FEATURES

- Eighty (80) separate programmable steps with two (2) analog setpoint channels and eight (8) on/off events per step.
- Programmable high and low temperature limit alarm.
- Step timing can be accomplished in hours and minutes or minutes and seconds.
- Can interloop up to 255 times and repeat entire program indefinitely.
- Delay actual starting time up to 99 days.
- L.E.D. readouts that will simultaneously display step, channel, and data.
- Delay timed sequence until temperature is reached—guaranteed soak cycle.
- Keylock switch for "tamper-proof" operation.
- Keyboard program entry in real engineering units — no programming experience required.
- Run/Halt key to stop and hold at any point.
- Internal battery that will maintain memory contents if a power loss occurs.
- L.E.D. indication of program status.
- Program can be monitored, displayed or changed without disturbing "on line" process control.
- Entire program can be stored on magnetic (cassette) or TTY (teletype) tapes.
- Self-prompting may be incorporated.
- Decimal points may be incorporated to either or both analog channels.
## MICRO-PRO 1000 — MICROPROCESSOR-BASED PROGRAMMER

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MICRO-PRO 1000 — MICROPROCESSOR-BASED PROGRAMMER

GENERAL DESCRIPTION

The Micro-Pro 1000 is a microprocessor-based programmer that has an 80-step capability with two (2) analog setpoint channels and eight (8) on/off event outputs per step. The analog outputs are used to provide setpoint signals to external controllers with a maximum temperature range of ±1000 degrees F or C. The on/off functions can be programmed for any combination of on/off events at the beginning of each step and when used with the optional power supply/relay board, can switch up to 10 amperes at 120 VAC. The unit has a built-in alarm network with a normally energized relay that will de-energize when an over temperature alarm condition exists. When an alarm condition does exist, the data readout will flash on and off and one or more of the four (4) alarm “flag” outputs will energize, telling the operator what alarm condition exists or has occurred.

The Micro-Pro will, when properly programmed, store within its memory a complete program of time and temperature related events and automatically execute these events when the proper time or temperature is reached. It has the capability of repeating portions of a complete program up to 255 times with L.E.D. indication on the number of loops remaining and the time length remaining in each step. The unit will also, unless instructed otherwise, repeat the entire program indefinitely. A delay system in incorporated in the unit that allows the operator to enter a complete program and delay the actual starting to some future data and time. The delay feature is also used to wait for a temperature to be reached before starting the timed sequence, thus guaranteeing a timed soak cycle at the prescribed temperature. Other standard features of the programmer include an output for loading the complete program onto external storage devices, magnetic (cassette) tape, or teletype equipment (TTY). The unit, of course, can be loaded from these devices. A keylock switch is also supplied that will guarantee “tamper-proof” operation. When the switch is in the run position, the data can be monitored but not changed.

In case the power should fail when the unit is executing a program, an internal battery is supplied that will maintain the memory contents for a minimum of 96 hours. When power is restored, the program will resume at the point where the failure occurred with the step L.E.D. display flashing on and off indicating a power loss. A check of the 24-hour clock will indicate how long the loss occurred.

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SPECIFICATIONS

POWER REQUIREMENTS: 120/240 VAC ± 10%, 50 or 60 Hz., 15 V.A.
Note: Unit is supplied with connection for 60 Hz. operation but is field selectable for 50 Hz. operation. See field selectable option chart.

OPERATING AMBIENT: 30 to 130°F.

PROGRAM CAPACITY:
1. One through 80 separate and independent steps with two analog outputs and eight on/off events per step.
2. Step Duration: One minute through 99 hours 59 minutes or one second through 99 minutes 59 seconds. See field selectable option chart.
3. Programmable high and low limit alarms for both analog channels.
4. Interloop up to 255 times.
5. Delay starting up to 99 days, 23 hours, 59 minutes.
6. Delay starting until temperature is reached.
7. Entire program will repeat indefinitely unless instructed to stop.

DISPLAY:
1. Eight (8) digits — seven segment, L.E.D. 0.5” high, allowing operator to simultaneously view the step, channel and data. Decimal points can be added to either or both analog channels and are field selectable. See field selectable option chart.
2. Nine (9) individual L.E.D. status indicators.

OUTPUTS:
1. Dual analog channels, each at ±5 VDC ± 0.1% of span, corresponding to ±1000 digits (°F, °C, % R.H., etc.) with 5 mV per least significant digit. Outputs will source 1 mA into 5K load.
2. On/Off Events: Eight (8) normally open transistor collectors, each rated 200 mA at 40 VDC maximum.
3. Limit Alarm: Normally energized S.P.D.T. relay rated 10 amperes resistive at 120 VAC, 5 amperes resistive at 240 VAC, 50 V.A. inductive.
4. Alarm Flags: Four (4) normally open transistor collectors, each rated 200 mA at 40 VDC maximum.
5. Tape: Audio (magnetic tape) output with 4K Hz. bandwidth or TTY with 110 baud, teletype compatible. See field selectable option chart.
INPUTS:
1. Inputs are provided to utilize data readout to indicate actual process temperatures. Input accepts 5 mV per digit (°F, °C, % R.H., etc.) supplied with external signal conditioners. Inputs are available on both analog channels.
   Note: External signal conditioners are required when programmer is used to set and sense limit temperatures.
2. Tape Load: Compatible with outputs.
3. Remote Halt: Switch closure when programmer is to be halted from a remote location.

