

DIVA Automation

Innovation in Motion

DA1000
Operating system
and interface for
National Semiconductor
LM629

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Description

The **DA1000**© is designed to provide an operating "shell" around the LM628/629 Servo Controller products from National Semiconductor. The LM628 has been an extremely popular servo controller for 20 years. However, there are some highly desirable features which it lacks, and its complex programming interface poses a technical challenge for many would-be users.

- **Ease of Use.** The **DA1000**© is controlled through a serial interface bus, using ASCII command strings and the **DIMAC**© programming language. For example, to set the acceleration value for subsequent moves, the **DA1000**© uses the simple command, **SA_n** (Set Acceleration = n). By contrast, the LM629 requires a complex sequence of binary transfers, synchronized by a BUSY signal, to accomplish the same operation. The programming units for the control of acceleration in the LM628 are a function of the clock rate and involve a complex calculation to create an integral and a fractional component. The value of "n" for the **DA1000**© example is in units of encoder counts/sec² --a much more easily calculated quantity.

All functions of the L628 are surrounded by the **DA1000**© to simplify operation and control, while extending the utility of the device. When acceleration is modified, as in the previous example, all functions required to convert the acceleration value into the proper format and to transfer the new data to the LM628 are executed automatically by the **DA1000**© without the need of intervention by the operator or high level program.

A more detailed description of the **DIMAC**© control language can be found on our web site.
www.divaauto.com

- **Parameter Storage** The LM628 executes a single move on receipt of a "Go" command, using the most recently entered values for velocity, acceleration and desired position. Likewise, the most recently entered values for the gains of the individual components for the **PID** filter algorithm are used. When power is removed, all such program information is lost and must be re-entered when power is re-applied, in order to achieve operation.

All such control parameters are stored in a non-volatile memory device controlled by the **DA1000**© and restored automatically on reset.

- **Stored-program Operation.** There is no provision made in the LM628 for repetitive motion. The **DA1000**© implements a complete stored-program execution capability, with macro features. A built-in command interpreter with over 50 commands translates from a near-natural language into the LM628 interface sequences. The program is stored in external permanent memory, with the operating parameters.
- **Additional I/O ports.** There are no general purpose I/O ports provided on the LM628. Such ports can be of great value for initiating or synchronizing a motion sequence or for control of optional features. Although it is always possible to service I/O ports at the host controller, this increases the complexity of the system design when several axes require synchronization based on the state of various discrete inputs, such as sensors to detect the presence or absence of parts.

- Some especially valuable uses of I/O ports are things like a start button, an emergency stop button, and "dead man" safety switches. Also, even though the LM628 has a very useful feature that can be used to trigger external events based on reaching a desired position, the reporting of this event from the LM628 can only be done through the programming interface. The **DA1000**© adds a dedicated port that can be used to trigger external equipment in response to this event.

- **Limit Switches.** The LM628 provides no support for any type of limit switch protection, which is a vital component of many mechanical designs. The **DA1000**© incorporates limit switch support in the form of inputs for both CW and CCW motor operation. When either limit switch input is active, the motor is no longer allowed to move in that direction, regardless of other commands.

- **Low cost.** The **DA1000**© is priced comparably with the price of the LM628, even though it extends the functionality of the LM628 by a great deal.

- **Compact.** The **DA1000**© is a single-chip integrated circuit. Some features require an external EEPROM chip, and an RS-232 level shifter.



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