TSC
(temperature setpoint control)
For Kilns and Furnaces

In a nutshell

The TSC control for your kiln has been set up for you here at Denver
Glass. This is a quick set of step-by-step instructions to get you started.

First of all: **The Buttons.**

<u>DSP</u>   The display button
<u>PAR</u>   The parameter button. It also acts as the Enter button for any values you change.
The **UP and DOWN ARROWS** are for adjusting the parameters.

<u>Let's turn it on and push some buttons.</u>
Flip the toggle switch on the front of the control panel up and the controller should come on.

It should be reading the temp inside the unit in red, and <u>OFF</u> in the green. If it does not say **OFF**, press the **DSP**
button until it does. The OFF position is where everything starts. But for now, let's get familiar with the displays.

Press: DSP This is the time left in the current segment. Should read 0.0 now.
Press: DSP Either F or C degrees.
Press: DSP This is reading the ramping temp or the holding temp.
Press: DSP This is reading the percentage of power output.
Press: DSP Back to OFF. This is the <u>Program State</u>.

The next thing that you need to know is that when you are using the **PAR** settings, you must keep moving. If the
next button is not pushed within 5 seconds, the controller will automatically go back to <u>Program State</u>. This will be
a little annoying at first, but the more familiar you become with the unit, the less trouble that it will be.

For the sake of simplicity, we will not be explaining the meanings of all the strange abbreviations that you will see
while programming your control to do what you want. We will start by telling you where to go and what to do. That
way you will be running a program sooner and not having to deal with the 5 second factor quite as often.

So, with no further adieu, **let's start.**

**If at any time you come out thinking that the kiln should be done and find it holding at some high temp,
calmly press the** DSP **button until you get to the temp reading and lower it to 50 with the down arrow.
Then, check your program.**

These are some "<u>nice things to know</u>" about navigating the front panel.

You can:
- **Change the times and temps in your program from the main display without changing the original program (we will talk about this in a minute).**
- **Advance a program to the next segment.**
- **Pause a program.**
- **Restart a program.**
- **Stop your program completely.**

For any one of those (except the first one), the control must be in what is called "Program State". For example, if you are currently in Program 1 / Hold 4, press the DSP **button until your green window reads P1H4.** Then:
- To **Advance** to the next ramp, press and hold the **UP** arrow for **3 seconds.**
- To **Pause**, press and hold the **DOWN** arrow for **3 seconds.**
- To **Continue** from pause, press and hold the **UP** arrow for **3 seconds.**
- To **Abort** your program, press and hold the UP/DOWN **simultaneously for** 3 seconds.

(If you abort your program, remember you **MUST** go back to the temperature display and lower that number to **50 degrees.** Use the **DSP** button to find the current temperature reading in the green window and change it with the **down** arrow.)

Let's say now that your project is not quite done and this hold segment is almost over, **"WHAT DO I DO?"** Press the **DSP** button until you get to the time remaining and push the **UP** arrow! Give yourself a little more time. Now think, **"SHOULD I RAISE THE TEMP, AS WELL?"** Push the **DSP** button **2** more times and raise the temp. It works! Now, then, take note of what you did because this **does not** affect the written program. If you are making adjustments for a permanent program, you will need to go back into programming and make the changes there.

I have not told you how to start the program, yet, on purpose. I wanted you to read all of this other stuff before you became completely confused pushing buttons. So, assuming that you have read all of this and that you didn't just skim down and find this paragraph first by accident, here is the last secret…

If the controller does not say **OFF** in the green window, press the **DSP** button until it does.

Now press and hold the **UP** arrow for **3 seconds.** The display will read **Pr-1.** If it skips to **Pr-2**, then use the **DOWN** arrow to put it back. Now press the **PAR** button. The green window will say **strt** and then it will change to **P1r1** (Program State). We are running! Press the **DSP** button. You will see the time remaining. Press it 2 more times and you will see the ramp temp counting its way up to your first setpoint (level). Goof around with it… you aren't going to wreck anything and if you get lost, you can always call us.

You may have noticed a blue asterisk on page 3 with no footnote. If on that step you push the **UP** arrow twice, you will be writing in Program 2. If you push it three times, you will be in Program 3, etc. Try it.

And, you will also note that in the start program instruction a few paragraphs ago, holding the button in longer shifts you into a different program. This is how you start Programs 2, 3 and 4. Try it; try everything. And call us. For further details, read the next section on furnaces. It utilizes some of these functions as primary operation.

First:
Be certain that the display says **OFF** (use **DSP** button). Then:

Press: PAR four times. The display reads **CNFP/NO.**
Press: UP arrow eight times. It will count for you in the green window.
Press: PAR once. Red window will read **PSet/NO.**

Press: UP arrow once. Green window reads **Pr-1** (program one).*
Press: PAR. Red window reads **P1CC**. Green window **must** read **"1"**. Use **UP/DOWN** to change.
Press: PAR. Red window reads **P1Ln**. Green window reads **"No"**.
Press: PAR. Red window reads **P1St**. Green window reads **CONt**.
Press: PAR. Red window reads **P1Eb**. Green window reads **25**.

This is proper program set-up. **Now for the real fun.**

Press **PAR**
P1r1 means Program 1, ramp 1.
P1L1 means Program 1, Level 1.
P1H1 means Program 1, Hold 1.
This is segment 1 of program 1. Segment 2 begins with P1r2. Now:
(If your controller has gone to Base Mode, return to the top of this page and start over. Sorry.)