TIMING:
1. 24-hour real time clock.
2. Process time programmable from one minute to 99 hours 59 minutes or one second through 99 minutes 59 seconds. See field selectable option chart.

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KEYBOARD AND READOUT FUNCTIONS
1. L.E.D. indicates when processor is in the Set-up Actual Mode.
2. L.E.D. indicates when processor is in the Program Set Point Mode.
3. L.E.D. indicates when processor is in the Monitor Actual Mode.
4. L.E.D. indicates when processor is in the Monitor Set Point Mode.
5. L.E.D. indicates when processor is halted.
6. Delay Start key: Used when the operator desires the processor to wait until a predetermined time or temperature is reached before starting. Indicated by the delay start L.E.D.
7. Run/Halt key: Alternate action switch used to halt and maintain the program at present position. When key is released into the run position, the processor will begin or resume the entered program. Indicated with the halt and run L.E.D.'s. As an option, the key may be functional or non-functional when keylock switch is in the run position.
8. Jump (Loop) key: Used when the process requires a portion of a complete program to be repeated before proceeding to the next step. Also used to stop a program.
9. Dump Tape key: Used when the entire memory contents are to be stored on external storage devices (magnetic cassette or TTY paper tape).
10. Enter key: Used to store the program into the memory of the system. Must be depressed for each time or temperature event.
11. Step key: Used to instruct the processor which step (memory location) the program is to begin. Also used to verify data in entered program without individually advancing through each step.
12. Load Tape key: Used to enter into the processor complete programs from external storage devices.
13. Clear key: When depressed, will erase the entire memory location in a given step (C1, C2, A1, A2, and time duration). Functional in Program Set Point Mode only.
14. Alarm key: Used to reset a temperature or power failure alarm condition. Functional in all modes.
15. Time/Data key: Alternately switches between the time and data positions. When in the time position, the time L.E.D. is energized.
16. Channel key: Sequentially advances through the appropriate channels as the key is depressed. Indication of channels will change depending on the mode of operation.
17. Mode key: Sequentially steps through Monitor Set Point, Monitor Actual, Program Set Point, and Set-up Actual modes. Key functions and L.E.D. readout information will change, depending on mode selected. For more detailed information, see Mode Operations and How-to-Program sections.
18. Minus (-) key: Used to enter any below zero temperature.
19. Next Step key: When depressed, will advance to the next step (memory location). This key will advance one step at a time.
20. Keyboard 0-9: Used to load all information into the processor (time, data, etc.).
21. Keylock Switch with Removable key: When switch is in the program position, the program may be entered, changed or run. In the run position, it may be run only and cannot be changed.
22. L.E.D. indicates when processor is running.
23. L.E.D. indicates when processor is in the time position.
24. L.E.D. indicates when instructions call for a delay start or wait-for-temperature condition.
25. L.E.D. indicates when unit is instructed to loop — jump back to a previous step and repeat the cycle.
26. Data Readout: 4-digit L.E.D. display used to indicate the inputs and outputs of the processor. Readout information depends on the mode of operation. For more detailed information, see Mode Operations and How-to-Program sections.
27. Channel Readout: 2-digit L.E.D. display used to indicate the channels under observation. Readout information changes depending on the mode of operation. For more detailed information, see Mode Operations and How-to-Program sections.
28. Step Readout: 2-digit L.E.D. display used to indicate the step (memory location) under observation or to be programmed. This readout will automatically advance when a program is running.
MONITOR SET POINT MODE:

In this mode, the set point signals generated by the processor and the time remaining at the present step are displayed on the data readout.

**Time/Data key:** When in the time position (time L.E.D. energized), the data readout will indicate the time remaining in the present step in process time. Channel readout will be blank. When in the data position (time L.E.D. de-energized), the data readout will indicate the set point signals generated by the programmer to channels 1 (C1) and 2 (C2) and on/off signals for auxiliaries 1 and 2 (1 = on, zero = off).

**Channel key:** Sequentially advances through Channel 1 (C1), Channel 2 (C2), Auxiliary 1 (A1), and Auxiliary 2 (A2). Data readout will display appropriate set points or on/off signals associated with these channels when the time/data key is in the data position.

Keyboard 0-9, minus, next step, clear, enter, load tape, dump tape, step, jump (loop), delay start keys are non-functional in this mode.

MONITOR ACTUAL MODE:

In this mode, the actual process temperature, as well as the real time of day, are displayed on the data readout.

**Time/Data key:** In the time position (time L.E.D. energized), the data readout will count down and display real time on the 24-hour clock. Channel readout will be blank. When in the data position (time L.E.D. de-energized), the data readout will display the actual process temperature of Channels 1 (C1) and 2 (C2) only.

**Channel key:** Sequentially advances through Channel 1 (C1) and Channel 2 (C2) only.

Keyboard 0-9, minus, next step, clear, enter, load tape, dump tape, step, jump (loop), and delay start keys are non-functional in this mode.

PROGRAM SET POINT MODE:

In this mode, all keys are functional provided the Keylock switch is in the "Prog." position. The setpoints for C1, C2, the on/off functions for A1, A2 and the time length (in process time) for each step are entered and stored in the processor. All functions such as delay starts, wait for temperature, jump (loop), load tape and dump tape are entered in this mode.

