UDC 700 Micro-Pro
Universal Digital Controller

Product Manual

EN11-6226
ELECTROMAGNETIC INTERFERENCE AND SAFETY

EMI Susceptibility: Certified to EN50082-1:1992 and EN50082-2:1995.
NOTE: For line-conducted disturbances induced by RF fields
(10V 80% AM 1kHz), the product is self-recoverable in the
frequency band 9.4MHz to 1.5MHz.


1 FRONT PANEL

1.1. INDICATORS

- Green: OFF = PV < SP; ON = PV = SP; Flashing = PV > SP
- Yellow: OFF = Normal operation; ON = Control Setup; Flashing = Instrument Configuration
- Red: Flash when alarm(s) active.

1.2. KEYS

Scroll key

- All Modes except Calibration:
  - If parameter value is displayed, shows parameter legend (for 1.5 seconds). If legend displayed, shows value of next parameter.
- Calibration:
  - Starts calibration phrase.

Down key

- Normal Operation:
  - Decrements parameter value. With PV displayed, dis-engages Pre-Tune. Also confirms request for entry into Instrument Configuration.
- Control Setup/Instrument Configuration:
  - Decrements parameter value.
- Calibration:
  - Steps to previous calibration phase.

Up key

- Normal Operation:
  - Increments parameter value. With PV displayed, requests Pre-Tune.
- Control Setup/Instrument Configuration:
  - Increments parameter value.
- Calibration:
  - Steps to next calibration phase.
Scroll and Down keys

Normal Operation:
Enters Calibration Mode.

Scroll and Up keys

Normal Operation:
Requests entry into Instrument Configuration

Down and Up keys

Normal Operation:
Enter Control Setup.

Control Setup/Instrument Configuration/Calibration:
Returns to Normal Operation.
2.1. UNPACKING THE INSTRUMENT

1. Remove the Controller from its packing. A panel gasket and a "no tools required" clamp are supplied. Retain the packing for future use (e.g. moving the Controller to a different site).

2. Examine the delivered items for damage or deficiencies. If any is found, notify the carrier immediately.

Figure 2-1 Main Dimensions

Max. panel thickness = 6mm. Panel must be rigid.

Figure 2-2 Cut-out Dimensions
2.2. INSTALLING THE CONTROLLER IN THE MOUNTING PANEL

CAUTION: Do not remove the front panel gasket from the Controller, as this may cause inadequate clamping of the Controller to the mounting panel. Ensure that this gasket is not distorted and that the Controller is positioned squarely against the mounting panel. Apply pressure to the front panel bezel only.
3 INSTALLATION - WIRING CONNECTIONS

RECOMMENDED POWER CONNECTION

- 12 - 30V DC Supply (Option)
- 24V AC Supply (Option)
- Mains (Line) Supply

1 The DC (mV) input may serve as a DC (V) input using an external attenuator.
2 If the DC (mA) input is used, Terminals 2 & 4 must be linked externally.
3 Output 2a is available only if Output 3 is not fitted.

Table 3-1 Output Usage

<table>
<thead>
<tr>
<th>Output</th>
<th>Control Output</th>
<th>Alarm 1 Output</th>
<th>Alarm 2 Output</th>
<th>Serial Comms.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output 1</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output 2a</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output 2b</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output 3</td>
<td></td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3-1 Rear Terminal Connections
3.1. **MAINS (LINE) SUPPLY**

This version will operate on a 96 - 264V AC 50/60Hz mains supply. The power consumption is approximately 4W.

**CAUTION:** This equipment is designed for installation in an enclosure which provides adequate protection against electric shock. Local regulations regarding electrical installation should be rigidly observed. Consideration should be given to prevention of access to the power terminations by unauthorised personnel. Power should be connected via a two-pole isolating switch (preferably situated near the Controller) and a 1A fuse, as shown in Figure 3-1.

If the contacts of the relay output(s) are used to carry mains voltage, it is recommended that the relay contacts mains supply should be switched and fused in a similar manner but should be separate from the Controller mains supply.

3.2. **LOW VOLTAGE (24V AC/DC) SUPPLY**

This version operates on 12 - 24V AC 50/60Hz or 12 - 30V DC supply. The power consumption is approximately 4W. Connection should be made via a two-pole isolating switch and a 315mA slow-blow (anti-surge Type T) fuse (see Figure 3-1).

