



## Configuring an Input Channel in the nanodac Recorder/Controller for Valve Potentiometer Application Note

### Product

The nanodac™ recorder/controller provides combined recording and control in a single ¼ DIN package.

There are two control loops both of which can be configured to control motorised valves. Typical applications are temperature control of gas or oil fired furnaces, flow control or position control.

The loops can operate in 'Unbounded' mode (VPU) or 'Bounded' mode (VPB). Unbounded mode does not require a position feedback potentiometer, although one can be fitted if required to show the actual position of the valve.

Unbounded mode controls directly the direction and velocity of the movement of the valve in order to minimise the error between the setpoint and the process variable. Control is performed by delivering a 'raise' or 'lower' pulse to control the velocity of the valve in response to the control demand signal. Relays are used to provide raise and lower drives to the valve motors.

Bounded control (VPB) generally uses PD Control, as the motor itself acts as an integrator, to set a required valve position. A feedback potentiometer must be used to provide the signal to measure the actual valve position. This allows the control loop to calculate the difference between the required and actual position dynamically, and adjust the control output accordingly.

Control is performed by delivering a 'Raise' or 'lower' pulse via relays.

### Purpose of this note

The purpose of this application note is to describe how to connect a feedback potentiometer to one of the inputs of the nanodac recorder/controller.

# Configuring an Input Channel in the nanodac Recorder/Controller for Value Potentiometer

## Introduction

The input channels do not have a selection "Pot Input" as one of their choices. As a result if a Valve Positioner with Potentiometer input is required it is necessary to use either a Volts or mV selection for this function. In general a mV input is preferable as this has the highest input impedance of the two possible selections and because it loads the potentiometer slider least will give the best linearity. The available voltage to drive the potentiometer using the VI terminal, although high at 5Volts, has an internal resistance of 25.5k. A potentiometer with a high resistance, although at first sight attractive is not ideal because its high resistance also means that its output impedance, at the slider, will also be high and the resulting loading by the input impedance of the Volts range will result in significant non-linearity in the measurement of position. It is therefore recommended that the resistance of the potentiometer should not be more than 2000ohms. At the low end, the limit for pot resistance is the reduction of the maximum available mV input signal. This should preferably be at least 5mV in order to retain the performance of the input converter.

## Application Example

Configure function blocks as follows:-

Loop 1; Temperature control with valve position output

Channel 1; Thermocouple input

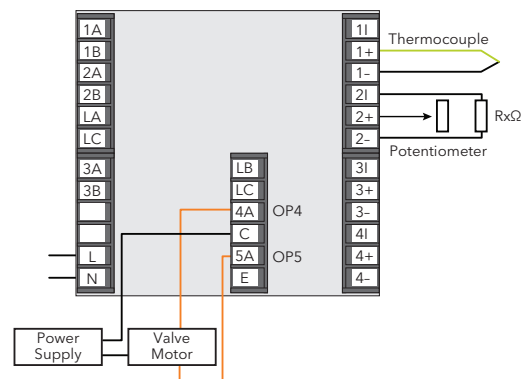
Channel 2; mV input

Connect the potentiometer to input terminals as shown (2I, 2+, 2-).

The nominal potentiometer value for a valve positioning motor is frequently 135Ω . However, in some applications other values may be used. In the case of the nanodac recorder/controller values between 100Ω and 2000Ω can be accommodated but may require a resistor in parallel.

The values of this resistor is shown in the table.

Pot resistance (Ohms)	Rx (Ohms)
100 to 450	Not required
500 to 600	2200
650 to 950	1000
1000 to 1400	680
1450 to 2000	560



nanodac Recorder/Controller Input Terminals

### Calibration

To calibrate the valve position:-

Drive the motor to the fully closed position (or the minimum required position). Make a note of the value of the parameter 'Measured Value', for example 1.6 (this value is in mV). Enter this value in 'Input Low'.

Drive the motor to the fully open position (or the maximum required position). Make a note of the 'Measured Value', for example 21mV. Enter this value in 'Input High'.

The potentiometer position is measured by the parameter 'PV'. To make this parameter show 0 to 100%, enter 0 in 'Scale Low' and 100 in 'Scale High'.

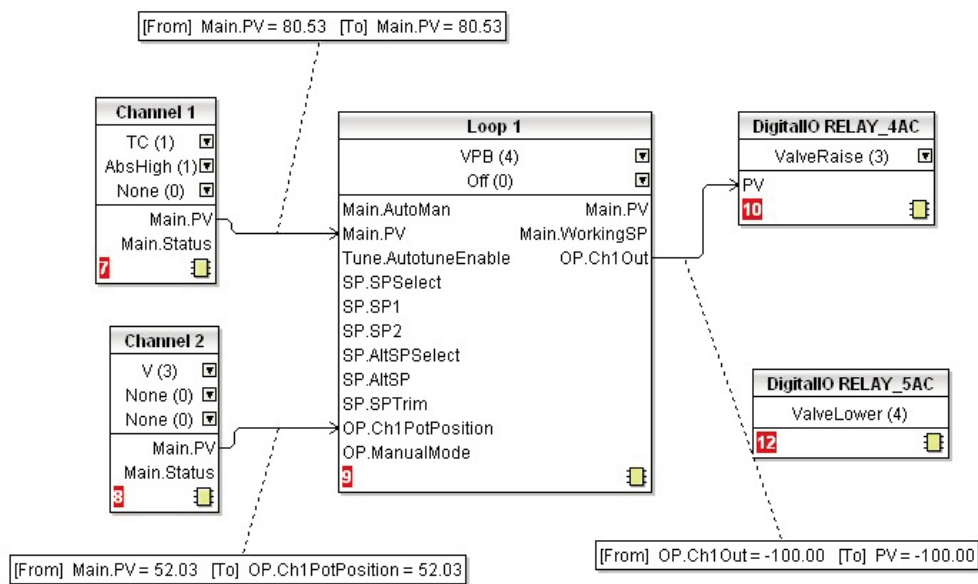
### Internal 'Soft' Wiring

To create a loop for valve position control, wire the process value (temperature) to a channel input (e.g. Channel.1.Main.PV) to the PV input of a loop (e.g. Loop.1.Main.PV).

