

SIX CHANNEL TEMPERATURE CONTROLLER

SPECIFICATIONS

• **INPUT** :

Thermocouple : Software Selectable -Type J or K,
Isolated (Ungrounded)
Range : 0 °C - 700 °C
Accuracy : 1 °C
Cold Junction Compensation: In built.
Sensor Break Indication : "oPn" on PV display.
Sample Rate : 3 seconds

• **CONTROL** :

Action : PID or On/Off (User Controllable)
Proportional Band : 0 - 100 % of span
Reset (Integral) : 0 - 9999 seconds
Rate (Derivative) : 0 - 9999 seconds
Anti-Reset windup : Inhibit Control action Outside Pband
Cycle Time : 0 - 100 seconds

• **INDICATIONS** :

Process Display : 0.75" Red LED, 3 digits
Set point Display : 0.75" Green LED, 3 digit
Channel Display : 0.75" Red LED, 1 digit
Status Indicators : Red LED for Heaters & alarm High
Green LED for Blower & alarm Low
Yellow LED for Program mode.

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• **OUTPUT** :

Heaters / Blowers

Type : Solid State Relay(SSRs)
Operating Voltage : 100 - 230 Vac
Current : 0.5 ampere maximum.

Alarm relay

Type : Single Change-over Potential free.
Operating Voltage : 250 V maximum
Current : 1 ampere maximum.

• **POWER** :

Ratings : 230 Vac 10 V - 50/60 Hz
Consumption : 6 VA maximum

• **ENVIRONMENT & PHYSICAL :**

Operating Temp. : -10 °C to 55 °C
Humidity : 0 to 95 % RH (non condensing)
Weight : 500 grams maximum

• **DIMENSIONS** :

Box size : 91(w) x 91(h) x 180(l)
Bezel size : 96(w) x 96(h) x 11(l)
Panel Cutout : 92(w) x 92(h)

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Time, channel Cycle Time, Blower point, Alarm High/Low set points and display Scan time

- > Modular structure facilitates easy access on sight
- > Modular output structure for individual channel offers easy on sight replacement in a worst case of output module failure.

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FEATURES

- > Inherently reliable Micro controller Based Technology
- > Time proportional PID action in Heat/Cool both, assure better quality of Control to achieve accuracy up to 1%
- > Offers Programmable Control parameters like Proportional Gain, Integral (Reset) Time, Derivative (Rate) Time and Cycle Time which can be more precisely set to Fine tune the process variable with the set point
- > Static Switching both an input & output offers inherent advantages over conventional mechanical relays like - fatigueless operation, proven noise immunity
- > Total security of configuration provided through reliable E2PROM technology.
- > All channel of two point type
- > Programmable high / low alarm point for individual channels
- > Individual channel On / Off control
- > Automatic cold junction compensation
- > OPN indication for thermocouple open condition
- > User friendly programming through membrane keypad
- > Extensive Programming Feature include - Set point, proportional gain, Integral (Reset) Time, Derivative (Rate)

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Thank you for purchasing the *STREAMLINE CONTROLS* make SCTE series temperature controller. We are sure you will have many years of trouble free service from this controller, Please spare the time to read through this manual carefully & keep it for future reference.

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SECTION 2. INSTALLATION :

Warning : Dangerous voltage may be present within this instrument Before installation or maintenance the power to the instrument must be switched off & isolated Unit suspected of being faulty must be returned to authorized service facility. There are no user serviceable part within the controller Only qualified person may access inside for maintenance as per guidelines in section 5.

Do not expose the controller to rain or excessive moisture. Adequate airflow must be provided to the controller.

2.1. UNPACKING :

Upon receipt of the instrument, inspect the unit for shipping damage If damage was caused during transit, the claim should be lodged with your carrier. Damaged instrument should not be installed for service.

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SECTION 1. INTRODUCTION :

This manual contains information for the installation & operation of the STREAMLINE CONTROLS make SCTC series Micro -controller based Six Channel PID temperature Controller.

Simplicity is an essential feature of this versatile controller Five touch key on a membrane front panel is used to select different control parameters.

Two 3-digit displays show set point and process values at a glance The high resolution analogue to digital converter, the cold junction compensation & PID calculations are all completed by single micro controller chip All values & parameter are stored in nonvolatile memory & retained for up to ten years, even if the unit is left unpowered This eliminates the need for batteries.

