RTC1000 - Technical Manual

GENERAL DESCRIPTION

The SMT600 is Bartlett Instrument's fifth generation kiln controller circuit board. It incorporates zone control features previously obtained with an add-on board and optional communication capabilities to interface with a personal computer using **KISS™** (**K**iln **I**nterface **S**oftware **S**ystem). The SMT600 board is the same as its predecessor boards in many ways but it has many more options:

❑ The SMT600 has the same panel size so it can replace any of the current boards.

❑ The power requirements (24V CT Transformer) and input hookups are the same.

❑ Output hook-ups can be used the same as present boards but also there are many more output options with the SMT600.

❑ The SMT600 can be programmed to use 1, 2, or 3 thermocouples. It can replace either the current single zone board or the 3 zone board.

❑ Outputs 2 and 4 have increased drive over the current zone board so they can drive 3 to 4 relays.

POWER SUPPLY

The SMT600 requires a 24V center-tap transformer. It connects to the board's bottom 3 quick connects, labeled AC1, CENTER TAP, and AC2 (see figure 1, page 5). The VA rating of the transformer is dependent on the electrical load of the board and relays. The board requires approximately 80mA at 12V DC and a relay typically requires approximately 140mA at 12V DC. Therefore, a three-relay system will require a transformer with a minimum rating of 6VA. (500mA X 12V DC = 6 VA)

OUTPUTS

The SMT600 has four 12V DC outputs. The four outputs are given power by a safety transistor. The safety transistor is capacitor coupled to the microprocessor so it only powers the output transistors when the microprocessor is operating correctly. Outputs 1, 2 and 3 respond to their respective thermocouple inputs. Outputs 1 and 3 can each drive a 150mA 12V DC load and outputs 2 and 4 can drive 600mA 12 V DC loads. Output 4 is an auxiliary output that can be used to run a fan or alarm.

Output 4 is controlled by the AOP option. AOP functions differently when in cone fire or ramp hold. In Cone Fire AOP will appear after the hold is set. When set to OFF, output 4 is activated during the cone fire firing. At the end of the firing output 4 shuts off. When AOP is set to ON, then output 4 is activated during both the cone fire firing and cooling. It shuts off after the kiln has cooled to 150°F (66°C). In ramp hold programs FAn will appear after SEG in programming. Output 4 can be turned on or off for each segment of a ramp hold program.

HIDDEN MENU

The "hidden" menu allows you to program the number of thermocouples, enter a diagnostics routine, set the shut off option for zone control, or set the helper PID parameter. To enter the "hidden" menu, press "ENTER", "0", "0" and "rSEt" is displayed. Press "4", "4", "3" and "notC" will appear. Continue to press "MENU" to scroll through the "hidden' options.   When the option that you want to set is displayed, press "ENTER".

Hidden menu options

- notC   Program number of thermocouples

- dIAG   Used to check if each section is connected to the right output and heating.

- SHtO   For 2 and 3 zone controls when shutoff is "off", the controller uses the average of all three t/c's to shut off the kiln. When "on" the kiln turns off when any one of the t/c's reaches temperature. OP A   Output 4 on during cone fire and cooling and programmable in vary fire.

- HLPr   Sets the amount of help section two gives section 3 when section 3 is lagging

PROGRAMMING NUMBER OF THERMOCOUPLES

Selecting the number of thermocouples is the first option in the hidden menu. This allows one controller board to be used for single or multi-zone kilns. To program the number of thermocouples - press "ENTER", "0", "0", "4", "4", "3" and "notC" will appear.   Press "ENTER" and the current number of thermocouples selected will be displayed. Press the number key representing the number of thermocouples (1,2 or 3). Now press "ENTER" and "StOP" will be displayed to indicate programming is complete. When programmed for use as a multi-zone board, the display will cycle between t/c X and the temperature, where X indicates which thermocouple's temperature is being displayed. When programmed as a single zone board, the display will not show the t/c number.

SINGLE ZONE. Input T/C 2 is used when the controller is programmed for single zone. All three outputs work in unison so there are two alternatives for connecting the outputs. You can connect all the relays to output 2 or you can connect one relay to each of the outputs. The first method allows direct replacement of the present single zone controller without changing wiring. The second method allows easy upgrading to a multi-zone kiln in the future by simply adding thermocouples and reprogramming the number of T/C's.

