

HANDS-ON LAB FOR THE UDC5300 PROGRAMMER-CONTROLLER

1. General Information and Demo Application

- This hands-on lab exercise is designed to make the **UDC5300** simulate an application and will provide you with a feel for the instrument's control capabilities. Analog inputs measure readings from temperature transmitters. Control is accomplished by applying analog output signals (4 to 20 mA) to gas valve actuators that modulate fuel flow to each of the furnace's burners.
- The UDC 5300 User Manual should also be handy as it will be the primary reference document. User Manual: **(51-51-25-58)**. (Although the CTX and CCP manuals are similar, they should not be used as these manuals do not include information on any revisions made to the Controller since its redesign as the UDC5300.)

2. Minimum Hardware and Wiring

- It is assumed that the a UDC5300 demo unit is available. The recommended minimum demo hardware is **Model # DC5300 -101 -B -10 -E000 -0**. Refer to the **Model Selection Guide (51-52-16-45)** for more information or the Product Release Announcement, (Feb.,1998) . The unit described has one 4-20 ma current output (CAT) and one loop on control. The unit also includes the Data Storage option and Set Point Programming. The data storage option is desirable for customer demonstrations; but is not essential for this exercise. If the unit has additional loops and I/O options, the exercise will also run in the unit.
- Wire the UDC5300 connecting AO1 to AI1. Because AO1 is a 4 to 20 mA output, 250 Ω resistors will need to be wired at the AI1 terminals. For more information on the UDC5300's wiring and installation, refer to the User Manual, Section 4.1. Follow Figure 1 below. Please note that a power cord (115VAC) will be required at terminals 25, 26, 27. Terminal 25 is Ground :Green. Terminal 26 is Line 1: Black. Terminal 27 is Neutral: White.

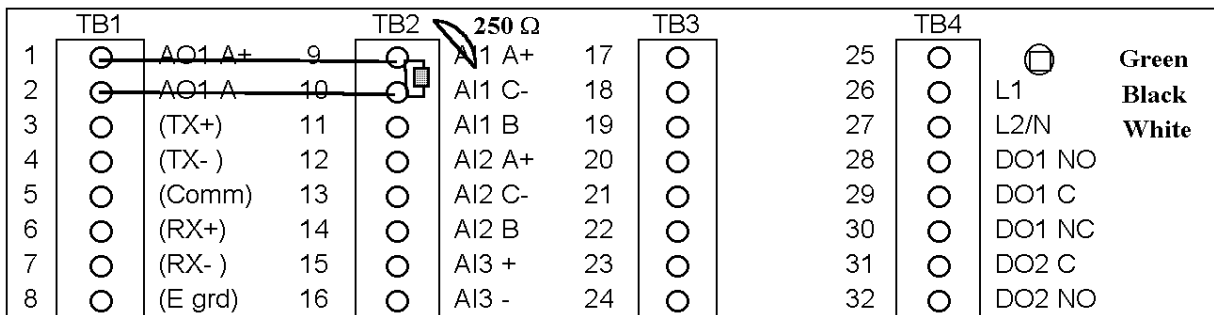


Figure 1 Instrument wiring that supports this exercise.

3. Modes of Operation

- The UDC5300 has three modes of operation: Program, On Line, and Maintenance. Each mode has its own menus. Most menu items provide access to sub-level menus. The “SET MODE” prompt permits switching the instrument from one mode to another.

Program Mode

- Program mode is an off-line mode for programming and configuring the instrument. In this mode, all outputs are frozen and all data storage is stopped.
- To Select the Program Mode, Press the Menu Key. The first prompt will read “TUNE LOOP”. Press the Arrow Up Key. The Prompt “SETMODE” will appear. Press the ENTER Key. By pressing the ENTER key again, you will have selected the Program Mode. If you use the Arrow Up key or the Arrow Down key, You will be able to view the other options. Pressing the MENU will permit you to escape the SET MODE prompt without changing the controller’s mode.

