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TECHNOLOGY GROUP

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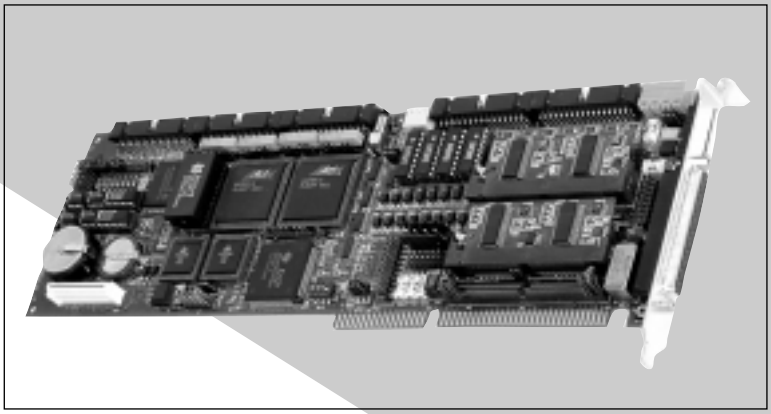
Find the *Parker / Acroloop ACR8010* at our website: *Click HERE*

Acroloop — *Perfection in Motion*

The Acroloop Catalog is organized to give you the information you need quickly and easily.

- First, glance through our Acroloop Corporate Profile. The corporate profile outlines the capabilities that are available from Acroloop.
- Second, scan the product index. The product index pictorially previews the products available and tells you where to find them.
- Next, take a moment to look over the selection guide. The selection guide provides you with an easy, visual, step-by-step approach to help build the perfect motion control system.
- Finally, the product catalog has detailed outlines of the products and services available from Acroloop.

If you don't see what you need or if you need additional help, contact Acroloop for assistance. An Acroloop applications engineer will assist you or redirect you to the local technical office that can help you solve your motion control needs.



Acroloop's ACR8010

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ACROLOOP
MOTION CONTROL SYSTEMS, INC.

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APPLICATIONS ASSISTANCE

Acroloop offers applications engineering assistance. If you have a motion control application, contact Acroloop to discuss your needs with one of our engineers. Acroloop Applications Engineers are technical specialists that work with motion control applications involving complex industrial projects or products with exacting technical specifications on a daily basis. We'll be glad to put our motion control knowledge to work and help solve your problems.

Acroloop also offers individual, technical brochures that describe the intricacies of the products available from Acroloop. These product brochures complement this product catalog.

Applications Engineering Assistance

Individual, Technical Brochures Available

In addition, Acroloop maintains a national and international network of factory trained manufacturers representatives, distributors, and value-added resellers. The main function of these organizations is to help you with motion applications while providing local technical support.

Manufacturers Representatives (MR's)
Acroloop has developed a network of MR's across the country. The Acroloop MR's are factory trained and possess years of industrial motion control experience.

Acroloop MR's are particularly effective in solving complex motion control applications, especially where hands on intimate knowledge must be maintained between the customer needs and the Acroloop products and services required to meet the application. Acroloop MR's have exclusive territories in which they service our customers, support distribution and our VARs.

Distributors
Acroloop also maintains a nationwide network of factory trained distributors. Acroloop distributors typically represent a number of complimentary product lines for a wide variety of applications. Acroloop distributors function in two main ways:

- First, to provide local technical support to Acroloop customers similar to that provided by manufacturers representatives.
- Second, to provide ongoing support for territory re-purchase of Acroloop products. Acroloop distributors will maintain an inventory of Acroloop products locally when the demand for specific products in the territory exists.

Thus, Acroloop distributors can provide local technical support, inventory management and parts support to help better serve the needs of our customers.

Value-Added Resellers (VAR's)
Acroloop also maintains a network of VARs. In general, an Acroloop VAR can provide local integration services in the form of engineering, programming, technical support, on-site training, and start-up assistance. Obviously, Acroloop also provides these services, but a VAR is essential when the application requires a local technical integration specialist.

An approved Acroloop VAR has undergone extensive and ongoing training at the factory in order to become familiar with the types of engineering issues that arise in applying Acroloop controllers and products. Contact Acroloop for a list of approved Acroloop VAR's.

Knowledgeable Manufacturers Representatives

Nationwide, Factory Trained Distributors

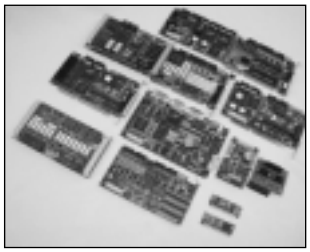
VAR: Local Technical Integration Specialists

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ACROLOOP PRODUCT INDEX

Building the Perfect System

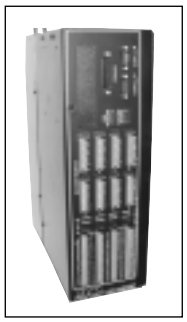
There are six main product categories to consider when designing your motion control system. These categories are outlined below. The outline visually shows the products that are available from Acroloop and where to locate them throughout the Selection Guide and the Product Catalog.



MOTION CONTROLLERS
ACR Family of Controls
Selection Guide: page 6
Product Catalog: pages 24-35



SOFTWARE/DEVELOPMENT TOOLS
AcroView, AcroCut, AcroJet, AcroMill, DLL's, OCX's
Selection Guide: page 7
Product Catalog: pages 36-42

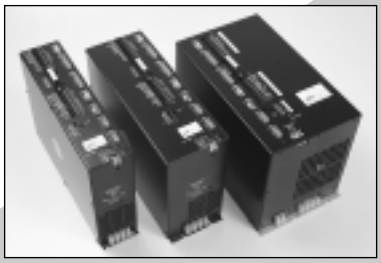


CHASSIS
ACH Family of Chassis
Selection Guide: page 8
Product Catalog: pages 43-45

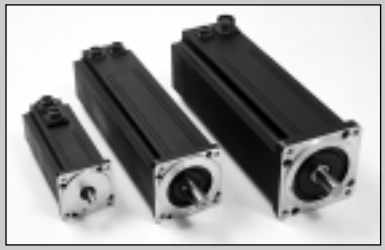


OPERATOR INTERFACE
OPS Family of Interfaces
Selection Guide: page 9 & 10
Product Catalog: Pages 46-48





AMPLIFIERS/MOTORS/ FEEDBACK
Selection Guide: Page 11
Product Catalog: pages 49-51



TURNKEY SYSTEM
Acroloop or an Acroloop approved Value-Added Reseller (VAR) can package all the components in a panel and provide start-up assistance.
Product Catalogs: page 52

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Selection Guide

The selection guide is an easy, visual, step-by-step tour to help you build the perfect motion control system. From components to integrated systems, the Selection Guide is designed to help you visualize exactly what you need for your motion control application.

Step 1 - Selection of Controller

The controller is the single most important element in motion control. There are a wide variety of issues to consider. However, the basic requirements consist of:

- Number of axes
- Type of motion control
- Communications interface requirement
- Input/Output requirements

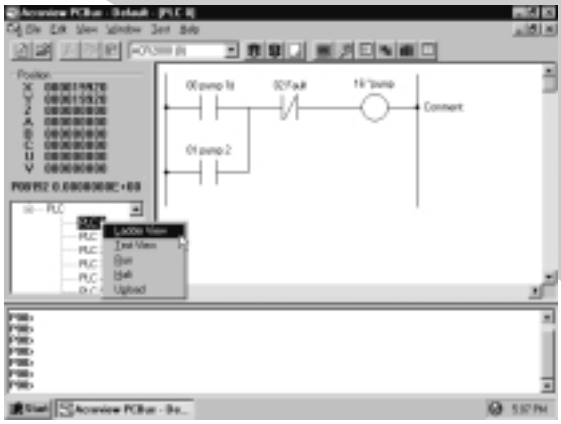
Model	ACR8020	ACR8010	ACR2000	ACR1500	ACR1200
					
Motion Control					
32 Bit Floating Point DSP	YES	YES	YES	YES	YES
CPU Speed	150 MHZ	60 MHZ	50 MHZ	40 MHZ	40 MHZ
Axes/Controller	2-8 (Expandable)	2-8	2-4	2-4	1-2
Servos	YES	YES	YES	YES	YES
Steppers	YES	YES	YES	YES	YES
Line/Arc/ Splines/Nurbs, 3D Arc Interpolation	YES	YES	YES	YES (except NURBS)	YES
Memory Size STD (OPT)	512K (2MB)	512K (2MB)	512K	128K	128K (512K)
Flash for Saving Programs	YES	YES	YES	YES	YES
PreEmptive Multitasker	YES	YES	YES	YES	YES
Communications					
Interface	Binary, ASCII	Binary, ASCII	Binary, ASCII	Binary, ASCII	Binary, ASCII
COM1, COM2 Serial	YES, Optional	YES, Optional	YES, Optional	NO	YES, Standard
AcroWire IEEE-1394 Option	YES, Optional	YES, Optional	YES, Optional	NO	YES, Optional
Standalone Option	N/A	YES	YES	NO	YES
PC-Bus Pluggable	YES, PCI	YES, ISA	YES, ISA	YES, ISA	N/A
Parallel (LPT) Option	YES	YES	YES	NO	YES
Dual Port Memory Option	YES, Standard	YES, Optional	NO	NO	N/A
Bus Mastering	YES	NO	NO	NO	N/A
Inputs/Outputs					
Encoder Inputs	4-10 (Expandable)	4-10	2-4	2-4	3
Encoder fault Detection	YES, in hardware	YES, in hardware	NO	NO	YES, in hardware
Absolute Encoder Option	YES	YES	YES	YES	YES
D/A Outputs	2-8 (Expandable)	2-8	2-4	2-4	2
Uncommitted I/O	64 (Exp. to 320)	64 (Exp. to 320)	32 (Exp. to 288)	48	32 (Exp. to 160)
I/O Type	24V Opto Isolated	24V Opto Isolated	24V Opto Isolated	TTL	24V Opto Isolated
I/O Active Hi/Lo Select	YES	YES	YES	YES	YES
AUX Analog Inputs 8 Single Ended/4 Differential	12 or 16 Bits	12 or 16 Bits	12 Bits	12 or 16 Bits	12 or 16 Bits

Additional technical information is available in the Motion Controllers section of this catalog.

Additional technical assistance and information can also be obtained from Acroloop or the local representative.

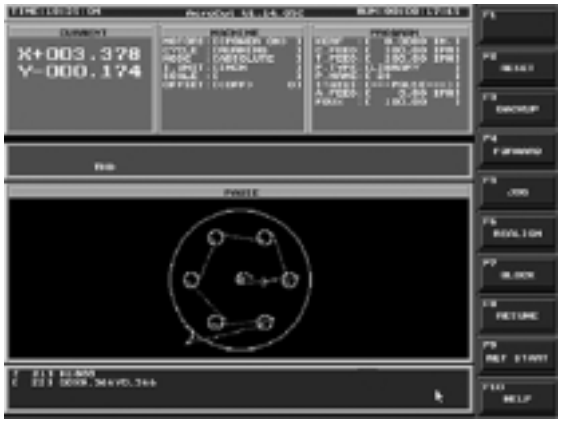
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Step 2 - Selection of Software Tools



AcroView

This is a diagnostic and programming tool that allows developers to communicate to all Acroloop controllers in PC-Bus, Serial or Acrowire IEEE-1394 applications. This software allows project based program design for motion and graphical ladder logic IEC1131 PLC programming.



AcroMill/AcroCut

CNC Machine Tool Software program standard RS-274D programming language. This software is offered for DOS as well as Windows. Can cycles, work coordinates, macros, parametric programming, cutter compensation is standard.



Customer Written Application using Acroloop SDK

The Acroloop Software Development Kit (SDK) allows customers to develop their own application very rapidly. Source code samples are provided in the SDK for visual Basic and Visual C++.



Custom Applications

Let Acroloop or an Acroloop VAR modify one of your existing application software programs to your specification.