**Time/Data key:** When in the data position (time L.E.D. de-energized), the data readout will indicate the setpoints and on/off functions that have been entered in C1, C2, A1, and A2. In the time position (time L.E.D. energized), the data readout will indicate the time length for each programmed step in process time. The channel readout is blank in the time position.

**Enter key:** Enters program into the memory of the processor. Must be depressed for each time or temperature event.

**Clear key:** When depressed, will clear the entire memory contents (C1, C2, A1, A2, and time length) in the step indicated by the step readout.

**Next Step key:** Will advance to the next step (memory location) in the processor.

**Step key:** Used to verify the information in any memory location (step) in the processor without individually advancing through each step. This key is functional with the Keylock switch in either the Run or Program position.

**Run/Halt key:** In the Run position (running L.E.D. energized), the processor will start running as soon as a time entry is made in any step. In the Halt position (halt L.E.D. energized), the processor will halt and remain in the step displayed on the step readout. The analog outputs will continue to generate the setpoints displayed on the data readout and the auxiliary outputs will remain in their present state until the key is released into the Run position. The entire program may be loaded and stored into the processor memory in the Halt position.

**Channel key:** Sequentially advances through Channel 1 (C1), Channel 2 (C2), Auxiliary 1 (A1), and Auxiliary 2 (A2) as the key is depressed and the Time/Data key is in the Data position.

**Delay Start key:** With Time/Data key in the Data position, the channel readout will display H1, H2, L1, or L2 corresponding to a temperature relative to the previous setpoint in that channel. H1 would indicate a higher temperature to be reached in Channel 1, H2 for Channel 2, L1 would indicate a lower temperature to be reached in Channel 1, L2 for Channel 2. The data readout will display the temperature to be reached in each channel before timing begins.

With the Time/Data key in the Time position (time L.E.D. energized), the channel readout will indicate the day the process is to begin (00 to 99) and the data readout the hour and minute of that day. (Example: 02 17 23 corresponding to the second day, 17th hour, and the 23rd minute.) In both situations, the delay start L.E.D. will be energized.

**Jump (Loop) key:** With the Time/Data key in the Data position (time L.E.D. de-energized), the channel readout will indicate the first step in the control loop and the data readout the number of times the complete loop is to be repeated (up to 255). (Example: 03 00 10 corresponding to the first step in the loop is step 03 with 10 repeats.)
Load Tape key: When the Time/Data key is in the Data position (time L.E.D. de-energized), all readouts will blank when the load tape key is depressed. The readouts will function normally, however, when the complete program has been loaded.

Dump Tape key: When the Time/Data is in the Data position (time L.E.D. de-energized), all readouts will blank when the Dump Tape key is depressed. The readouts will function normally, however, when the memory contents have been dumped (loaded in external storage).

NOTE: For more specification information concerning the Load and Dump Tape keys, see How to Program section.

SET-UP ACTUAL MODE:

When in this mode and the Keylock switch is in the "Prog." position, the high and low limits for each channel (C1, C2), as well as the 24-hour real time clock, are programmed. The step (memory location) where the actual program is to begin is also generated in this mode. When the Keylock switch is in the Run position, the data readout will change if the keyboard (0-9) keys are depressed. This information, however, is erroneous and will not be entered into the program. Nothing can be entered when in the Run position.

Time/Data key: When in the Data position (time L.E.D. de-energized), the data readout will indicate the temperature limits of the appropriate channels (C1, C2). In the Time position (time L.E.D. energized), the data readout will indicate the real time on the 24-hour clock. The channel and step readouts are blank in the Time position.

Channel key: Sequentially advances from Channel 1 (C1) and Channel 2 (C2). The step readout will display the associated limit function (HL for high limit, LL for low limit) for each channel.

Enter key: Enters temperature limits and real time clock time into the processor. Must be depressed for each condition.

Step key: Used to select the step where the actual program is to begin. The data readout will display the two-digit number selected. This information is removed when the step key is depressed and the processor function is changed to a different mode. The memory contents will not change.

Jump (Loop) key: Used when a control loop has previously been programmed in the Program Set Point mode. When this key is depressed, the step readout will display the step (memory location) where the program has been instructed to jump back to a previous location and repeat. The channel readout will indicate the first step in the control loop. The data readout will display the number of cycle repeats and will count down as the loops are completed.

(Example: 10 01 0030. Where step 10 is the memory location the loop instruction has been made, 01 is the step the program is to jump to and 0030 the number of repeats to be completed before proceeding with the remainder of the program.)

Delay Start, Load Tape, Dump Tape, and Next Step keys are non-functional in this mode.

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HOW TO PROGRAM

NOTE: Place keylock switch in "Program" position before energizing unit. When switch is in program, the internal battery is removed from the circuit and will insure the unit will "come up" with the proper information displayed. Place the switch in "Run" for running program.