Wire the potentiometer (if required) to a second channel (e.g. Channel.2.Main.PV to Loop.1.Output Ch1 Pot Pos)

Wire the control output of Loop 1 to relay output 4 (OP.Ch1Out to RELAY\_4AC PV).

Configure RELAY\_4AC to Valve Raise (RELAY\_5AC will automatically configure to Valve Lower)



Graphical View of 'Soft' Wiring using iTools

Further information may be downloaded  
from [www.eurotherm.co.uk](http://www.eurotherm.co.uk)

### nanodac Recorder/Controller

User Guide HA030554  
Brochure HA030685  
Specification sheet HA030686

### iTools Configuration & Monitoring Software

Help Manual HA028838

### Eurotherm Review PC Based Software Package

Brochure HA028081

### Dream Report Software

Brochure HA029515  
User Friendly Reporting Software

### Data Security with Store & Forward

Brochure HA029878

### Environmental Quality Monitoring System

Brochure HA030142

## Eurotherm: International sales and service

[www.eurotherm.com](http://www.eurotherm.com)

**AUSTRALIA** Melbourne  
T (+61 0) 8562 9800  
E [info.eurotherm.au@invensys.com](mailto:info.eurotherm.au@invensys.com)  
**AUSTRIA** Vienna  
T (+43 1) 7987601  
E [info.eurotherm.at@invensys.com](mailto:info.eurotherm.at@invensys.com)  
**BELGIUM & LUXEMBOURG** Moha  
T (+32) 85 274080  
E [info.eurotherm.be@invensys.com](mailto:info.eurotherm.be@invensys.com)  
**BRAZIL** Campinas-SP  
T (+5519) 3707 5333  
E [info.eurotherm.br@invensys.com](mailto:info.eurotherm.br@invensys.com)  
**CHINA**  
T (+86 21) 61451188  
E [info.eurotherm.cn@invensys.com](mailto:info.eurotherm.cn@invensys.com)

Beijing Office  
T (+86 10) 5909 5700  
E [info.eurotherm.cn@invensys.com](mailto:info.eurotherm.cn@invensys.com)  
**FRANCE** Lyon  
T (+33 478) 664500  
E [info.eurotherm.fr@invensys.com](mailto:info.eurotherm.fr@invensys.com)  
**GERMANY** Limburg  
T (+49 6431) 2980  
E [info.eurotherm.de@invensys.com](mailto:info.eurotherm.de@invensys.com)  
**INDIA** Mumbai  
T (+91 22) 67579800  
E [info.eurotherm.in@invensys.com](mailto:info.eurotherm.in@invensys.com)  
**IRELAND** Dublin  
T (+353 1) 4691800  
E [info.eurotherm.ie@invensys.com](mailto:info.eurotherm.ie@invensys.com)

**ITALY** Como  
T (+39 031) 975111  
E [info.eurotherm.it@invensys.com](mailto:info.eurotherm.it@invensys.com)  
**KOREA** Seoul  
T (+82 2) 2090 0900  
E [info.eurotherm.kr@invensys.com](mailto:info.eurotherm.kr@invensys.com)  
**NETHERLANDS** Alphen a/d Rijn  
T (+31 172) 411752  
E [info.eurotherm.nl@invensys.com](mailto:info.eurotherm.nl@invensys.com)  
**POLAND** Katowice  
T (+48 32) 78395000  
E [info.eurotherm.pl@invensys.com](mailto:info.eurotherm.pl@invensys.com)  
**SPAIN** Madrid  
T (+34 91) 6616001  
E [info.eurotherm.es@invensys.com](mailto:info.eurotherm.es@invensys.com)

**SWEDEN** Malmo  
T (+46 40) 384500  
E [info.eurotherm.se@invensys.com](mailto:info.eurotherm.se@invensys.com)  
**SWITZERLAND** Wollerau  
T (+41 44) 7871040  
E [info.eurotherm.ch@invensys.com](mailto:info.eurotherm.ch@invensys.com)  
**UNITED KINGDOM** Worthing  
T (+44 1903) 268500  
E [info.eurotherm.uk@invensys.com](mailto:info.eurotherm.uk@invensys.com)  
**U.S.A.** Ashburn VA  
T (+1 703) 724 7300  
E [info.eurotherm.us@invensys.com](mailto:info.eurotherm.us@invensys.com)

ED65

© Copyright Eurotherm Limited 2011

Invensys, Eurotherm, the Eurotherm logo, Chessell, EurothermSuite, Mini8, Eycan, Eyris, EPower, nanodac, Foxboro and Wonderware are trademarks of Invensys plc, its subsidiaries and affiliates. All other brands may be trademarks of their respective owners.

All rights are strictly reserved. No part of this document may be reproduced, modified, or transmitted in any form by any means, nor may it be stored in a retrieval system other than for the purpose to act as an aid in operating the equipment to which the document relates, without the prior written permission of Eurotherm Limited.

Eurotherm Limited pursues a policy of continuous development and product improvement. The specifications in this document may therefore be changed without notice. The information in this document is given in good faith, but is intended for guidance only.

Eurotherm Limited will accept no responsibility for any losses arising from errors in this document

**i n v e n s y s**  
Operations Management