On Line Mode

- All settings made within Program mode menu items become active when the instrument is placed in On Line mode. In this mode, the instrument sustains the data acquisition and/or control application for which it has been configured to support.
- To Select the On Line Mode, Press the Menu Key. The first prompt will read “CALIB AI” or “PRG AI”. Press the Arrow Up Key. The Prompt “SETMODE” will appear. Press the ENTER Key. Now use the Arrow Up key or the Arrow Down key to view the other options. When ONLINE” appears, press ENTER. By pressing the ENTER key, you will have selected the On Line Mode. Pressing the MENU will permit you to escape the SET MODE prompt without changing the controller’s mode.
- An alternative way to select the On line Mode is by pressing the “DISPLAY” key. If you are in the Program Mode, you will be prompted to “SAVE CHANGES?”. Pressing “ENTER” will save the changes. Pressing “MENU” will permit exiting without changing the configuration.

Maintenance Mode

- Maintenance mode is an off-line mode for maintaining proper and complete functioning of the instrument. Maintenance mode functions include calibration, off-line diagnostic testing, and various setups for operation. In Maintenance mode, all outputs are frozen and data storage is stopped.
- Follow the instruction for Selecting the Program Mode. Select the “MAINT” prompt by pressing “ENTER”.

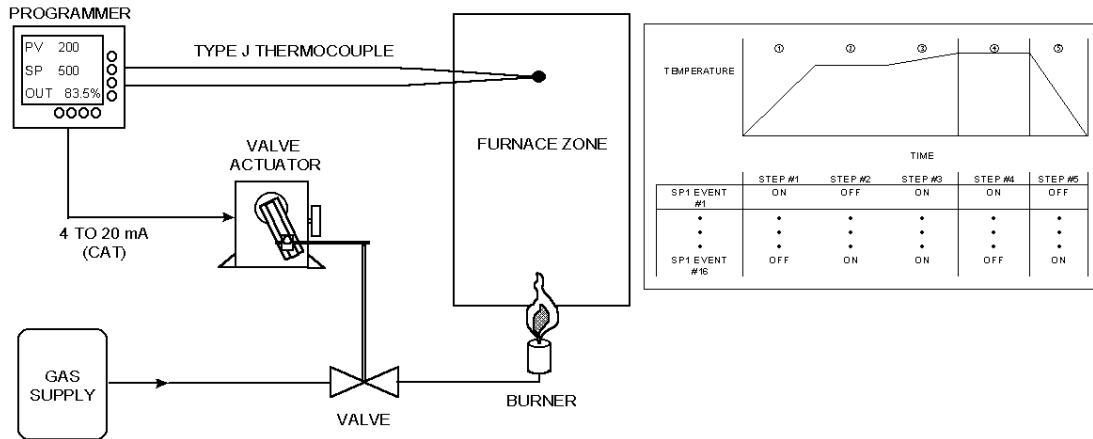
Menu Navigation

- Moving between the Program, On Line, and Maintenance modes of the instrument is accomplished through use of the instrument’s Menu, Increment, Decrement, and Enter keys located on its front bezel. Refer to UDC5300 Manual, Section 6.2 for more detailed information.
- To develop a feel for navigating between modes, power up the instrument and perform the sequence of steps that follows.
- Upon turning the instrument on for the very first time, the PRODUCT INFO display will initially appear. It will Display “UDC 5300”. Press the Menu button once until the “TUNE LP” prompt appears. Press the Arrow Up key once. Press the Enter Key and then press the Arrow Up or Arrow Down key. Select a Mode by pressing “ENTER.”

