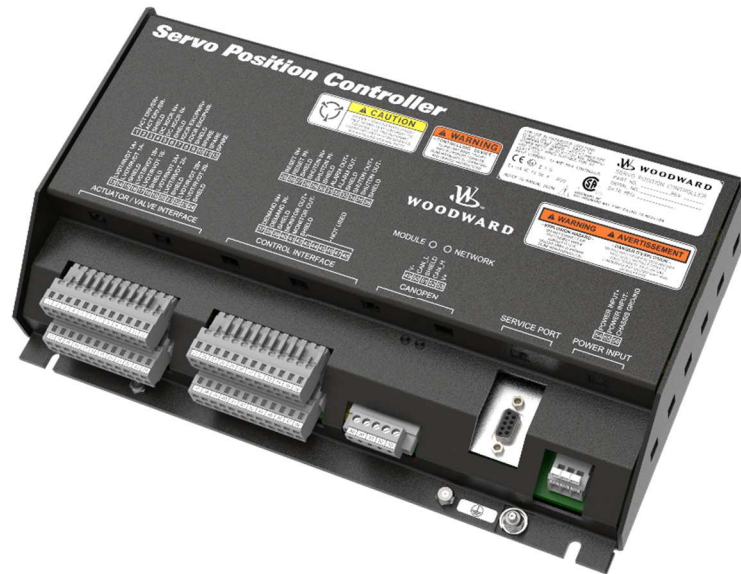




Product Manual 26236
(Revision W, 4/2020)
Original Instructions



SPC
Servo Position Controller

Installation and Operation Manual

Chapter 1.

General Information

The SPC (Servo Position Controller) is available in two model configurations:

8200-226: DeviceNet Control with Analog Backup (or Analog primary demand)
 8200-227: CANopen Control with Analog Backup (or Analog primary demand)

Models 8200-224 & 8200-225 are inactive and replaced by above item numbers.

The SPC positions a hydraulic or pneumatic actuator based on a position demand signal received from a control. The SPC positions a single-coil actuator using single or dual position feedback devices. The position demand signal can be sent to the SPC via DeviceNet or CANopen, (4 to 20) mA, or both. A software program running on a Personal Computer (PC) allows the user to easily configure and calibrate the SPC.

