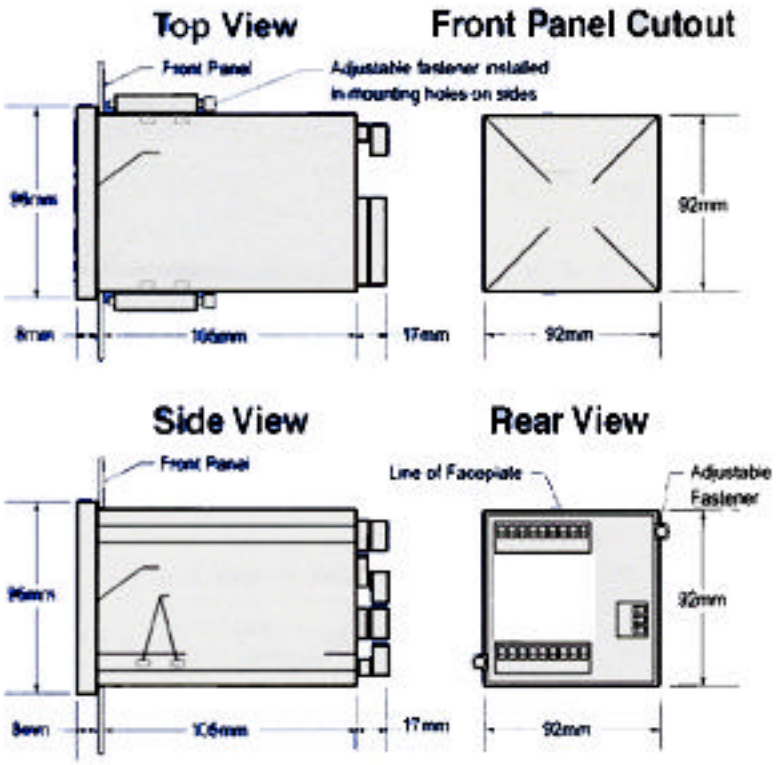


Figure 1

Controls

All functional controls and displays are located on the front of the unit. The unit has six input keys, two having dual functions. These are PRG/SET and ENT/RESET. Keys may be categorized as, programming, screen display, and test.

Programming keys are located at the bottom of the unit and may be identified by the blue type. These are PRG, ENT, UP (symbol) DOWN (symbol). The screen display may be changed by the DISPLAY MODE key located to the right side of the display, identified by the yellow type. The TEST key is located beside the display mode key, identified by white type. When the test provision is enabled the SET and RESET keys are activated, with the PRG and ENT keys disabled.

Screen Displays

EACH ACTIVE CHANNEL HAS FOUR ASSOCIATED LED'S, INDICATING STATUS. TRIP, ALARM, FAN, OR FAULT, THE LED COLOURS ARE INTERPRETED AS FOLLOWS

Green

Displays the active channel 1-2-3 or 4

Yellow

-The associated channel has exceeded the alarm trip set point, and the alarm output relay has changed state

-The fan relay has been energized

Red

-The associated channel has exceeded the trip set point and the trip output relay has changed state.

-Indication of a fault condition

All messages and operating parameters are displayed on the screen. The DISPLAY MODE key controls the operating mode of the screen display allowing any one of four modes to be selected: **scan, auto , man,** or **Tmax**. An illuminated yellow LED at the top of the display indicates the active mode and pressing the DISPLAY MODE key toggles the four different modes. The different modes display the following information:

Scan

Each channel is scanned for approximately three seconds during which the actual temperature of that channel is displayed

Auto

All active channels are scanned, but only the temperature of the hottest channel is displayed on the screen. This mode does not affect protection.

Man

Each channel may be viewed manually by pressing the UP or DOWN key. The information displayed on the screen will be that of the channel whose green LED is lit. All active channels are still scanned but only the temperature of the selected channel is displayed. This mode does not affect protection.