3-ZONE. Generally T/C 1 is the top thermocouple, T/C 2 is the middle, and T/C3 is the bottom. Likewise, output 1 drives the top relay, output 2 the middle, and output 3 the bottom. For taller kilns, output 2 can control several middle sections.

2-ZONE. When two thermocouples are selected, use inputs T/C1 and T/C2 and outputs 1 and 2.

<u>**DIAGNOSTICS (dIAG)**</u> This option is used to check each of the outputs. It will individually turn on each of the three outputs for one minute and 20 seconds starting with the top. The display will indicate which output is "on" throughout the test. The
To select the diagnostics option press "ENTER", "0", "0", "4", "4", "3" and "notC" will appear, press "MENU" and dIAG will be displayed. Press "ENTER" and "OUt 1" will be displayed and output 1 will be "on". The display will proceed through the other outputs then return to idle. You can proceed faster through the outputs by pressing "ENTER" to move to the next output before the 1min 20 secs are up.

<u>**SHUT OFF (SHtO)**</u> For 2 and 3 zone controllers when shutoff is "off", the controller uses the average of all three t/c's to transition from one segment to the next or to shut off the kiln. When "on" the kiln turns off or transitions when any one of the t/c's reaches temperature. FOR ALL DOWN RAMPS, the controller transitions from one segment to the next as if Shut Off were turned on, i. e., when any one section reaches the next segment temperature.
To set the shut-off option, press "ENTER", "0", "0", "4", "4", "3" and "notC" will appear, press "MENU" 2 times and "SHtO" will be displayed. Press "ENTER" and SHtO alternating with "OFF" will be displayed. Press the "1" to toggle the option from "OFF" to "ON" then press "ENTER".

<u>**Helper PID (HLPr)**</u>   In most kilns without elements in the bottom slab, the bottom section is usually the coolest of the sections. The PID option is designed to help speed up the firing when the bottom section is cooler and lagging behind the other sections. When the bottom section is on at full power, that is, it is lagging behind, then output 2 comes on as a percent of output 1. The middle section will fire hotter and help the bottom section catch up. The percent can be set from 0 (zero) to 150. It is factory preset at 85%. When the top section is the lagging section, the PID parameter comes into play also. In this case when the top (output 1) is on full power then the center section (output 2) is on as a percent of the top. In this case the PID should probably be decreased or set to zero to even the firing.
To set the HLPr percent press "ENTER", "0", "0", "4", "4", "3" and "notC" will appear, press "MENU" 3 times and HLPr will be displayed. Press "ENTER" and PCt and the current percentage are displayed. Enter the new percent that you want and press "ENTER".

TECHNICAL SPECIFICATIONS

THERMOCOUPLE INPUT   TYPE K   (maximum resistance 100 Ohms)