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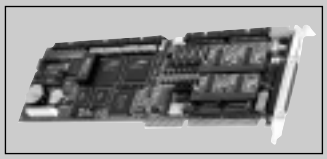
Step 3 - Selection of Controller Chassis

The third step is to decide how to physically mount the controller within the motion control system. The main factors in selecting a controller chassis are:

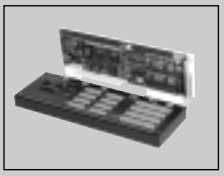
- Type of chassis required
- Acroloop controller supported
- Interface Connectors
- Physical size considerations

Model*	Standalone or PC-Bus**	Controller Supported	Interface Connectors	Size (W x H x D)
ACH3120	Standalone	ACR1200	34 pin/26 pin headers	4.25” x 9.6” x 7.45”
ACH3200	Standalone	ACR2000	34 pin headers	4.38” x 11” x 6.75”
ACH4800	Both	ACR8010	Terminals	4.75” x 15” x 11.25”
ACH6200	Both	ACR1500/ACR2000	D-connectors	9.12” x 5.75” x 9”
ACH6800	Both	ACR8010	D-connectors	6.38” x 6.75” x 15.5”

* = Acroloop Industrial Controller Chassis include +/- 5VDC and +/- 12VDC power supply
** = 65 Watt Power Supply is supplied with Standalone chassis’
** = 150 Watt Power Supply is supplied with PC-Bus chassis’



ACR8010



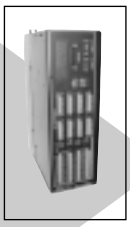
SPL026 with Breakout Box

or

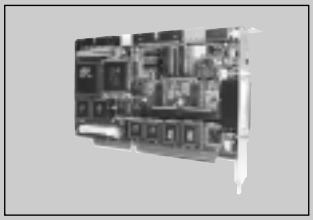


ACH6800

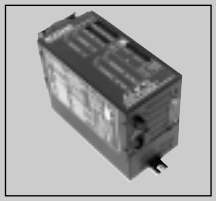
or

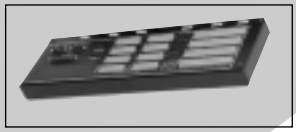


ACH4800



ACR2000





ACH3200 with Breakout Box

or

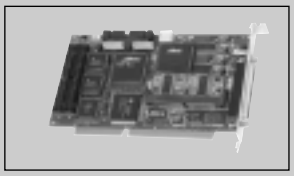


ACH6200

or



ACH4800



ACR1500

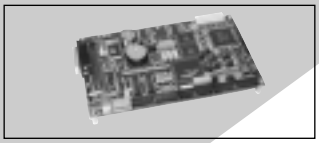


ACH6200

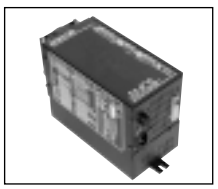
or



ACH6800



ACR1200



ACH3120

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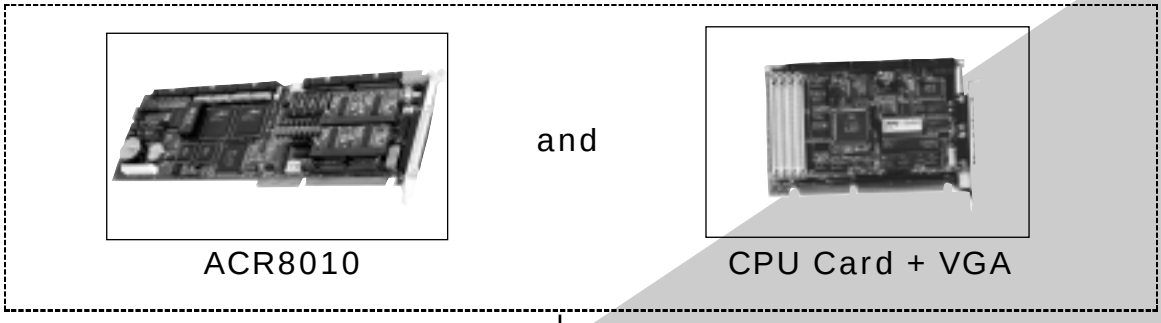
Step 4 - Selection of Operator Interface

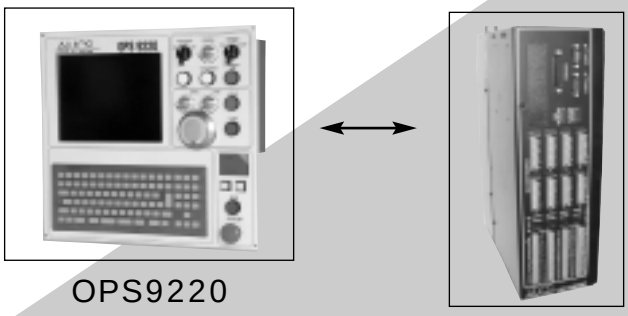
Acroloop carries four main types of operator interfaces. The main question is to decide what information needs to be displayed and communicated to the operator. When deciding on the operator interface, the main factors are:

- Number and Type of Keys
- Interface requirements and operating system
- Application, physical constraints, and aesthetics
- Cost Sensitivity

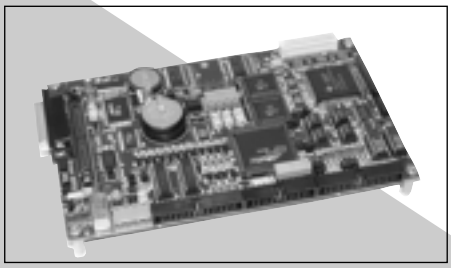
Model*	Interface Type	Display Type	Keyboard Type	Size (W x H x D)	Power Requirements
OPS9200	PC/CNC	14” Color CRT	Tactile	19” x 15.75” x 14.5”	120VAC
OPS9210	PC/CNC	12.1” Color LCD	Tactile	19” x 12.25” x 4”	120VAC
OPS9220	PC/CNC	12.1” Color LCD	Full 90 Key	19” x 17.5” x 4”	120VAC
OPS9000	PC	14” Color CRT	Membrane	19” x 15.75” x 14.5”	120VAC
OPS8200	PC	10” Flat Panel**	Touchscreen	12” x 10.5” x 8.5”	120VAC
OPS8220	PC	12.1” Color CRT	Full 90 Key	19” x 17.5” x 10.75”	120VAC
OPS8100	PC	10” Flat Panel**	Tactile	19” x 10.5” x 10.5”	120VAC
OPS8000	Smart	4x40 LCD	Membrane	10.3” x 6.6” x 3.1”	+/-12 & 5VDC
OPS1200	Smart	4x40 LCD	Membrane	10.3” x 6.6” x 3.1”	+/-12 & 5VDC
OPS1000	Smart	2x20 LCD	Membrane	6.25” x 9.38” x 2”	+/-12 & 5VDC
KBD 16	Dumb	1x16 LCD	Membrane	7.1” x 4.1” x 1.1”	5VDC

* = Acroloop Operator Interfaces are all NEMA 12 and can be panel or pendant mounted
** = Flat Panel display can be LCD, EL, Passive Color or Active Color

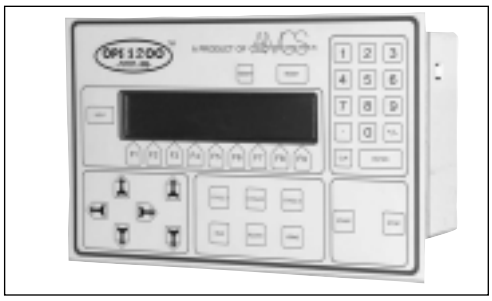




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ACH1200



OPS1200

Complete low cost motion box for 1-2 Axis application can reside totally on the ACR1200 controller! Ideal for cut to length, roll feed machines, screw machines and more!

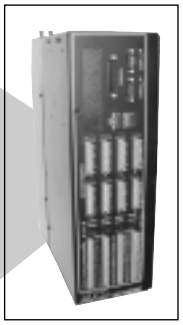
Smart Terminals

Smart terminals are useful for applications involving standalone controllers. Since the terminal is “smart”, it has the capability of being programmed to display messages and request information from the operator. Smart terminals have the ability to update the display, accept keypad input, and communicate with the Acroloop controllers over a serial port.

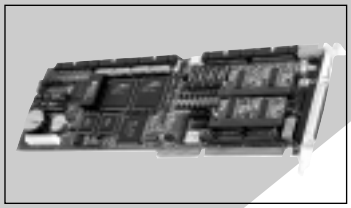


OPS8000

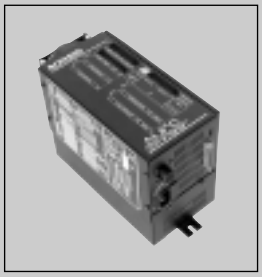
talk



ACH4800



ACR 8010

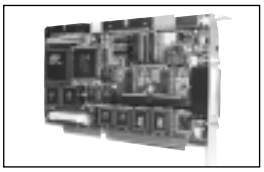


ACH3200

talk



KBD16



ACR2000

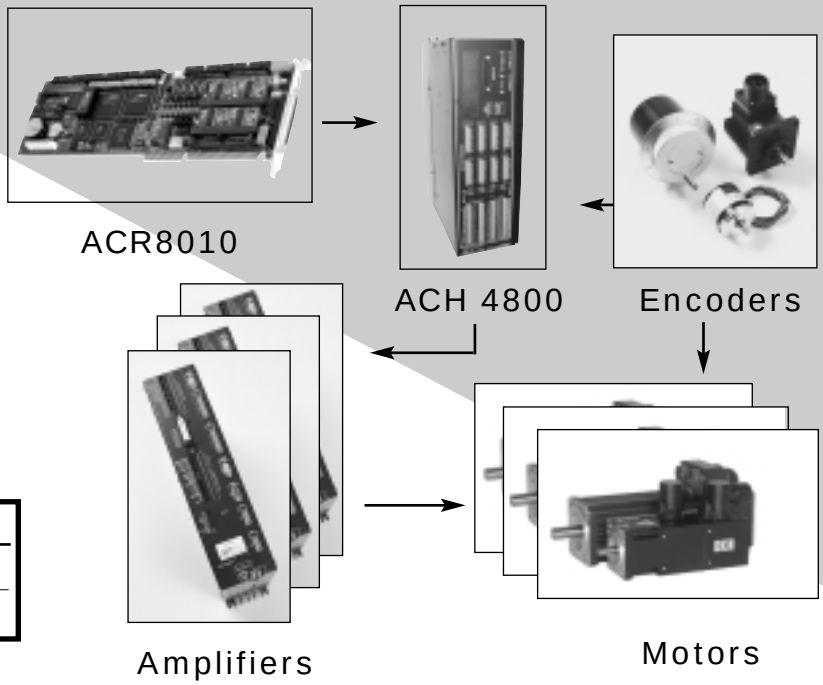
Dumb Terminals

Dumb terminals are useful for standalone applications that can run entirely on the Acroloop controllers and require limited information that needs to be displayed. The Acroloop controllers receive and transmit ASCII text by polling the serial port with a separate multi-tasked program running on the Acroloop controller.

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Step 5 - Motors, Amplifiers, and Feedback Devices

Many motors are available from stock inventory for immediate delivery. The motors can be supplied with integral encoders, matched amplifiers, power supplies, and the appropriate interconnecting motor cables.



Motor Type	Motor Size Range
Brushed	10 in./oz. - 75 in./lb.
Brushless	15 in./lb. - 950 in./lb.

Step 6 - Consider a Turnkey Package

Acroloop or a local distributor or VAR can supply a complete turnkey package. Complete turnkey packages include:

- Motion Controller(s)
- Controller Chassis'
- Operator Interface
- Motor(s), Amplifier(s), and Feedback Device(s)
- Software
- Complete Integration Hardware

Acroloop or a local Acroloop approved integration specialist will package all the electronics in an industrial enclosure complete with all interconnecting cables. Since the system is specifically designed for the application, product differentiation is easily achieved. Both single and multi-axis turnkey packages are available.



Multi-Axis Turnkey Package

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Product Catalog

ACR8020 (1-8 Axes Controller) - Page 24
ACR8010 (1-8 Axes Controller) - Page 26
ACR2000 (1-4 Axes Controller) - Page 28
ACR1500 (1-4 Axes Controller) - Page 30
ACR1200 (1-2 Axes Controller) - Page 32

Unique Features:

- 32/64 Bit Floating Point DSP
- On-the-Fly High Speed Trajectories
- Pre-Emptive Multi-Tasker
- Service up to 4 Comm. Channels Simultaneously
- Floating Point Electronic Gearing
- Automatic Rollover for No Cumulative Error
- Real Time Phase Advanced on Gears, Cams or Jog
- 50 usec Servo Update Time
- 200-500 usec (Addressable) Trajectory Loop Update Time
- Ladder Logic PLC
- Programmable Limit Switch with Multiple Sources for Initiation
- Hardware Position Registers
- On-Board Data Aqusition
- Optically Isolated I/O*
- Multi-Threaded Windows 98, NT Drivers
- Unlimited Data Array Size
- Complete Access to Variables Through Pre-mapped Parameters
- Free C++, Visual C & Visual Basic Libraries
- Free Active X Controls
- Free Development Software with Tuning Tool

*Except ACR1500 which are 5 Volt TTL Signals

- **Backlash and Ballscrew Compensation**
- **Hardware & Capture Registers**
- **S-Curve Profiling**
- **String Handling**
- **Time Based Moves**
- **Synchronized Master Moves**
- **Segmented Cams**
- **High Speed Triggered Cams**
- **Dual Feedback Control (Velocity and Position)**
- **Feedback can be Analog or Digital**
- **Outputs can be Stepper or Servo**
- **On-Board Diagnostics**
- **On-Board Oscilloscope**
- **Software Limits**
- **Torque Limits**
- **Spline Moves**
- **NURBS**
- **3-D Arcs**
- **Sinusoidal Commutation**
- **AcroWire IEEE-1394**
- **Automatic Tangential Tool Orientation**

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Acroloop's Family of Multi-axes Motion Controllers

At Acroloop Motion Control Systems, we have designed a family of motion control cards that incorporate state-of-the art hardware, firmware, and software.

We believe that a high-end motion controller should be as small, flexible, and high-speed as possible, yet, remain affordable.

Highlighting the Floating Point DSP

We have designed our entire family of motion controllers using high-speed Floating-Point Digital Signal Processors (DSP's). Floating-Point DSP's are the fastest, most accurate processors available today.