Tmax

This value is logged in memory and is the maximum temperature recorded on any active input channel. The temperature value is shown and the channel is identified.

Screen Messages

The main LED screen displays a variety of messages some of which only appear during programming or as a result of component or unit failure. During the course of normal operation the following screen display indicates a fault condition:

- FOC: Fault open circuit - RTD input to one or more channels has open circuited. LED illumination is provided showing fault relay indication, and the affected channel is identified
- FCD: Fault sensor reading - RTD signal is erroneous. This is a programmable feature that is enabled by the user. Sensitivity is user selectable from 1(low) to 30 (high) This determines response time
  The controller decides if the signal input from the RTD is accurate. The fault relay will trip if a signal input is determined to be wrong. The sensor must be replaced. To reset the fault relay push RESET until RST appears on the main display
- FCC: Fault short circuit - RTD is short-circuited. The RTD has failed or the RTD selection and the unit are not compatible. The cause is the result of lower resistance across the input than the unit is calibrated for. Indication of this problem is provided by fault relay LED indication. The main display will show FCC and a channel is identified If all alarm and trip LED's illuminate with fault indication, the probability is, the RTD's are not compatible with the unit

All other messages pertain to program or test functions, which are described under programming or test.

Light Test

This test is conducted automatically after completion of programming or viewing programmed information. It is intended to provide visual indication of all illuminated LED's and their operation.
It is advisable to carry out this test on a regular basis to ensure all lamps are functioning normally. Pressing the TEST key at any time allows the user to test all lamps.
If any lamp is not functioning the unit must be returned for repair.

Control Power

The T154 has a universal power supply. It can be supplied with 24 to 240V AC or DC without respect to polarities.
The ground cable must be fixed to terminal # 41

ATTENTION: The unit may be damaged by over voltage when power is supplied directly from the secondary of the transformer it is monitoring. This may occur when the 240V is obtained directly from the secondary winding and there are fixed capacitors online. Use a control circuit transformer, with a secondary voltage of 24 to 120V AC or DC to avoid damage.

ATTENTION: Disconnect the power supply to the T154 when conducting insulation testing with an AC or DC HiPot.

Failure to do so may result in damage to the unit.

Wiring

Terminal blocks are located at the rear of the unit for all input channels (4), output relays (4) and control power.
The terminal blocks are removable for ease of wiring
Wiring connections are shown in Figure **2**

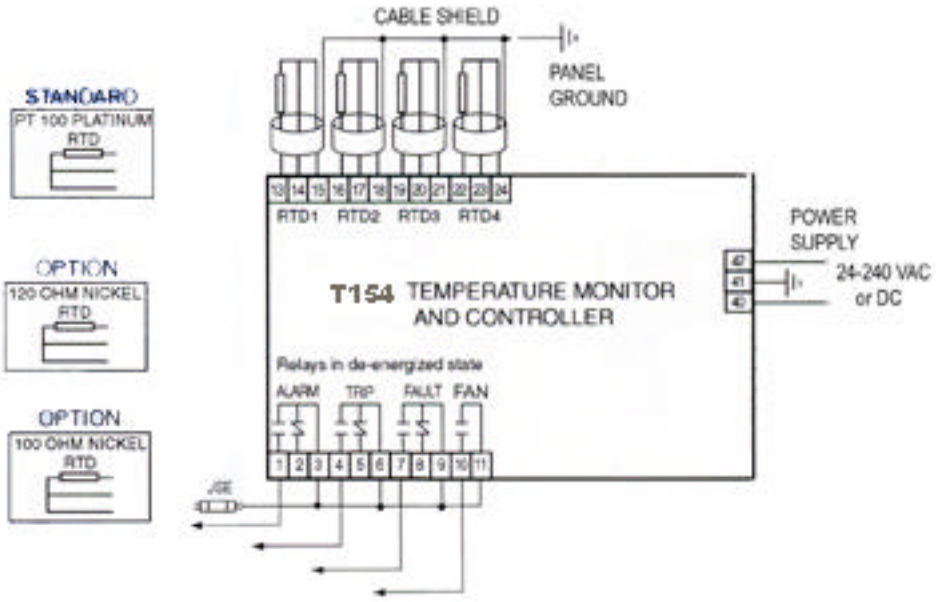


Figure 2

Wiring (Cont.)