3.3. **THERMOCOUPLE INPUT**

The correct type of thermocouple extension leadwire or compensating cable must be used for the full distance between the Controller and the thermocouple, ensuring that the correct polarity is observed throughout. Joints in the cable should be avoided, if possible.

**NOTE:** Do not run thermocouple cables adjacent to power-carrying conductors. If the wiring is run in a conduit, use a separate conduit for the thermocouple wiring. If the thermocouple is grounded, this must be done at one point only. If the thermocouple extension lead is shielded, the shield must be grounded at one point only.

3.4. **RTD INPUTS**

The compensating lead should be connected to Terminal 3. For two-wire RTD inputs, Terminals 2 and 3 should be linked. The extension leads should be of copper and the resistance of the wires connecting the resistance element should not exceed 5 ohms per lead (the leads should be of equal length).
3.5. **DC INPUTS**

DC (mV) inputs are connected to Terminals 2 and 3 in the polarity shown in Figure 3-1; DC (V) inputs are connected to the same terminals with the same polarity but require an external attenuator. DC (mA) inputs are connected to Terminals 3 and 4 in the polarity shown in Figure 3-1 with Terminals 2 and 4 linked externally.

3.6. **RELAY OUTPUTS (OUTPUTS 2 & 3)**

The contacts are rated at 2A resistive at 120/240V AC.

3.7. **SSR DRIVE OUTPUT (OUTPUT 1)**

This output produces a time-proportioned non-isolated DC signal (0 - 10V nominal, into 500Ω minimum).

3.8. **RS485 COMMUNICATIONS**

The “A” terminal (Terminal 12) on the Controller should be connected to the “A” terminal on the master device; the “B” terminal (Terminal 11) on the Controller should be connected to the “B” terminal on the master device. This instrument uses standard RS485 devices, isolated from all other inputs and outputs. The devices present a $\frac{1}{2}$-unit load to the RS485 line. Generally, termination will not be required but may be necessary for line lengths greater than 100 metres. Where termination is necessary, it is recommended that a 120Ω resistance in series with a 0.1µF capacitor be used at each end of the line (see Figure 3-2).

![Figure 3-2 RS485 Line Termination](image-url)
4 INSTRUMENT CONFIGURATION

4.1. ENTRY

To enter Instrument Configuration mode, use the key sequence shown on the right.

4.2. PARAMETER SEQUENCE

Use the Scroll key to step through the parameters, as shown on the right. Use the Up/Down keys to adjust the displayed value. The parameter sequence is shown in Figure 4-1. Adjustment ranges are shown in Table 4-1 and default values are shown in Table 4-4.

4.3. EXIT

To exit from Instrument Configuration mode, select display of a parameter name, then hold down the Up and Down keys for three seconds (see right). The instrument will then return to Normal Operation Mode via an instrument reset and self-test sequence.

NOTE: If there is no key activity for five minutes in Instrument Configuration Mode, an automatic return is made to Normal Operation Mode (via an instrument reset and self-test sequence).
Use Scroll key to select parameter

Sensor Select
Input Range Min.
Input Range Max.
Input Decimal Point Position
Output Select
Communications Address

Use Up/Down keys to adjust displayed value

Communications Baud Rate
Communications Parity
Single/Dual Setpoint Select
Alarm 1 Type
Alarm 2 Type
Control Select
Tuning

1. Appears only if sensor selected is DC (mA, mV or V)
2. Appears only if Communications option is configured and fitted
3. Appears only if Output 3 is configured and fitted
4. Appears only if PID control is configured