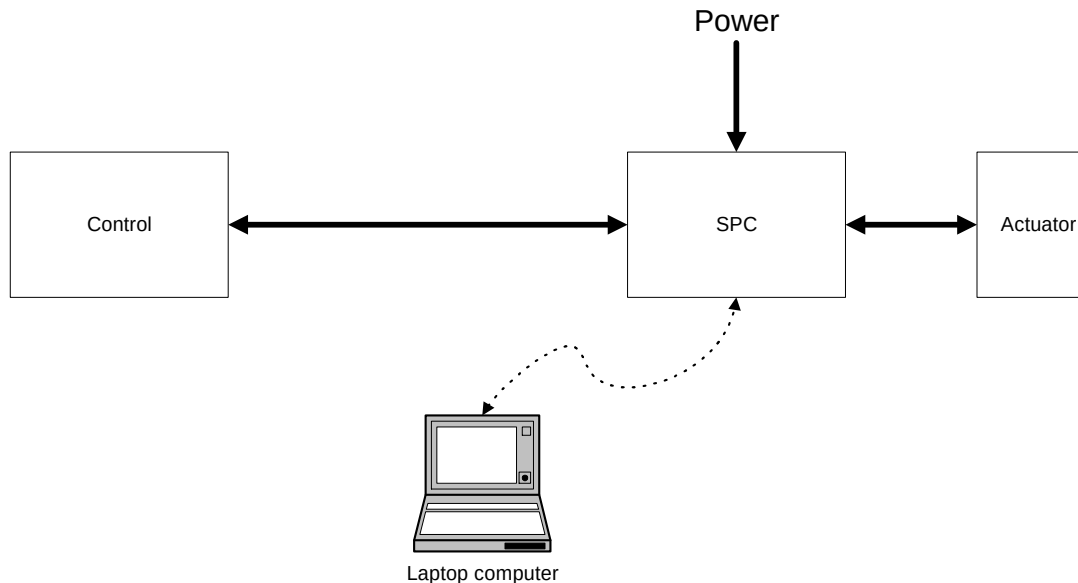


Figure 1-1. SPC Connections

The SPC Service Tool is used to configure, calibrate, adjust, monitor, and troubleshoot an SPC. The service tool runs on a PC and communicates with the SPC through a serial connection. The serial port connector is a 9-pin sub-D socket and uses a straight-through cable to connect to the PC. Woodward offers a USB to 9-pin Serial Adapter kit if needed for new computers that do not have a 9-pin serial connector (P/N 8928-463). This kit contains a USB adapter, software, and a 1.8 m (6 feet) serial cable. (See Chapter 4 for SPC Service Tool installation instructions.)

The SPC is configured by using the SPC Service Tool's configuration file editor to create a file that is then loaded into the SPC. The SPC Service Tool can also read an existing configuration from an SPC into the configuration file editor.

See Chapter 4, SPC User's Guide, for detailed instructions on using the SPC Service Tool.

The first time an SPC is connected to an actuator, it must be calibrated to the actuator's position feedback transducer. The user is guided through the calibration process by the service tool. Calibration can also be performed by the control via the Digital Control link (DeviceNet or CANopen). The calibration procedure can be found in the GAP help file.

IMPORTANT

The SPC chassis must be connected to PE Ground (Potential Earth) using the grounding lug. The wire used for PE ground must be the same size used for the input wires.

The SPC must be attached to protective earth by a ground strap or otherwise, and all cables shielded to ensure electromagnetic immunity integrity.

For best noise immunity, power cables should be run in separate cable trays or conduits from the low-level I/O cables.

Terminal Block Connections

All inputs and outputs are made through spring-actuated terminal blocks. The spring clamp can be actuated using the plastic lever included or by a standard 2.5 mm or 3/32 inch flat-bladed screwdriver. The terminal blocks accept wires from (0.08 to 4) mm² / (26 to 12) AWG. The recommended strip length is 8 mm (0.3 inch).

IMPORTANT

Do not tin (solder) the wires that terminate at the terminal blocks. The spring-loaded terminal blocks are designed to flatten stranded wire, and if those strands are tinned together, the connection loses surface area and is degraded.

See Figure 2-4 for the wiring diagram.

Actuator Driver Output

Connect shielded twisted-pair cable from actuator to ACT DRIVER+(1) and ACT DRIVER-(2). Connect the cable shield to SHIELD (3) but do not connect the shield at the actuator end. The Actuator Driver output is software configurable for ± 10 mA, ± 25 mA, ± 50 mA, ± 100 mA and ± 250 mA ranges.

DC Transducer Input

If a (4 to 20) mA position transducer is used for feedback, connect shielded twisted-pair cable from transducer to DC XDCR IN+(4) and DC XDCR IN-(5). Connect the cable shield to SHIELD(6) but do not connect the shield at the transducer end.

Transducer Exciter/Transducer Power Output

If an AC transducer is used for feedback, this output is used as an exciter for the LVDT or RVDT. Connect a shielded twisted-pair cable from the transducer excitation winding to XDCR EXC/PWR+(7) and XDCR EXC/PWR-(8). Connect the cable shield to SHIELD (9) but do not connect the shield at the transducer end.

If a DC transducer is used for feedback, this output is used to supply 18 V (dc) (120 mA max) for the transducer power. Connect a shielded twisted-pair cable from the transducer power input to XDCR EXC/PWR+(7) and XDCR EXC/PWR-(8). Connect the cable shield to SHIELD (9) but do not connect the shield at the transducer end.

LVDT/RVDT Inputs

If an AC transducer is used for feedback, connect a shielded twisted-pair cable from each LVDT or RVDT secondary to LVDT/RVDT 1A (13 & 14) and LVDT/RVDT 1B (16 & 17). Connect the shields to SHIELD (15 & 18).

