

Epsilon EP

Compact and Economical

The Epsilon EP Series is the most compact digital servo drive in the Control Techniques lineup. Designed to fit in cabinets as small as six inches (152 mm) deep, with cables attached. The Epsilon EP drives possess the same rugged quality and reliability found in our larger drive series.

NEW 16 Amp Drive

There are five sizes of each Epsilon EP drive: 2.2 A, 4 A, 6.5 A, 9 A and 16 Amp. The largest drive delivering up to 200 lb-in continuous torque. Each drive contains a 14-segment status display, reset button, removable connectors and utilizes standard "D" type connectors.

RoHS approved option!

Position Tracker™

Epsilon EP



- Flexible voltages DC, AC 90V to 264V
- 5 Drive Power Options: 2.2, 4, 6.5, 9 and 16 Amp
- 1 to 200 lb-in continuous torque
- Drive types: Base, Indexing, and Programmable. Indexing and Programmable can be ordered with optional DeviceNet or Profibus
- Easy install, setup and operation
 - Compact, space saving design, six-inch (152 mm) panel depth including cables
 - Pluggable connectors, Standard D-Shell and Screw Terminals
 - State-Space Observer Control, which allows 10-1 inertia mismatch out of the box, and 50-1 with tuning
 - Free PowerTools software, and upgrades
 - Programmable, optically-isolated I/O
 - RS485 serial communication interface using Modbus protocol
- Ethernet/IP and Modbus TCP/IP standard on the Epsilon EP-P programmable drive
- Field programmable flash memory firmware (upgrades are free)
- Wide variety of motor combinations: FM, MG, NT, XV
- Auto-Tune support for any servo motor with encoder feedback
- 24 VDC input for logic power supply



FEATURE

Performance Advantage

Three Configurations Available

- EP-B base drive
- EP-I indexing drive
- EP-P programming drive

Base – Multiple Operating Modes

Analog Torque, Analog Velocity, Position Tracker™ – Analog, Preset Velocity, Preset Velocity + Analog Velocity, Pulse/Pulse, Pulse/Direction, Pulse/Quadrature.

Indexing – Simple & Powerful Capabilities

16 Indexes with chaining and linking capability, jogging, a multitude of homing routines, user units and Position Tracker™ – Fieldbus Indexing. Optional EP-IDN with DeviceNet.

Programmable – Provides Advanced Capabilities

Complex functionality is easily achieved in the Epsilon EP-P programming environment including Position Tracker™ – Fieldbus Indexing. Online help, application notes and programming examples readily available. Capable of 1½ axis control. Optional EP-PDN (DeviceNet), or EP-PPB (Profibus).

PowerTools Pro Software

Enables “Motion Made Easy” with Drag & Drop, Fill in the Blank, Point & Click set up. Tabbed setup screens and hierarchical views.



Extensive Motors, Cables & Options

FM, MG, NT and XV motors offer a wide range of inertia, torque, speed and cost. Provides “Motion Made Easy” system solution.

Easy to Use Communications

Modbus RTU standard, Ethernet IP, Modbus TCP/IP, Profibus and DeviceNet.



MODBUS TCP/IP

MODBUS RTU

DeviceNet



Epsilon EP-B

Base Drive Operation

The Epsilon EP-B (base) drive is a compact drive that is ideal for use with single and multi-axis controllers, PLCs and host controllers. The analog torque or velocity modes can be used with classic position controllers using analog outputs and encoder inputs. The pulse mode is ideal for use with low-cost PLC stepper controllers. This drive works in a variety of applications where a host control provides a command signal determining the desired motion profile.

The new Analog Position Mode allows the user to replace costly external position control electronics with a simple analog voltage source. The drive accepts an analog command and interprets it as an absolute position command. And of course, it's fully scalable to meet any application requirements.

The drive is configurable for eight flexible modes of operation, and the parameters for each mode can be adjusted to tailor the drive to the specific application using Windows™-based PowerTools Pro software.