Figure 4-1 Instrument Configuration Parameter Sequence
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Function</th>
<th>Adjustment Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Select</td>
<td>Selects input sensor type, resolution and input units (°F or °C) by means of a code number.</td>
<td>See Table 4-2.</td>
</tr>
<tr>
<td>Input Range Min.</td>
<td>Defines minimum value of input range</td>
<td>Thermocouple/RTD inputs: Range Min. Value for selected sensor (see Table 4-2) to 100 LSDs less than current Input Range Max. setting. DC Inputs: −1999 to 9999 with decimal point set according to Input Range Decimal Point Position parameter.</td>
</tr>
<tr>
<td>Input Range Max.</td>
<td>Defines maximum value of input range</td>
<td>Thermocouple/RTD inputs: 100 LSDs greater than current Input Range Min. Setting to Range Max. For selected sensor (see Table 4-2). DC Inputs: −1999 to 9999 with decimal point set according to Input Range Decimal Point Position parameter.</td>
</tr>
<tr>
<td>Input Range Decimal Point Position</td>
<td>For DC inputs only, determines decimal point position.</td>
<td>0 (xxxx), 1 (xxx.x), 2 (xx.xx) or 3 (x.xxx)</td>
</tr>
<tr>
<td>Output Selection</td>
<td>Links outputs to required functions by a 3-digit code (see Figure 4-2).</td>
<td>See Figure 4-2.</td>
</tr>
<tr>
<td>Comms. Address</td>
<td>Defines unique communications address of controller</td>
<td>1 to 128.</td>
</tr>
<tr>
<td>Comms. Baud Rate</td>
<td>Selects Baud rate for serial communications</td>
<td><img src="chart" alt="Baud Rate Options" /></td>
</tr>
<tr>
<td>Comms. Parity</td>
<td>Defines parity for serial communications</td>
<td><img src="chart" alt="Parity Options" /></td>
</tr>
<tr>
<td>Single/Dual Setpoint Select</td>
<td>Selects Single Setpoint or Dual Setpoint operation</td>
<td><img src="chart" alt="Setpoint Options" /></td>
</tr>
<tr>
<td>Parameter</td>
<td>Function</td>
<td>Adjustment Range</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Alarm 1 Type</td>
<td>Selects type of alarm for Alarm 1.</td>
<td>PHd Process High, direct-acting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pl d Process Low, direct-acting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dEd Deviation, direct-acting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bAd Band, direct-acting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PHr Process High, reverse-acting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pl r Process Low, reverse-acting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>dEr Deviation, reverse-acting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bAr Band, reverse-acting</td>
</tr>
<tr>
<td>Alarm 2 Type</td>
<td>Selects type of alarm for Alarm 2.</td>
<td>As for Alarm 1 Type.</td>
</tr>
<tr>
<td>Control Select</td>
<td>Selects the control action and algorithm</td>
<td>r_P Reverse-acting PID</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d_P Direct-acting PID</td>
</tr>
<tr>
<td></td>
<td></td>
<td>r_o Reverse-acting ON/OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d_o Direct-acting ON/OFF</td>
</tr>
<tr>
<td>Tuning Select</td>
<td>Selects Manual Tuning or Hands-Off Tuning (Easy Tune)</td>
<td>EASY Easy Tune</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pA_n Manual Tuning (with Pre-Tune)</td>
</tr>
<tr>
<td>Input Type</td>
<td>Code</td>
<td>Range Min.</td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Thermocouple</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type J</td>
<td>100 (°C)</td>
<td>−200°C</td>
</tr>
<tr>
<td></td>
<td>101 (°F)</td>
<td>−328°F</td>
</tr>
<tr>
<td></td>
<td>110 (°C)</td>
<td>−128.0°C</td>
</tr>
<tr>
<td></td>
<td>111 (°F)</td>
<td>−198.4°F</td>
</tr>
<tr>
<td>Type T</td>
<td>200 (°C)</td>
<td>−240°C</td>
</tr>
<tr>
<td></td>
<td>201 (°F)</td>
<td>−400°F</td>
</tr>
<tr>
<td></td>
<td>210 (°C)</td>
<td>−128.0°C</td>
</tr>
<tr>
<td></td>
<td>211 (°F)</td>
<td>−198.4°F</td>
</tr>
<tr>
<td>Type K</td>
<td>300 (°C)</td>
<td>−240°C</td>
</tr>
<tr>
<td></td>
<td>301 (°F)</td>
<td>−400°F</td>
</tr>
<tr>
<td></td>
<td>310 (°C)</td>
<td>−128.0°C</td>
</tr>
<tr>
<td></td>
<td>311 (°F)</td>
<td>−198.4°F</td>
</tr>
<tr>
<td>Type N</td>
<td>400 (°C)</td>
<td>0°C</td>
</tr>
<tr>
<td></td>
<td>401 (°F)</td>
<td>32°F</td>
</tr>
<tr>
<td>Type B</td>
<td>500 (°C)</td>
<td>100°C</td>
</tr>
<tr>
<td></td>
<td>501 (°F)</td>
<td>211°F</td>
</tr>
<tr>
<td>Type R</td>
<td>600 (°C)</td>
<td>0°C</td>
</tr>
<tr>
<td></td>
<td>601 (°F)</td>
<td>32°F</td>
</tr>
<tr>
<td>Type S</td>
<td>700 (°C)</td>
<td>0°C</td>
</tr>
<tr>
<td></td>
<td>701 (°F)</td>
<td>32°F</td>
</tr>
<tr>
<td><strong>RTD (Pt100)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>800 (°C)</td>
<td>−199°C</td>
</tr>
<tr>
<td></td>
<td>801 (°F)</td>
<td>−327°F</td>
</tr>
<tr>
<td></td>
<td>810 (°C)</td>
<td>−127.9°C</td>
</tr>
<tr>
<td></td>
<td>811 (°F)</td>
<td>−198.3°F</td>
</tr>
<tr>
<td><strong>DC Linear</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 20mA</td>
<td>900</td>
<td>−1999</td>
</tr>
<tr>
<td>4 - 20mA</td>
<td>1000</td>
<td>−1999</td>
</tr>
<tr>
<td>0 - 50mV</td>
<td>2000</td>
<td>−1999</td>
</tr>
<tr>
<td>10 - 50mV</td>
<td>3000</td>
<td>−1999</td>
</tr>
</tbody>
</table>