If a redundant AC transducer is used, connect a shielded twisted-pair cable from each LVDT or RVDT secondary to LVDT/RVDT 2A (19 & 20) and LVDT/RVDT 2B (22 & 23). Connect the shields to SHIELD (21 & 24).

Redundant SPC Interface

These terminals are reserved for a possible future feature and must be left unconnected.

DeviceNet Interface (8200-226 Model)

The SPC can be alternatively controlled via a network interface. The standard DeviceNet 5-pin plug-in connector allows connection to a DeviceNet network. Red/green indicators are provided to indicate the module and network status. The SPC conforms to DeviceNet Specification Release 2.0 as a Group II only slave. This product has been self-tested by Woodward and found to comply with ODVA Protocol Conformance Test Version 16.

The DeviceNet baud rate and MAC address can be configured using the “DeviceNet” tab under the Configuration File Editor in the Service Tool.

SPC DeviceNet Electronic Data Sheets (EDS) for selected Woodward products that conform to Group II on DeviceNet Specification Release 2.0 can be downloaded from the Woodward website. From www.woodward.com/software, select **DeviceNet Electronic Data Sheets (EDS)**.

The different values are either 4 or 2 bytes long. The entire value must be gathered before the application can be updated. After each index is received, the index sent must be increased by one with looping back to zero when the max is reached.

See Appendix B for specific signal addresses.

CANopen Interface (8200-227 Model)

The SPC can be alternatively controlled via a network interface. The standard CANopen 5-pin plug-in connector allows connection to a CANopen network. Red/green indicators are provided to indicate the module and network status.

The CANopen baud rate and Node Id can be configured using the “CANopen” tab under the Configuration File Editor in the Service Tool. The possible options are:

- 125kbps
- 250kbps
- 500kbps

Per CiA DS-102 Standard, the following are the recommended maximum cable lengths. Differences in the baud rate and the cable length affect the number of units that can be put onto a network.

Table 2-1. Recommended Maximum Cable Lengths and Number of Units

Baud Rate	Cable Length	Number of SPC on link
500kbps	100m	10
250kbps	250m	5
125kbps	500m	2

IMPORTANT

The use of controlled impedance (120 ohm) cable is recommended for proper CAN bus operation. See ISO 11898 series standards for further information.

See Appendix D for specific signal addresses.

Chapter 3.

SPC Specifications

Table 3-1. System Accuracy

Using Digital Input	0.25 % of full scale @ 25 °C, TC < 150 ppm/°C
Using (4 to 20) mA Input	0.25 % of full scale @ 25 °C, TC < 300 ppm/°C

IMPORTANT

System accuracy excludes the position transducer. It assumes field calibration with a minimum feedback span of 4 V (rms) (LVDT/RVDT) or 8 mA (dc transducer).

Table 3-2. Electrical Specifications

Power Input

Nominal Voltage	24 V (dc)
Maximum Voltage Range	(18 to 32) V (dc)
Maximum Continuous Current	1.1 A

Power Dissipation 20 W typical heat load

Actuator Driver Output

Current Range	±10 mA
	±25 mA
	±50 mA
	±100 mA
	±250 mA
Output Filter	6 ms lag
Resolution	11 bits
Linearity	0.2 % of full scale
Temperature Sensitivity	300 ppm/°C
Dither	(0 to 10) %, 25 % duty cycle @ 25 Hz
Load Resistance Range	see Diagnostics section below

Analog Demand and DC Transducer Inputs

Nominal Range	(4 to 20) mA
Operating Range	(2 to 22) mA
Fault Detection	Current < 1 mA or > 23 mA
Common Mode Input Voltage	200 V (dc)
Common Mode Impedance	400 kΩ
Common Mode Rejection	−60 dB @ 60 Hz
Input Impedance	200 Ω
Input Filter	5 ms lag
Resolution	13 bits
Linearity	0.1 % of full scale
Temperature Sensitivity	150 ppm/°C