Please take care to read through this manual & for any technical assistance please contacts the supplier.

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2.2. MOUNTING :

A square panel cutout is required to mount the instrument. The dimensions of the cutout are 92mm X 92mm. Remove any burrs from the cutout prior to installation. Insert the instrument through front of the panel cutout & fill up the same with the help of mounting clamps supplied separately with the instrument. Removing the mounting clamps & then pushing forward can only remove the instrument from the rear of the panel.

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2.3 WIRING PRECAUTIONS :

Before wiring the controller, ensure the supply voltage to fall within the range 230 VAC. A fuse or circuit breaker with a rating not exceeding 3 amps should suitably protect the power supply to the controller. All wiring must confirm to applicable standards and local regulations. It is advised that a single throw on/off type switch and a fuse in series with the heater/blower output from the controller & contactor coil.

Take care in routing thermocouple cables away from high voltage/ current carrying cables, to avoid possible malfunction of the input section of the controller.
Only strip leads should be used for connections. Do not use cables with thickness of more than 0.5 sq. mm. Double check wiring before finally applying power to the controller. Take care not to over tighten terminal screws. Unused terminal screws must not be used as jumper points as they may be internally connected.

2.4. WIRING CONNECTIONS :

Please refer fig.1 for the connection details.

2.5. SENSOR WIRING :

Take care to see that the thermocouples used are all of isolated type only. (This may be confirmed by testing isolation between the signal carrying cables & the housing of the thermocouple. This should be in range of \pm to 2 KVs.) Take care that the type of thermocouple selected matches the thermocouples to be used.

• **CAUTION :**

Take care to see that heater &/or blower outputs & thermocouple input of particular channel are connected to that particular channel only. ie The thermocouple for the first zone must be connected to TC \pm terminal & heater for the first zone must be connected to H \pm whereas the blower for the same zone must be connected to B \pm terminal. Interchanging of sensor & output corresponding to different channels cause malfunction of the controller.

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• **CAUTION :**

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CONTROLLER FRONT PLATE DESCRIPTION :

- **PROCESS VALUE DISPLAY:**
During normal running operation indicates actual process temperature. During programming mode indicates value of parameter being changed.
- **SET POINT DISPLAY :**
During normal running operation indicates the set value of the temperature. During programming mode indicates the parameter being changed.
- **CHANNEL DISPLAY :**
During normal running operation indicates channel No. During programming mode it serve as MSB digit for the setting of 4 digit parameters (ti & td) Otherwise it displays the channel being programmed.
- **HEATER INDICATIONS :**
Indicates the status of heater O/P of the corresponding channel
- **BLOWER INDICATIONS :**
Indicates the status of blower O/P of the corresponding channel.
- **ALARM INDICATIONS :**
Indicates the status of alarm if there in any of the six channel
- **PROGRAM INDICATIONS :**
Indicates program mode operation.

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SECTION 3. OPERETION :

3.1. PARAMETER UNDERSTANDING :

- A. DISPLAY SCAN TIME (dS) :**
Scanning Time of channel display in RUN Mode.
Range : 0 - 999 Seconds.
(Internally limited to 10 Seconds Max.)
- B. CHANNEL PARAMETERS :**
 - 1. CHANNEL ON - OFF (Ch) :**
Individual Channel can be turned off when not in use.
Range : On/Off
 - 2. SET POINT (SP) :**
Set value of Temperature in C.
Range : 0 - 999 C
 - 3. PROPORTIONAL BAND(Pb) :**
Decides Proportional Band for the Control.
Initiates On/Off Control
Range : 0 - 999 C
 - 4. INTEGRAL (RESET) (ti) :**
Decides Integral Time.
TIME Anti-reset wind-up incorporated.
Range : 0 - 9999 Seconds
 - 5. DERIVATIVE (RATE)(td) :**

Decides Derivation Time.
Range : 0 - 9999 Seconds

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6. CYCLE TIME (Ct) :

Decides Output Update Time.
Range : 0 - 999 Seconds

7. BLOWER POINT (bP) :

Decides temperature offset above the set point at which the blower should turn on bP 1/2 ° initiates PID in Cooling.
Range : 0 - 999 C