Position Tracker™ Analog Mode

Analog Torque Mode

Analog Velocity Mode

Digital Velocity Preset

Pulse Mode

- Pulse/Pulse
- Pulse/Direction
- Pulse/Quadrature

Summation of Analog Velocity and Digital Velocity

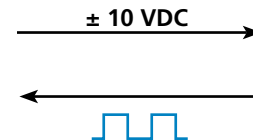
- **Programmable I/O**
 - 5 optically-isolated inputs
 - 3 optically-isolated outputs
 - 1 analog input ± 10 VDC, 14 bit
 - 2 analog output ± 10 VDC, 10 bit
- **Programmable encoder output, (up to 2,048 lines per revolution)**
- **Separate stop and travel limit decel ramps**
- **Torque, Travel, Following Error and Velocity Limits**
- **8 user defined speed presets with individual accel/decel rates**
- **2 Programmable Torque Level Outputs**
- **RS485 Dual Serial Port, Modbus RTU**
- **Software Oscilloscope**



STANDARD CONTROL MODES

Analog Velocity/Torque Mode

- MC206X, MC224
- Position Controller



Digital Velocity Preset

- PLC
- User Logic



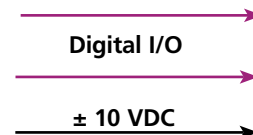
Pulse Mode

- PLC
- Master Axis
- Synchronized Encoder



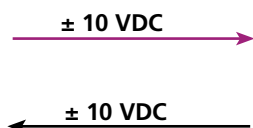
Summation of Analog Velocity and Digital Velocity

- PLC
- User Logic
- Analog Trim

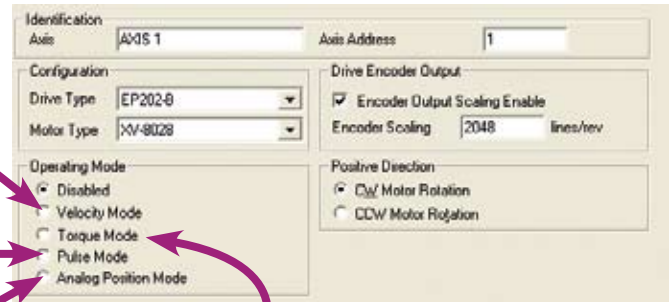


Position Tracker™ Analog Mode

- PLC
- Analog Feedback



The operating mode of the drive is simply selected with one click in the PowerTools Pro Setup view.



VELOCITY MODE

Analog— In Analog Velocity Mode the drive develops a velocity command in proportion to the voltage (± 10 VDC) received on the Analog Input. *Note: Analog full scale voltage and offset are programmable.*

Preset Velocity— In this mode one of up to eight digital velocities can be selected using the digital I/O or Modbus. Each preset has its own accel/decel ramps. No analog source is required!

Application Examples

- Clutch-brake replacement
- Phase control with a differential
- Automatic feed control
- Spindle speed control

Velocity Summation— This mode combines the features of Analog Velocity and Preset Velocity in one mode. It allows running a preset velocity and trimming it with an analog input, or vice versa, allowing advanced applications to be solved simply and elegantly without complex controllers.

Application Examples

- Loop/dancer arm control
- Phase advance/retard
- Speed trimming

PULSE MODE

In Pulse Mode the drive will receive pulses from a master source (single-ended or differential), which can be interpreted in three ways:

- Pulse/Pulse
- Pulse/Direction
- Pulse/Quadrature

Application Examples

- PLC pulse command outputs
- Electronic gearing
- Stepper drive replacement
- Web line ratio control

TORQUE MODE

In Analog Torque Mode the drive develops a torque command in proportion to the voltage (± 10 VDC) received in the Analog Input. *Note: Analog full scale voltage and offset are programmable.*

Application Examples

- With Position/Velocity Controller
- Tension Control

POSITION TRACKER™ ANALOG MODE

In this Analog Mode the drive moves to an absolute motor position in proportion to the voltage (± 10 VDC) received in the Analog Input. *Note: Analog full scale voltage and position are programmable.*

Application Examples

- Position Control with simple analog signal
- Replaces expensive PLC position control modules

FLEXIBLE I/O FUNCTIONALITY

The digital I/O of the drive is completely programmable with the ability to map one or more I/O functions to each I/O point.

Input Functions

- Stop
- Reset
- Travel Limit (+ and -)
- Torque Limit Enable
- Torque Mode Enable
- Velocity Presets (3)
- Brake Release
- Brake Control
- Enable Analog Position
- Teach Analog Position
- Define Analog Position

Output Functions

- Drive OK
- At Velocity
- Travel Limits (+ and -)
- In Motion (+ and -)
- Power Stage Enabled
- Torque Limit Active
- Velocity Limiting Active
- Fault
- Brake
- Shunt Active
- Torque Level 1 or 2 Active
- Foldback Active
- Power Module System Ready

Epsilon EP-I

Compact Indexing Drive

The Epsilon EP-I (Indexing) drive offers user units, indexing, homing and jogging, and additional I/O in a package that is the same compact size as the base Epsilon EP-B Drive. Operating information is setup via a PC. These setup parameters are easily entered and stored with the use of our feature filled Windows™-based PowerTools Pro software. The setup can be downloaded, stored on disk or printed out for documentation. The ease-of-use saves time and money during installation and makes long term support simplistic.