Sensor wiring and routing

All sensor wiring must be:

- Separated from power wiring;
- Shielded cable with twisted conductors;
- Have a cross section of 0.5mm (22AWG);
- Be twisted conductor if no shield;
- Have tinned or silvered conductors;
- Be firmly fixed in the terminal board.

Inputs

The T154 will accept three or four, three-wire RTD inputs.
The standard unit is calibrated for 100-ohm, platinum RTDs.
The T154 may also be ordered for use with 100 or120-ohm, nickel RTDs.
Channels 1-2-3 must have inputs connected or the unit will read an open circuit with the FOC message displayed, and the fault relay tripped. In applications with less than three channels connected, a resistor of 100 ohms or more must be connected across the open channel. This will eliminate nuisance tripping of the fault relay. The display will show a value for the unused channel, which is based on resistance vs. temperature for 100 ohm platinum RTD's. To select a resistance value corresponding to a temperature value, a 100 ohm resistor is equivalent to 0°C. Each 3.89 ohms (minus .01 per increment) is equivalent to 10°C. Ensure this does not interfere with the alarm or trip set points. Always choose a fixed resistance to provide a value lower than the set point values on the active channels.
Applications with transformers requires the RTD's to be connected in sequence for best performance, i.e. Winding 1-2-3 connected to channels 1-2-3
Channel 4 is a programmable option. This channel may be enabled/disabled in the program mode.

Outputs

The standard version of the T154 incorporates four output relays. These are: Trip, Alarm, Fault and Fan.

- Alarm , Trip & Fault relays are single-pole, double throw, fan relays are SPST.
- The Alarm, and Trip relays may be programmed with individual temperature set point values All channels will respond to the programmed values.
- The Fan relay may be programmed with an ON and Off set point temperature value. The operation is selected in program mode. Two choices are offered; one based on RTD inputs connected to channels 1,2 or 3 or; controlled by an RTD connected to channel 4. The fan relay incorporates a fan test procedure this is selected in program mode. This feature allows automatic cycling of the fans five minutes of a selected hourly interval from one to ninty nine hours. To disable this feature enter **ooo**
- The alarm and trip relays will change contact state when the set- point temperature value is reached. This value must be present for a minimum of four seconds in excess of 1 degree C above the set-point threshold
- The Fault relay is activated when the unit senses a defective component or failure of the relay. This relay changes contact state when the unit is powered on line. Resetting this relay requires repair, replacement or correction of components. Resetting the fault relay is affected by the FCD program selection, refer to SCREEN MESSAGES for more detail..
- Output relays are controlled by set-point thresholds for alarm trip and fan relays. Each channel surveys the temperature independently, and the hottest channel will cause the relays to trip when the threshold is exceeded. The reset function requires all channels to drop one degree C below the trip thresholds and the relays reset automatically.

Programming

Getting started

Programming the T154 is simple and requires no special tools. The set point values for alarm, trip and fan control should be at hand.
The unit will automatically step through each program sequence and upon completion will repeat each step or may be returned to normal operation.
The program sequence is as follows;

1) Input alarm temperature value for all channels, range 0-240°C (32-464°F)
2) Input trip temperature value for all channels, range. 0-240°C (32-464°F)
3) Select channel four; **yes** or **no**. If **YES** set alarm & trip set points

Note: set point values for this channel are independent of channels 1-2 or 3
This channel would normally be used with fan operation.