HIGH AND LOW LIMITS FOR CHANNELS 1 AND 2:

1. Keylock switch to Program position.
2. Advance Mode key to Set-up Actual mode.
3. Time/Data key to Data position (time L.E.D. de-energized).
4. Advance Channel key to C1 position with step readout indicating HL (high limit).
5. Using keyboard, load a 4-digit number corresponding to the high limit temperature desired. Push Enter key.
6. Advance Channel key to C2 position with step readout indicating HL (high limit).
7. Using keyboard, load a 4-digit number corresponding to the high limit temperature desired. Push Enter key.
8. Advance Channel key to C1 with step readout to LL (low limit).
9. Using keyboard, load a 4-digit number corresponding to the low limit temperature desired. Push Enter key.
10. Advance Channel key to C2 with step readout to LL (low limit).
11. Using keyboard, load a 4-digit number corresponding to the low limit temperature desired. Push Enter key.

SET REAL TIME ON 24-HOUR CLOCK:

1. Keylock switch to Program position.
2. Advance Mode key to Set-up Actual.
3. Time/Data key to Time position. Step and channel readouts will be blank.
4. Using keyboard, load a 4-digit number corresponding to the real time of day. Push Enter key.
SET POINTS FOR CHANNELS AND 2, ON/OFF OUTPUTS FOR AUXILIARIES 1 AND 2 AND TIME LENGTH (PROCESS TIME) FOR EACH STEP:

1. Keylock switch to Program position.
2. Advance Mode key to Program Set Point mode.
3. Time/Data key to Data position (time L.E.D. de-energized).
4. Depress Halt key indicated by the halt L.E.D. If not in the Halt position, the process will begin as soon as a time length for any step is entered.

When initially energized, the unit will start in step 01. If another step is to be used as the starting point, load a 2-digit number corresponding to the desired step and push Step key.

5. Push Clear key. This operation clears the entire step of any random information.
6. Using Channel key, advance to C1.
7. Load a 4-digit number corresponding to the desired set point — enter.
8. Advance to C2 and load a 4-digit number corresponding to the desired set point — enter.
9. Advance to A1 and load desired on/off functions (0 = off, 1 = on) in all four locations — enter.
10. Advance to A2 and load desired on/off functions — enter.
11. Time/Data key to Time position (time L.E.D. energized).
12. Load a 4-digit number corresponding to the time length for this step in hours and minutes — enter.

This completes the procedure for loading any step in the program. To proceed to the next step, depress the Next Step key and program in the same manner as the previous step.

NOTE: Although this procedure incorporates the entire capability for each step, all functions are not required; however, at least one set point (C1, C2) or one auxiliary (A1, A2) must be used as well as the time length for each step.

DELAY (WAIT-FOR) TEMPERATURE:

1. Keylock switch to Program position.
2. Advance to Program Set Point mode.
3. Time/Data key to Data position (time L.E.D. de-energized).
4. Push Delay Start key indicated with the Delay Start L.E.D.
5. Channel readout will indicate H1, H2, L1, or L2 corresponding to Channels 1 and 2. H1 would indicate a higher temperature to be reached for Channel 1 (C1); likewise, H2 for C2. L1 would indicate a lower temperature to be reached for Channel 1 (C1); likewise, L2 for C2. Channel key is used to select desired operation.
6. Select desired operation and channel.

NOTE: Only one channel and one temperature may be entered per step. If both channels are required to wait-for temperature, the next memory location (step) must be used.

DELAY START (TIME)

1. Keylock switch to Program position.
2. Advance to Program Set Point mode.
3. Push Delay Start key indicated with Delay Start L.E.D.
4. Time/Data key to Time position (time L.E.D. energized).
5. Using keyboard, load a 2-digit number corresponding to the day (up to 99) the process is to begin (if same day, load 00). Load a 4-digit number corresponding to the hour and minute of that day, in real time, on the 24-hour clock. Push Enter key. On completion, the channel readout will indicate the day and the data readout, the hour and minute of that day.

LOOP REPEAT (CONTROL LOOP WITHIN A PROGRAM):

1. Keylock switch to Program position.
2. Advance to Program Set Point mode.
3. Time/Data key to Data position (time L.E.D. de-energized).
4. Load and enter all set points and on/off functions for each step within the control loop.
5. When the last step of the loop has been entered, advance to the next step.
6. Depress Jump (Loop) key (jump L.E.D. energized). The channel and data readouts are blanked.
7. Using the keyboard, load a 2-digit number corresponding to the first step in the loop. Load a 4-digit number corresponding to the number of times the loop is to be repeated (up to 255). Push Enter key.
8. When the specified number of repeats have been accomplished, the unit will proceed to the next step and perform whatever instructions it has been given, either a stop and hold or continue with next step. If no previous instruction has been given, however, the loop will repeat itself indefinitely.

DUMP TAPE:

1. Keylock switch to Program position.
2. Advance to Program Set Point mode.
3. Time/Data key to Data position (time L.E.D. de-energized).
4. Load a 2-digit (01-99) identification number. This number will be used when recalling from tape.
5. Start recorder.
6. Depress Dump Tape key. All readouts will blank until entire memory contents are loaded onto tape (approximately 45 seconds). After tape is loaded the readouts will light and operate normally.

LOAD TAPE:
1. Keylock switch to Program position.
2. Advance to Program Set Point mode.
3. Time/Data key to Data position (time L.E.D. de-energized).
4. Load the 2-digit identification number for the program that is to be recalled.
5. Start recorder. Considerable time will be saved if counter in recorder is preset at the starting point of the instructions to be recalled.
6. Depress Load Tape key. All readouts will blank until the processor memory is loaded from the tape. After processor is loaded, the readouts will function normally.