Monitor Output

Nominal Range	(4 to 20) mA
Operating Range	(0 to 25) mA
Isolation Voltage	500 V (rms)
Maximum Load	500 Ω
Output Filter	3 ms lag
Resolution	12 bits
Linearity	0.2 % of full scale
Temperature Sensitivity	300 ppm/°C

LVDT/RVDT/DC Voltage Input

Maximum AC Voltage	10 V (rms)
DC Voltage Range	(0 to 12) V (dc)
Common Mode Input Voltage	200 V (dc)
Common Mode Rejection	-60 dB @ 60 Hz
Input Impedance	100 k Ω min
Input Filter	10 ms lag
Resolution	14 bits
Linearity	0.1 % of full scale
Temperature Sensitivity	150 ppm/°C

Transducer Exciter Output

Voltage Range	(4 to 10) V (rms)
Frequency Range	(1 to 5) kHz
Maximum Load	120 mA
Resolution	0.1 V (rms)
Accuracy	0.2 % of full scale @ 25 °C
Temperature Sensitivity	150 ppm/°C

Transducer Power Output

Nominal Voltage	18 V (dc) $\pm$ 10 %
Maximum Load	120 mA

Discrete Inputs

Operating Current	10 mA
Contact Open Threshold	> 11 V
Contact Closed Threshold	< 4 V

Relay Driver Outputs

Normal Operating State	Driver On
Maximum Voltage	32 V (dc)
Maximum Current	500 mA
Maximum Voltage Drop	1 V @ 500 mA
Maximum Leakage	10 μ A
Isolation Voltage	500 V (rms)
Maximum Delay	1 ms

Digital Input (DeviceNet/CANopen)

Node Isolation	500 V (rms)
Node Power	self-powered

Service Port

Protocol	RS-232
Connector	9-pin Sub-D socket
Interface Cable Type	Extension (not null modem)
Isolation	500 V (rms)

Diagnostics

The SPC performs multiple diagnostic functions as described in the User Guide of the SPC Service Tool. Following are some details on the hardware-specific aspects of these diagnostic functions:

Table 3-3. Diagnostics

Driver Current Error Threshold:	Demanded current does not match measured current to within $\pm 20\%$.
Driver Overcurrent Threshold:	Measured current exceeds demanded current by more than 25 %.
Approximate Actuator Open Threshold (minimum):	13/(maximum required current, in amps) The open threshold varies with current. The lowest open threshold occurs at the highest required output current. For example, if the maximum current required is 120 mA, the lowest value that will count as an open is $13/0.120 = 108\ \Omega$.
Approximate Actuator Shorted Threshold:	$1/(\text{full scale current, in Amps})$ ohms, where full scale current is the driver current range displayed on the service tool. For example, if the driver current range is ± 100 mA, the short threshold is $(1/0.100) = 10\ \Omega$.
Exciter Voltage Tolerance:	± 0.2 V (rms)
System Diagnostics:	Memory test, continuous monitoring of internal supply voltages, A/D converter reference check, hardware CPU power monitor, software watchdog timer
DeviceNet Communication Faults:	Communications between the SPC and its assigned master have stopped or slowed to less than 200 ms.
CANopen Communication Faults:	The SPC does not receive SYNC and RXPDO1 messages for the configured timeout.

Table 3-4. Environmental Specifications

Temperature Range:	(-40 to +70) °C
Shock:	30 G, 11 ms half sine pulse
Vibration (random):	0.7 G, (5 to 2000) Hz
Humidity:	95 % condensing

Mechanical Specification

Dimension:	330 X 203 X 76 mm (13 X 8 X 3 Inches)
Weight :	1.565 Kg (3.45 lbs)

Pollution Resistance

Particulate Pollution Resistance:	IEC 664-1 Pollution Degree 2 (Normally only nonconductive pollution occurs. Temporary conductivity caused by condensation is to be expected.)
Gaseous Pollution Resistance:	The polyacrylate conformal coating withstands NO ₂ , CO ₂ , SO ₂ , and H ₂ S gases per IEC 60068-2-60: 1995 Part 2.60 Method 1 and 4 (Flowing Mixed Gas Corrosion Test). It will withstand levels typical of telecommunications and computer installations as defined by Battelle Labs Class III (between IEC 60721-3-3 classification 3C1 and 3C2, light industrial to urban industrial, heavy traffic).