4-5
<table>
<thead>
<tr>
<th>Process Output</th>
<th>Alarm 1 Output</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code</td>
<td>Meaning</td>
<td>Code</td>
</tr>
<tr>
<td>0</td>
<td>Not fitted</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>Relay</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>SSR Drive</td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 4-2  Display of Output Selection Code

Table 4-3  Parameter Default Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Default Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Select</td>
<td>100 - Thermocouple “J” (−200°C to 1200°C)</td>
</tr>
<tr>
<td>Input Range Min.</td>
<td>Thermocouple/RTD - Input Range Min.; DC Linear - 0</td>
</tr>
<tr>
<td>Input Range Max.</td>
<td>Thermocouple/RTD - Input Range Max.; DC Linear - 1000</td>
</tr>
<tr>
<td>Decimal Point Posn.</td>
<td>0</td>
</tr>
<tr>
<td>Output Selection</td>
<td>1200 - Relay control output, SSR Drive, no option</td>
</tr>
<tr>
<td>Comms. Address</td>
<td>1</td>
</tr>
<tr>
<td>Comms. Baud Rate</td>
<td>4800</td>
</tr>
<tr>
<td>Comms. Parity</td>
<td>None</td>
</tr>
<tr>
<td>Single/Dual SP Select</td>
<td>1 - Single Setpoint operation</td>
</tr>
<tr>
<td>Alarm 1 Type</td>
<td>Process High Alarm</td>
</tr>
<tr>
<td>Alarm 2 Type</td>
<td>Process Low Alarm</td>
</tr>
<tr>
<td>Control Select</td>
<td>Reverse-acting PID control</td>
</tr>
<tr>
<td>Tuning Select</td>
<td>Easy Tune</td>
</tr>
</tbody>
</table>
5 CALIBRATION MODE

The Controller is shipped from the factory ready-calibrated and normally does not need further calibration. However, some users may have a legal requirement for annual calibration. The procedures set out in this Section serve that purpose.

NOTE: These procedures should be implemented only by personnel competent and authorised to do so.

Table 5-1 Calibration Mode Pre-requisites

<table>
<thead>
<tr>
<th>Phase 1: DC mV Linear Input</th>
<th>50mV DC across Terminals 2 &amp; 3 in the polarity shown in Figure 3-1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 2: RTD Input</td>
<td>200Ω across terminals 1 &amp; 2 with compensating lead connected to Terminal 3.</td>
</tr>
<tr>
<td>Phase 3: DC mA Input</td>
<td>20mA source current connected to Terminals 3 &amp; 4 in the polarity shown in Figure 3-1.</td>
</tr>
<tr>
<td>Phase 4: Thermocouple Input/CJC</td>
<td>0°C reference facility, Type K thermocouple leads (or equivalent) connected to Terminals 2 &amp; 3.</td>
</tr>
</tbody>
</table>

5.1 ENTRY INTO CALIBRATION MODE

To enter Calibration Mode, proceed as shown on the right:

Power-up the Controller, then:

To display

Indicates that first calibration phase is ready to be executed.