4. Programming and Configuration

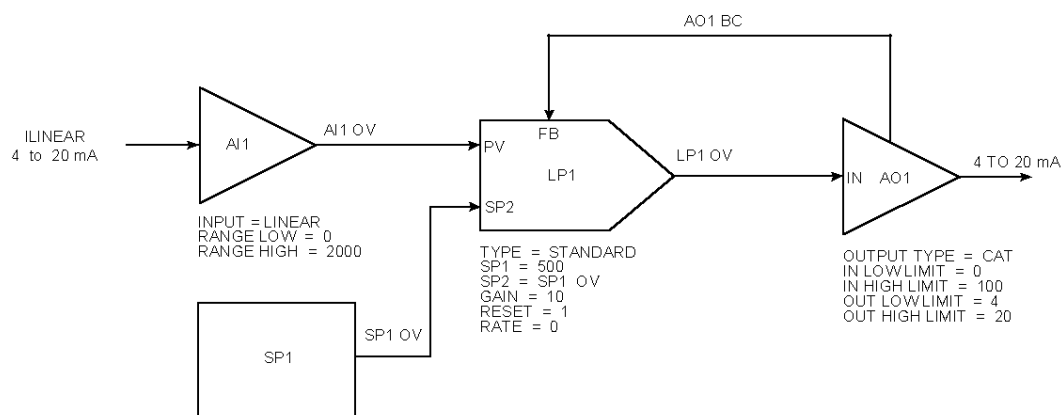
- The Furnace application example illustrated in Figure 1., requires a temperature profile. The furnace will temperature needs ramped and held at a soak temperature on a precise time schedule. This is a classic Heat Treatment cycle for a Metals Application. The exposure to elevated temperature alters the inter-atomic structure of the metals to alter the metal's outward properties of hardness, toughness, ductility, etc.

Basic Control Application : Set Point Profiler Implementation



- We will now proceed with programming the instrument. *Note that the configuration that will be implemented is represented by the function block diagram shown in Figure 2.* Menu settings that correlate with the function block diagram are also provided. Refer to the User Manual, Section 8.1, for more information on using function blocks to graphically represent UDC5300 control configurations.

Basic Function Block Diagram representing UDC5300's Set Point Profiler



- Set Point Profiler 1 Function Block (SP1) feeds SP2 (Remote Set Point) of Control Loop 1 (LP1).

Figure 2 Function block diagram representing demo configuration.

It is important to correlate the function block diagram of Figure 2 with the physical layout of the application. Analog input function block AI1 will process the signals from the furnace zone temperature transmitters to generate temperature measurements. The temperature is denoted as AI1 OV, where "OV" stands for "Output Value". This temperature measurement will be used as the Process Variable (PV) inputs for the temperature control loop (LP1) dedicated to the zone. LP1 is a PID control function block whose output is denoted LP1 OV. Based on calculations performed by each control loop block's internal PID algorithm, the loop outputs will assume a value between 0 and 100 % to drive the analog output block (AO1). The back calculated feedback signal (AO1 BC) will be sent from the analog output blocks back to their corresponding control loop blocks to confirm that each has fulfilled the output level request called for by the loops. Note that each control loop block has a remote set point input denoted "SETPOINT # 2" to which a time-varying set point can be applied from one of two set point profiler function blocks (SP1 and SP2) or from another calculated source (CVn).

The Following script can be used to develop the Function Block Diagram illustrated in Figure 2.

*Function block diagrams are graphical representations of configurations that may be programmed into the UDC5300 instrument. They should be thought of and used as "construction blue prints" that detail the overall structure of the control configuration you wish the instrument to support. In general, each block within a particular diagram will be found to directly correlate with one unique menu within the UDC5300's PROGRAM mode MAIN MENU. **The exception to this rule will be Set Point Profiler function blocks, since their configuration settings are determined through two menus: a PROGRAM mode menu and an ON LINE mode menu.***

Be advised that the interconnections shown between function blocks are actual menu settings that you will specify.

- Before programming access the **Maintenance Menu** to clear all previous configurations. This is good practice when starting a new application.
- Press the MENU key. When TUNE LP appears, press the Arrow Up key. press the ENTER key, then the Arrow UP key. When MAINT appears, press ENTER. Scroll the selections using the Arrow UP or DOWN key. When DB SRVCE (Data Base Services) appears, press ENTER. When CLR CFG appears press ENTER. When SURE ? appears Press ENTER again. This action will clear all previously entered configurations. The CLRING MEMORY and the UDC 5300 banner will appear.
- You should now return to the PROGRAM Menu. Use the Arrow UP key and then the ENTER key to select PRGRM.
- Select PRG AI (PROGRAM ANALOG INPUTS.) Make the following entries. For more information on programming analog inputs, refer to Section 9 of the User Manual.
- General Key Stroke guide: ENTER is used to enter a menu, accept data, or to confirm a selection. Arrow UP and Arrow DOWN are used to scroll through a selection list of parameters, options, or to increment values. The Arrow LEFT moves the selected digit on numerical displays.