ACCURACY   +/- 10 degrees F

COLD JUNCTION COMPENSATION   ELECTRONIC

POWER INPUT   24V CENTER-TAP TRANSFORMER

OUTPUTS 1 & 3   150mA at 12V; one 12 V relay with 80 Ohm coil per output

OUTPUTS 2 & 4   600mA at 12V; four 12 V relays with 80 Ohm coil

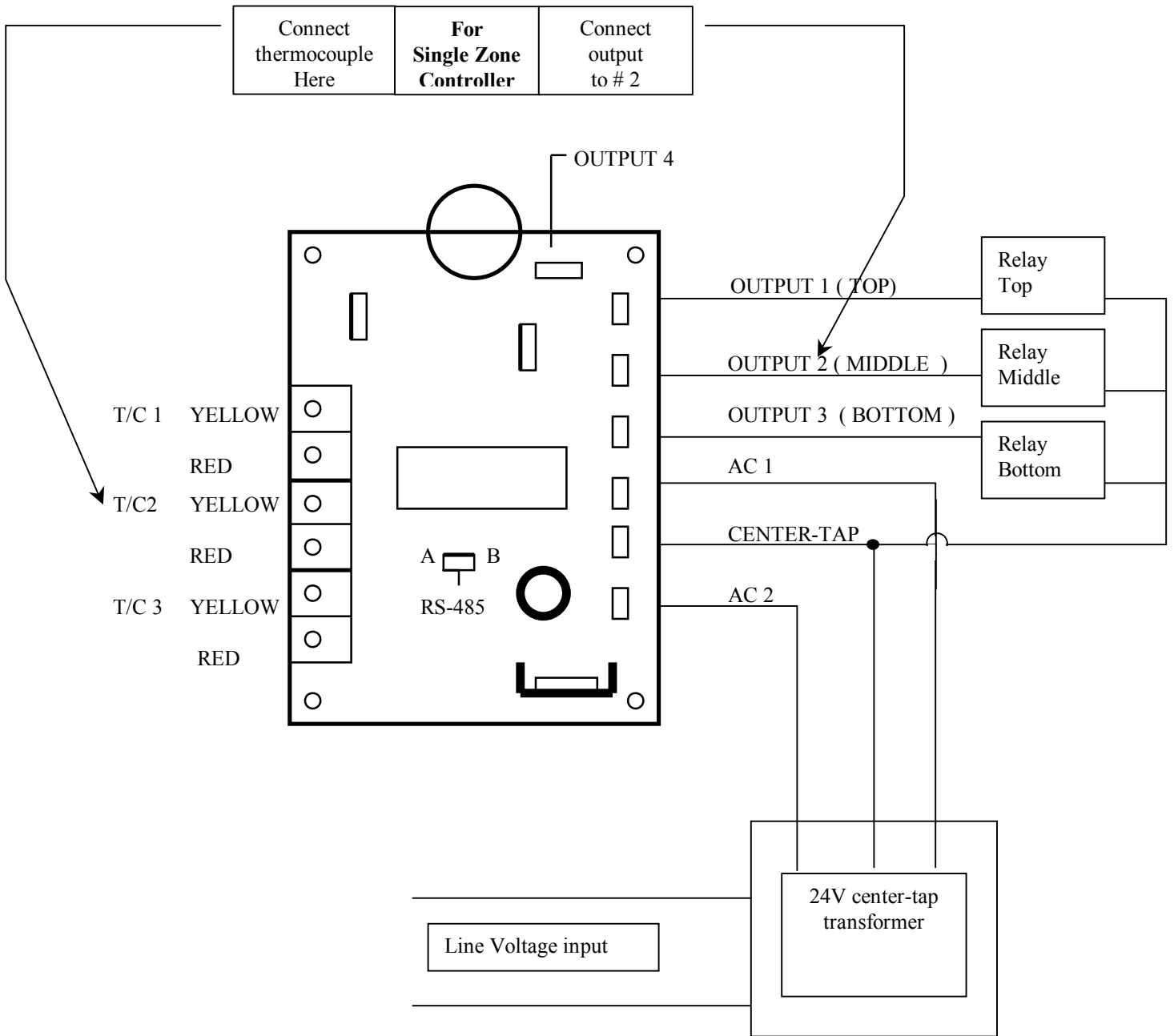OPERATING TEMPERATURE RANGE   0 TO 125°F or 0 to 52°C

PRECAUTIONS

This controller contains static sensitive parts, which can be damaged by static electricity. Use ground strap or touch a grounded object when handling this controller. Pack in anti-static treated material or paper. Do not pack in plastic bags or untreated packing.

This controller is a temperature regulating device not a safety device. You should attend your kiln during firings

CONNECTION DIAGRAM

(Figure 1)

Connect thermocouple Here	**For Single Zone Controller**	Connect output to # 2

OUTPUT 4

OUTPUT 1 (TOP)

Relay Top

OUTPUT 2 (MIDDLE)

Relay Middle

OUTPUT 3 (BOTTOM)

AC 1

Relay Bottom

CENTER-TAP

AC 2

T/C 1   YELLOW

RED

T/C2   YELLOW

RED

T/C 3   YELLOW

RED

A   B

RS-485

24V center-tap transformer

Line Voltage input

KISS

KISS (Kiln Interface Software System) connects up to 10 controllers to a personal computer running Windows 95 or 98. *KISS* is an easy to use interface for programming and monitoring of the controller from a computer. During the firing, the status screen will show the current program, current set point, current segment, firing time, and each zone temperature.   Firing information can also be collected in a file for later viewing or graphing.

To give your kiln a **KISS,** you need a **KISS** starter kit. For each additional kiln you connect to the network, a **KISS** kiln kit is required. The starter kit includes **KISS** software, an RS232 to RS485 opto-isolated converter with power supply, a 25 ft. modular cord, a modular wall jack to connect to the kiln, and a communications chip (integrated circuit) to insert in the controller circuit board. The kiln kit includes a 25 ft. modular cord, a modular wall jack to connect to the kiln, and a communications chip (integrated circuit), and a "T" adapter.