Press	Red	Green	Action	Description
PAR	P1r1	10.0	UP/DOWN	10 deg. per min (600 deg. per hour)
PAR	P1L1	1100 deg	UP/DOWN	Ramping to 1100 deg.
PAR	P1H1	0.0	DOWN	No hold
PAR	P1r2	20.0	UP/DOWN	20 deg. per min (1200 deg per hour)
PAR	P1L2	1500 deg	UP/DOWN	Ramping to 1500 deg.
PAR	P1H2	10.0	UP/DOWN	Hold for 10 min.
PAR	P1r3	0.0	UP/DOWN	Quick cool
PAR	P1L3	960 deg	UP/DOWN	960 deg annealing temp
PAR	P1H3	60.0	UP/DOWN	Hold for 1 hour
PAR	P1r4	5.0	UP/DOWN	5 deg per min (300 deg per hour)
PAR	P1L4	700 deg	UP/DOWN	Ramping to 700 deg
PAR	P1H4	0.0	DOWN	No hold
PAR	P1r5	0.0	UP/DOWN	Natural cool
PAR	P1L5	50 deg	UP/DOWN	Cooling to 50 deg
PAR	P1H5	0.0	DOWN	No hold
PAR	P1r6	-0.1	DOWN	End of program
PAR	Press 3 times to exit programming.			

One of the most important things to remember is that the controller holds the last programmed temperature after it has finished its program. So you must write 50 degrees into the last segment. For example, in the program above, if you told the kiln to turn off after it reached the 700 degrees in Segment 4, the control would hold the temperature in the kiln at 700 degrees indefinitely, even though the program would turn off. It will do the same thing if you stop a program in the middle of its cycle.

Furnaces

The **TSC** Control is perfect for the furnaces. One program can do everything!

Because the ramping time is set in degrees per minute, the ramp always starts at the current temp and the program holds at the last given temp value when it ends its program, you have a piece of equipment that almost

works by itself. You can write a program that will not only run your routine melt cycles, but will also do the cold start for you.

Here is a sample program:

First:
Be certain that the display says **OFF** (use **DSP** button). **Then:**
Press: **PAR** four times. The display reads **CNFP/NO.**
Press: **UP** arrow eight times. It will count for you in the green window.
Press: **PAR** once. Red window will read **PSet/NO**.
Press: **UP** arrow once. The green window will read **Pr-1** (Program 1).
Press: **PAR**. Red window reads **P1CC**. Green window **must** read **"1"**. Use **UP/DOWN** to change.
Press: **PAR**. Red window reads **P1Ln**. Green window reads **"No"**.
Press: **PAR**. Red window reads **P1St**. Green window reads **CONt**.
Press: **PAR**. Red window reads **P1Eb**. Green window reads **25**.

We will write the Cold Start here. It is a short program, but you can lead it into another.

Press	Red	Green	Action	Description
PAR	P1r1	1.3	UP/DOWN	1.3 deg per min (approx 100 deg per hour)
PAR	P1L1	2200	UP/DOWN	Ramping to 2200 deg
PAR	P1H1	600.0 min	UP/DOWN	Hold for 10 hours
PAR	P1r2	0.0	UP/DOWN	Drop to squeeze temp
PAR	P1L2	1900 deg	UP/DOWN	Squeeze temp
PAR	P1H2	180 min	UP/DOWN	Hold for 180 min (3 hours)
PAR	P1r3	1.3	UP/DOWN	1.3 deg per min (approx 100 deg per hour)
PAR	P1H3	0.0	DOWN	No hold
PAR	P1r4	-0.1	DOWN	End program
PAR	Three times to exit programming			

Now, that looks a little scary. But remember from the previous instructions that the controller remembers the last temperature programmed. It **will** hold at 2050 degrees indefinitely. And, because it always starts at current temp and counts in degrees per minute, it can be restarted at any time.

To start or restart, press **DSP** until the green display says **OFF**. Hold the up arrow in to Pr-1 and quickly press the **PAR** button. The green display will read **"Strt"**.

Once again, the last temp will hold. It is a blessing for the furnace operators and a curse for the kiln people. You **MUST** remember that this control does act this way!

(Note, that in this Nutshell *the word Program is the same as "profile" in the* TSC *Manual.)*

Call anytime for assistance 303 781 0980

TSC Controller Short Cuts

1. To start the kiln: Press the DSP (display) button until the display says OFF. Hold the up arrow for 3 seconds. As soon as you see Pr1 (Program 1), if this is the program you want

to run, immediately hit the PAR button. If you want Program 2, when the display says Pr1, hit the up arrow once and it will go to Pr2. Hit the PAR button, etc.

2. To skip into the next segment, press the up arrow for 3 seconds.

3. To change any value during the run program, first press the DSP (display) button until you get to what you want (set point, ramp time or time left in hold), then use the up or down arrows to change the value.

4. To abort a program: Press the up and down arrows simultaneously. Then press the DSP button until it shows the temperature in the green window; press the down arrow until it goes to 50.

5. To pause a program: Press and hold the down arrow for 3 seconds.

6. To restart the program: Press and hold the up arrow for 3 seconds.