EASY SETUP!

Using PowerTools Pro, the EP-I is easily programmed. Homes, Jogs and Indexes are set up using units representative of the application. This allows for an easy translation of motor revolutions to rotary, linear or other units. Once the desired user units are entered into the user units view, all motion will be based on units specific to the application—not arbitrary units requiring conversion.

- Programmable I/O
 - 16 Optically-isolated inputs
 - 8 Optically-isolated outputs
- Indexing
 - 16 Indexes
 - Position Tracker™ – Fieldbus Indexing
 - Chaining index capability
 - Chain indexes to home
- Jogging and Homing
 - 2 Jog velocities
 - Homing (Standard and One-Sided)
 - Home to sensor
 - Home to marker
 - Home to sensor/marker
- Alternate Mode
 - Analog Velocity
 - Analog Torque (with Speed Limit)
 - Pulse Mode
- Optional DeviceNet Version—EP-IDN
- User Units
 - Distance
 - Velocity
 - Time Scale
 - Acceleration

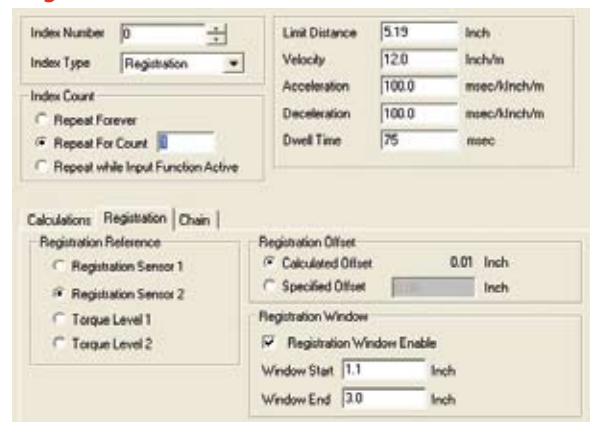


INDEXING

The Epsilon EP-I drive is easily programmed to meet a wide variety of indexing requirements, either using our PowerTools Pro software or with a Modbus Master. Sequencing multiple indexes is possible using the chaining command.

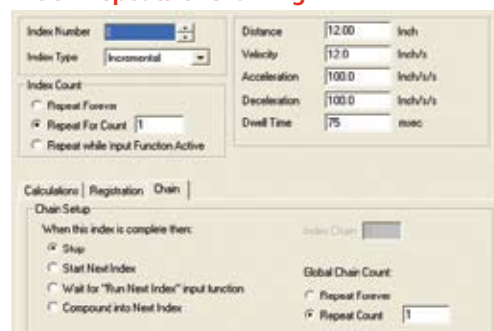
- 16 Indexes – Incremental, Absolute, Registration, Rotary Plus, and Rotary Minus index types
- Position Tracker™ – Fieldbus Indexing
- Parameters for Distance, Velocity, Accel/Decel, Dwell and Registration to Sensor or Torque Levels
- Chaining Options – Counts, Repeat Counts, Repeat Forever, Stop, Start Next Index, Wait for “Run Next Index” input function.

Registration Index



The screenshot shows the 'Registration Index' configuration window. It includes fields for Index Number (0), Index Type (Registration), and Index Count (Repeat For Count: 1). On the right, there are fields for Limit Distance (5.19 Inch), Velocity (12.0 Inch/m), Acceleration (100.0 msec/Inch/m), Deceleration (100.0 msec/Inch/m), and Dwell Time (75 msec). Below, the 'Calculations' section is set to 'Registration | Chain |'. Under 'Registration Reference', 'Registration Sensor 2' is selected. Under 'Registration Offset', 'Calculated Offset' is selected with a value of 0.01 Inch. The 'Registration Window' section has 'Registration Window Enable' checked, with Window Start at 1.1 Inch and Window End at 3.0 Inch.