8. ALARM HIGH (Ah) :

Decides temperature (in C) at which alarm high should operate.
Range : 0 - 999 C

9. ALARM LOW (AL) :

Decides temperature (in C) at which alarm Low should operate.
Range : 0 - 999 C

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3.2. FRONT PANEL ADJUSTMENT :

1. PRG /RUN :

Toggles between Program and Run Mode

2. INC :

PRG Mode : Increments Toggles the parameter Value

RUN Mode : Rolls up Channel Display

3. DEC :

PRG Mode : Decrements Toggles the parameter Value

RUN Mode : Rolls down Channel Display

4. SAVE-ENTER/FRZ :

PRG Mode : Saves Current parameter & switches to next parameter

RUN Mode : Freezes the Channel Display at current Channel

5. NEXT - ALARM ACK :

PRG Mode : Increments Channel

RUN Mode : Acknowledges Alarm in RUN Mode

--> Use INC & DEC keys to update the value.

--> Use SAVE to save the value of the parameter.

--> **REMEMBER** : The saving of parameter is confirmed by glowing DP (Decimal Point) momentarily in DisSP.

--> Use NEXT to Switch to Set Point of the next channel.

--> To exit, press PRG again. PRG indication turns off.

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3.3 HOW TO CHANGE THE CONTROL PARAMETERS

The unit facilitates two levels of programming.

1. SET POINT PROGRAMMING :

--> To enter, press PRG. PRG Indication Glows

--> DisSP displays SP & DisPV displays the value of Set Point.
DisCH displays Channel No. corresponding to the Set Point Displayed.

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2. CONFIGURATION PROGRAMMING :

--> To enter : Press INC. Keeping INC pressed, press PRG. PRG indication glows

--> DisSP displays dS & DisPV displays the value of Display

Scan Time.

--> Use INC and DEC keys to update the value.

--> Use SAVE to save the value of the parameter and to switch to channel programming.

--> Use NEXT to Switch to channel programming

CHANNEL CONFIGURATION :

<i>No</i>	<i>PARAMETER</i>	<i>DISPV</i>	<i>DISSP</i>
1.	Channel On/Off	CH	On /OFF
2.	Set Point	SP	Value of SP
3.	Proportional Band	Pb	Value of P
4.	Integral Time	ti	Value of ti
5.	Derivative Time	td	Value of td
5.	Cycle Time	Ct	Value of Ct
6.	Blower Point	bP	Value of bP
7.	Alarm Low	AL	Value of AL
8.	Alarm High	AH	Value of AH

UPDATE /SAVE USING INC/DEC/SAVE

--> Use NEXT to Switch to Configuration of the next channel.

--> To exit, press PRG again. PRG indication turns off.

SECTION 4. :

GUIDELINES TO SETTING OF CONTROL PARAMETERS

It is important that prior to making changes to the control settings, that you record the current settings for future reference. Make slight changes to only one setting at a time & observe the result on the process. Because each of the setting interact with each other, it is easier to become confused with the results if you are not familiar with the process control procedures.

TUNING PROCEDURE :

STEP 1 : Adjust the integral & derivative values to zero. It inhibits the rate & reset action.

STEP 2 : Set an arbitrary value of proportional band.

In case of slow responding zone (eg die zones) Set value around 12 - 15 %.
In case of fast responding zone (eg barrel zones) set value around 25 - 30 %.
Monitor the control results.

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STEP 3 : If the original settings introduces large process oscillations, gradually increase the proportional band, until steady cycling occurs. Record this proportional band value P_c .
If original settings stabilizes the process value below set point, gradually dec. the proportional band, until steady cycling occurs. Record this proportional band value P_c .

Step 4 : Measure the period of steady cycling T_c in seconds.