4) Select fan operation; **NO** or (YES) select channels 1-2-3 or 4
5) Set the fan ON temperature. High temperature
6) Set the fan OFF temperature. Low temperature
7) Select fan test interval, 5 minutes of xxx (1 – 99 hrs) or disable by entering 000
8) Select FCD; **NO**. If YES, set sensitivity 1 to 30

Higher numerical values offer faster response time under fault conditions

End of program

Push **ENT** key to return to normal operation
Unit will perform light test and return to normal operation.

Programming Sequence

1) To begin programming, **press the PRG key for approximately seven seconds**. After this interval the main screen display will present the message PRG. The unit will then advance to the first program selection, and the yellow PROG light above the PRG key will illuminate. After each selection press the PRG key to advance to the next selection. At any time during the program sequence you may discontinue by pressing the ENT key. To enter programming again you must repeat the sequence above.
2) To review the entered values, momentarily press the PRG key and continue to do so advancing to each programmed value. If the yellow LED is not on, no program changes are possible
3) After advancing to any program selection, use the up/down keys to enter your selection, or set point value.

During the programming sequence a timer allows 60 seconds for any input. If time elapses and no input is made the unit reverts to normal operation.
As the unit advances to each of the program selections the main LED screen will display a message or set point value.
When entering set point values for all selections, green, yellow and red LED's will illuminate providing reference to the functions and channels.

Enter Program Values

1) Input set point temperature value for alarm
   Screen display: numerical value, yellow alarm LED flashing, green chn indicators 1-2-3
   Action: Scroll up/down, using up down keys
   Options: 0-240°C (32-464°F)
   Complete: Press PRG—Advance
   Discontinue: Press ENT

2) Input set point temperature value for trip
   Screen display: numerical value, red trip LED flashing green chn indicators 1-2-3
   Action: Scroll up/down using up-down keys
   Options: 0-240°C (32-464°F)
   Complete: press PRG-Advance
   Discontinue: Depress ENT

3) Select channel 4
   Screen display: YES
   Action: Scroll up/down using up-down keys
   Options: Yes / No
   IF YES: Set alarm & trip temperatures specific to chn 4 repeat steps 1& 2
   Complete: press PRG-Advance
   Discontinue: press ENT

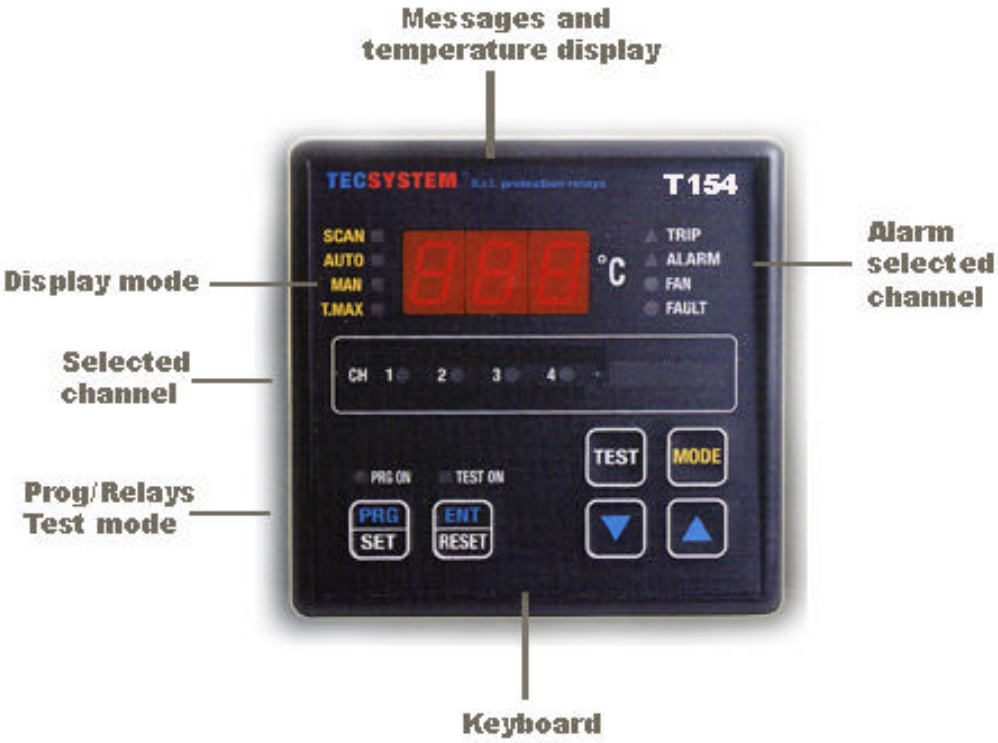
Programming (Cont.)

