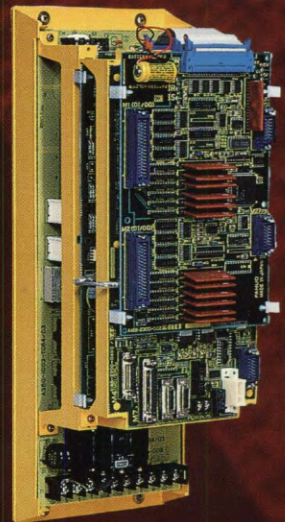




FANUC

Power Mate Model A Single-Axis CNC

**Bringing
the Power
of CNC to
Single-Axis
Applications**



From the World Leader in CNCs . . .

Multi-axis operations require the power of CNCs. But CNC speed, precision, flexibility, and reliability can also enhance many single-axis applications. With Power Mate, GE Fanuc brings the performance, features, and world-reknoned reliability of our multi-axis systems—the Series 0 and Series 15—to single-axis users.

Power Mate is a small, compact unit. It combines advanced electronic control functions with the GE Fanuc digital servo drive used in

hundreds of thousands of applications around the world. The result: the Power Mate Model A.

Power Mate Model A is a true CNC, offering precise servo control plus high-speed machine control (PMC) functions. A member of the latest generation of CNCs, Power Mate opens up new possibilities for single-axis control, auxiliary axis control, and grouped installations such as transfer lines. If you've used any of the CNCs in our Series 0 and Series 15 lines, you already know the Power Mate Model A.

Sharing Common Ties . . .

Power Mate Commonality with the World Leading CNCs

	Series 0	Series 15
Servo Amplifier & Motor	✓	✓
Spindle Amplifier & Motor	✓	✓
Motor Connections	✓	✓
Drive Parameters	✓	✓
Part (Motion) Programming	✓	✓
Ladder/Custom Macros*	✓	✓
I/O Link Communications	✓	✓
Program Development & Storage Hardware	✓	✓

* Power Mate is a Subset





All the Functions You Need in One Compact Package . . .

• Compact Design

In most models, the Power Mate control unit is integrated with the GE Fanuc 230 V AC servo amplifier, allowing it to fit into a space otherwise reserved for the servo amplifier alone.

• Precise CNC Motion Control

Power Mate introduces new possibilities in motion control for single-axis units. Using a series of easily programmed commands, the Power Mate CNC and servo can control motor movement in increments of one ten-thousandths of an inch (0.0001 inch) with feed rates of up to 999 inches per minute. Acceleration and deceleration rates can be set to yield improved cycle times. With this performance and a host of features, Power Mate revolutionizes the world of single-axis control.

• High-Performance, All-Digital Servo

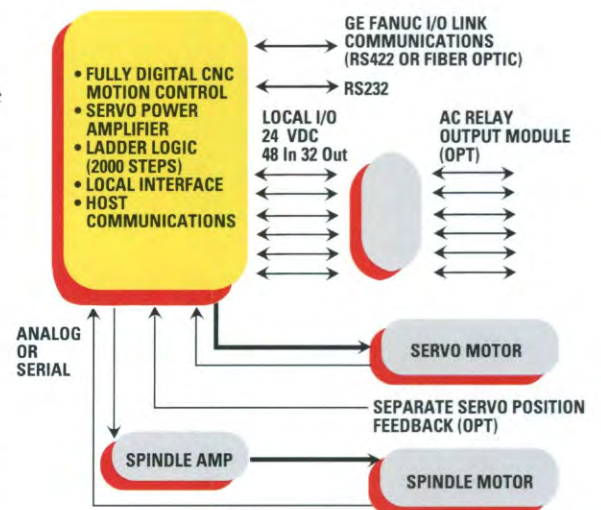
The heart of the Power Mate is a rugged, high-torque, digital servo, the workhorse of the machine tool industry. Because the system is completely digital, there is no need for drive tuning with analog variables. As a result, a change in environmental conditions cannot induce drift. All parameters are stored in battery-backed software so, in the event of a failure, the parameters can be easily downloaded for fast system restart.

• Built-in Sequence Control

Power Mate's PMC provides direct, reliable control of machine functions with a significant reduction in cycle time. The PMC is programmed in ladder logic and includes a rich set of commands, including timers, counters, trigonometry, and conditional logic functions. High speed interfaces with the CNC, fast processing times, and two priority levels in the ladder can enhance machine performance significantly and, in many cases, eliminate the need for a separate PLC.

• Spindle Motor Control

Power Mate can provide a +/- 10 volt speed signal to a GE Fanuc or similar spindle drive. Linked to a GE Fanuc spindle drive, Power Mate offers a number of methods to control spindle motor speed. The rigid tap function controls spindle position as well as spindle speed, allowing precise high-speed tapping without a floating tap.