Step 5 : The control setting are determined as follows.
 $P_b = 1.7 P_c$, $T_i = 0.5 T_c$, $T_d = 0.125 T_c$

Tuning Guide :

Symptom Solution

PROPORTIONAL BAND

- | | |
|-----------------------------------|----------------------|
| 1. Slow response | Decrease P_b value |
| 2. High Overshoot or oscillations | Increase P_b value |

RESET (INTEGRAL)

- | | |
|--------------------------------|------------------------|
| 1. Slow response | Decrease integral time |
| 2. Instability or Oscillations | Increase integral time |

RATE (DERIVATIVE)

- | | |
|-------------------|----------------------|
| 1. Slow response | Dec. derivative time |
| 2. High Overshoot | Inc. derivative time |

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SECTION 6. : CALIBRATION :

Warning : Do not proceed through this section unless there is a genuine need to recalibrate the controller. All previous calibration data will be lost. Do not attempt recalibration unless you have available appropriate calibration equipment. If the calibration data is lost you will need to return the controller to your supplier. Disconnect all wiring except power input to the controller. Turn on the supply by keeping INC key pressed. The controller enters the calibration mode. The display of Set value indicates "rt" (Room Temperature). The display of process value indicates the value of room temperature.

Use INC/DEC keys to set the correct room temperature. Press ENTER key to save the value of the room temperature. The display of set value indicates "MV" (millivolts) & the display of process value indicates 10. Apply 10 millivolts from the standard calibrated millivolt generator to TC_{\pm} terminal as per indicated polarity on the terminals. Press ENTER key.

--> **Note :** (If on pressing ENTER key the controller doesn't respond, the values are estimated to be out of range. Check the milivolt source & retry the procedure. If the condition repeats, contact the supplier.)

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The display of process value indicates the value of gain factor of the system & display of set value indicates the value of offset in the system.

--> **Note** : (Please refer to manufacturer for the detailed understanding of Gain factor and offset of the system).

Turn off the power to the controller.
Turn the power on once again, keeping 10 milivolts applied at the first channel. Observe the first channel reading. This reading should be

a. 185 C + room Temperature : If J type Thermocouple is selected

b. 245 C + room Temperature : If K type Thermocouple is selected

If the reading falls within the above range, your instrument is calibrated properly & is ready for reuse.

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SECTION 5.0. : TROUBLE SHOOTING :

Symptom	Probable Cause	Remedy
<i>No display.</i>	<i>No power to instrument.</i>	<i>Check power wiring & fuses.</i>
	<i>Power Supply Defective. LED display defective.</i>	<i>Return to Supplier. Return to Supplier.</i>
<i>Some Segment of the display not lit.</i>	<i>Relative LED driver Defective.</i>	<i>Return to supplier.</i>
<i>Process value Display unstable</i>	<i>A to D converter defective</i>	<i>Return to supplier.</i>
	<i>Sensor Defective. Intermittent connection of sensor wiring</i>	<i>Check sensor. Check sensor's connection</i>
<i>Considerable</i>	<i>Wrong Sensor connected</i>	<i>Check sensor.</i>

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<i>Error in Temperature Indication</i>	<i>Defective analog component</i>	<i>Return to supplier.</i>
<i>Process Value Display shows</i>	<i>Sensor Break Intermittent connection</i>	<i>Check sensor. Check sensor's</i>
<i>"OPN"</i>	<i>of sensor wiring</i>	<i>connection</i>
<i>Process value Display shows "REV"</i>	<i>Sensor end wiring of Reverse polarity</i>	<i>Correct the polarity of sensor connection</i>
<i>Control Operation Incorrect</i>	<i>Operation incorrect</i>	<i>Read Manual.</i>
<i>All Channels show "OPN"</i>	<i>Power supply faulty (Ref Appendix 1) Multiplexer Chip DG 508 Faulty. (Ref Appendix 1)</i>	<i>Return to supplier Replace the chip.</i>
<i>All Channels show 000</i>	<i>Power supply faulty (Ref Appendix 1) Multiplexer Chip DG 508 Faulty. (Ref Appendix 1)</i>	<i>Return to supplier Replace the chip.</i>
<i>Heater/Blower Indication glows but corresponding output doesn't operate.</i>	<i>Solid State Relay Faulty</i>	<i>Replace the SSR Module (Ref Appendix 2)</i>

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<i>Symptom</i>	<i>Probable Cause</i>	<i>Remedy</i>
<i>Heater/Blower Indication is off but corresponding output is on.</i>	<i>Solid State Relay Faulty</i>	<i>Replace the SSR Module (Ref Appendix 2)</i>

<i>Temperature in Particular Ch. Keeps increasing although corresponding output is off</i>	<i>Sensor /Heater wiring may be improper. External Heat from other source is entering</i>	<i>Check the wiring (Ref Section 2.5) Beyond limits of Control action.</i>
<i>Temperature in Particular Ch. Keeps decrease although corres. output is on</i>	<i>Sensor /Heater wiring may be improper. Lower Heater capacity</i>	<i>Check the wiring (Ref Section 2.5) Beyond limits of Control action.</i>
<i>Temperature Oscillation</i>	<i>Improper Settings (Ref. Section 5)</i>	<i>Set PID parameters.</i>

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APPENDIX 1 :

Warning : This section explains how to test the inside of the unit. It is strictly advised that only qualified person should look into this.