Acroloop uses the Texas Instrument TMS3203X DSP in all of the Acroloop family of Motion Controllers. The TI DSP simply outperforms non-DSP type processors in speed and accuracy. The Acroloop family's DSP's vary from 40-150MHz, and have the ability to perform floating-point calculations on-board. This gives us an advantage over a fixed-point DSP, or fixed-point Microprocessor-based controls. If a chip cannot perform floating point calculations on-board, then floating point calculations must be done in software.

Software calculations, instead of processor-based calculations, are typically updated at a much lower rate. This is one of the main reasons Acroloop's family of controllers can process trajectory calculations so fast, typically in the 200-500 usec range (our competitors are typically in the 5000-8000 usec range). The ability to perform calculations on-board the floating point DSP frees the controller to service a pre-emptive multi-tasker, with up to 24 programs at once, and service up to four communication channels concurrently. This means you can communicate with an Acroloop controller for troubleshooting and still have the HMI on a production machine fully on line and active!

State of the Art Manufacturing

Our commitment to product also extends to manufacturing. All cards from Acroloop described in this brochure are manufactured as Dual Sided Surface Mount Technology Cards on Acroloop's own Surface Mount manufacturing line. This keeps the leadtimes short and insures quality.

All cards, after passing a test fixture, are burned-in at Acroloop's test facility. In line with our commitment to being flexible, Acroloop controllers can be configured as stepper or servo in pairs. So you could have 2-axis of servo, and 2-axis of stepper, with 2 encoder inputs on a four-axis ACR1500 controller card. The same software applies to stepper or servo.

Common Firmware

Acroloop has common firmware for all the Acroloop family of controllers. This means if you want to upgrade to a faster or larger card later, all of your development work will carry over. Our firmware is infinitely flexible because it is parameter and flag based.

Any value such as commanded position, jog offset, ballscrew compensation, etc., is a parameter. This means it can be the result of a parametric equation, or perhaps loaded off a spreadsheet or possibly changed on the fly as the result of a flag being set.

Development Software

At Acroloop we embrace the trend towards Visual Basic, Visual C, or C++ Human Machine Interface. We also support many Soft PLC manufacturers as possible. Acroloop offers DLL's, Libraries and OCX's for various windows platforms.

Documentation such as User Guides, Hardware or Software Manuals, Technical Brochures and Specification Sheets are free on CD with any order. Our Development Tool, Acroview, is also available free of charge with any order.

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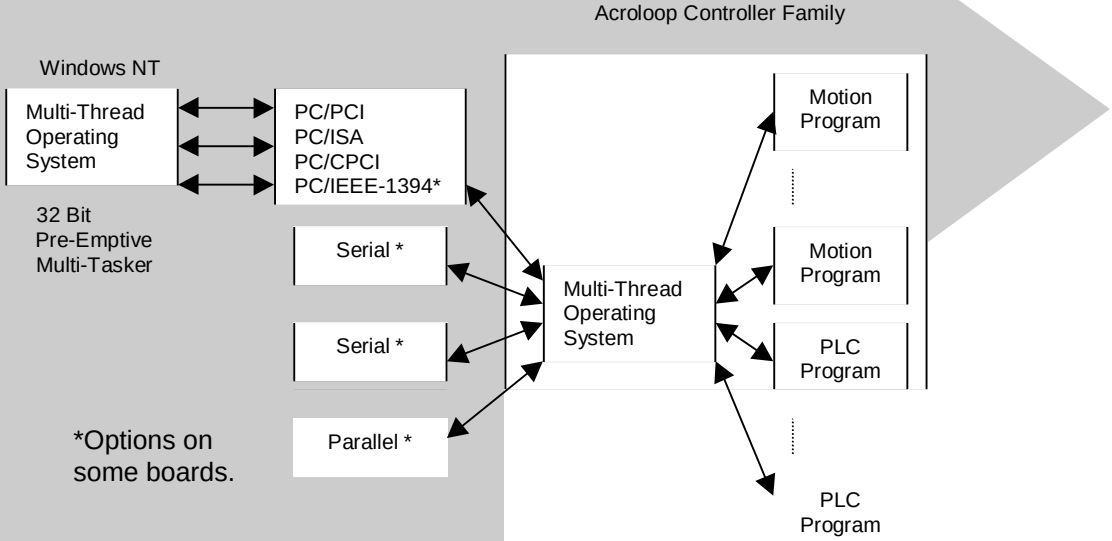
Pre-Emptive Multi-Tasker

The ACR Family of Controllers are true pre-emptive multi-taskers capable of performing multiple simultaneous tasks. The advantage of a pre-emptive multi-tasker is in its ability to toggle tasks based on the condition of a bit. When you have a program that need not always run, but needs to be readily available to run, a pre-emptive multi-tasker is the best choice. For example, if you need to dress a wheel on a grinder based on an input, or parametric equation. In this example, it would be a waste of valuable time to have this program being serviced constantly. However, if you did not have a pre-emptive multi-tasker, it would be necessary to allocate time for this little used program. In a pre-emptive situation, the program would be dormant until called for, and only then would it require time to be serviced.

The 32-bit pre-emptive multi-tasker can perform motion programs, PLC programs, and multi-threaded communications simultaneously.

The architecture permits the motion controllers to be able to communicate over the PC-Bus, and two serial ports simultaneously. This ability for all communication ports to be active at once means troubleshooting can be performed on a machine from one port while the standard communication port is active with the HMI. This means on-line trouble shooting is standard with Acroloop controllers.

Because of the standard on-board operating system in Acroloop controllers, time critical events can be off loaded to the controller. This is important, since the loading and therefore timing issues of the host PC CPU, are variable and the programmer cannot be sure of real-time execution. Therefore, real time application programming can be off-loaded to the Acroloop controller to insure real time execution.



32 Bit Pre-Emptive Multi-Tasker

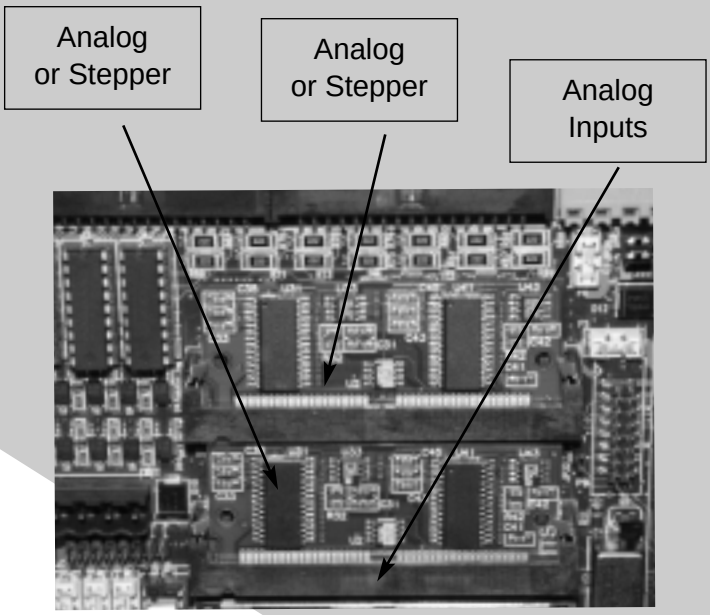
The ACR Controllers can perform the following with the pre-emptive multi-tasker:

· Perform up to 8 motion programs (50 usec/axis servo update rate)
· Perform up to an additional 8 programs (non-motion programs)
· Perform up to 8 PLC programs (2-5 msec scan time)
· Command up to 4 communication ports simultaneously

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Analog/Stepper Flexibility

The Acroloop Motion Controllers can be set up to accommodate stepper or servo analog outputs. The controllers can be configured in combinations explained in the ordering matrix on pages 34-35 of this brochure. Analog inputs at 12 or 16-bit resolutions are available as options. These may be field configured as single-ended or differential inputs.



Acroloop Trajectory Calculation

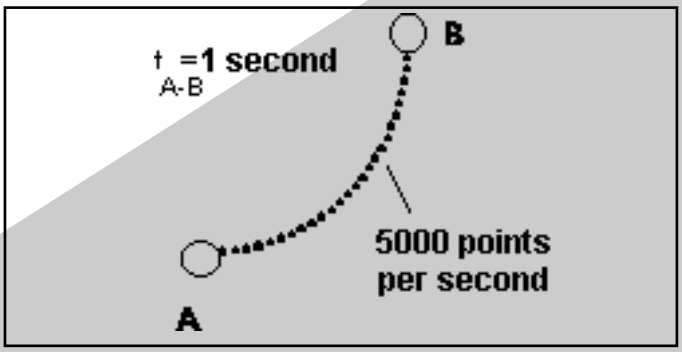
The architecture of the Acroloop controllers permits not only pre-emptive multi-tasking, but also highly accurate trajectory calculations. The Controllers are unique since they calculate a new trajectory point every interrupt. A new trajectory point is calculated every 200-1000 microseconds, depending on the user programmed interrupt period. Comparatively, other "high performance" motion controllers on the market calculate trajectories at a 5-10 millisecond rate. Thus, the Acroloop controller is an "order of magnitude" better with floating point calculations.

All of the trajectory calculations are performed on-board and calculated with a floating point processor. Based on a servo loop update time of 50 microseconds per axis, the servo update time for 2 axes is 100 microseconds. By adding an additional 100 microseconds for "overhead" tasks (PLC programs, communications, etc.), the total interrupt period is 100usec + 100usec = 200usec. The trajectory calculation is then the inverse of 200 microseconds or 5,000 points per second.

Trajectory Calculation Table

Number of Axis	Calculation Bits	40-150 MHz Points/Second
2	64	5,000
4	64	3,333
6	64	2,500
8	64	2,000

Acroloop Controller Trajectory Calculation-Trajectories calculated every interrupt.

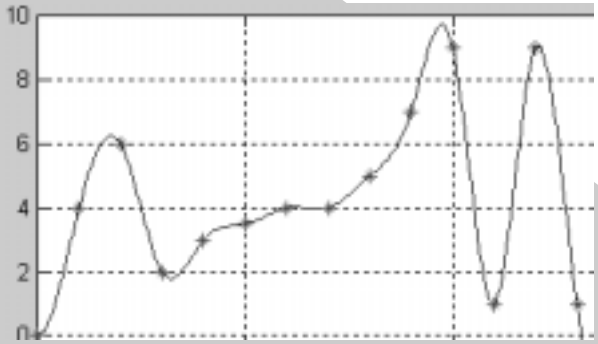


Calculating a new trajectory every interrupt is the method of choice when the process consists of normal motion geometry's (i.e. lines and arcs). In PC-Bus applications, the controllers perform the trajectory calculations without host intervention. The host simply sends the appropriate coordinate information to the Acroloop controller.

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Acroloop Cubic Splines

· Cubic Spline Interpolation with smoothness of continuous first and second derivatives of position.
· Can handle uniform and non-uniform data points.
· Ability to define initial and final velocity to blend with other motion profiles.
· Exactly goes through the data points.
· Spline interpolation can be time based or velocity based.




```
470 SPLINE mode 0
500 KO  X0
510 K1  X4
515 K2  X6
518 K2.5  X2
520 K4  X3
525 K5  X3.5
530 K6  X4
```

Fig 1. Example of how points can be randomly spaced in time greatly reducing program length.

Additional Features with NURBS and SPLINES.
· Dynamic Feed Rate over-ride.
· Feed Hold and Cycle Start facility like normal moves.
· Any source with source scaling like normal moves.
· Blending with other motion profiles. Allows normal line/arc move at the beginning or end of spline/nurb segment.
· Unique mix of modes only offered by Acroloop.

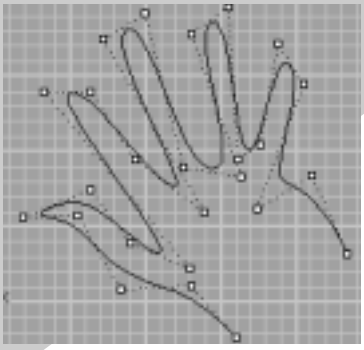
Acroloop NURBS

· Mathematical method of defining entire curve of up to 8 Axes.
· Free form curves can be accurately defined.
· Suitable for high speed machining up to 8 Axes.
· Gives better surface finish.
· Shorter program and fewer data points.
· No break between points at high speed.
· No need for high speed data transfer from the host.
· No error due to approximating NURB curve by small linear line segments.

Acroloop NURBS interpolation has three MODES.
· Nurb Mode0. Time based interpolation.
· Nurb Mode1. Linear Interpolation.
· Nurb Mode2. Dynamic Interpolation.

With these three modes, one can obtain the right velocity control over the nurb curve.

Acroloop Nurbs interpolation allows variable degree of RANK (smoothness).
· Nurb Rank 2 results in linear connection of points with least amount of smoothness.
· Nurb Rank 3 results in smooth 1st and 2nd derivatives of position.
· Nurb Rank 4 results in smooth 1st through 3rd derivatives of position.
· Nurb Rank 5 results in smooth 1st through 4th derivatives of position.



```
490 NURBS mode 0
502 KO        X23.4 Y8.2
504 KO        X21   Y13.4
506 KO        X17.4 Y11.2 VEL 100
208 KO        X20.6 Y19.5
510 K2.96     X18.8 Y22.1 VEL 200
512 K5.83     X17.7 Y15.5 VEL 100
514 K7.17     X16.1 Y14.5
516 K9.82     X15.5 Y24.6
518 K10.82    X13.1 Y22.8
```

Fig2. Example shows few control points needed to draw random shape and accompanying program.