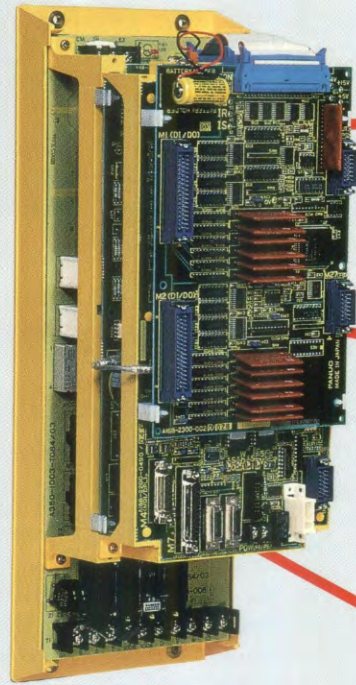
. . . Without Any Unpleasant Surprises

Careful integration of proven technology is the hallmark of Power Mate design. Motion programming is accomplished using internationally

accepted CNC (EIA) commands, and machine control functions are performed using straightforward ladder diagrams.

**Let Our Proven Technology
Drive Your Productivity to New Heights**

A Complete Single-Axis CNC System



Power Mate

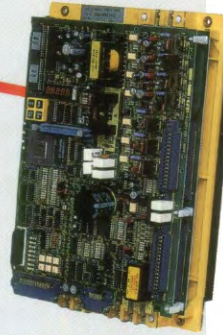
- Control Unit Integrated with Servo Amplifier



DPL/MDI

- Compact
- Detachable

Spindle Amplifier



High Performance Communications for High Performance Products

Power Mate is designed to work closely with other elements of your system. In addition to its DPL/MDI port and the discrete I/O, Power Mate has two versatile communications interfaces: an RS232C port and the GE Fanuc I/O Link.

At a transmission rate of 1.5 MHz, it can easily keep up with the most rigorous communication loads. With the optional fiber-optic configuration, the link span can be extended to 200 meters.

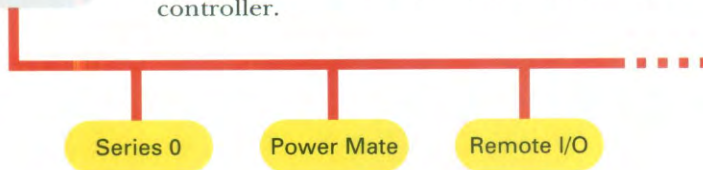
GE Fanuc I/O Link

Host

FD Mate or Series 15 or Series 0

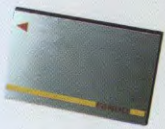
The RS232C port can be used to upload or download part programs and for communicating with other devices such as bar code readers and gauges.

The GE Fanuc I/O Link, a high-speed serial interface, can connect Power Mate to a host control such as the Series 0, the Series 15, or the F-D Mate, the GE Fanuc new machinery cell controller.



GE Fanuc I/O Link

- Host: Series 0, Series 15, F-D Mate
- 16 Devices on a link
 - Series 0
 - Power Mate
 - Remote I/O Rack (up to 4 I/O racks can be a device)
- Transmission Rate: 1.5 MHz
- Media: RS 422 or Fiber Optic
- Traffic
 - 32 I, 32 O per Series 0 and Power Mate
 - 256 I/O per Remote I/O Rack
 - Part Program Upload and Download
 - Program Parameters and Variables



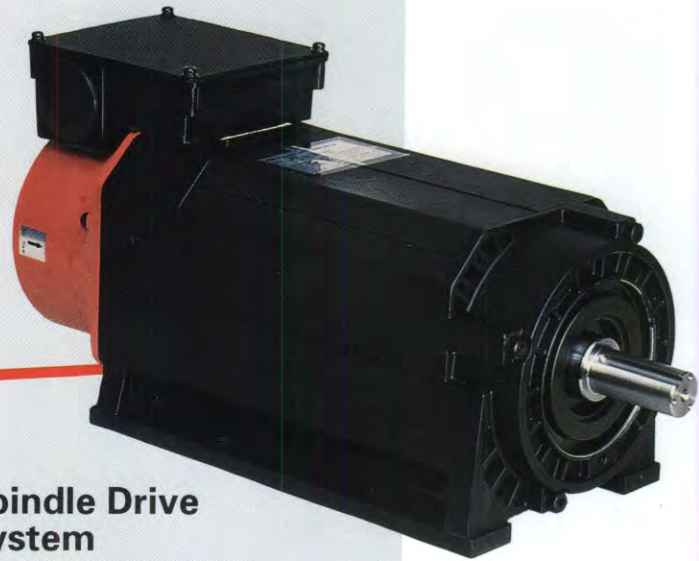
FA Card

- Solid State Memory; Stores all Programs, Parameters, Variables
- Plugs into DPL/MDI
- Credit Card Size