Index Repeats & Chaining

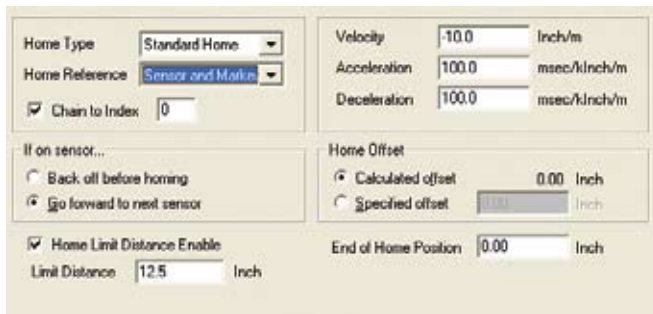


The screenshot shows the 'Index Repeats & Chaining' configuration window. It includes fields for Index Number (1), Index Type (Incremental), and Index Count (Repeat For Count: 1). On the right, there are fields for Distance (12.00 Inch), Velocity (12.0 Inch/s), Acceleration (100.0 Inch/s/s), Deceleration (100.0 Inch/s/s), and Dwell Time (75 msec). Below, the 'Calculations' section is set to 'Registration | Chain |'. Under 'Chain-Setup', 'When this index is complete then:' is set to 'Stop'. The 'Global Chain Count' section has 'Repeat Count' set to 1.

HOMING

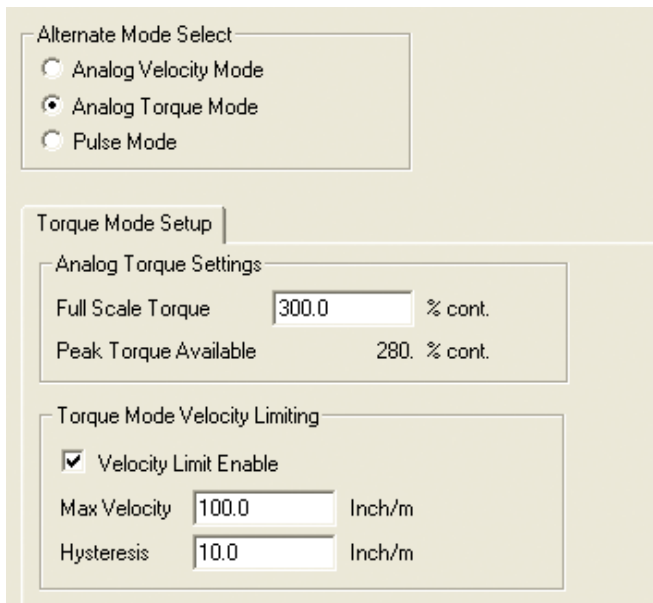
The Homing feature set in the EP-I is very powerful. The large number of parameters gives the user added flexibility and simplifies setting homing functions.

- Home to Sensor, Marker or Sensor & Marker
- If on home sensor, then back off before homing, or go forward to next sensor
- Home Offset distance relative to sensor/marker
- Parameters for Velocity, Accel, Decel, Home Offset, End-of-Home Position and Limit Distance
- Chain to Index Number



ALTERNATE MODE

Alternate Mode adds base drive capabilities to the Indexer. Users may achieve motions such as analog signal following and analog torque control using the Alternative Mode function while retaining the full functionality of a powerful indexing drive.



In Pulse Mode the drive will receive pulses from a master source (single-ended or differential), which can be interpreted three ways:

- Pulse/Pulse
- Pulse/Direction
- Pulse/Quadrature
- **Analog Velocity Mode**

In Analog Velocity Mode, the drive develops a velocity command in proportion to the voltage (± 10 VDC) received on the Analog Input. *Note: Analog full scale voltage and offset are programmable.*

- **Analog Torque Mode**

In Analog Torque Mode, the drive develops a torque command in proportion to the voltage (± 10 VDC) received on the Analog Input. *Note: Analog full scale voltage and offset are programmable.*

FLEXIBLE I/O FUNCTIONALITY

The digital I/O of the drive is completely programmable with the ability to map one or more I/O functions to the I/O points

Input Functions

- Index Initiate
- Index Select 0
- Index Select 1
- Index Select 2
- Index Select 3
- Run Next Index
- Home Initiate
- Home Sensor
- Define Home
- Stop
- Jog +
- Jog -
- Jog Fast
- Travel Limit +
- Travel Limit -
- Brake Control
- Brake Release
- Reset
- Registration Sensor 1
- Registration Sensor 2
- Torque Limit Enable
- Alternate Mode Enable
- Repeat Current Index
- Define Analog Position
- Teach Analog Position Min.
- Teach Analog Position Max.