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Floating Point Mathematics Precision

As previously discussed, the Acroloop Controllers are engineered around the Texas Instruments TMS320C3X Floating Point CPU. The controllers are also provided with 64-bit precision floating point math functions. Compare the 32-bit and 64-bit precision floating point variables to other motion controllers; you won't get rounding errors with the Acroloop Controllers. For example, a simple electronic gearing ratio can be set to a floating point number unlike other controllers with limited gear ratio ranges.

The Acroloop controller family is supplied with a 64 bit Floating Point Math Library. The Texas Instruments TMS320C3X uses 6 "decimal" digit numbers as standard to provide 32 bit accuracy. The Acroloop Controllers use 16 "decimal" digit floating point numbers to provide greater accuracy. For example, you can represent the distance between the Earth and the Sun to a precision of about 20 miles with a 6 "decimal" digit number. The same distance can be represented to a precision of 1/1000th of an inch with the 16 "decimal" digit number in the Acroloop Controllers.

The superior design of the processor permits the Floating Point Library to be installed on-board. The same Floating Point Library cannot be installed on other motion controllers due to their limited design and architectural features. With the Floating Point Library installed on the Acroloop Controllers, a full complement of parametric evaluations is possible.

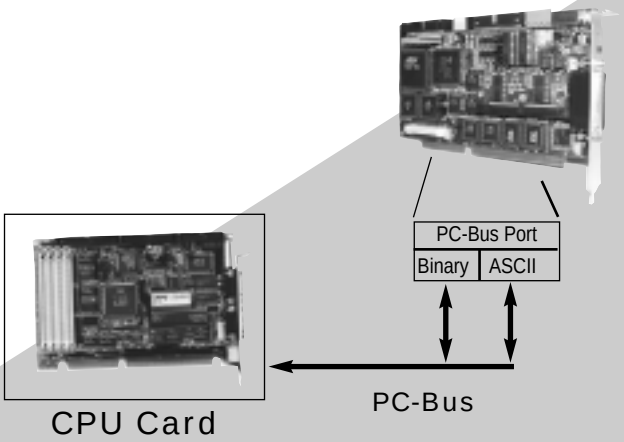
The built-in floating point evaluator operates on both global and local variables programmed in the Acroloop controller family. Unlike other motion controllers, the intermediate calculations for trajectories, parametric evaluations, PLC operations, high speed position captures, and many other tasks can all be performed simultaneously on the Acroloop controller without host intervention. If a PC host is required, it only requires updating the graphical display and feeding new operator information to the motion controller; the Acroloop controllers take care of everything else.

Simultaneous Port Access

The Acroloop controllers are unique since they can communicate both ASCII and Binary simultaneously. The simultaneous access ports permit unrestricted integration of front end software designs. Typically, the ASCII scheme is used for traditional serial communications in standalone situations. Simple ASCII codes can be transmitted to the board over any of the on-board communications ports (COM1,COM2, LPT, and the PC-BUS). However, the ASCII port on the PC-Bus port is critical in PC-Bus applications. The Binary port is used to handle the coordinate system data while the ASCII port is left open for additional communication that may require bypassing the Binary interface port. The Acroloop design allows 2 access doors to the Acroloop Controllers simultaneously.

The second door is open for bi-directional communications to and from the controller to the CPU.

In typical PC-Bus applications, the high speed data communications use the binary interface. A binary interface allows communications to occur in "coded" form. By using the "coded" form, communications can be increased dramatically to allow increased data throughput to and from the controllers. As a standard feature, the Acroloop controller family has 2 on-board high speed FIFO buffers to form a queuing system for the data from the host processor.



ACR2000

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Acroloop Controller Firmware Design

The Acroloop firmware is structured into specific object groups. Each group has a function and consists of similar commands. The firmware design lets the user tailor the board to the application. Consider the operating system group.

The Operating System group is capable of handling up to 8 coordinate systems.
The coordinate systems are referred to as MASTER. Each MASTER is an independent motion profiler. Each MASTER can have up to 8 SLAVE's. A slave is the model for an AXIS. A set of axes is dependent on the MASTER for the profile velocity, acceleration, and deceleration parameters.

The declarations for a 3-axis system with dual loop feedback on the X-Y axis are:

Command	Description
ATTACH MASTER0	REM: Setup profiler 0
ATTACH SLAVE0 AXIS0 "X"	REM: Setup the X axis
ATTACH SLAVE1 AXIS1 "Y"	REM: Setup the Y axis
ATTACH SLAVE2 AXIS2 "Z"	REM: Setup the Z axis
ATTACH AXIS0 ENC0 DAC0 ENC1	REM: Setup dual feedback for X axis
ATTACH AXIS1 ENC2 DAC1 ENC3	REM: Setup dual feedback for Y axis
ATTACH AXIS2 ENC4 DAC2	REM: Setup Z axis

In general, any combination of encoder, analog, stepper, and DAC output/input combinations can be attached to an axis. The only restrictions are how the board is configured from a hardware standpoint.

Additional firmware commands are available to perform complex algorithms or dynamic control.
Almost all motion controllers have some form of camming, gearing, and I/O control, but at Acroloop, even these general commands are taken to another level of performance. The Acroloop firmware commands include:

- Local Variables and Arrays - dynamic local program manipulation
- Global Variables and Arrays - dynamic global program manipulation
- String Variables and Arrays - full complement of string handling commands
- Segmented Electronic Cam - position and velocity matching mode
- Floating Point Electronic Gearing - velocity matching mode
- Programmable Limit Switch - Digital I/O control (200-500 microsecond scan time)
- Ladder Logic PLC - Multi-tasked PLC control (2-5 millisecond scan time)
- Cubic Splines Interpolation
- NURBS Interpolation
- 3D Arc Interpolation
- Sinusoidal Commutation
- Time Based Moves

Acroloop firmware is "OBJECT" based. This makes programming and diagnosing very easy to accomplish. As an example, take the COMMUTATION objects CMT0, CMT1...CMT7. These 8 objects are responsible to software commutate motor windings if the user chooses to use them. To set control parameters, the user can simply address the object properties in easy to understand commands. The following properties come up as default with the commutator turned off.

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Command	Description
CMT0 OFF	REM Commutator if Off.
CMT0 ENC0 ENC1	REM Encoder Inputs used for commutation.
CMT0 MODE 8	REM Mode is Trapezoidal then Sinusoidal.
CMT0 ANG 120	REM Angle between windings is 120 degrees.
CMT0 DAC0 DAC1	REM Dac outputs used for Phased Sine Outputs.
CMT0 ADC0 ADC1	REM Optional ADC inputs used for current loop.
CMT0 SHIFT0	REM Shift between marker and winding.
CMT0 PPR 1024	REM Pulses per rev of the encoder.
CMT0 ERPMR 2	REM Electrical revs per motor shaft revolution.
CMT0 MAX RPM 0	REM Max allowable revolutions per minute.
CMT0 MAX AMP 0	REM Max allowable AMPS into motor.

Object based programming is not only easy to program but it makes a big impact in diagnosing and debugging a program.

The Acroloop programming details are unique in their implementation. Compare these details before you buy! For a complete detailed description of the commands and the firmware structure, contact Acroloop or your local sales office for an Acroloop Technical Brochure.

Hardware Parameter Access

The Acroloop firmware is implemented for infinite flexibility. The structure is a completely open design allowing the designer complete access to virtually every possible motion control parameter and flag. As previously discussed, there are up to 8 MASTER's and up to 8 axes on a motion controller. A master controls a group of axes. Thus, each MASTER has a unique group of variables that can be monitored or changed on-the-fly.

Analyzing the tables, the vector velocity for MASTERprofiler 0 is stored in hardware parameter number P8193. Variable P8193 is a 32-bit floating point variable. If the programmer wanted to display the current position of AXIS0 on the operator display, a request would be made to the Acroloop controller to retrieve the 32-bit long integer stored in hardware register P12288. There are approximately 15,000 different parameters pre-programmed into the Acroloop controllers.

Examples of MASTER Parameters

Position Parameters	Type	MASTER0
Vector Position	FP32	P8192
Vector Velocity	FP32	P8193
Vector Acceleration	FP32	P8194
Vector Jerk	FP32	P8195
Vector Length	FP32	P8196
Target Velocity	FP32	P8196
Target Acceleration	FP32	P8197

Examples of AXIS Parameters

Position Parameters	Type	AXIS0
Current Position	LONG	P12288
Target Position	LONG	P12289
Actual Position	LONG	P12290
Following Error	LONG	P12291
Hardware Capture	LONG	P12292
Software Capture	LONG	P12293
Primary Setpoint	LONG	P12294
Secondary Setpoint	LONG	P12295

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3-D Arc Generation

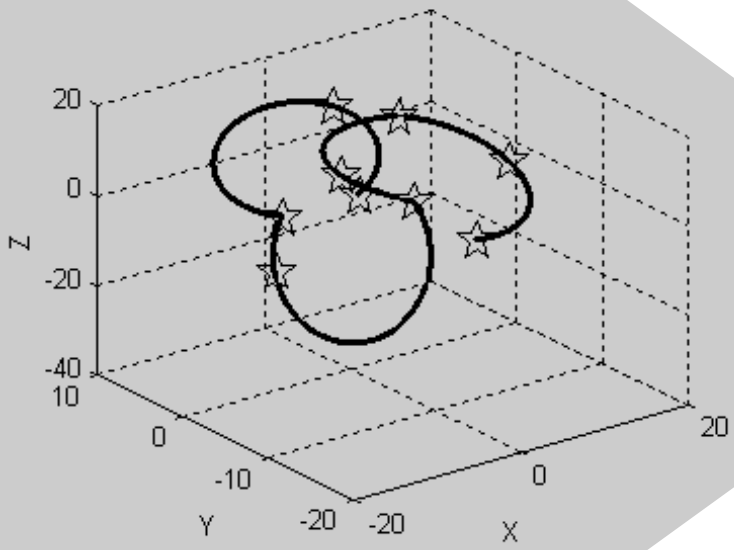
In addition to the Spline and Nurb feature, the Acroloop controllers now offer Three Dimensional Arc Interpolation.

In 3-D machining, smart CAD systems have the ability to output 3-D arc segments to the CNC control. For this specific reason, Version 1.18.05 and above software allows user to specify 3-D Arcs (TARC command) directly into the controller. This command is used to select any three of the axes attached to the master to do 3-dimensional circular interpolation. In this mode, the 3-D Arc is defined by a start point, an intermediate point and an end point of the arc.

These points can be specified as incremental or absolute position. For successive 3-D Arcs, the end point of the arc is used as the start point of the next arc.

As required, any additional number of axes can be specified to the three-dimensional interpolation axes to perform a coordinated move.

The user simply specifies the start point, intermediate point and the end point. There is no need to specify clockwise or counterclockwise direction, since the controller can automatically calculate the direction of rotation from user specified intermediate point.



EXAMPLE

TARC OFF	Default is TARC mode off.
X1 Y-14 Z1	Position to start point
TARC ON X Y Z	XYZ-axes are put to 3-D circular interpolation mode
X13 Y-6 Z5	1st Arc intermediate point
X8 Y2 Z10	1st Arc end point
X5 Y6 Z-5	2nd Arc
X10 Y2 Z-10 A2	A-axis will do linear coordinated move with XYZ-axes
X0 Y0 Z-4.5	3rd Arc intermediate point
X-10 Y-2 Z1	3rd Arc end point
X1 Y3 Z15	4th Arc
X-1 Y-2 Z1	

This feature is not only limited to 3-D arcs. In 2-D, this is the simplest method of making an Arc. This command is a superset of the 3 point circle generate function. This has tremendous advantages for digitizing and teaching applications.

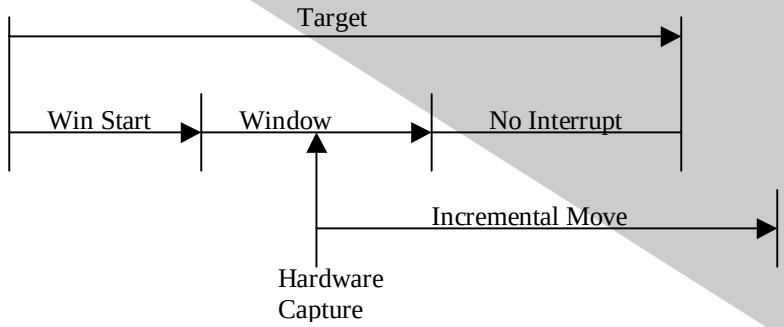
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HSINT - High-Speed Interruptible Move

The purpose of the HSINT command is to give the programmer a way to initiate an incremental move based on an input. On webs, in particular, it is common to initiate motion on the leading edge of a marker.

With this command one needs to define a target position, then a window. Once this is done, point to an input and when it goes to the correct state, it will initiate the incremental move. This is all done at high speed with one line of code.