Also Available

- Programming System
- Line Filters, Transformers
- Connectors, Cable Sets
- Discharge Resistor
- Separate Encoders (Servo & Spindle)
- Absolute Encoder Battery Units
- Position Display
- CRT Display (4Q '90)

Spindle Motor

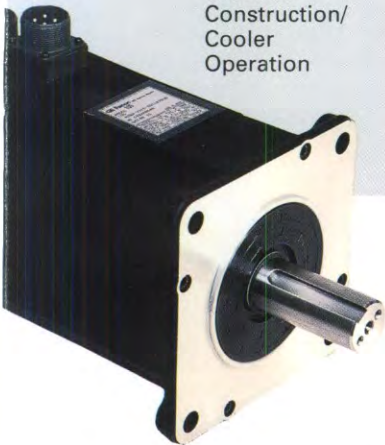


Synchronous AC Servo Motors

- Built-in Encoder
- Caseless Construction/ Cooler Operation
- High Torque/ Low inertia
- Numerous Options:
 - Shaft Types
 - Brakes
 - Encoders
 - Sealant

Spindle Drive System

- All Digital
- Analog or Optional High Speed Serial Interface
- High ACC/DEC with Regen Braking
- Over 50 Models 1.5-50 hp
- Speeds up to 20,000 rpm
- Wide Constant Power Range up to 33:1



Proven Programming and Operator Interfaces

Power Mate is supported by the same tools used with the Series 0 and Series 15. These include the P-G programming system, the cassette adapter, and the paper punch reader.

The new hand-held DPL/MDI unit can be used to write and edit part programs as well as enter system parameters and program variables. The DPL/MDI can also monitor the status of the current position, program variables and parameters, as well as diagnostic and alarm messages. In addition, the DPL/MDI has a plug interface for the handy FA Card, which can store parameters, ladder and part programs in nonvolatile memory.

Packaged for Quick Installation

With its integrated servo amplifier and compact design, Power Mate brings total machine control to applications where space is at a premium. For rigorous environments, Power Mate can be mounted in its own industrial enclosure. And with the GE Fanuc prefabricated cable sets, you can have Power Mate installed in a matter of minutes.

Fast, Safe Set Up and Maintenance

A number of features make the job of setting up and maintaining the machine easy to accomplish. In addition to several manual control operations, these include dry run, single block, machine lock, program protect, interlock input to stop travel, and stored software travel limits.

Enhance Your Application . . .



Stand-Alone Machine Control

"I want to use one controller that can run my whole machine."

*Drills . . . Grinders . . .
Test Beds . . .
Conveyers . . .
Packaging Machines . . .
Assembly Machines . . .*

The compact Power Mate performs all the functions—motion, sequence, and spindle operations—and adds

to them the precision and speed of CNC. Whether it's linear or rotary motion, Power Mate gets the job done.

With the detachable DPL/MDI, motion profiles (part programs) can be developed and downloaded without sacrificing space. And Power Mate offers exceptional versatility: its large program memory can store up to sixty-three part programs right on board.

Station Control on Transfer Lines

Drilling . . . Tapping . . . Boring . . . Facing . . .

Power Mate is ideal for single-axis stations in such applications as transfer lines and dial index machines. The slide can run faster because Power Mate can be precisely tuned to the machine. Better tolerances can be achieved with our high resolution closed loop system.

Power Mate also offers exceptional versatility. The on-board part program memory can process a succession of different parts. With its motion and sequence capabilities, Power Mate can provide a distributed control implementation, making the line easily adaptable to different needs as they arise. This approach can also help cut costs by eliminating some of the line controller's remote I/O.

Power Mate responds extremely quickly to variations in the operating environment. Although mechanical stops can be used with the Torque Limit function, the Skip function makes adaptive cutting possible. In the event of an interruption, the Absolute Feedback eliminates the need to "home" the machine.

Together with the GE Fanuc family of factory automation products, CNC, PLC and Cell Control, GE Fanuc offers total line control.

"I want to go to one controls supplier who can help me get our line producing better parts and more of them every day."

"We need to improve the performance of our aux axes so we can deliver better cycle times to our customers."