TO INITIATE A CYCLE:
1. Keylock switch to the Program position.
2. Advance to Set-up Actual mode.
3. Time/Data Key to Data position.
4. Using keyboard, select the step (01-80) where the process is to begin.
5. Depress Step Key.
6. Release the Run/Halt Key to the Run position

Note: If program was entered with the Run/Halt Key in the Run (Released) position, the program started when the first step was entered.

TO STOP A CYCLE:
1. Keylock switch to Program position.
2. Mode Key to Program Set Point.
3. After last setpoint in program has been entered, advance to next step.
4. Depress Jump Loop Key.
5. Load a 6-digit number corresponding to last programmed step and number of repeats. Enter.

Example: Total program length is 5 steps and processor is to hold at step 5. Advance to step 6 and load 05 0000.

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SAMPLE PROGRAM 1

The following program will execute the parameters necessary to perform Mil. Spec. 810C. The specification calls for a starting point of 28°C, a ramp to 65°C in two hours and hold at 65°C for six hours — all with 95% relative humidity. After the six-hour hold period, a slow ramp down to 28°C in 16 hours is required and is accomplished with 85% relative humidity. The entire cycle is to repeat nine (9) times.

![Temperature vs. Time Graph]

- 95% R.H.
- 85% R.H.

TEMP °C

25 30 35 40 45 50 55 60 65 70 75 80

TIME - HOURS

2 4 6 8 10 12 14 16 18 20 22 24
<table>
<thead>
<tr>
<th>Step</th>
<th>C1</th>
<th>C2</th>
<th>A1</th>
<th>A2</th>
<th>Time</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>0028</td>
<td>0095</td>
<td>0000</td>
<td>0000</td>
<td>0001</td>
<td>Proceed to 28°C, 95% R.H.</td>
</tr>
<tr>
<td>02</td>
<td>0028</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L1, wait for 28°C.</td>
</tr>
<tr>
<td>03</td>
<td>0036</td>
<td>0095</td>
<td></td>
<td></td>
<td>0026</td>
<td>Proceed to 36°C, 95% R.H. in 26 min.</td>
</tr>
<tr>
<td>04</td>
<td>0044</td>
<td>0095</td>
<td></td>
<td></td>
<td>0026</td>
<td>Proceed to 44°C, 95% R.H. in 26 min.</td>
</tr>
<tr>
<td>05</td>
<td>0052</td>
<td>0095</td>
<td></td>
<td></td>
<td>0026</td>
<td>Proceed to 52°C, 95% R.H. in 26 min.</td>
</tr>
<tr>
<td>06</td>
<td>0060</td>
<td>0095</td>
<td></td>
<td></td>
<td>0026</td>
<td>Proceed to 60°C, 95% R.H. in 26 min.</td>
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<tr>
<td>07</td>
<td>0065</td>
<td>0095</td>
<td></td>
<td></td>
<td>0016</td>
<td>Proceed to 65°C, 95% R.H. in 16 min.</td>
</tr>
<tr>
<td>08</td>
<td>0065</td>
<td>0095</td>
<td></td>
<td></td>
<td>0600</td>
<td>Hold at 65°C, 95% R.H. for 6 hours.</td>
</tr>
<tr>
<td>09</td>
<td>0063</td>
<td>0085</td>
<td></td>
<td></td>
<td>0052</td>
<td>Proceed to 63°C, 85% R.H. in 52 min.</td>
</tr>
<tr>
<td>10</td>
<td>0061</td>
<td>0085</td>
<td></td>
<td></td>
<td>0052</td>
<td>Proceed to 61°C, 85% R.H. in 52 min.</td>
</tr>
<tr>
<td>11</td>
<td>0059</td>
<td>0085</td>
<td></td>
<td></td>
<td>0052</td>
<td>Proceed to 59°C, 85% R.H. in 52 min.</td>
</tr>
<tr>
<td>12</td>
<td>0057</td>
<td>0085</td>
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<td>0052</td>
<td>Proceed to 57°C, 85% R.H. in 52 min.</td>
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<tr>
<td>13</td>
<td>0055</td>
<td>0085</td>
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<td>0052</td>
<td>Proceed to 55°C, 85% R.H. in 52 min.</td>
</tr>
<tr>
<td>14</td>
<td>0053</td>
<td>0085</td>
<td></td>
<td></td>
<td>0052</td>
<td>Proceed to 53°C, 85% R.H. in 52 min.</td>
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<tr>
<td>15</td>
<td>0051</td>
<td>0085</td>
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<td></td>
<td>0052</td>
<td>Proceed to 51°C, 85% R.H. in 52 min.</td>
</tr>
<tr>
<td>16</td>
<td>0049</td>
<td>0085</td>
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<td>0052</td>
<td>Proceed to 49°C, 85% R.H. in 52 min.</td>
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<tr>
<td>17</td>
<td>0047</td>
<td>0085</td>
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<td></td>
<td>0052</td>
<td>Proceed to 47°C, 85% R.H. in 52 min.</td>
</tr>
<tr>
<td>18</td>
<td>0045</td>
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<td>Proceed to 45°C, 85% R.H. in 52 min.</td>
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<td>0043</td>
<td>0085</td>
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<td></td>
<td>0052</td>
<td>Proceed to 43°C, 85% R.H. in 52 min.</td>
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<td>0041</td>
<td>0085</td>
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<td></td>
<td>0052</td>
<td>Proceed to 41°C, 85% R.H. in 52 min.</td>
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<td>21</td>
<td>0039</td>
<td>0085</td>
<td></td>
<td></td>
<td>0052</td>
<td>Proceed to 39°C, 85% R.H. in 52 min.</td>
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<tr>
<td>22</td>
<td>0037</td>
<td>0085</td>
<td></td>
<td></td>
<td>0052</td>
<td>Proceed to 37°C, 85% R.H. in 52 min.</td>
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<tr>
<td>23</td>
<td>0035</td>
<td>0085</td>
<td></td>
<td></td>
<td>0052</td>
<td>Proceed to 35°C, 85% R.H. in 52 min.</td>
</tr>
<tr>
<td>24</td>
<td>0033</td>
<td>0085</td>
<td></td>
<td></td>
<td>0052</td>
<td>Proceed to 33°C, 85% R.H. in 52 min.</td>
</tr>
<tr>
<td>25</td>
<td>0031</td>
<td>0085</td>
<td></td>
<td></td>
<td>0052</td>
<td>Proceed to 31°C, 85% R.H. in 52 min.</td>
</tr>
<tr>
<td>26</td>
<td>0029</td>
<td>0085</td>
<td></td>
<td></td>
<td>0052</td>
<td>Proceed to 29°C, 85% R.H. in 52 min.</td>
</tr>
<tr>
<td>27</td>
<td>0028</td>
<td>0085</td>
<td></td>
<td></td>
<td>0024</td>
<td>Proceed to 28°C, 85% R.H. in 24 min.</td>
</tr>
<tr>
<td>28</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jump to Loop to Step 01 (010009)</td>
</tr>
<tr>
<td>29</td>
<td>0028</td>
<td>0085</td>
<td></td>
<td></td>
<td>0001</td>
<td>Jump to step 01 and repeat 9 times.</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Proceed to 28°C, 85% R.H. in 1 min.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jump to Step 29 (290000)</td>
</tr>
</tbody>
</table>