HSINT



PLS - Programmable Limit Switch

The PLS command allows sequencing an Output Parameter (usually Physical I/O bits) based on the changing values of an Input Parameter (usually an encoder). The simplest form of a PLS is what is used in most "drum" sequencers in washing machines to control various wash cycles. In the Acroloop PLS, the user can select from a host of input and output parameters. Via software, the user can electronically advance and retard the source parameter, mask and scale the output parameter. Typically, Outputs are fired based on the position of a source encoder. This can be done in conjunction with a CAMMING operation. The MASK feature allows the user to allow the PLS to operate only on as many I/O bits as required. The firing sequence is programmed into a Local Variable Array. The size of the array can be as long as available memory allows.

PLS SRC	Set PLS source
PLS BASE	Attach array to PLS
PLS ROTARY	Set PLS rotary length
PLS ROTARY	Set PLS rotary length
PLS ON	Enable PLS update
PLS DST	Set PLS destination pointer
PLS RES	Reset or pre-load counter
PLS FLZ	Set PLS index offset
PLS RATIO	Set PLS Scaling ratio
PLS OFF	Disable PLS update

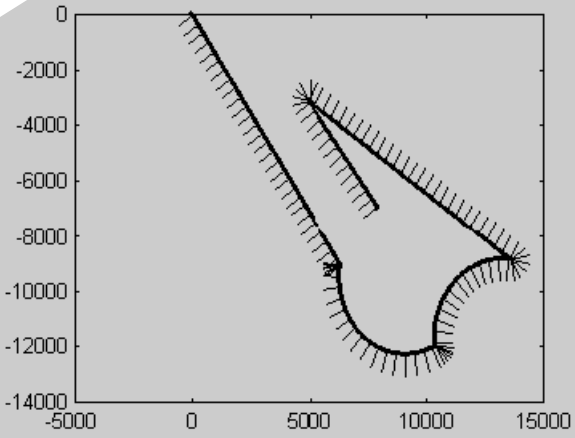
Automatic Tangential Orientation

This feature automatically orients a cutting tool to a user set angle along an XY path. Rather then jump at discontinous geometries, the control delays the next move and waits for the tool axes to orient.

TANG Z X Y ANG 90

The above command will hold the tool at 90 degrees along the path shown.

Tangential Orientation

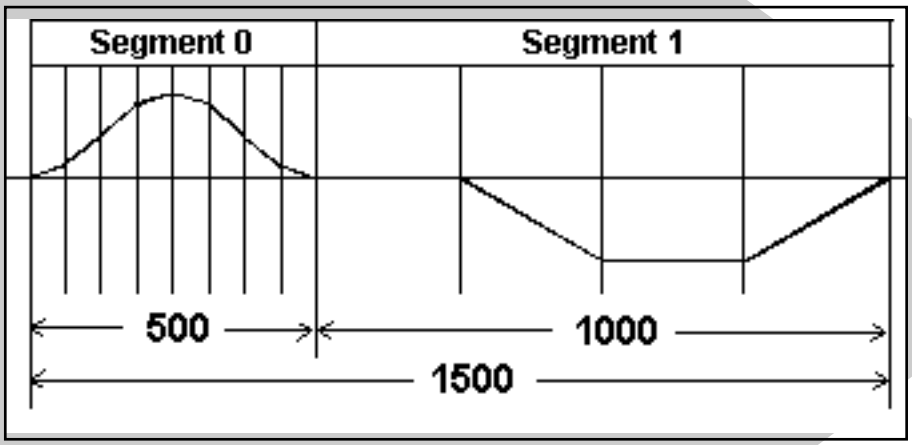


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Cam - Electronic Cam

The CAM command is used as a replacement for mechanical cam. The ability to segment the CAM gives the programmer flexibility. The CAM profiler will automatically linearly interpolate between any two points no matter the density of the points. The data for each segment of the CAM table resides in separate long integer arrays, possibly of different sizes. This allows some parts of the table to be defined coarsely, and others to be defined in more detail.

CAM Commands	
CAM DIM	Allocate cam segments
CAM SRC	Redefine cam source
CAM OFF	Disable cam output
CAM OFFSET	Set cam output offset
CAM SHIFT	Set incremental cam shift
CAM SEG	Define cam segments
CAM ON	Enable cam output
CAM SCALE	Set cam output scaling
CAM FLZ	Set cam input offset
CAM RES	Transfer cam offset



TRG Cam - Triggered Cam

The TRG CAM command allows that a cam be started with almost no following error or time delay. The advantage to this type of move is the ability to negate the hysteresis typically associated with this type of move. For instance, if a web line was moving at 60 ft/sec and there is a 2msec hysteresis before motion took place you can see by formula that there will be an error of:

60ft/sec x 12in/ft = 720in/sec x .002sec = 1.44 inches of error.

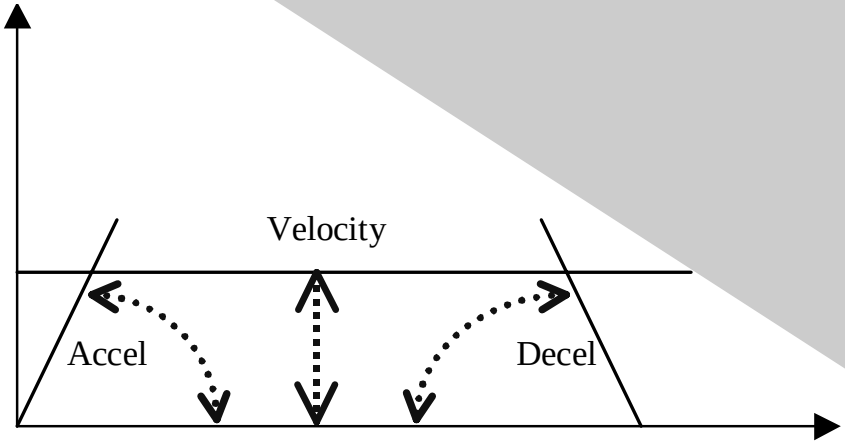
The TRG CAM command negates this and therefore increases repeatability and accuracy to within one microsecond. Barring mechanical limitations, the electronic accuracy is now reduced by a factor of 2000 to 0.0007”!

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TMOV - Time Based Move

The TMOV command was implemented to give programmers an eloquent means of having moves be completed in a specific amount of time. Previous to TMOV, the programmer would need to program with a calculator to determine the speed, acceleration and deceleration needed to arrive at a destination in a specific amount of time.

With a constant time for moves the speed would need to be different for every length of move and would have to be recalculated. Now the Acroloop family of controllers solves your equation using TMOV. You need just to decide the length and time of your move!

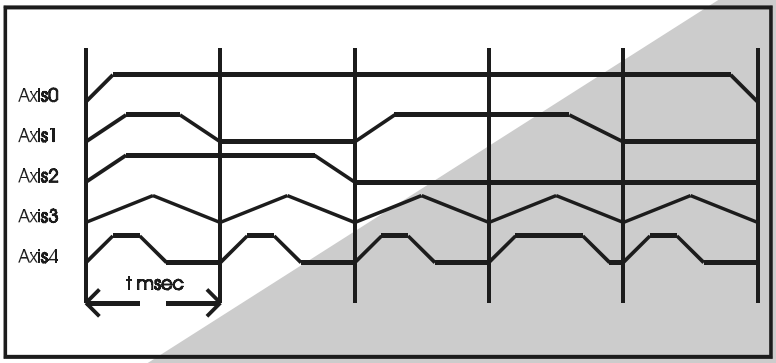


Once Velocity, Accel and Decel are set in the default settings, TMOV will calculate Velocity, Accel and Decel based on length and time of move.

SYNC - Master Synchronizing

Occasionally it is necessary to run several coordinated groups of axis' masters, in synchronization with another master. For instance, in sewing, if a X-Y table is under a needle, the table can only move when the needle is up out of the fabric. In this example the SYNC command can be used to coordinate the movement of the needle to the movement of the table.

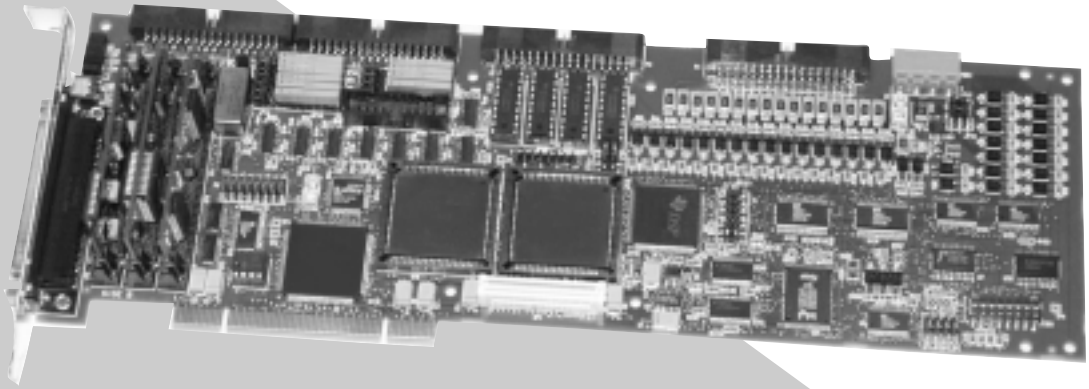
Using SYNC moves, instead of coordinated moves, gives the flexibility of using different motion profiles for different masters, while still keeping them in sync.



The figure above shows a velocity vs. time graph for five axes attached to different masters that move with independent accelerations and decelerations yet are synchronized amongst themselves. They all complete their moves within the prescribed time interval of tmsec specified by the user. This mechanism can be useful in coil winding applications when the wire feed moves continuously, yet other axes must come and go at their own pace, but yet be synchronized to the wire feed.

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ACR8020



Our fastest most featured packed controller ever! (PCI, CPCI PC Bus Operation)

The ACR8020 is Acroloop Motion Control Systems' newest and most feature packed controller ever for PCI/ CPCI PC Bus Operation. It has the ability to run 8 Servo Loops (16 with expansion board), DAC or Stepper outputs and 10 encoders (20 with expansion board) at 20Mhz counting rate. It can also be equipped with 8 analog (12 or 16 bit resolution) inputs. MultiAxis coordinated motion can be performed in multiple groups of axes. Because of our modular design, it is possible to have several axes of servo mixed with stepper outputs on the same controller. All of the Acroloop Motion Control Systems' controllers are software compatible so the standard features and benefits apply to the ACR8020.

As far as speed, the ACR8020 is unmatched in the industry at 150MFLOPS!

ACR8020 Exclusives

- 150 MHz floating Point DSP
- 8 Axes of Servo or Steppers Expandable to 16
- 10 Encoder Inputs at 20MHz Expandable to 20
- User and System Memory 512Kbytes (Expandable to 2 Mbytes) each
- Encoder Loss and Fault Protection
- 64 Optically Isolated 24VDC I/O Expandable to 320 I/O
- Dual Port Memory Standard
- Master PCI and CPCI DMA Interface
- Full size PCI and 6U CPCI Size
- Optional Parallel Port and 2-Serial RS232/RS422/ RS485 or AcroWire (IEEE1394) Interface

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ACR8020 SPECIFICATIONS

Hardware

Axes/controller	1-8 Axes (Expandable to 16)
Communications	PCI, CPCI Bus
Processor	32/64 bit Floating Point DSP @150MHz
Trajectory Calc.	64-bit Precision
User Memory	512KB (expandable to 2 MB)
System Memory	512KB (expandable to 2 MB)
Firmware	Flash Based
Flash Memory	512KB (expandable to 2 MB)
Size	Full size PCI, 6U CPCI
Operating System	Multitasking RTOS

Communications

PC Interface	Bus Mastering PCI, CPCI with Dual Port Memory

Inputs/Outputs

Encoder Inputs	10 (expandable to 20) at 20MHz
Analog Outputs	Up to 16 16-bit Precision
Stepper Outputs	Up to 16 @ 4 MHz
Digital I/O	64, 24V-DC Optically-Isolated (expandable to 320)
Auxiliary Analog Inputs	Up to 8 (12 or 16 bit)

Performance

Multi-tasker	16 Coordinate Systems, Motion/PLC programs
Trajectory Update	Every 100-500 usec
Servo Update	25usec/axis
Ladder Logic PLC	100-500usec scan
Interpolation	Linear, Circular, Sinusoidal, Helical and Elliptical, Splines, Nurbs, 3-D Arcs
Servo Loop	PID, Velocity Feedforward, Acceleration Feedforward Notch, LoPass filtering
Position Reg.	Hardware, < 1usec
Communications	Simultaneous PCI, Serial and LPT ports, AcroWire IEEE-1394