Auxiliary-Axis Control on Multi-Axis Machines

*Work Piece Load/Unload . . . Tool Magazines . . .
Tool Changers . . .*

Power Mate is a perfect addition to the Series 0 or Series 15 because it's based on the same digital electronics. As an independent CNC, Power Mate can bring auxiliary axis performance up to par with the primary axes. With the GE Fanuc I/O Link, built-in discrete I/O, and Wait function, the Power Mate axis can be tightly coordinated with the main control.

with Features That Make a Difference

Programming Made Easy

Canned Cycles (Optional)

Power Mate's twelve canned cycles provide a variety of drilling, tapping, and boring operations. They reduce programming steps significantly and are invoked by a simple G code command. The cycle parameters can be changed for each part program. Canned Cycle List:

- Peck drilling
- Peck drilling with dwell
- Drill/spot boring
- Drill/counter boring
- Fine boring
- Boring
- Boring with dwell
- Boring with stop and manual retract
- Boring with dwell and feed retract
- Back boring
- Tapping CW
- Tapping CCW

Skip (Probe)

The skip function allows a probe to set reference points for the feed command, thus allowing machining of variable or irregular work pieces. The probe trip position data can be accessed by a custom macro to calculate the subsequent motion commands.

Programmable Parameter Entry

Various parameters such as maximum feed rate and acceleration time constant can be set for each part program. This allows machine performance to be optimized for each part being processed.

And a Host of Others

Linear or Rotary Axis; Inch/Metric Conversion; Absolute/Incremental Programming; Decimal Point Programming; Mirror Image Programming.

Flexible, High-Speed Control of the Whole Machine Process

High-Speed PMC

Power Mate is shipped with a standard ladder. The most common I/O are pre-assigned to memory addresses and connections. This ladder may be used as is or a new ladder may be tailored to the specific application.

The ladder can be segmented into two priority levels. The first runs at a fixed sixteen milliseconds, providing fast predictable processing of machine control functions. Power Mate has two thousand steps and up to eighty I/O. High-speed, direct interface with the CNC and eighteen-microsecond step processing times contribute to significantly improved machine throughput.

Custom Macros

Custom Macros greatly extend power, flexibility, and programming efficiency for many applications. Functional subroutines can be created to examine variable data whether programmed or sensed via I/O. Math, logic, and program flow capabilities can then be applied to facilitate applications such as a family of parts, custom gauging, and probing cycles. These include:

- Definition, substitution
- Addition
- Subtraction
- Multiplication
- Division
- OR
- And
- Exclusive OR
- Square root/Composite square roots
- Absolute value
- Remainder
- Conversion from BCD
- Composite multiplication & division
- Sine
- Cosine
- Tangent
- Arc tangent
- Unconditional branch
- Conditional branch equal, not equal, greater than, less than, equal to or greater than, equal to or less than
- Input/output of 16-bit data

Rigid Tapping (Optional)

Normally, tapping operations require only the spindle speed to be controlled. Rigid tapping requires the rotation of the spindle and travel of the feed axis to be synchronous. With this function, the spindle and feed axes can be controlled as the linear interpolation of two axes, allowing precise high-speed tapping with less costly tool holders. Note, the Canned Cycle option is required for Rigid Tapping.

The Ultimate in High-Speed Motion Control

With Power Mate's high-speed CNC and all-digital servo, you can produce more parts more accurately. For the most demanding machine conditions and motion control tasks, there are a number of parameterized features available; these include velocity loop gain, backlash compensation, overshoot compensation, torque filter, and velocity feed forward.

Minimize Nonproductive Time

Absolute Position Feedback (Optional)

The servo motor can be equipped with an absolute position encoder. This arrangement is especially valuable in completely automated environments. Once the machine coordinates are set, the system retains the servo position data even if power is shut off. This ensures easy, exact recovery without the need for homing operations. Position data is maintained in battery-backed memory and the battery unit can be installed in the control cabinet.

Axis Signal Status

Three servo status conditions can be monitored: in-position, acc/dec mode, and axis under control of interpolator. This information can be used to precisely coordinate other machine devices.

Zone Signal

With Power Mate, the tool travel or work area can be segmented into eight zones. The Power Mate PMC continuously monitors current zone status, which can be used for system permissives. As a result, interlocking with other machines and restart operations are greatly facilitated.

Wait Function

Motion commands can be interlocked with input from external signals.

Multiple Reference Points

Three different points can be set. As a result, programmed moves can begin close to the work piece.



Power Mate Model A Ratings

Model	Power Mate Spec	Motor Spec	Max Speed K rpm	Continuous Torque in lbs
4-0S	B010*	532	3	2
3-0S	B010*	533	3	4
2-0S	B005	310	3	9
1-0S	B005	312	2	17
1-0S/3000	B005	309	3	17
0S	B002	313	2	26
0S	B003	313	3	26
5S	B002	314	2	52
5S/3000	B006	514	3	52
10S	B003	315	2	104
10S/3000	B006	317	3	104
20S/1500	B003	505	1.5	199
20S	B004	502	2	199
20S/3000	B010*	318	3	199
30S/3000	B010*	319	3	260
30S	B004	590	1.2	329
40S	B010*	583	2	495

* Model B010 is a separate unit from the Servo Amplifier



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