IMPORTANT

SPC model 8200-227 requires SPC Service Tool version 14.05 or later to function correctly. This tool version also supports the 8200-226.

Models 8200-224 and 8200-225 can use version 1.2 or later.

Loading an updated version of the Service Tool will automatically remove any previous versions of the Service Tool on the PC. You will receive a prompt that the software will remove the previous version when installing the later version of the Service Tool.

Existing configuration files that reside inside the SPC control created with an earlier version of the Service Tool can be downloaded/saved onto a PC. The downloaded configuration file will automatically be converted to the latest version of the Service Tool.

Finding Detailed Operating Instructions

From the Windows Start menu, select **Programs**, then **Woodward**, then **SPC Service Tool**, and finally select **SPC Service Tool**. Once the SPC Service Tool has started, select **Help** from the menu, and then select **User's Guide**.

The User Guide describes how to configure and calibrate the SPC, and how to monitor and control operation using the service tool, the Digital Control Network, and the analog and discrete I/O lines.

LED Status Indicators

The SPC has two LEDs for status indication. The Network Status LED provides information about the Digital Network port. The Module Status LED provides information about the general operating status of the SPC.

Table 4-1. Network Status LED

LED state	Indicates
Off	SPC is not on-line
Flashing Green	SPC is on-line but no connections have been established
Green	SPC is on-line and allocated to a master
Flashing Red	One or more connections have timed out
Red	SPC is unable to communicate

Table 4-2. Module Status LED

LED State	Indicates
Off	SPC is not powered
Flashing Green	SPC requires configuration and/or calibration
Green	SPC is running normally
Red	SPC internal fault—unit may need to be replaced

Minimum Computer Requirements

- Microsoft Windows 95 / 98 / Me / NT 4.01 2000 / XP
- 300 MHz Pentium CPU
- 64 MB RAM
- 800 by 600 pixel screen
- Serial Port
- Serial Extension Cable