Software Support

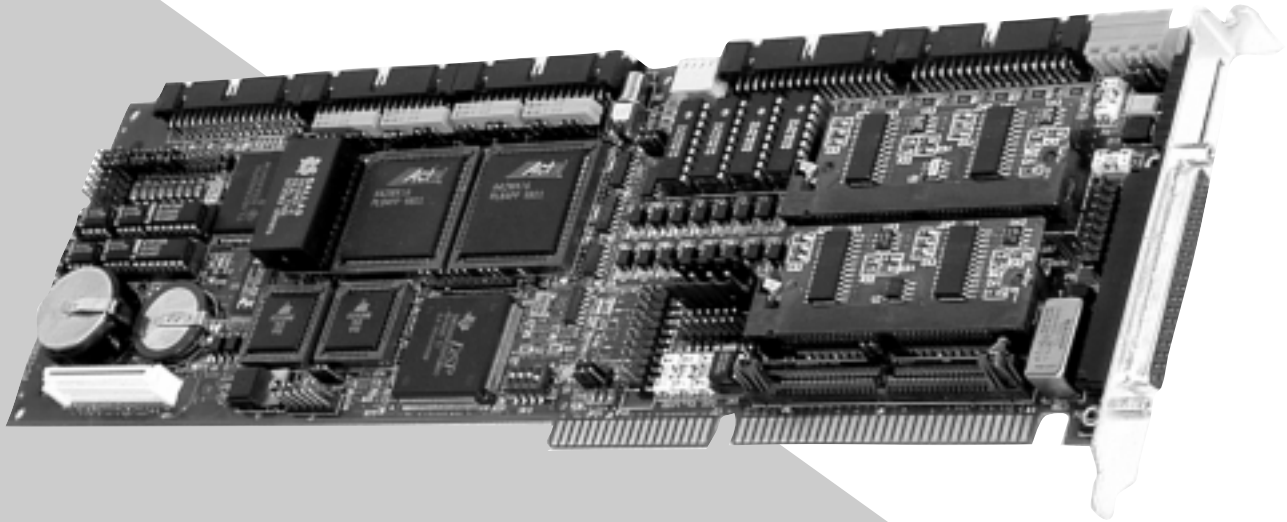
Standard Lang.	Visual Basic,C++,
Program Tools	AcroVIEW Motion/PLC Program
Dev. Tools	ActiveX Controls
Operating System	Windows NT, 98, 2000

Additional Firmware Highlights:

· Triggered Floating Point Electronic GEARING
· Triggered Segmented Electronic CAM
· On-the-fly Position and Velocity Matching
· Ladder Logic PLC
· Interruptible Moves
· Either Analog or Digital Feedback for Position or Velocity Loops
· Dual Encoder Feedback
· Teach and Learn Functions
· Parameter Based with over 15,000 addressable Predefined Hardware Registers
· Sinusoidal Commutation
· NURBS and Splines
· 3-D Arcs
· Automatic Tangential Tool Orientation

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ACR8010



Our fastest most featured packed controller ever! (Standalone or ISA PC Bus Operation)

The ACR8010 is Acroloop Motion Control Systems' newest and most featured packed controller for ISA PCBus Operation. The ACR8010 is capable of Standalone or PC-Bus operation. It has the ability to run up to eight servo loops, with up to 10 encoders at 20MHz. It can optionally be equipped with 8 analog inputs through a 12 or 16 bit analog/digital converter and introduce these inputs into servo loops. It is possible to have a Virtual Axis be the Master to multi-axis coordinated motion. Because of our modular design to our outputs, it is possible to have several axis of servo with several axis of stepper on the same controller. Of course all of Acroloop Motion Control Systems' controllers run on the same software and firmware, so the standard features and benefits apply to the ACR8010 as well.

The ACR8010 is Acroloop Motion Control Systems' answer to affordable high performance control when flexibility, real-time speed, and ease of programming are most needed.

This product is the successor to the very popular ACR8000 and offers plug compatibility with the older product.

ACR8010 Exclusives

- 8 axis of Servo or Stepper Control
- 60 MHz Floating Point DSP
- Up to 10 Encoder Inputs at 20MHz
- User and System Memory 512KBytes Standard (Each Expandable to 2 Mbytes)
- Encoder Loss and Encoder Fault Protection
- 64 Optically Isolated 24 VDC Inputs and Outputs (Expandable to 320 Optically Isolated 24 VDC Inputs and Outputs)
- Up to Four Communication Channels (PC Bus, 2 Serial RS-232/RS-422, 1Parallel Port)
- Calendar Clock Option
- Dual Port Memory Option
- Single Slot Plug & Play Controller

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ACR8010 SPECIFICATIONS

Hardware

Axes/controller	1-8 axes
Communications	PC-Bus or Standalone
Processor	32/64 bit Floating Point DSP @ 60MHz
Trajectory Calc.	64-bit precision
User Memory	512KBytes (expandable to 2 MB)
System Memory	512K bytes (expandable to 2 MB)
Firmware	Two 128K x 16 EPROM's
Flash Memory	512K bytes (expandable to 2 MB)
Size	Full size ISA board
Operating System	Real time system independent of PC

Communications

PC Interface	Two 512 x 8 hardware FIFO's, Optional Dual Port RAM
Standalone	Two Serial Ports (RS-232 and/or RS-422) One Parallel Port (8-bits)
Protocols	Binary (PC), String, & ASCII

Inputs/Outputs

Encoder Inputs	10 (32-bit registers), up to 20 MHz
Analog Outputs	up to 8, 16-bit precision
Stepper Outputs	up to 8, 4 MHz
Digital I/O	64, 24VDC optically-isolated (expandable to 320)
Auxiliary Analog Inputs	up to 8 (12 or 16 bit)

Performance

Multi-tasker	8 coordinate systems, Motion/PLC programs
Trajectory Update	Every 200-500 micro seconds
Servo Update	50 microseconds/axis
Ladder Logic PLC	200-500 microsecond scan time
Interpolation	Linear, Circular, Sinusoidal, Helical and Elliptical, Splines, Nurbs, 3-D Arcs
Servo Loop	PID, Velocity Feedforward, Acceleration Feedforward with Notch, LoPass and programmable filtering
Position Capture	Hardware, < 1 microsecond
Communications	Simultaneous PC, Serial and LPT Ports, AcroWire IEEE-1394

Software Support

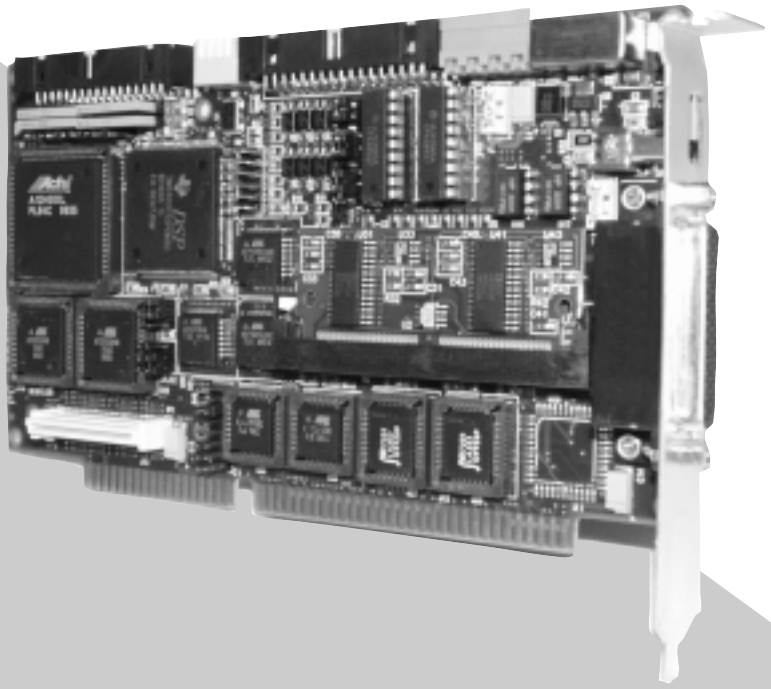
Standard Lang.	Visual Basic,Visual C++, C++
Program Tools	AcroVIEW Motion/PLC Program
Dev. Tools	ActiveX/OCX controls
Operating System	Windows NT, Windows 95/98, DOS

Additional Firmware Highlights:

· Triggered Floating Point Electronic GEARING
· Triggered Segmented Electronic CAM
· On-the-fly position and velocity matching
· Ladder Logic PLC
· Programmable Limit Switch
· Interruptible moves
· Either analog or digital feedback for position or velocity loops
· Dual encoder feedback
· Teach and Learn functions
· Parameter based with over 15,000 addressable pre-defined hardware registers
· Sinusoidal commutation
· NURBS and Splines
· 3-D Arcs
· Automatic Targential Tool Operation

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ACR2000



Full featured 1 - 4 axis PC or standalone controller!

The ACR2000 is capable of Standalone or PC-bus operation. It has the ability to run up to four servo loops, with up to 4 encoders at 20MHz. It can optionally be equipped with 8 analog inputs through a 12-bit analog/digital converter and introduce these inputs into servo loops. Because of our modular design to our outputs, it is possible to have four axis of servo or four axis of stepper on the same controller. The ACR2000 controller, like the ACR8010, uses a SIMM card for analog outputs or stepper outputs and can be purchased as 2 or 4 axis. Of course, all of Acroloop's systems run on the same software and firmware, so the standard features and benefits apply to the ACR2000 as well.

The ACR2000 is Acroloop Motion Control Systems' answer to four axis or less affordable high performance control, when flexibility in the field, real-time speed, and ease of programming are most needed.

ACR2000 Exclusives

- 4 axis of Servo or Stepper Control
- 50 MHz Floating Point DSP
- Up to 4 Encoder Inputs at 20MHz
- User and System Memory 128 x 8 bytes Standard (Each Expandable to .5 Mbytes)
- 32 Optically Isolated 24 VDC Inputs and Outputs (Expandable to 288 Optically Isolated 24 VDC Inputs and Outputs
- Up to Four Communication Channels (PC Bus, 2 Serial RS-232/RS-422, 1Parallel Port)

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ACR2000 SPECIFICATIONS

Hardware

Axes/controller	1-4 axes
Communications	PC-Bus or Standalone
Processor	32/64 bit Floating Point DSP @50MHz
Trajectory Calc.	64-bit precision
User Memory	512KBytes
System Memory	512KBytes
Firmware	Two 128K x 16 EPROM's
Flash Memory	512KBytes
Size	Half- size ISA board
Operating System	Real time system independent of PC

Communications

PC Interface	Two 512 x 8 hardware FIFO's
Standalone	Two Serial Ports (RS-232 and/or RS-422) One Parallel Port (8-bits)
Protocols	Binary, String, & ASCII

Inputs/Outputs

Encoder Inputs	4 (32-bit registers), 8 MHz
Analog Outputs	up to 4, 16-bit precision
Stepper Outputs	up to 4, 4 MHz
Digital I/O	32, 24VDC optically-isolated (expandable to 320)
Auxiliary Analog Inputs	up to 8 (12- bit)

Performance

Multi-tasker	8 coordinate systems, Motion/PLC programs
Trajectory Update	Every 200-500 micro seconds
Servo Update	50 microseconds/axis
Ladder Logic PLC	200-500 microsecond scan time
Interpolation	Linear, Circular, Sinusoidal, Helical and Elliptical Splines, Nurbs, 3-D Arcs
Servo Loop	PID, Velocity Feedforward, Acceleration Feedforward with Notch, LoPass and programmable filtering
Position Reg.	Hardware, < 1 microsecond
Communications	Simultaneous PC, Serial and LPT ports, AcroWire IEEE-1394

Software Support

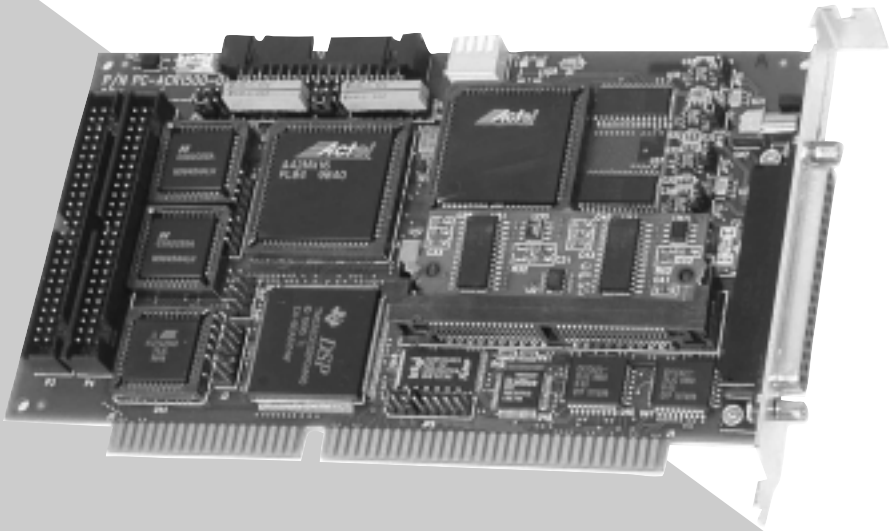
Standard Lang.	Visual Basic,Visual C++, C++
Program Tools	AcroVIEW Motion/PLC Program
Dev. Tools	ActiveX/OCX controls
Operating System	Windows NT, Windows 95/98, DOS

Additional Firmware Highlights:

· Triggered Floating Point Electronic GEARING
· Triggered Segmented Electronic CAM
· On-the-fly position and velocity matching
· Ladder Logic PLC
· Programmable Limit Switch
· Interruptible moves
· Either analog or digital feedback for position or velocity loops
· Dual encoder feedback
· Mixing of Axes and interpolation
· Teach and Learn functions
· Parameter based with over 15,000 addressable pre-defined hardware registers
· NURBS and Splines
· Spherical Commands
· Automatic Targential Tool Operation

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ACR1500



OEM priced PC based ACR controller!