4) Select fan operation
   Screen display: NO Yellow fan LED flashing
   Action: Scroll up/down using up-down keys
   Options: NO, or choice of channel 1-2-3 or 4
   Select channels 1-2-3 or 4 using up down keys. Green channel indicators will change. Press PRG to select.
   Enter fan **ON** temperature (high) press PRG set value. Press PRG
   Enter fan **OFF** temperature (low) press PRG set value. Press PRG
   Set fan test interval Hfn (1hr to 99 hrs) Press PRG set value, or **ooo** to disable
   Complete: Press PRG - Advance
   Discontinue: Press ENT

5) Select FCD operation
   Screen Display: FCD flashing, NO, or numeric value (NO, is factory default)
   Action: Scroll up/down using up-down keys
   Options: NO (disable feature) or 1 to 30 to enable feature
   Numeric value represents response time 1=slow 30=fast
   Complete: Press PRG-Advance
   Discontinue: Press ENT

END OF PROGRAM
PRESS **PRG** to return to step #1
Or **ENT** to return to normal operation

Pictorial


Messages and temperature display
TECSYSTEM
T154
SCAN
AUTO
MAN
T.MAX
°C
TRIP
ALARM
FAN
FAULT
Display mode
Alarm selected channel
Selected channel
CH 1 2 3 4
TEST
MODE
PRG ON
TEST ON
Prog/Relays Test mode
PRG SET
ENT RESET
Keyboard

TECSYSTEM S.r.i ™

TECHNICAL SPECIFICATIONS

Auxiliary Power Supply

- Rated voltage 24-240 Vac-dc
- Maximum ratings 20.270 Vac-dc
- Vdc with reversible polarities

Inputs

- Four inputs RTD PT 100 sensors – 3 wires
- Removable rear terminals
- Input channels protected against electromagnetic noises and spikes
- Sensors length cables compensation up to 500 m (1 mm²)

Tests and Performances

- Assembling in accordance with CE rules
- Protection against electrical and magnetic noises: CEI-EN50081-2/50082-2
- Dielectric strength 2500 Vac for 1 min. from relays to sensors, relays to power supply, power supply to sensors
- Accuracy: ± 1% full scale, ± 1 digit
- Ambient operating temperature -20ºC to 60ºC (-4ºF to 140ºF)
- Humidity 90% non-condensing
- ABS self-extinguishing housing NORYL 94VO
- Frontal in polycarbonate IP54
- Burden 3Va
- Data storage 10 years minimum
- Digital linearity of sensors signal
- Self-diagnostic circuit
- Opt. Protection treatment of electronic part
- Opt. frontal plastic protection

Dimensions

- 96 x 96mm (3.78 x 3.78 in.) – DIN N43700-Prof. 127 mm deep 5.51" (with rear terminals)
- panel cutout 92 x 92mm (3.62 x 3.62)

Communication

- **Not available**

Outputs

- Three alarm relays (Alarm -Trip-Fan)
- One-alarm relay for sensor fault or working anomaly (FAULT)
- Output contacts capacity: 5A-250Vac res.
- Arranged for output relays test

