



B Servo Systems

The APEX Series

Brushless Servo Systems

The APEX series provides a common user-friendly system that delivers high performance and reliability in many different packages. The entire series can operate a variety of servo motors, in addition to the standard resolver-based motors. Each unit can accept either hall effect or resolver commutation feedback and can be configured for different pole pair motors.

The entire series incorporates the latest developments in power electronics, including a Smart power block that interfaces directly to the control board. The APEX10, 20 and 40 drives are designed for use with servo controllers in torque or velocity mode, to allow control by any standard $\pm 10V$ analog servo controller.

The APEX6151, APEX6152 and APEX6154 combine the power and reliability of Compumotor's APEX10, 20 and 40 drives with the flexibility of the company's 6000 Series of analog servo controllers. All of these APEX systems use digital signal processor (DSP) technology for a position loop update time of 205 μsec , and a separate microprocessor to execute high-level motion programs. This advanced design makes the series one of the highest performing single-axis stand-alone systems in the industry today.

The APEX6151, 6152 and 6154 also include the powerful set of 6000 position-based following commands that are required in electronic gearing, flying cutoff, and random timing infeed applications.

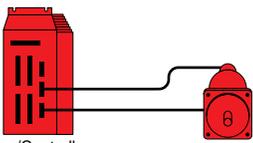
The APEX Series offers maximum ease-of-use through Motion Architect and Motion Builder—Compumotor's exclusive application development software.

Motion Architect allows a user to automatically generate setup code, edit and execute motion control programs, and create a custom operator test panel.

Motion Builder provides a visual development environment for graphical icon-based programming of the 6000 Series products.

A Servo Tuner module is available as an option to Motion Architect, providing a powerful servo tuning aide. The APEX Series is also compatible with Motion Toolbox and DDE Server for additional application flexibility.





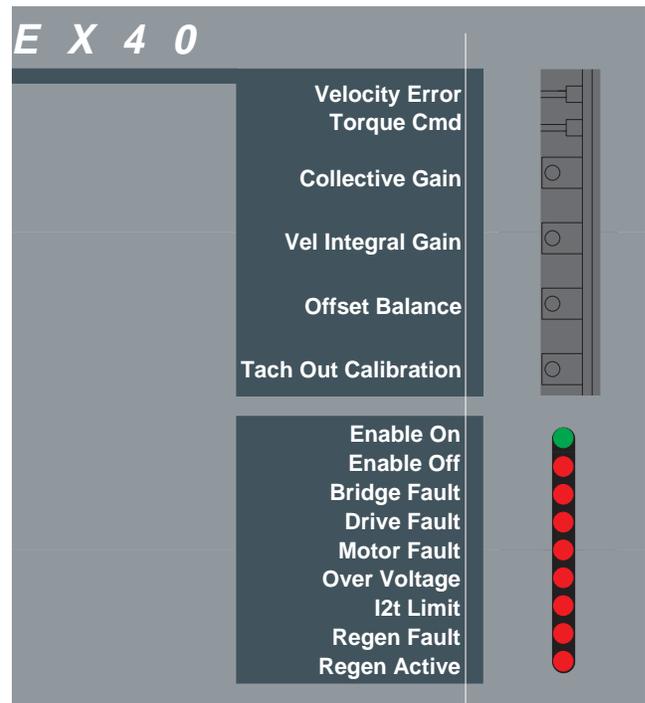
Drive/Controller

Test Points and Tuning Pots

Velocity Error and Torque Command test points and multi-turn tuning pots are all easily accessible at the front panel.

Diagnostics

LED	Description
Enable	Indicates drive is enabled.
Disable	Indicates drive is disabled.
Bridge Fault	Power stage overtemperature. Power stage overcurrent.
Drive Fault	Motor short circuit. Control board overtemperature. Undervoltage (brownout).
Motor Fault	Feedback not connected. Motor overtemperature
Over Voltage	Bus voltage exceeded 420VDC.
I ² T Limit	I ² T Limit exceeded. Drive output limited to continuous current setting.
Regen Fault	Drive faulted due to excessive regeneration. Additional power dump is required.
Regen Active	Indicates drive is dumping excess power.



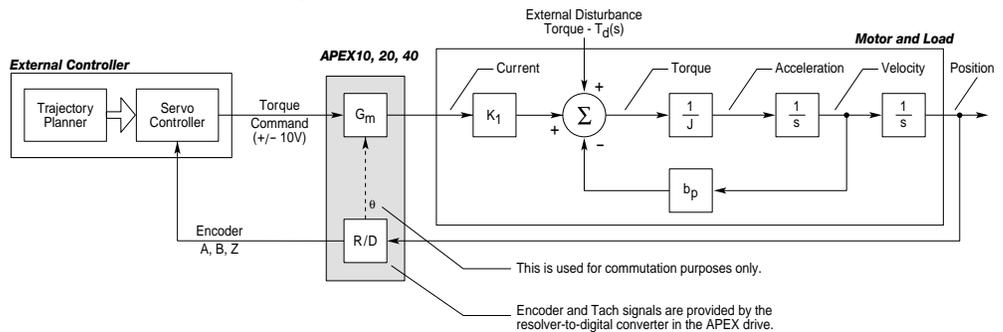
The APEX10, APEX20 and APEX40 Drive

There are two basic modes in which the APEX10, APEX20 and APEX40 drives can operate: torque and velocity. Shown here is a block diagram of the drive operating in **torque mode**. The gain G_m represents the transfer function of the current regulator and is set up by using the dip switches.