Digital Control Only

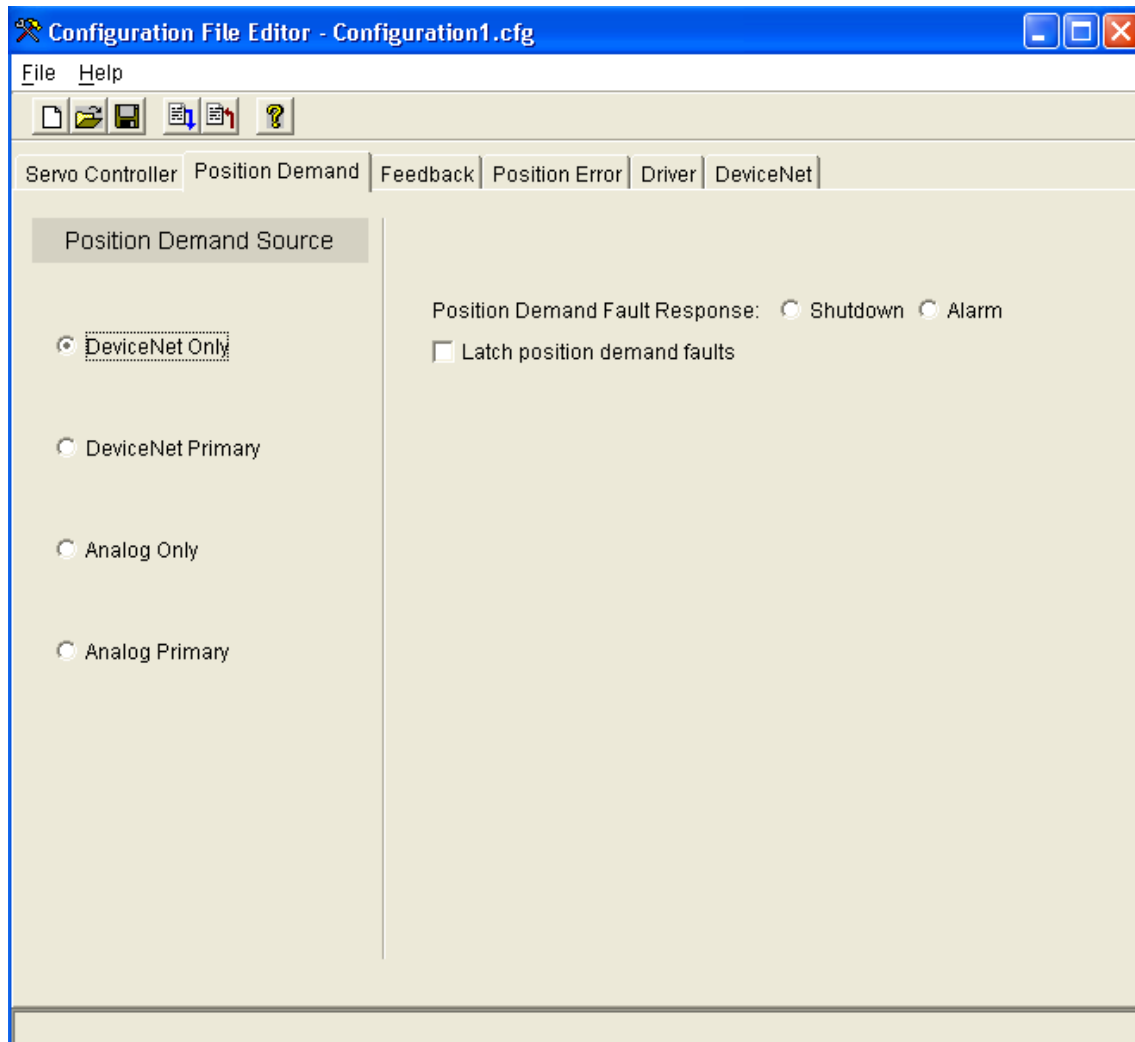


Figure 4-22. Position Demand DeviceNet or CANopen Only

DeviceNet or CANopen Only—The SPC position demand is received on the DeviceNet or CANopen bus.

Position Demand Fault Response

Select Position Demand Fault to respond as an alarm or shutdown.

Latch position demand fault check-box

Check this box if position demand faults should be latched.

