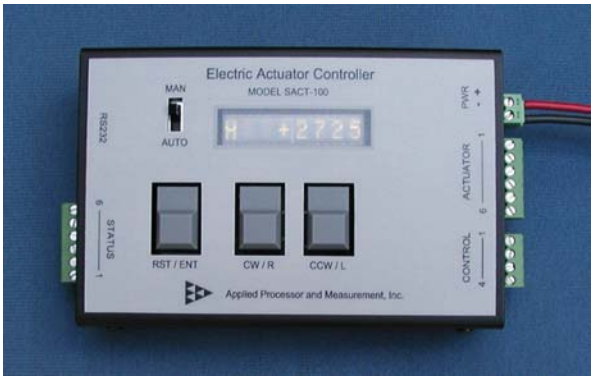
**Applied Processor and Measurement, Inc.**

# Model SACT-100, SACT-101
# Electronic Stepper Motor Actuator Controller

## FEATURES

- unipolar stepper motor drive
- power MOSFET drivers, >2A at 12V outputs
- full step or half step control
- +/- 32,767 step counter
- stepper frequency from 100 to 300 Hz
- built-in front-panel interface
  - 8 character bright green LED display
  - pushbutton controls
- built-in current sensing with stepper motor stall detection capability
- configurable start-up timing / ramp
- 3 control methods
  - manual front-panel controls
  - RS-232 manual or computer controlled
  - digital input / output control
- 2 automatic cycling modes
  - stall to stall cycling
  - cycle based on step count
- 2 opto-isolated digital inputs: move controls
- 2 digital outputs: pulse output, stall indicator
- 2 analog outputs: average current, position
- configurable operation – options on stall
- single letter ASCII command interface
- controller operating voltage 9 to 28 V DC
- stepper operating voltage 1 to 50V DC
- I/O connections using pluggable terminal strip
- rugged metal enclosure, small size
  - 3 in. x 5 in. x 1 in.
- operating temperature: -25 °C to +60 °C
- designed for long service life and high reliability using components rated for industrial temperature range




## APPLICATIONS

- general purpose stepper motor based actuator control – ideal for stand-alone positioning applications
- PLC interface front-end controller for stepper motor based actuators
- HVA/C vent controls
- automotive controls
- engineering development and production test

## MODELS

- SACT-100 – with pushbutton/display interface
- SACT-101 – RS-232, digital I/O control only

## DESCRIPTION

The Model SACT-100 from Applied Processor and Measurement, Inc. is designed for control of electronic stepper motor based actuators used in general purpose industrial, automotive and commercial control applications. The SACT-100 is particularly useful in stand-alone stepper motor control applications because of its built-in pushbutton, LED display interface. The built-in pushbutton / LED display interface may be used in product development and test activities to easily determine and evaluate actuator positioning requirements. The SACT-100 is also designed for automotive stepper motor applications, particularly in HVA/C development and test applications. With its built-in pushbutton / display interface, the SACT-100 is one of the most cost effective, completely stand-alone, manually operated stepper motor controllers available.

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The SACT-100 Controller provides an electronic interface to command a unipolar stepper motor based actuators from a manual pushbutton interface, a standard (computer) serial port, or via digital I/O from a device such as a PLC. Additionally, the controller is able to operate the actuator in a stand-alone automatic cycling mode for durability test applications.

A distinguishing feature of the SACT-100 controller is the ability of the controller to detect a stalled stepper motor. The SACT-100 measures stepper motor winding current at each step and monitors for abnormalities, which indicate a stalled stepper motor. The stall feature allows for determination of the number of steps for your application, or, it can be used to determine points in the travel where the motor is being stressed or hung-up.

The SACT-100 Controller has an 8 digit alphanumeric character LED display which continuously displays the stepper motor position in a signed number format from +32767 (full CW) to –32767 (full CCW). The display also indicates movement direction and motor status (stall indication). The display is a high quality, bright green module, capable of being used in an industrial setting or even in a vehicle passenger compartment in direct sunlight, or at night. Manual, stand-alone operation is performed using the built-in pushbuttons and LED display on the controller. The controller will step the actuator in the direction indicated by pressing the clockwise (CW / R) or counterclockwise (CCW / L) pushbutton.

The SACT-100 Controller has the capability of starting up the stepper motor with step times of other than the operating frequency (pulse period). This is done such that the stepper motor may be brought up to speed using configurable slower step times for the first few motor stepping pulses. The start-up steps are executed at the beginning of every CW or CCW move in either manual or automatic cycling mode.