- Enter the parameters values below.

INPUT #1 (AI 1)

1	AI 1 TYPE	LINEAR	
2	AI 1 ODPT	XXXX.XX	Output Decimal Point
3	AI 1 OTEU	F	Output Temperature Units
4	AI 1 RGLO	0.00	Range Low
5	AI 1 RGHI	2000.00	Range High
6	AI 1 TMPU	F	Temperature Units
7	AI 1 D-ID	INDIRE	INDIRECT
8	AI 1 CKLO	1.00	Circuit Low
9	AI 1 CKHI	5.00	Circuit High
10	AI 1 CKUN	VOLTS	Circuit Electrical Units
11	AI 1 LAG	20.00	Lag or filtering
12	AI 1 HOLD	OFF	Sample Hold
13	AI 1 FAIL	UP	Failsafe
14	AI 1 CLMP	NONE	Range Clamp

- Once the above settings have been entered for AI1, press the Menu key once. You will be prompted to PRESS ENTER TO SAVE. Press the Enter key to save the programming settings you have made for AI1. Move on to programming LP 1.(THIS WILL BE USED LATER ON IN THE EXERCISE)
- Press the Menu key until you have returned to the Program Menu. Select PRG LP. Then LP 1.

LOOP #1 (LP 1)

1	LP 1 TYPE	STD	Standard Loop Algorithm
2	LP 1 IDPT	XXXX.XX	Input Decimal Place
3	LP 1 ODPT	XXXXX.X	Output Decimal Place
4	LP 1 PV	AI 1 OV	Loop 1 Input
5	LP 1 PVLL	0.00	Process Variable Low Limit
6	LP 1 PVHL	2000.00	Process Variable High Limit
7	LP 1 CTLA	REV	Control Action
8	LP 1 GNPB	PB	Select Gain or Proportional Band Tuning
9	LP 1 PB 1	120.0	Proportional Band Value # 1
10	LP 1 RST 1	8.000	Reset Value # 1
11	LP 1 RTE 1	OFF	Rate Value # 1
12	LP 1 PB 2	OFF	Proportional Band # 2
13	LP 1 RST 2	OFF	Reset Value # 2
14	LP 1 RTE 2	OFF	Rate Value # 2
15	LP 1 MRST	OFF	Master Reset
16	LP 1 SPTR	OFF	Set point Tracking
17	LP 1 SPT 1	100.00	Set Point # 1
18	LP 1 SPT 2	SP 1 OV	Set Point # 2
19	LP 1 SPLL	OFF	Set Point Low Limit
20	LP 1 SPHL	1900.00	Set Point High Limit
21	LP 1 INEU	F	Input Engineering Units
22	LP 1 PVTR	NONE	Process Variable Tracking
23	LP 1 FB	AO1 BC	Feedback
24	LP 1 OSUP	NO	Fuzzy Logic Over Shoot Suppression
25	LP 1 DTUN	OFF	Dual Tuning Selection
26	LP 1 IACT	NO	Interacting Gain
27	LP 1 RLIM	OFF	Reset Limit
28	LP 1 LBAD	NO	Loop Bad Action Required

- Once the above settings have been entered for LP 1, press the Menu key once. You will be prompted to: SAVE CHANGES? Press the Enter key to save the programming settings you have made for LP 1. Press the Menu key once to return to the PROGRAM mode MAIN MENU.
- From the PROGRAM mode MAIN MENU, select PRG AO (Program Analog Outputs),press for AO 1, and enter the following. For more information on programming control loops, refer to Section 4 of the User's Manual.