Display and Data Management

- One display, 13mm (0.5 in.) high 3 digit with 3 digit for displaying temperatures
- LED for displaying reference channel
- Eight LEDs indicating alarm or trip
- LED indicating fault, LED indicating fan
- Temperature monitoring from 0-240°C (32-464°F)
- Separate alarm and trip values
- Sensors diagnostic (Fcc-Foc-Fcd)
- Program entry by frontal push button
- Automatic output from programming cycle after 1 min. of no operation
- Wrong programming automatic display
- Programmed data call out
- Possibility of setting manual channel scanning or hottest channel
- Maximum temperatures storage

Testing

All relays may be tested using the following procedure:

1) Press and hold the TEST key for 7 seconds. The main screen display will flash TST and then default to an active test of the fault relay
2) Release the test key when the yellow test on LED illuminates. The screen display will show OFF and the red LED indicating fault relay is illuminated.
3) Test the fan, fault, alarm or trip relay. Use the Scroll up/down keys to make the selection. The screen display will show the relay selected for testing. LED's illuminate identifying the relay being tested. Press the SET (white print) key and check for contact operation. To reset press the RESET (white print) key.
4) To discontinue operation and revert to normal operation, press the TEST key.

At the start of the test, a timer is automatically initiated which reverts the unit to normal operation if no inputs are detected for a period of five minutes

Temperature Simulation

Connect fixed or variable resistors across all channels to simulate RTD inputs. All resistors must be connected to the input channel using the three terminations provided. This is achieved by terminating the resistor to the two lowest termination numbers of each channel with a jumper from the middle to highest number

Example Channel #1

Termination #'s 13-14-15

Connect the resistor across 13-14

Connect the jumper from 14-15

Repeat for channels two, three. and four

The resistance values for all inputs must be variable between 100 and 200 ohms.

Connect the T154 to a suitable power supply.

Set the resistance value to a corresponding temperature value for the RTD type being used. All RTD's have published resistance vs temperature values For 100 ohm platinum a resistance value of 175.84 ohms will yield 200ºC A resistance of 138.50 ohms yields a temperature of 100ºC Check to verify the readings on the main display.

The unit is completely functional with the resistors connected, and complete evaluation is possible by following the instruction manual.

Warranty

The T154 is warranted for a period of 12 months from date of shipment.

Warranty is limited to repair or replacement of the defective product and no contingent liabilities will be accepted.

Warranty will be voided if the unit is found to be tampered with or it has been damaged as a result of incorrect input or power supply connections, or is damaged as a result of transitory over voltages.

Freight expense is not covered under warranty.

Troubleshooting

Problem	Causes / Solution
The unit will not switch on, with control power energized	Check the terminal block for correct installation Check for voltage at terminal block
The sensor is damaged	The fault relay closes and the fault LED switches on. The red LED of the respective channel is illuminated. A message is displayed. FOC- sensor open FCC- sensor is short circuited
The fault relay has tripped , and the main screen is displaying FOC/FCC	Check the sensor connections. Look for damaged sensors. Replace damaged sensor
When switching the unit on-off, alarm and trip relays energize	Strong electrical noise is being picked up on the power line. Install a transient suppressor (PT73) Check to ensure the shield of the sensor cable is connected to the panel ground Install shielded cable, or twist the sensor conductors
All the sensors are displaying FCC	Wrong wiring connections The terminal block is upside down RTD's are not compatible
The temperature indicated by one, or more channels is wrong	The sensors are defective. Check the sensor resistance for compatability, with your unit. The unit is calibrated incorrectly Return for repair
Sudden operation of trip relay, with normal operating temperature, One channel caused the occurance	Sensor defective FCD Replace the sensor
With a power supply of 24VDC the unit, switches off and will not switch back on	Check the input voltage is between 20-24VDC Reconnect to a stable source of power Return if unit does not respond

Options

- Protective display cover
- 120 or 100 ohm nickel RTD input

Approvals

- Assembled in accordance with CE rules.
- Protection against electrical and magnetic noises CEI-EN50081-2/50082-2
- C-UL approval, File No, 190427