The ACR1500 is Acroloop Motion Control Systems' new OEM 4-axis PC-Bus based controller. The ACR1500 is a PC-bus based card only and offers no serial or LPT ports as an option. It has the ability to run up to four servo loops with up to 4 encoders at 20MHz. It can optionally be equipped with 8 analog inputs through a 12 or 16 bit analog/digital converter, and introduce these inputs into the servoloop. Because of our modular design to our outputs, it is possible to have two axis of servo with two axis of stepper on the same controller or all of one type. Unlike the Acroloop family of controllers the ACR1500 utilizes a 16-bit bus, therefore, reducing cost dramatically. Until the ACR1500, this level of control had been typically double the price! Of course, all of Acroloop's systems run on the same software and firmware, so the standard features and benefits apply to the ACR1500 as well.

The ACR1500 is Acroloop Motion Control Systems' answer to affordable high performance control when low cost, real-time speed, and ease of programming are most needed.

ACR1500 Exclusives

- 4 Axis of Servo or Stepper Control
- 40 MHz Floating Point DSP
- 4 Encoder Inputs at 20MHz
- User and System Memory 128KBytes Standard
- 48 TTL I/O with an Industry Standard Opto 22, 50 Pin Connector
- Low Cost 16-bit Bus
- High Performance at a Low Cost

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ACR1500 SPECIFICATIONS

Hardware

Axes/controller	1-4 axes
Communications	PC-Bus
Processor	32/64 bit Floating Point DSP @40MHz
Trajectory Calc.	64-bit precision
User Memory	128KBytes
System Memory	128KBytes
Firmware	One 256K x 16 EPROM
Flash Memory	128KBytes
Size	Half- size ISA board
Operating System	Real time system independent of PC

Communications

PC Interface	Two 512 x 8 hardware FIFO's
Standalone	N/A
Protocols	Binary, String, & ASCII

Inputs/Outputs

Encoder Inputs	4 (32-bit registers), up to 20 MHz
Analog Outputs	up to 4, 16-bit precision
Stepper Outputs	up to 4, 4 MHz
Digital I/O	48 Opto-22 compatible, programmable as inputs or outputs in groups of 8
Auxiliary Analog Inputs	up to 8 (12 or 16 bit)

Performance

Multi-tasker	8 coordinate systems, Motion/PLC programs
Trajectory Update	Every 200-750 micro seconds
Servo Update	75 microseconds/axis
Ladder Logic PLC	200-750 microsecond scan time
Interpolation	Linear, Circular, Sinusoidal, Helical and Elliptical Splines, 3-D Arcs
Servo Loop	PID, Velocity Feedforward, Acceleration Feedforward with Notch, LoPass and programmable filtering
Position Reg.	Hardware, < 1 microsecond
Communications	PC,Bus

Software Support

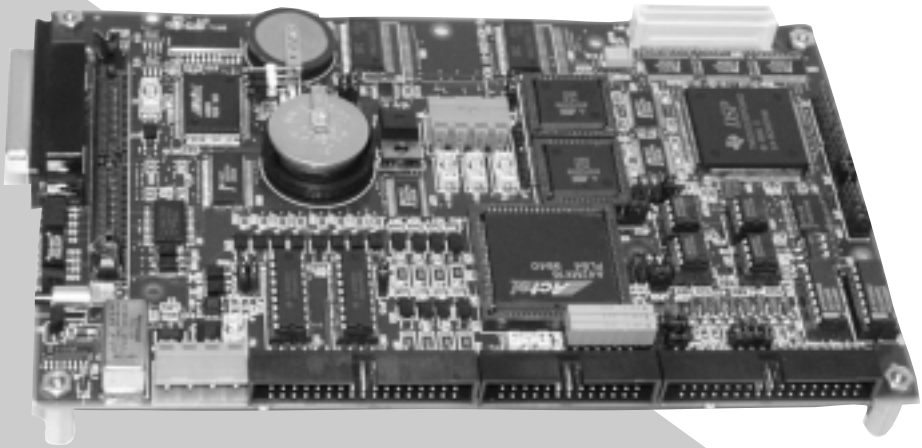
Standard Lang.	Visual Basic,Visual C++, C++
Program Tools	AcroVIEW Motion/PLC Program
Dev. Tools	ActiveX/OCX controls
Operating System	Windows NT, Windows 95/98

Additional Firmware Highlights:

· Triggered Floating Point Electronic GEARING
· Triggered Segmented Electronic CAM
· On-the-fly position and velocity matching
· Ladder Logic PLC
· Programmable Limit Switch
· Interruptible moves
· Either analog or digital feedback for position or velocity loops
· Dual encoder feedback
· Mixing of Axes and interpolation
· Teach and Learn functions
· Parameter based with over 15,000 addressable pre-defined hardware registers
· Sinusoidal Commutation
· Automatic Targential Tool Operation

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ACR1200



OEM priced Full Featured Standalone Controller!

The ACR1200 is Acroloop Motion Control Systems' new OEM 2-axis standalone controller. The ACR1200 is a standalone controller card only and offers no PC port as an option. The ACR1200 comes standard with two serial ports, either RS-232 or RS-422. It has the ability to run up to two servo loops with up to 3 encoders at 20MHz. It can optionally be equipped with 8 analog inputs through a 12 or 16 bit analog/digital converter and introduce these inputs into the servoloop. Because of our modular design to our outputs, it is possible to have one axis of servo with one axis of stepper on the same controller, or all of one type. Until the ACR1200, this level of control at our price had not been available. Of course, all of Acroloop's systems run on the same software and firmware, so the standard features and benefits apply to the ACR1200 as well.

The ACR1200 is Acroloop Motion Control Systems' answer to affordable high performance standalone control, when low cost, real-time speed, and ease of programming are most needed.

ACR1200 Exclusives

- 2 Axis of Servo or Stepper Control
- 40 MHz Floating Point DSP
- Up to 3 Encoder Inputs at 20MHz
- User and System Memory 128KBytes, each, Standard
- Encoder Loss and Encoder Fault Protection
- High Performance, at a Low Cost
- 32 Opto Isolated, 24 VDC, I/O Standard (Expandable to 160 Opto Isolated 24 VDC, I/O)

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ACR1200 SPECIFICATIONS

Hardware

Axes/controller	1-2 axes
Communications	Standalone
Processor	32/64 bit Floating Point DSP @40MHz
Trajectory Calc.	64-bit precision
User Memory	128K bytes (expandable to 512K)
System Memory	128K bytes (expandable to 512K)
Firmware	Two 128K x 16 EPROM's
Flash Memory	128K bytes (expandable to 512K)
Size	8" W x 5" H
Operating System	Real time system independent of PC

Performance

Multi-tasker	8 coordinate systems, Motion/PLC programs
Trajectory Update	Every 200-750 micro seconds
Servo Update	75 microseconds/axis
Ladder Logic PLC	200-750 microsecond scan time
Interpolation	Linear, Circular, Sinusoidal, Helical and Elliptical Splines, Nurbs, 3-D Arcs
Servo Loop	PID, Velocity Feedforward, Acceleration Feedforward with Notch, LoPass and programmable filtering
Position Reg.	Hardware, < 1 microsecond
Communications	Simultaneous, Serial and LPT ports

Communications

Interface	N/A
Standalone	Two Serial Ports (RS-232 and/or RS-422)
Protocols	Binary, String, & ASCII

Software Support

Standard Lang.	Visual Basic,Visual C++, C++
Program Tools	AcroVIEW Motion/PLC Program
Dev. Tools	ActiveX/OCX controls
Operating System	Windows NT, Windows 95/98, DOS

Inputs/Outputs

Encoder Inputs	3 (32-bit registers), up to 20 MHz
Analog Outputs	up to 2, 16-bit precision
Stepper Outputs	up to 2, 4 MHz
Digital I/O	32, 24VDC; expandable to 160, opto-isolated 24 VDC I/O
Auxiliary Analog Inputs	up to 8 (12 or 16 bit)

Additional Firmware Highlights:

- Floating Point Electronic GEARING
- Segmented Electronic CAM
- On-the-fly position and velocity matching
- Ladder Logic PLC
- Programmable Limit Switch
- Interruptible moves
- Either analog or digital feedback for position or velocity loops
- Dual encoder feedback
- Mixing of Axes and interpolation
- Teach and Learn functions
- Parameter based with over 15,000 addressable pre-defined hardware registers
- Sinusoidal Commutation
- NURBS and Splines
- Spherical Commands
- Automatic Targential Tool Operation

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ACR8020 ORDERING MATRIX

EXAMPLE: 8 Axis PCI-Bus Controller

1-8 AXIS PCI-BUS CONTROLLER
EXAMPLE: ACR8020 / PS / E8 / D4 / D4 / A0 / 0 / 0

PC = PCI Bus Card
PS = PCI Bus Card w/ 2 Serial and 1 Parallel Port
CP = CPCI Bus Card
CS = CPCI Bus Card w/ 2 Serial and 1 Parallel Port

E0 = 0 Encoder Inputs
E2 = 2 Encoder Inputs
E4 = 4 Encoder Inputs
E5 = 5 Encoder Inputs
E6 = 6 Encoder Inputs
E8 = 8 Encoder Inputs
E10 = 10 Encoder Inputs
Y5 = 5 Absolute Encoder Inputs (Yaskawa)
Y10 = 10 Absolute Encoder Inputs (Yaskawa)

D2/00 = 2 Digital-Analog Outputs
D4/00 = 4 Digital-Analog Outputs
D4/D2 = 6 Digital-Analog Outputs
D4/D4 = 8 Digital-Analog Outputs
S2/00 = 2 Stepper Outputs
S4/00 = 4 Stepper Outputs
S4/S2 = 6 Stepper Outputs
S4/S4 = 8 Stepper Outputs
D2/S2 = 2 Analog and 2 Steppers
D4/S2 = 4 Analog and 2 Steppers
D2/S4 = 2 Analog and 4 Steppers
D4/S4 = 4 Analog and 4 Steppers

0 = No I/O Expansion
1 = Add 64 Digital I/O
2 = Add 128 Digital I/O
3 = Add 196 Digital I/O
4 = Add 256 Digital I/O

0 = 64 Optically-Isolated, 24VDC, Sinking
1 = 64 Optically-Isolated, 24VDC, Sourcing

A0 = No Analog Inputs
A8 = 12-bit Analog-Digital Inputs
AA = 16-bit Analog-Digital Inputs
Note: Maximum of 8 Single-Ended or 4 Differential Analog-Digital Inputs.

ACR8010 ORDERING MATRIX

EXAMPLE: 8-Axis PC-Bus Servo Controller with serial ports

1-8 AXIS PC-BUS CONTROLLER
EXAMPLE: ACR8010 / PS / E8 / D4 / D4 / A0 / 0 / 0

PC=PC/ISA Bus Card
SA=Standalone Card
PS=PC & Standalone
Note: SA and PS options include 2 serial and 1 parallel port. Serial ports are programmable for RS-232 or RS-422 communications.

E0 = 0 Encoder Inputs
E4 = 4 Encoder Inputs
E5 = 5 Encoder Inputs
E8 = 8 Encoder Inputs
E10 = 10 Encoder Inputs
Y5 = 5 Absolute Encoder Inputs (Yaskawa)
Y10 = 10 Absolute Encoder Inputs (Yaskawa)

D2/00 = 2 Digital-Analog Outputs
D4/00 = 4 Digital-Analog Outputs
D4/D2 = 6 Digital-Analog Outputs
D4/D4 = 8 Digital-Analog Outputs
S2/00 = 2 Stepper Outputs
S4/00 = 4 Stepper Outputs
S4/S2 = 6 Stepper Outputs
S4/S4 = 8 Stepper Outputs
D2/S2 = 2 Analog and 2 Stepper
D4/S2 = 4 Analog and 2 Stepper
D2/S4 = 2 Analog and 4 Stepper
D4/S4 = 4 Analog and 4 Stepper

0 - No I/O Expansion
1 - Add 64 I/O
2 - Add 128 I/O
3 - Add 196 I/O
4 - Add 256 Digital I/O

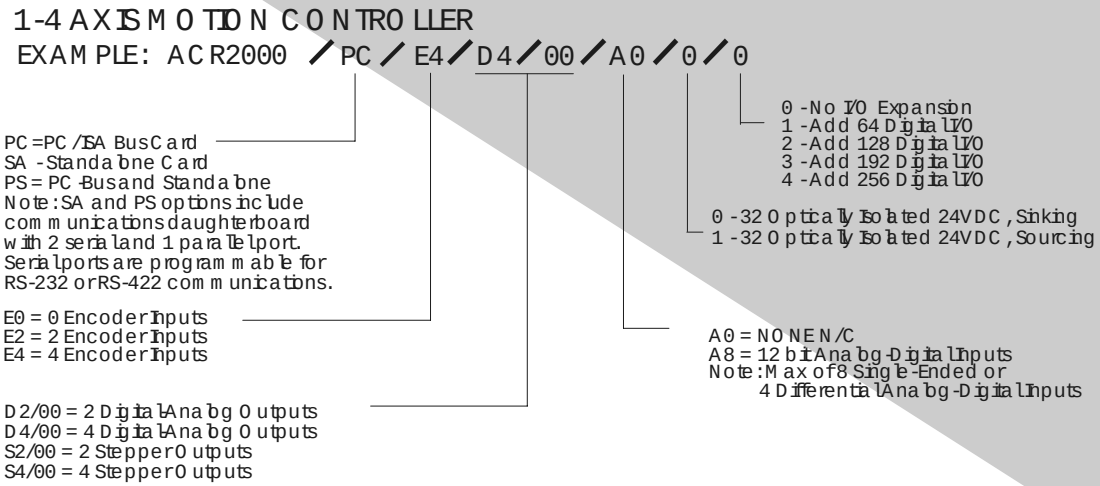
0 - 64 optically isolated, 24VDC, SINKING
1 - 64 optically isolated, 24VDC, SOURCING

A0 = No Analog Inputs
A8 = 12-bit Analog-Digital Inputs
AA = 16-bit Analog-Digital Inputs
Note: Maximum of 8 Single-Ended or 4 Differential Analog-Digital Inputs.