1	AO 1 TYPE	CAT	Analog Output Type
2	AO 1 IDPT	XXXX.XX	Input Decimal Position
3	AO 1 INP	LP 1 OV	Input Source
4	AO 1 INLL	0.00	Input Low Level
5	AO 1 INHL	100.00	Input High Level
6	AO 1 ODPT	XXXX.XX	Output Decimal Position
7	AO 1 OVLL	4.00	Output Value Low Level
8	AO 1 OVHL	20.00	Output Value High Level
9	AO 1 OTEU	NONE	Output Temperature Engineering Units (data)
10	AO 1 ISLW	OFF	Increasing Slew Limit
11	AO 1 DSLW	OFF	Decreasing Slew Limit
12	AO 1 FSAF	NONE	Failsafe Enable
13	AO 1 FSV	OFF	Failsafe Value

- After Saving the Analog Output Configuration, Return to the Main Program Menu. Go to the PRG SPP prompt. Press ENTER. Enter the following.

1	SP IDPT	XXXX.XX
2	SP ODPT	XXXX.XX
3	SP LO LI	OFF
4	SP HI LI	OFF
5	SP DP LI	OFF
6	SP DP L2	OFF
7	SP RR IN	OFF
8	SP HOLD	OFF

- Once the above settings have been entered for SP, press the Menu key once. SAVE CHANGES? Press the Enter key to save the programming settings you have made for SP. Move on to programming the Profile.
- Press the MENU key until you see PRG AI. Arrow UP to SET MODE. Select ON LINE by pressing ENTER. Arrow DOWN to the PROFILE Prompt. Press ENTER. At the PRF EDIT Prompt. Press ENTER. Enter the Data Below.

1	PRF NAME	ONE
2	T UNITS	MINS
3	DVP L L	OFF
4	DVP H L	OFF
5	S1 VAL	100.00
6	S1 TIM	4.00
7	S1 EV 1	OFF
8	S1 EV 2	OFF
9	S1 DV 1	OFF
10	S1 DV 2	OFF
11	S2 VAL	500.00
12	S2 TIM	2.00
13	S2 EV 1	OFF
14	S2 EV 2	OFF
15	S2 DV 1	OFF
16	S2 DV 2	OFF
17	S3 VAL	500.00
18	S3 TIM	3.00
19	S3 EV 1	OFF
20	S3 EV 2	OFF
21	S3 DV 1	OFF
22	S3 DV 2	OFF
23	S4 VAL	1500.00
24	S4 TIM	2.00
25	S4 EV 1	OFF
26	S4 EV 2	OFF
27	S4 DV 1	OFF
28	S4 DV 2	OFF
29	S5 VAL	1500.00
30	S5 TIM	5.00

31	S5 EV 1	OFF
32	S5 EV 2	OFF
33	S5 DV 1	OFF
34	S5 DV 2	OFF
35	S6 VAL	200.00
36	S6 TIM	OFF
37	S6 EV 1	OFF
38	S6 EV 2	OFF
39	S6 DV 1	OFF
40	S6 DV 2	OFF

- Once the above settings have been entered for the Profile, press the Menu key once. SAVE CHANGES? Press ENTER to Save. Press the Menu key once to return to the PROGRAM mode MAIN MENU.

5. On - Line Operation of Demo UDC5300

- To observe your demo UDC5300 in action, press the Display key once.
- Use the Display Key to access other configured parameters that have been assigned to the Display Key
- Use the Increment or Decrement Button to raise and lower the displayed parameter.

6. Activating Data Storage

- While the Controller is running, the temperature data for Furnace Zone may be recorded to PCMCIA CARD.
- Refer to the UDC5300's User Manual for detailed descriptions of the unit's data storage capabilities.

NOTE

The instrument cannot read from or write to disk if the bezel is open. PCMCIA slot operations are completely suspended whenever the UDC5300's bezel is not closed.

STAND BY for more control problems:

Configure AI2 as a J type Thermocouple.

1. Input selection based on temperature.:

When AI 2 rises above 85 degrees, switch the Input to LP1 to AI.

2. Compute the average of AI 1 and AI 2

3. Add AO2 as a Time Proportioning Output. Reconfigure LP1 as a split PID. Add a split output block.

4. More? Your applications.



You have successfully completed programming, configuring, and operating your UDC5300 instrument – the first of many integrated product solutions in the works at Honeywell.