Output Functions

- Absolute Position Valid
- End of Index
- End of Index Motion
- End of Index Count
- End of Chaining Counts
- Registration Limit Distance Hit
- Home Limit Distance Hit
- End of Home
- At Velocity
- In + Motion
- In - Motion
- Drive OK
- Fault
- Brake
- Travel Limit +
- Travel Limit -
- Foldback Active
- Shunt Active
- Torque Limit Active
- Power Stage Enabled
- Torque Level 1 Active
- Torque Level 2 Active
- Index In Position
- Torque at Max Velocity
- Power Module System Ready

Epsilon EP-P

Programmable Motion

The EP-P (Programmable) drive provides the highest level of control by allowing the user to create complete user programs to sequence the motion control along with other machine functionality. The EP-P can be used to solve the most complex motion applications and still be easy-to-use because of the PowerTools Pro configuration software. PowerTools Pro uses simple drag-and-drop and fill-in-the-blank views that make setup a snap.

User programs are created using a text based motion language that is as easy to read as it is to program. If you don't know the command, just drag it in from the drop down box and PowerTools Pro will assist you with the syntax. With intuitive software and plenty of online help, programming this servo drive is easy; in fact it's **"Motion Made Easy!"™**

FIELDBUS COMMUNICATIONS

- **RS485 Modbus - Standard**

The EP-P has built in RS485 multi drop serial ports. The ports use industrial standard Modbus RTU. Connects easily with many PLC and HMI products.

- **EtherNet/IP and Modbus TCP/IP standard**

The Ethernet port is configured to communicate using two industrial protocols: EtherNet/IP and Modbus TCP/IP. Communication setup is easily done with drag and drop drive information into the Ethernet Mapping.

- **Profibus, DeviceNet - Optional**

The EP-PDN and EP-PPB are EP drives with these industry standard fieldbus options.

- **Position Tracker™ – Fieldbus Indexing**

Replace expensive PLC motion controllers with fieldbus communications. Motion profiles can be dynamically changed on the fly.

- EtherNet/IP and Modbus TCP/IP standard
- RS485 Multi Drop Modbus RTU standard
- Synchronized Motion, Gearing, Camming
- PLS (Programmable Limit Switch) Outputs
- High Speed Capture
- Queuing
- S-Curve Accel and Decel
- Analog Input (1)
- Analog Output (2)
- User Programs
- User Variables
- Program Multitasking

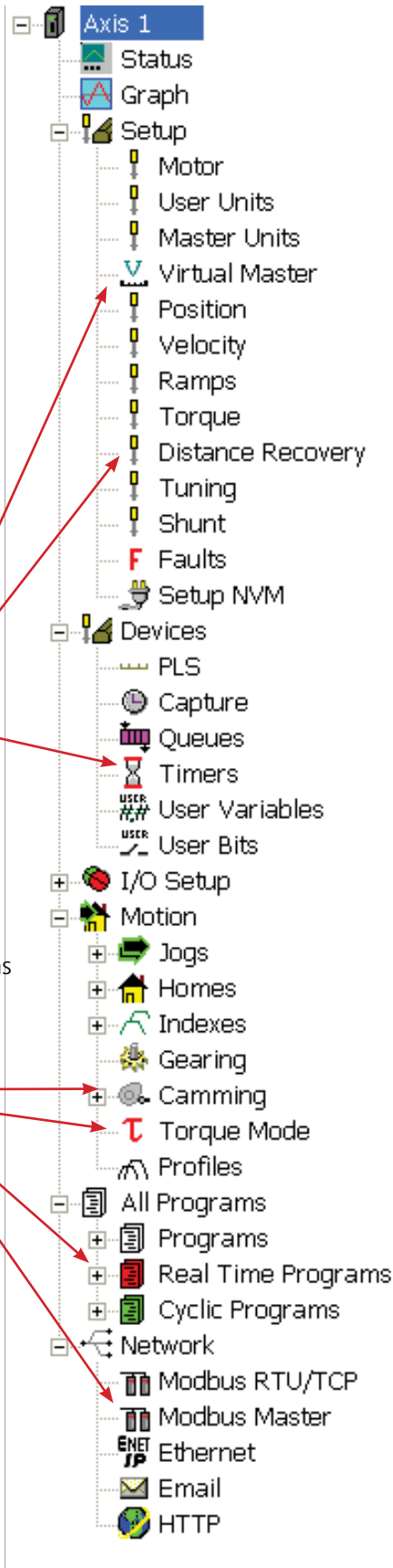


POWERFUL SOFTWARE FEATURES!