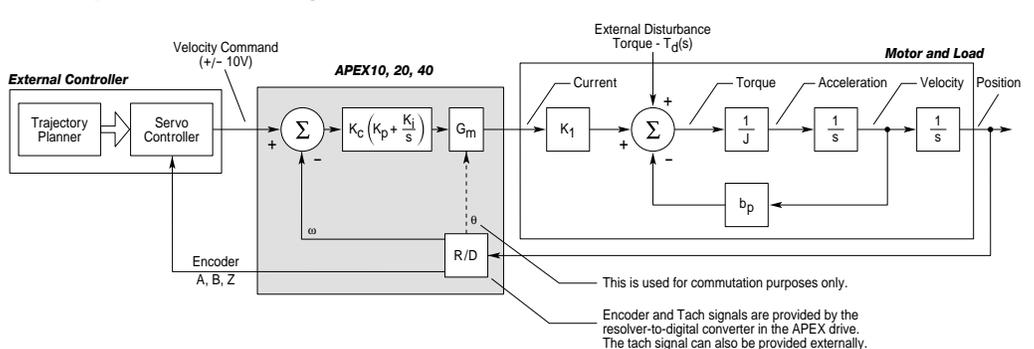
The drive can also be set up in **velocity mode**. In this case, the ± 10 volt signal represents commanded motor speed. This block diagram is shown here.

The gains, K_c and K_i , are set by the pots labeled "Collective" and "Vel Integral" gain, respectively. The gain, K_p , is factory set to 1. The gain G_m again represents the transfer function of the current regulator and is set up by dip switches. Refer to the Owners Manual for a more complete description of these gains.

Torque Mode Block Diagram



Velocity Mode Block Diagram



Safety Features

To help ensure a safe operating environment, take advantage of the APEX6151, APEX6152 and APEX6154's safety features.

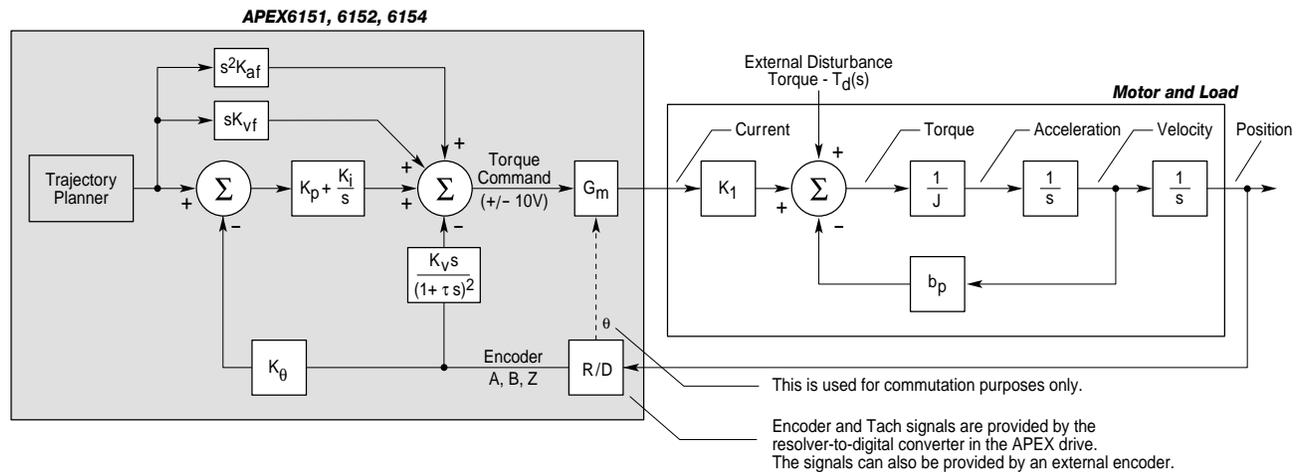
Feature	Description
Enable Input	The enable input (Enable In, pin #4) on the drive auxiliary connector, is provided as an emergency stop input. When you open the Enable input, with respect to the GND, power output to the motor is disabled.
End-of-travel Limit Inputs	End-of-travel limits prevent the load from crashing through mechanical stops, an incident that can damage equipment and injure personnel. You can use either hardware and/or software limits, as your application requires.
User Fault Input	You can assign any of the programmable inputs the User Fault function. You can then wire the input to activate when an external event or fault occurs.
Maximum Allowable Position Error	A Position Error is defined as the difference between the commanded position and the actual position as measured by the feedback device. When the maximum allowable position error is exceeded (usually due to instability or loss of position feedback), the APEX6151, APEX6152 or APEX6154 shuts down power to the motor and registers a fault condition.

APEX6151, APEX6152 and APEX6154 Tuning

The control gains available for the APEX6151, APEX6152 and APEX6154 are:

- K_p Proportional Feedback (controlled with the SGP command)
- K_i Integral Feedback (controlled with the SGI command)
- K_v Velocity Feedback (controlled with the SGV command)
- K_{vf} Velocity Feedforward (controlled by the SGVF command)
- K_{af} Acceleration Feed-forward (controlled by the SGAF command)
- K_o Encoder resolution scaling (controlled by the ERES command)

The shaded area represents the components.



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