**MICRO-PRO 1000 — MICROPROCESSOR-BASED PROGRAMMER**

**SAMPLE PROGRAM 2**

The following program utilizes both auxiliary channels to provide additional switching capability in controlling an environmental chamber. In this case, the chamber uses two heaters and two stages of cooling to achieve rapid transitions in temperature. At temperatures higher than ambient, one heater and one stage of cooling are utilized to maintain temperatures.

The program starts at 75°F with a rapid rise (2 heaters) to 175°F. When 175 is reached, one heater is disconnected and one stage of cooling is energized to maintain 175°F for two hours. At the end of two hours, both heaters are disconnected and both stages of cooling are energized to give a rapid descent to -50°F. A temperature of -50°F is maintained for two hours. The entire cycle is repeated two times. Upon completion of three complete cycles, the temperature is maintained for 5-1/2 hours at 175°F and then proceeds back to 75°F and holds. Note: C1 is used for chamber temperature, C2 not used, A1-1 for heater 1, A1-2 for heater 2, A2-1 for compressor 1, and A2-2 for compressor 2.
### MICRO-PRO 1000 PROGRAM CHART

<table>
<thead>
<tr>
<th>Step</th>
<th>C1</th>
<th>C2</th>
<th>A1</th>
<th>A2</th>
<th>Time</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>0175</td>
<td>—</td>
<td>1100</td>
<td>0000</td>
<td>0001</td>
<td>Proceed to 175°F. Heaters 1 &amp; 2 energized.</td>
</tr>
<tr>
<td>02</td>
<td>H1</td>
<td>0175</td>
<td>—</td>
<td>—</td>
<td></td>
<td>Wait for 175°F.</td>
</tr>
<tr>
<td>03</td>
<td>0175</td>
<td>—</td>
<td>1000</td>
<td>1000</td>
<td>0200</td>
<td>Hold at 175, Heater 2 off, Compressor 1 on.</td>
</tr>
<tr>
<td>04</td>
<td>-050</td>
<td>—</td>
<td>0000</td>
<td>1100</td>
<td>0001</td>
<td>Proceed to -50°F. Heaters 1 &amp; 2 off, Compressors 1 &amp; 2 on.</td>
</tr>
<tr>
<td>05</td>
<td>-050</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
<td>Wait for -50°F.</td>
</tr>
<tr>
<td>06</td>
<td>-050</td>
<td>—</td>
<td>0000</td>
<td>1100</td>
<td>0200</td>
<td>Hold at -50°F.</td>
</tr>
<tr>
<td>07</td>
<td>Jump Loop</td>
<td>01</td>
<td>0002</td>
<td></td>
<td></td>
<td>Jump to step 1 and repeat twice.</td>
</tr>
<tr>
<td>08</td>
<td>0175</td>
<td>—</td>
<td>1100</td>
<td>0000</td>
<td>0001</td>
<td>Proceed to 175°F.</td>
</tr>
<tr>
<td>09</td>
<td>H1</td>
<td>0175</td>
<td>—</td>
<td>—</td>
<td></td>
<td>Wait for 175°F.</td>
</tr>
<tr>
<td>10</td>
<td>0175</td>
<td>—</td>
<td>1000</td>
<td>1000</td>
<td>0530</td>
<td>Hold at 175.</td>
</tr>
<tr>
<td>11</td>
<td>0075</td>
<td>—</td>
<td>1000</td>
<td>1000</td>
<td>0001</td>
<td>Proceed to 75°F. Heater 1 on, Compressor 1 on.</td>
</tr>
<tr>
<td>12</td>
<td>Jump Loop</td>
<td>11</td>
<td>0000</td>
<td></td>
<td></td>
<td>Hold at 75°F.</td>
</tr>
</tbody>
</table>