Digital Control Primary

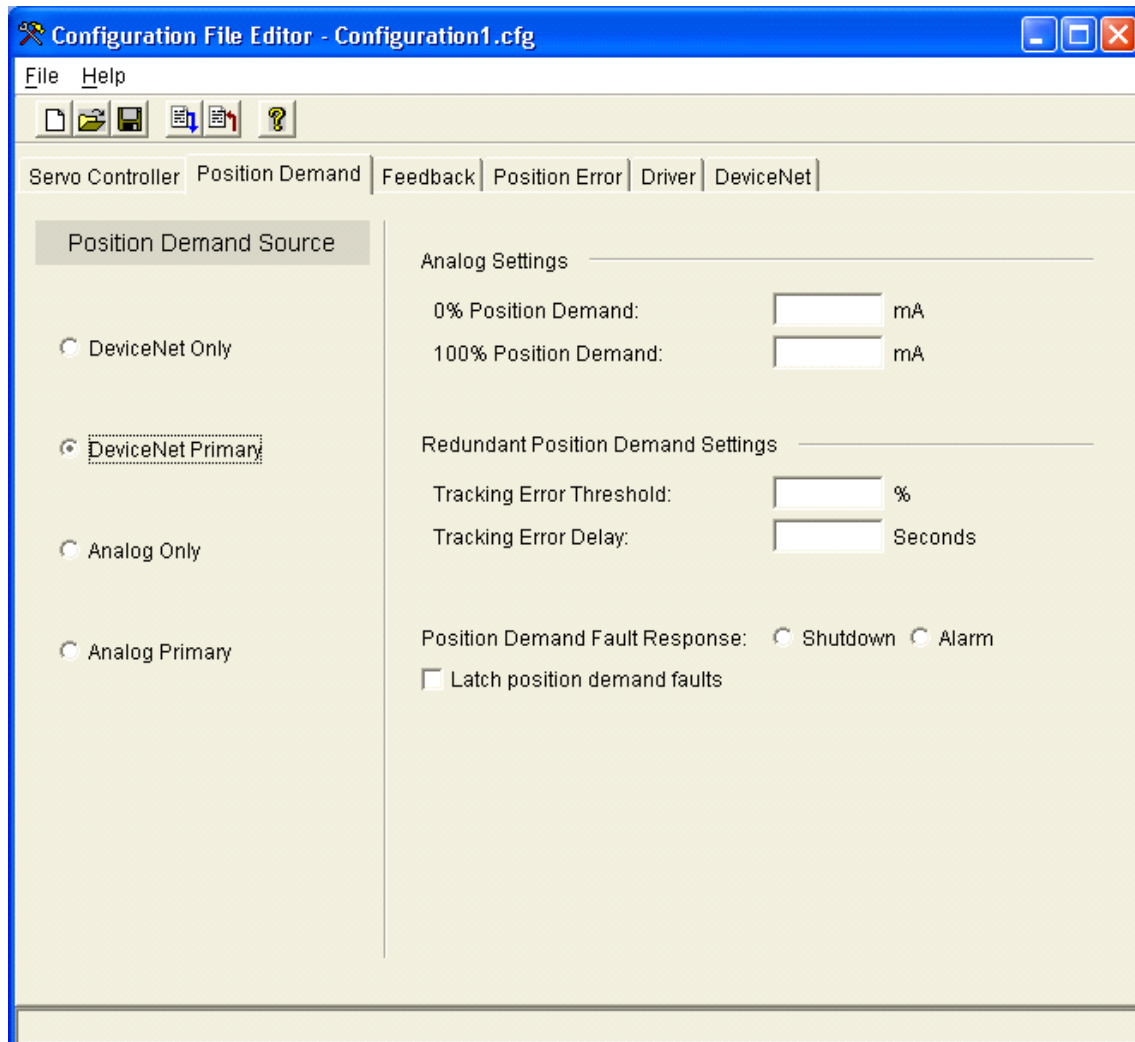


Figure 4-23. Position Demand DeviceNet or CANopen Primary

DeviceNet or CANopen Primary—The SPC position demand is received on the DeviceNet or CANopen bus, and uses the Analog Demand Input as a backup.

Analog 0 % Position Demand

mA value that represents 0 % position demand on the Analog Demand Input.

Analog 100 % Position Demand

mA value that represents 100 % position demand on the Analog Demand Input.

**WARNING**

All SPCs configured for redundant input (CAN/Analog, DeviceNet/Analog or Analog/Analog) must be configured for Fault Response = Shutdown. Please see the SPC Calibration section.

DeviceNet Configuration Settings

Firmware versions 5418-2322 and previous.

The DeviceNet settings are entered on the DeviceNet page of the Configuration File Editor.