API.1. How to open the unit ? :

1. Disconnect all the connections.
2. Remove the controller from the panel | take it to comfortable place.
3. As shown in fig 2, press the screws (after removing nuts) to remove the controller from the front side.

API.2. How to Check power supply ? :

1. Remove unit from the housing as explained in AP1.1.
2. Refer fig 3. As shown, pull out gently 2 pin power header of white color, located on the left side(looking from front) on the base card.
3. The female connector is connected to primary of the power supply transformer.
4. Apply 230 Vac through this female connector externally.
5. Check DC voltages at following places.
(Refer fig 4 for location guidelines)
 - a. Between pin 13 & 14 of IC DG 508 : 12 Vdc
 - b. Between pin 3 & 14 of IC DG 508 : 12 Vdc

If the voltages are as explained, power supply card is working.
Refer to further guidance in trouble shooting section.

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API.3. How to replace Multiplexer IC DG 508 :

1. Remove unit from the housing as explained in AP1.1.
2. Refer fig 5. Remove 4 nos. mounting screw (1). Remove the power supply card gently. Take care for 2 pin connection of power supply card to the front card (CPU).
3. Refer fig 4 to locate the multiplexer IC DG 508. Replace the IC with another fresh one.

IC DG508 : Make Analog Devices / Intersil.

4. Pack the unit as before. Check for proper operation.

APPENDIX 2 :

1. Refer AP1.3 (1 & 2) to open the unit & remove the power supply card.
2. Refer fig 6. This shows the modules corresponding to channel output.

Identify the module corresponding to malfunctioning output & replace the same with the spare one supplied.

3. Pack the unit as before. Check for correct operation.

For detailed inquiry and trouble shooting contact :

STREAMLINE CONTROLS PVT.LTD.
OFFICE: 401/402, "MEGHANSH" COMPLEX,
OPP. Oxford Tower, Gurukul Road,
Memnagar, Ahmedabad-380 052.
Gujrat, India.

Ph.No. - (91 79) 30910812 (O)

Fax No.- (079) 55522740

e-mail - mktg@streamlinecontrols.com

web - www.streamlinecontrols.com

Business Mission

Streamline Controls Pvt. Ltd. (SCPL) is in the business of providing electronic & computerized automation solution for different industries so as to enhance the quality and productivity. Our motto is to provide indigenous, reliable and proven products & hence to ensure consistent performance. Our concept of value to the customers is to supply indigenous control systems designed with latest technology, developed through extensive R & D, incorporating state of art technology (world technology trend), manufactured under strictest quality control system and duly tested, at competitive prices, delivered in time and supported by service teams.

We feel it to be our responsibility to ensure that our business operates at a reasonable profit, as profit provides opportunity for R&D, growth and job security. Therefore we are dedicated to profitable growth - growth as a company and growth as an individual.



**OPERATING MANUAL OF CONTROL SYSTEM
FOR
SIX CHANNEL TEMPERATURE CONTROLLER**

AUTOMATION... PRODUCTIVITY THROUGH TECHNOLOGY.

OUR PRODUCT RANGE

- ✓ Dedicated Controller for Plastic Injection /Blow molding Machines
- ✓ DC Stepper Drives
- ✓ PID Temperature Controllers - 6 CH/1CH
- ✓ Pre Programmable Logic Controllers - PPLCs
- ✓ Man Machine Interfaces (MMIs)
- ✓ Digital Timers & Counters
- ✓ Dedicated Controller for Plastic Bag /Pouch Making Machines
- ✓ Dedicated Controller for Food / Pharma labeling Machines
- ✓ Dedicated Controller for Grinding Machines
- ✓ 2/3/4 Axes Motion Controller (Using DC Stepper / AC Servo Drives)