### MICRO-PRO 1000 — MICROPROCESSOR-BASED PROGRAMMER

#### FIELD SELECTABLE OPTIONS

Many of the programmer functions may be changed at the discretion of the user in order to fill a particular application. With the removal of selected components (diodes) process timing change, decimal point activation, 50 Hz. operation, teletype output, keylock step option, automatic prompt, jog option, and halt option may be incorporated. To activate any of these options, the operator must select the function desired, identify the particular component to be removed and either desolder or clip that component. To return the unit to its original condition, simply replace the component. The following is a list of the various options, along with an explanation of each:

1. **Programmer Timing:**
   - Hours and minutes.
   - Minutes and seconds.
   - Keylock jog:
     - Run Position — hours and minutes
     - Program Position — minutes and seconds
   - Use CR188 and CR192.
   - Use CR192 Remove CR188.
   - Remove CR188 and CR192.

2. **External Storage Outputs:**
   - Cassette (audio output)
   - Teletype (TTY) output.
   - Use CR187.
   - Remove CR187.

3. **A.C. Line Frequency:**
   - 60 Hz. operation.
   - 50 Hz. operation.
   - Use CR193.
   - Remove CR193.

4. **Prompt Option:** (Automatically advances to next channel C1, C2, A1, A2 when correct entry is made.)
   - Prompt.
   - No Prompt.
   - Remove CR191.
   - Use CR191.

5. **Decimal Point Activation:**
   - C1 without decimal.
   - C1 with decimal.
   - C2 without decimal
   - C2 with decimal
   - Use CR189.
   - Remove CR189.
   - Use CR190.
   - Remove CR190.

6. **Keylock Step Option:** (Allows operator to advance to different step when keylock is in Run position.)
   - Keylock in Run — Cannot advance to different step.
   - Keylock in Program — May advance to different steps.
   - Use CR203.
   - Remove CR203.

7. **Halt Option:** (Allows operator to halt program when keylock switch is in Run position.)
   - Keylock in Run — Cannot halt program.
   - Keylock in Program — May halt program.
   - Remove CR194
   - Use CR194.

The option diodes are located on the printed circuit board nearest the front panel. All the diodes are in sequential arrangement on the bottom of the P.C. board. To obtain access, the back must be removed and the programmer situated to view the diodes. Refer to the below drawing.
TERMINAL STRIP CONNECTION

**J1 TERMINALS**

   240 VAC Connection. Jumper to terminal 5.

2. Not Used.
   240 VAC Connection. L2.

5. Transformer Primary — 120 VAC Connection. Jumper to terminal 3 - L2.  
   240 VAC Connection. Jumper to terminal 1.

   240 VAC Connection. L1.

8. Not Used.
10. A.C. Ground.
11. Not Used.
12. Alarm Relay Contacts — Common — Jumper to N.
15. Not Used.
17. Not Used.
18. Not Used.

**J1 TERMINALS**

A. Transformer Primary — Jumper to terminal 1.
B. Not Used.
C. Transformer Primary — Jumper to terminal 3.
D. Not Used.
E. Transformed Primary — Jumper to terminal 5.
F. Not Used.
H. Transformer Primary — Jumper to terminal 7.
J. Not Used.
K. Not Used.
L. A.C. Ground — Jumper to terminal 10.
M. Not Used.
N. Alarm Relay Contact — Common — Jumper to terminal 12.
P. Not Used.
R. Alarm Relay Contact — Normally Open — Jumper to terminal 14.
S. Not Used.
T. Alarm Relay Contact — Normally Closed — Jumper to terminal 16.
U. Not Used.
V. Not Used.
EXTERNAL CONNECTION DIAGRAM FOR J1

120 VAC CONNECTION
L2 L1 GROUND

COMPONENT SIDE A-V
CIRCUIT SIDE 1-18

1, A
3, C
5, E
7, H
10, L
12, N
14, R
16, T

ALARM RELAY CONTACT COMMON

240 VAC CONNECTION
L2 L1 GROUND

COMPONENT SIDE A-V
CIRCUIT SIDE 1-18

1, A
3, C
5, E
7, H
10, L

ALARM RELAY CONTACT NORMALLY OPEN
ALARM RELAY CONTACT NORMALLY CLOSED
MICRO-PRO 1000

TERMINAL STRIP CONNECTION

J2 TERMINALS
1. TTY Inputs
2. TTY Outputs
3. Audio Input (Cassette)
4. TTY Common
5. Audio Common — Analog Common
6. Channel 1 (C1) Output
7. Auxiliary 2, Output 2
9. Channel 2 (C2) Input
10. Channel 1 (C1) Input
11. Auxiliary 1, Output 4
12. Auxiliary 1, Output 3
14. High Limit Flag, Channel 2 (C2)
15. Auxiliary 2, Output 4
16. Not Used
17. Halt 2 — Used for External Halt Switch
18. Halt 1 — Used for External Halt Switch