Hold down for at least 6 seconds
5.2 CALIBRATION PROCEDURE

Use Up or Down key to select phase

Phase running

PASS

Press Scroll key to start phase

Phase running

PASS

Press Scroll key to start phase

Phase running

PASS

Press Scroll key to start phase

If FAIL is displayed, use the Up and Down keys to re-start the phase in question.

5.3 TO EXIT CALIBRATION MODE

NOTE: If there is no key activity for five minutes in Calibration Mode, an automatic return is made to Normal Operation Mode.
MODBUS COMMUNICATIONS

A.1 FUNCTIONS SUPPORTED

The following MODBUS functions are supported, (JBUS names - where such an equivalence exists - in italics):

- Read Coil Status *(Read n Bits)* - 01/02
- Read Holding Registers *(Read n Words)* - 03/04
- Force Single Coil *(Write 1 Bit)* - 05
- Preset Single Register *(Write 1 Word)* - 06
- Loopback Diagnostic Test - 08
- Preset Multiple Registers *(Write n Words)* - 16

The instrument will identify itself in reply to a Read Holding Registers message which enquires the values of parameter numbers 121 and 122.

A.2 PARAMETER NUMBERS

Bit Parameters are summarised in Table A-1 and Word Parameters are summarised in Table A-2.

<table>
<thead>
<tr>
<th>Table A-1</th>
<th>Bit Parameter Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>Number</td>
</tr>
<tr>
<td>Reserved</td>
<td>1 - 3</td>
</tr>
<tr>
<td>Pre-Tune</td>
<td>4</td>
</tr>
<tr>
<td>Alarm 1 Status</td>
<td>5</td>
</tr>
<tr>
<td>Alarm 2 Status</td>
<td>6</td>
</tr>
<tr>
<td>Reserved</td>
<td>7 - 16</td>
</tr>
</tbody>
</table>

To enable Pre-Tune, write a non-zero value; to disable Pre-Tune, write zero. Enable Pre-Tune will fail if the process variable is within 5% of input span from the setpoint. This failure will not be signalled by communications.

Read Only
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Number</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Variable value</td>
<td>1</td>
<td>Read Only</td>
</tr>
<tr>
<td>Current Setpoint value</td>
<td>2</td>
<td>Read Only</td>
</tr>
<tr>
<td>Output Power</td>
<td>3</td>
<td>Read Only</td>
</tr>
<tr>
<td>Deviation</td>
<td>4</td>
<td>Read Only</td>
</tr>
<tr>
<td>Proportional Band</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Reset</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Rate</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Bias</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>ON/OFF Differential</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Output Cycle Time</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Input Filter Time Constant</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Alarm 1 value</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Alarm 2 value</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Selected Setpoint (1 or 2)</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Setpoint 1 value</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Setpoint 2 value</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Process Variable Offset</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Range Decimal Point Position</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Manufacturer ID</td>
<td>121</td>
<td>Read Only - 231 (representing “W1”)</td>
</tr>
<tr>
<td>Equipment ID</td>
<td>122</td>
<td>Read Only - number 2300</td>
</tr>
</tbody>
</table>
TECHNICAL ASSISTANCE

If you encounter a problem with your unit, please review all the configuration data to verify that your selections are consistent with your application (i.e. inputs, outputs, alarms, limits etc.). If the problem persists after checking the above parameters, you can get technical assistance by calling the following:

In the U.S.A.: 1-800-423-9883
In other countries: See following Honeywell Service Center addresses
HONEYWELL SERVICE CENTERS

ARGENTINA
HONEYWELL S.A.I.C.
BELGRANO 1156
BUENOS AIRES
ARGENTINA
Tel.: 54 1 383 9290

AUSTRALIA
HONEYWELL LIMITED
5 Thomas Holt Drive
North Ryde Sydney
NSW AUSTRALIA 2113
Tel.: 61 2 353 7000

BELGIUM
HONEYWELL S.A.
Avenue de Schipol, 3
1140 BRUSSELS
BELGIUM
Tel.: 32 2 728 27 11

CANADA
HONEYWELL LIMITED
THE HONEYWELL CENTRE
529 McNicoll Avenue
M2H 2C9 NORTH YORK, ONTARIO
CANADA
Tel.: 416 502 5200

DENMARK
HONEYWELL A/S
Lyngby Hovedgade 98
2800 LYNGBY
DENMARK
Tel.: 45 45 93 56 56

FRANCE
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