EP-P has been upgraded with many powerful software features to meet the most demanding servo application.

Complete machine control is now possible with the drive's motion, I/O and communications ability.

- **Virtual Master** - Provides a programmable clock signal for many drives to follow, eliminating mechanical jitter from following a physical axis.
- **Modbus Master** - Provides drive to drive and expanded I/O control with the built in master. The drive is no longer limited to onboard I/O! Communications to other Modbus slave devices is possible.
 - Multiple drives can share I/O over the networks
 - Stop/Start control such as VFD driven conveyors
 - Use low cost slice I/O to add digital and analog I/O
- **Real Time Programs** - Provides deterministic program cycle times for controlling I/O and scheduling program tasks.
- **Torque Mode** - Switch seamlessly from position or velocity mode into torque mode and back for unlimited flexibility and control for nut running and torque controlled clamps or grippers or any other controlled torque application.
- **Electronic Camming** - Electronic cams provide unlimited motion profiles to accomplish servo replacement of rigid mechanical cams. Use the internal time base to create a motion profile for custom indexing.



NEW

- Virtual Master
- Distance Recovery
- Timers
- Camming
- Torque Mode
- Real Time Programs
- Modbus Slaves

NEW

ADVANCED PROGRAMMING

The EP-P Advanced Programming features take all of the power and features of the EP-I and combines them with advanced functions such as a Position Capture Object, Multiple Profile Summation, Queuing, and Program Multitasking. The EP-P is the perfect solution for applications with complex motion profiles such as a random infeed conveyor, rotary knife, or high speed labeling machine. Using the same software as the other EP drives, PowerTools Pro makes programming quick and easy.

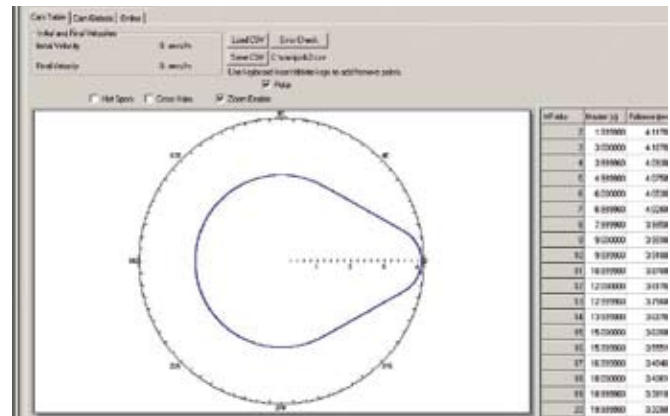
MODBUS MASTER I/O

The Modbus I/O is a simple and flexible IP20 Din rail mountable I/O. The I/O consist of a Modbus TCP/IP Bus coupler and snap-on I/O terminals. There are a variety of digital and analog snap-on terminals to meet specific application needs. One Bus coupler is capable of 256 digital inputs or outputs and up to 100 analog inputs and outputs.