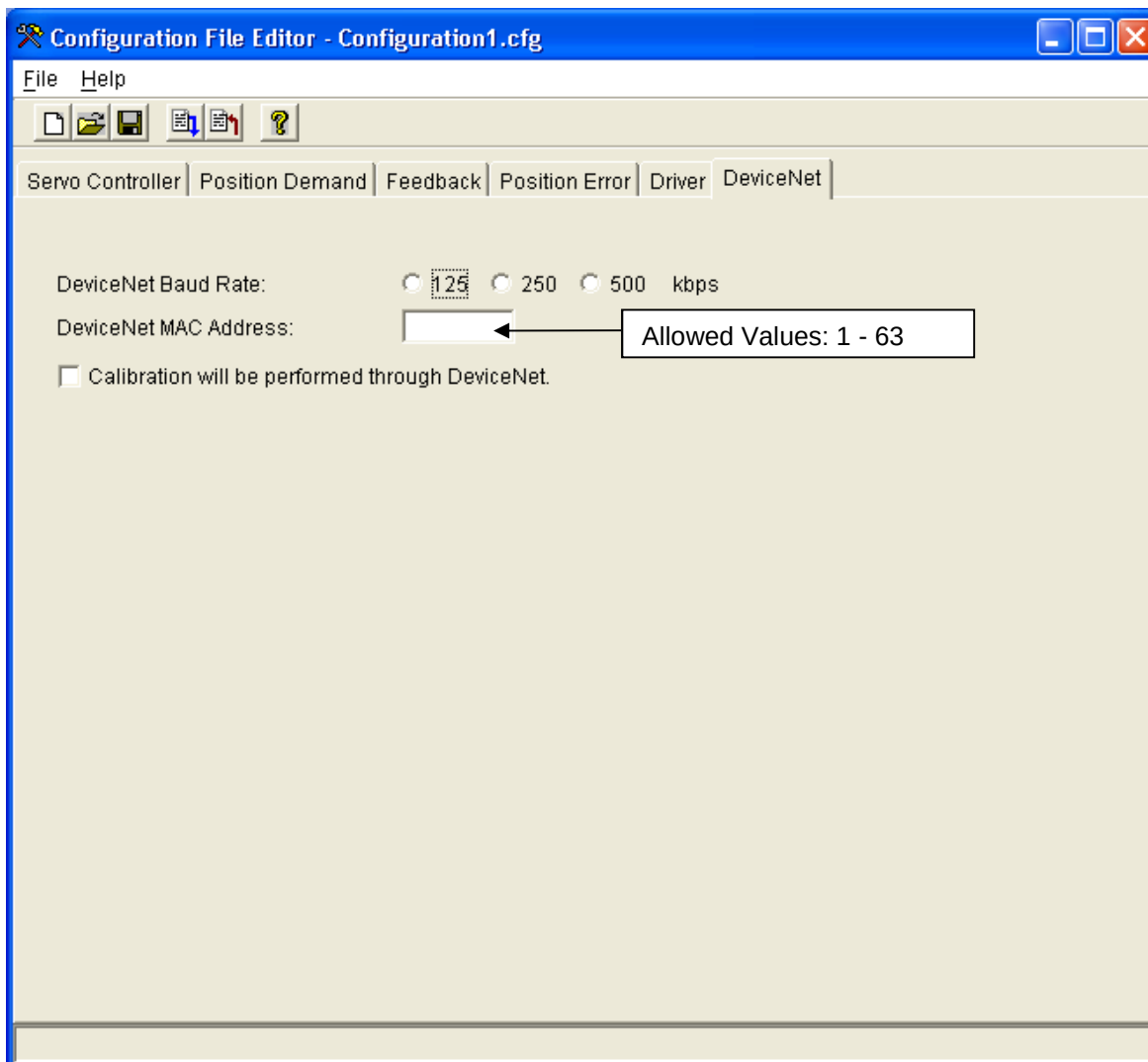


Figure 4-33. DeviceNet Configuration

DeviceNet Baud Rate

Sets the DeviceNet baud rate.

DeviceNet MAC Address

Sets the DeviceNet MAC address.

Allowed values: 1–63

Calibration will be performed through DeviceNet check box

Determines whether calibration will be performed with the service tool or through the DeviceNet port.

Appendix C.

SPC Driver with Pollution Resistance

SPC Part Number	Rev	Description
8200-226	C	Servo Position Controller with silicon coating
8200-226	D	Servo Position Controller with polyacrylate coating

SPC revisions prior to Rev C are coated with a silicon coating material.