J2 TERMINALS
A. Connect to terminal 13 on J2
B. Audio Output (Cassette)
C. Channel 2 (C2) Output
D. Auxiliary 2, Output 3
E. Auxiliary 2, Output 1
F. Low Limit Flag, Channel 2 (C2)
H. Not Used
J. Auxiliary 1, Output 1
K. Not Used
L. Not Used
M. Auxiliary 1, Output 2
N. Not Used
P. Not Used
R. Low Limit Flag, Channel 1 (C1)
S. High Limit Flag, Channel 1 (C1)
T. Not Used
U. Not Used
V. Not Used
EXTERNAL CONNECTION DIAGRAM FOR J2

Component Side A-V

1. TTY INPUT
2. TTY COMMON
3. TTY OUTPUT
4. AUDIO OUTPUT (CASSETTE)
5. AUDIO INPUT (CASSETTE)

Shield

Channel 2 Control

Channel 1 Control

Channel 2 Signal Conditioner

Channel 1 Signal Conditioner

Notes: Shielded cable recommended for micro pro to controller connections.

Power Supply/Relay Board A007-S15-XXX

J2

REMOTE Halt Switch

RUN
THIS SURFACE LABELED WITH NUMBERS 1 THRU 18 AS SHOWN

THIS SURFACE LABELED WITH LETTERS A THRU V AS SHOWN
EXTERNAL CONNECTION DIAGRAM

TEMPERATURE CONTROLLER

SET POT

S1 = PUSH TO READ SET POT SET POINT

S2 = S.P.D.T. TO CONNECT SET POT. OR PROGRAMMER TO TEMP. CONTROLLER

TO MICRO PRO PROGRAMMER

CH1 (IN)

J2-10

COMMON

J2-5

CH1 (OUT)

J2-6

LOCAL

PROGRAMMER

NOTE: SHIELDED CABLE RECOMMENDED FOR MICRO PRO TO CONTROLLER CONNECTIONS
<table>
<thead>
<tr>
<th>Step</th>
<th>C1</th>
<th>C2</th>
<th>A1</th>
<th>A2</th>
<th>Time</th>
<th>Function</th>
</tr>
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<tbody>
<tr>
<td>01</td>
<td></td>
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</tbody>
</table>
FIELD TROUBLESHOOTING

Symptom
Programmer loses memory upon power failure.

Possible Solution
1. Keylock not in Run position.
2. Broken wire on Keylock switch.
3. Defective Keylock switch.
4. Defective battery.

When initially energized, the programmer "comes up" with random information (should start in step 01 with 0075 in C1 and 0050 in C2).

1. Keylock switch is not in Program position.
2. Broken wire on Keylock switch.
3. Defective Keylock switch.

Programmer does not accept program with Keylock switch in Program position.

1. Insure proper procedure for entering is followed (see How to Program section).
2. Broken wire on Keylock switch.
3. Defective Keylock switch.

Programmer timing is fast when operating on 60 Hz.

1. Insure 50/60 Hz. diode is installed, CR193.

Programmer completely non-functional.

1. Insure proper input connections are made.
2. Check internal ribbon cable connections.

Programmer blanks out when executing a program.

1. Push Alarm key to restart.
2. Insure Keylock switch is in Run position.
3. Insure A.C. ground connections (Term. 10 on J1) is properly made.
4. Utilize shielded wire on input and output connections.

Programmer does not perform the wait-for temperature function.

1. Insure external signal conditioner is used.
2. Insure proper connections between signal conditioner and programmer.

Alarm functions do not operate.

1. Insure external signal conditioner is used.
2. Insure proper connections between signal conditioner and programmer.

ACCESSORIES AND REPLACEABLE PARTS

<table>
<thead>
<tr>
<th>Unit</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply/relay board</td>
<td>A007-915-000 without relays</td>
</tr>
<tr>
<td>Relays</td>
<td>A007-915-100 (one relay),</td>
</tr>
<tr>
<td>Battery</td>
<td>A007-915-200 (two relays), etc.</td>
</tr>
<tr>
<td>Keylock Switch</td>
<td>003-052</td>
</tr>
<tr>
<td>Rear cover</td>
<td>830-064-002</td>
</tr>
<tr>
<td>Front Bezel</td>
<td>807-105</td>
</tr>
<tr>
<td>Lens (for front bezel)</td>
<td>216-539</td>
</tr>
<tr>
<td>Connector (18 pin)</td>
<td>216-517/237-457</td>
</tr>
<tr>
<td>Switch (Keyboard pushbutton)</td>
<td>822-022/237-460/237-459</td>
</tr>
<tr>
<td>Switch (Run/Halt pushbutton)</td>
<td>836-090-018</td>
</tr>
<tr>
<td>Cassette recorder with 3 tapes</td>
<td>807-079</td>
</tr>
<tr>
<td></td>
<td>807-080</td>
</tr>
<tr>
<td></td>
<td>A001-068</td>
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