The SACT-100 Controller is capable of manual or computer controlled operation via the serial port on the controller. The serial port may be used to command the controller by using a host computer such as a PC with a terminal emulator (HyperTerm). Control programs may be written for a host computer or PLC to command and control the SACT-100. A simple ASCII based command set is provided. When using the serial port control, the actuator may be positioned exactly using the ‘C’ and ‘W’ commands, issuing the command with an exact count.

PLC and PC control is also possible using the SACT-100 Controller digital I/O signals. The SACT-100 possesses 2 optically isolated digital input controls (Control I/O connector), which allow for CW and CCW movement of the stepper motor. The inputs are designed (with an internal current set resistor) to accept signals from 5V to 24V nominal for PC and PLC digital outputs. Additionally, the PLC or computer may monitor the digital output pulse and the stall signal available on the Status Connector. The output pulse provides one active high pulse for each step commanded to the stepper motor. The stall output signal will indicate when a stall condition is determined by the controller.

The SACT-100 controller may be used in an automatic cycling mode of operation. The cycling mode can be used to actuate devices in a long term test or in product validation tests. Cycling can be performed in two ways: cycling from end to end of travel, automatically detecting stall at each end, or, cycling a fixed number of steps each direction. A cycle count is available.

The SACT-100 has two analog outputs, one indicating position in the automatic cycling mode and an output voltage indicating the average output current of the stepper/actuator.

The SACT-100 Controller is highly configurable, allowing for settable actions when detecting stall and indicating stall.

The SACT-100 Controller is an in-system reprogrammable microcomputer based controller, the controller is field reprogrammable for upgrades and new features.

A comprehensive User's Manual is provided on our website in PDF format, describing the operation and application of the PWM controller.

## SPECIFICATIONS

- Stepper Coil Output: open drain power MOSFET, maximum power dissipation 50W
  - up to 4A @ 12V, pulsed
  - must operate within safe area of IRL530N
- Stepper Output Coil Operating Voltage: 50V maximum, 1V minimum
- Stepper Output Operating Frequency: 100 to 300 Hz, configurable, 1 Hz resolution
- Controller Power: 9 to 28V DC
  - SACT-100: 200mA typical (exact current depends on LED display reading)
  - SACT-101: 60mA typical
- Digital Inputs: CW, CCW, 5V to 24V DC amplitude, opto-isolated
- Analog Outputs: 0 to 5V, position, average stepper motor current
  - average stepper motor current output, 5mV = 1mA
- RS-232: TX, RX, GND, 9600 baud, no parity, 8 data bits, 1 stop bit, standard DB-9M connector
  - TX pin 2, RX pin 3, ground pin 5
- I/O connections: Phoenix or equivalent 3.81mm pin spacing pluggable terminal strips
- Operating Temperature: -25 °C to +60 °C
- Size: 3 in. x 5 in. x 1 in.
- Packaging: metal enclosure
- Warranty: 90 days, for manufacturing defects

## ORDER NUMBERS

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|---|---|
| SACT-100 | Electronic Stepper Motor Actuator Controller with built-in pushbuttons and display |
| SACT-101 | Electronic Stepper Motor Actuator Controller, I/O control only |
| SACT-101-DIN | Electronic Stepper Motor Actuator Controller, I/O control only, DIN mountable |

## ALTERNATE OUTPUT DRIVER

The SACT-100 Controller may be configured with an output driver to match your specific application in order to meet requirements for product development testing, validation testing, or production testing. Examples of alternate output drivers for stepper motors include the ULN2003A and TJA1010. The SACT-100 has facilities for installation of a daughter board with an alternate output driver. This architecture allows for development and deployment of a SACT-100 unit with an alternate output driver at a very reasonable cost. Contact APM, Inc. with your output driver hardware and software requirements.

## CUSTOM / SEMICUSTOM CONTROLLERS

All standard products from Applied Processor and Measurement, Inc. including the SACT-100 Electronic Stepper Motor Actuator Controller are available for customization. The Model SACT-100 can be designed to exacting specifications for your application, reducing cost for OEM or embedded product applications, changing functionality, or adding features. For more information, contact APM, Inc. via our website, or, call to talk to one of our engineers. APM, Inc has been supplying embedded electronic controls and electronic circuits for nearly 20 years for a wide variety of industrial, automotive and commercial applications.