ELECTRONIC CAM

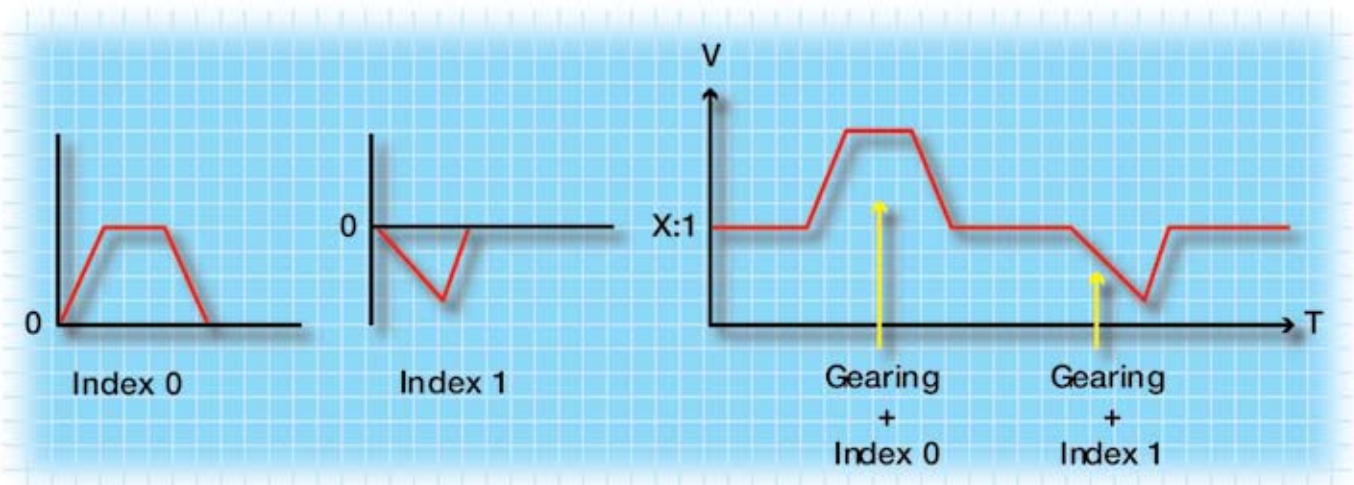
Powerful, flexible cam features make it easy for you to create unlimited motion profiles. You can change cams on the fly or based upon direction. PowerTools makes it simple to import your exported cam system data for mechanical to servo cam replacement.



Electronic Camming

MULTIPLE PROFILE SUMMATION Profiles

Motor motion or "Axis" motion may be generated from either of two Profiles: Profile.0 and Profile.1. Each of these Profiles can run any type of motion (Index, Jog, Gear, etc) at any time or both of the Profiles can generate motion simultaneously.



QUEUING Queues

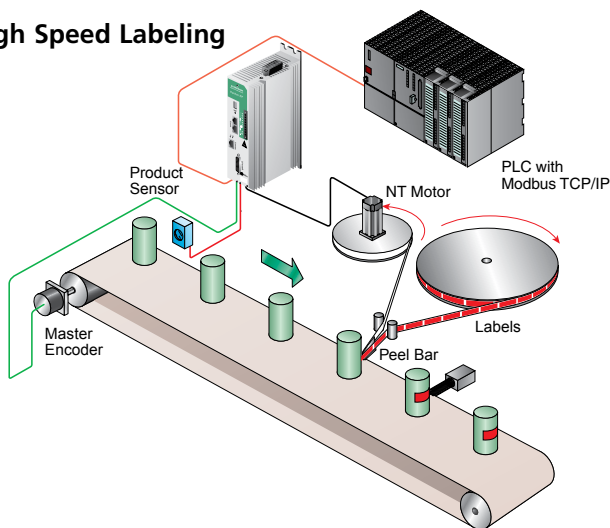
Queuing is used when the ability to store data in a temporary memory location is needed. Up to eight Queues are available. Queues are generally found in applications where a sensor is located several product lengths ahead of the actual drive motion. The EP-P stores the captured position with an offset and accesses it using a built-in compare function.

PROGRAM MULTI-TASKING

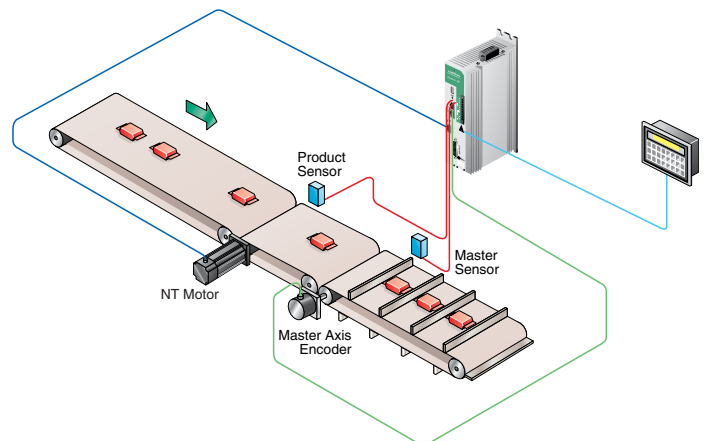
Because many applications require the operation of a background task that operates outside of the main program loop, but must be consistently processed, the EP-P has the ability to execute multiple tasks.



High Speed Labeling



Random Infeed – Smartbelt



The EP-P is used to speed up or slow down the motor. The product is dropped exactly in the desired position.