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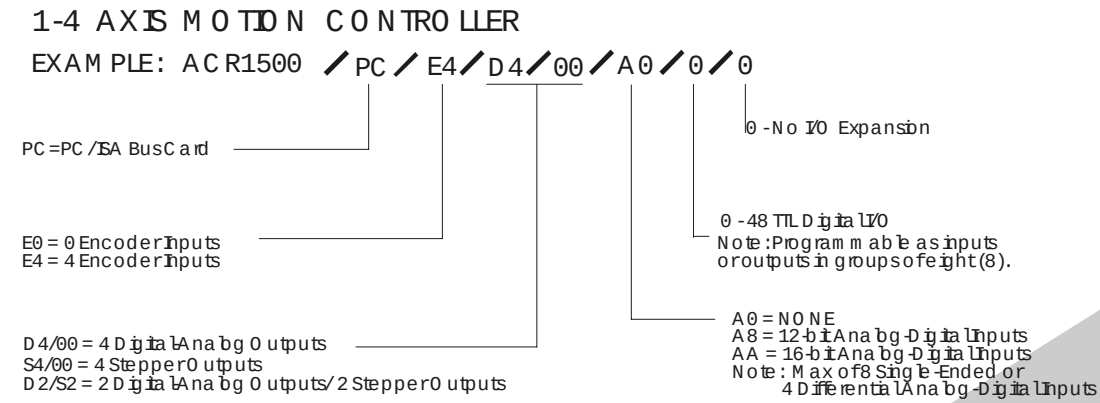
ACR2000 ORDERING MATRIX

EXAMPLE: 4-Axis PC-Bus Servo Controller



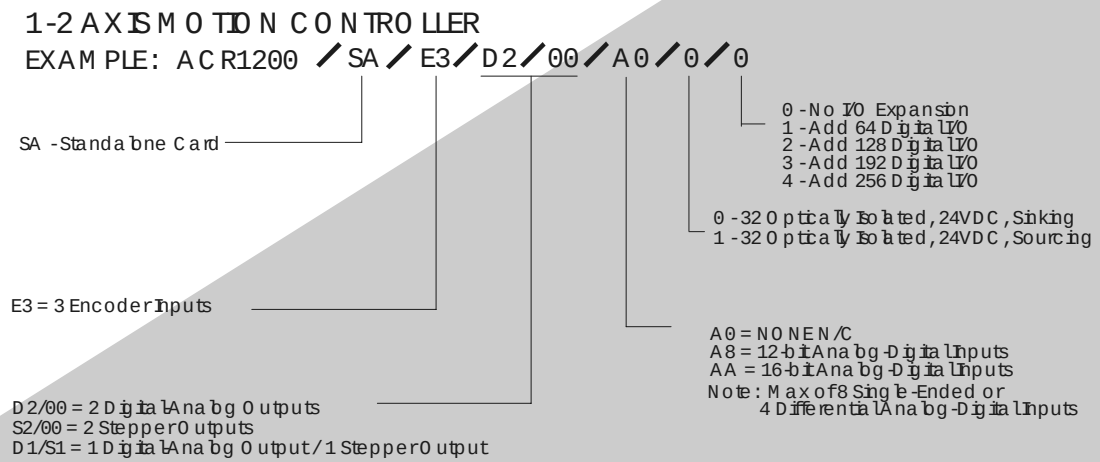
ACR1500 ORDERING MATRIX

EXAMPLE: 4-Axis PC-Bus Servo Controller



ACR1200 ORDERING MATRIX

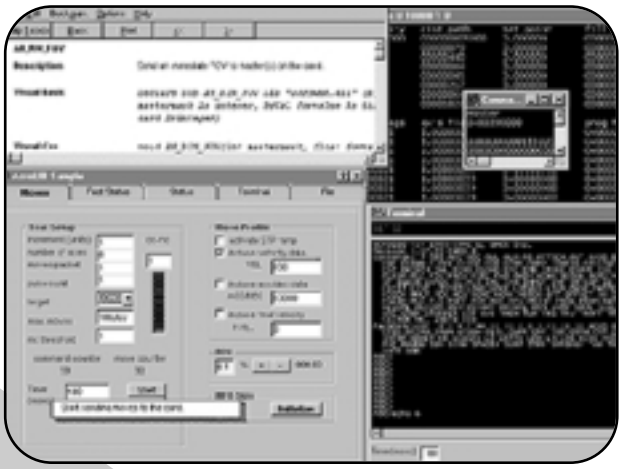
EXAMPLE: 2-Axis Standalone Servo Controller

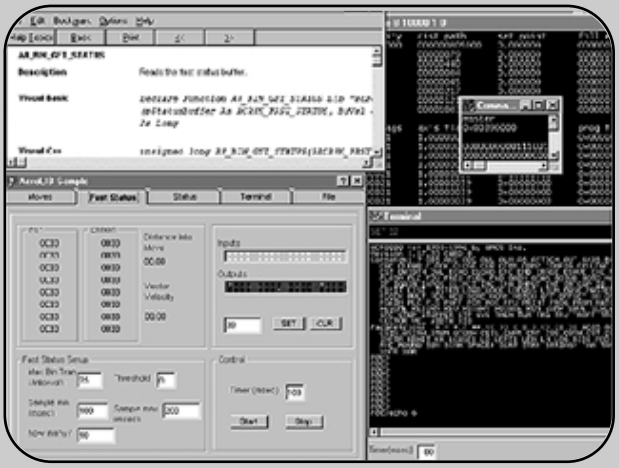


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DEVELOPMENT TOOLS

There are several development tools that are provided with the Acroloop controller family. The controllers can be provided with C++ libraries, Visual C libraries, or Visual Basic libraries. Since the libraries are generically designed, the libraries can be used for additional programming languages such as Delphi. The development tools can be provided with drivers for Windows 98, Windows 2000 and Windows NT operating systems. With the development tools, the controllers can be integrated into customized application software.





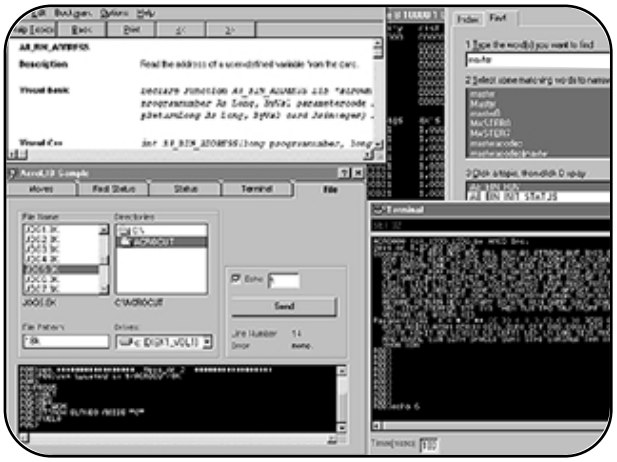
Acroloop Libraries

With the Acroloop Library, commands available on the Acroloop motion controller have a corresponding function call. Applications that are programmed on the PC simply use the function call provided in the library when the program needs to use the controller's motion control capabilities. The Acroloop controller family can be supplied with the following libraries:

- Visual C /C++ Dynamic Link Library (Windows98, 32-bit)
- Visual C/C++ Libraries (Windows NT, 32-Bit multi-threaded)
- Visual Basic Dynamic Link Library (Windows98, 32-bit)
- Visual Basic Dynamic Link Libraries (Windows NT, 32-bit multi-threaded)

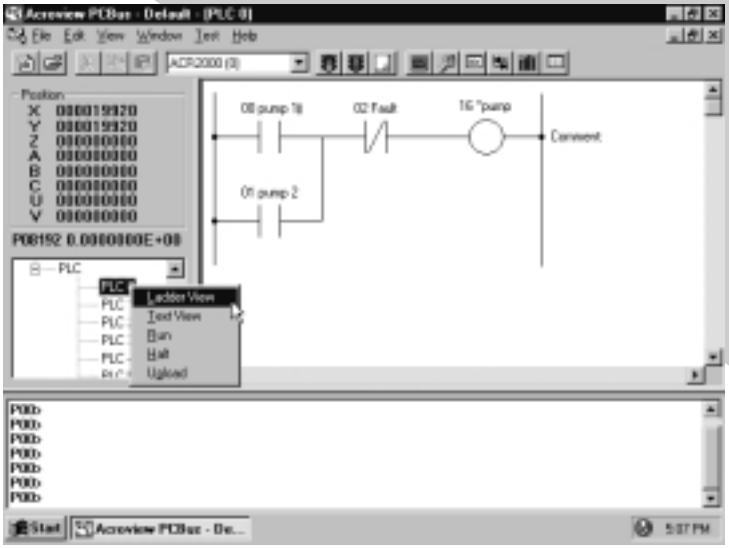
Since the libraries are generically designed, the libraries can be used for additional programming languages such as Borland's Delphi. With Delphi, the proper arguments must be programmed for the function call.

Visual C/C++ and Visual Basic DLL's allow the programmer to easily customize a graphically orientated operator interface to work in conjunction with the Acroloop controllers. The Acroloop controllers support simultaneous binary and ASCII interface schemes. The "double door" design allows complete access without worrying about congesting the port. Acroloop also supports Windows NT,Windows 2000 and Windows 98 environments. The Windows NT DLL's can support multi-threaded applications running under Windows NT or Windows 98 and Windows 2000.



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AcroVIEW

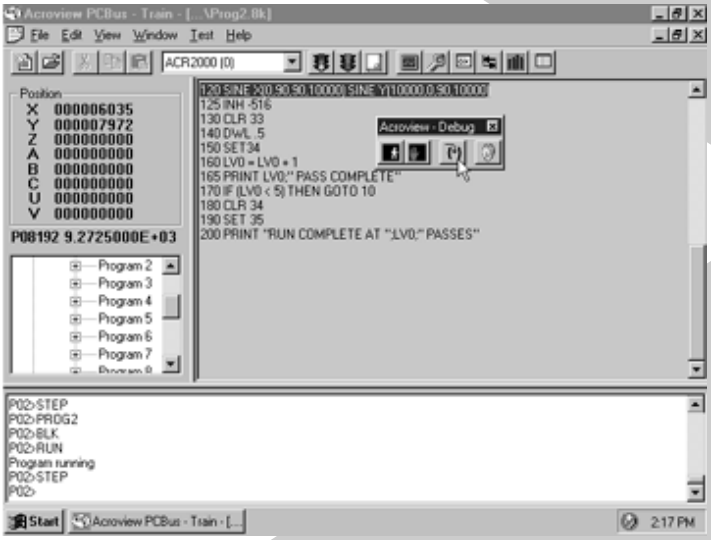


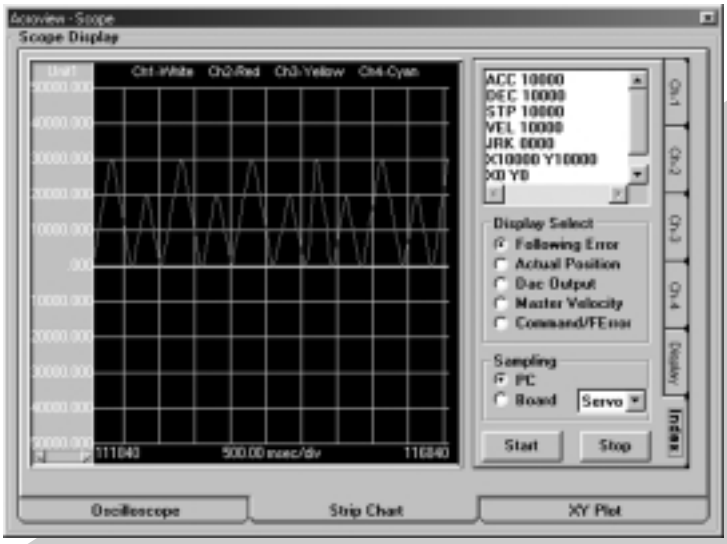
AcroVIEW is a development tool used to communicate to the motion controllers. AcroVIEW can talk to the controllers either over the PC-BUS or RS-232 communications ports. AcroVIEW is provided at no charge to help integrate, diagnose, and graphically tune the Acroloop motion controllers.

AcroVIEW can also be used to debug customized PC applications. Since the Acroloop controllers can communicate simultaneously, the API can be operating on the PC while AcroVIEW tool can dynamically diagnose the Acroloop controller with AcroVIEW on the serial port. This saves valuable development time.

AcroVIEW-Diagnostics

The AcroVIEW supplied software can also act as a valuable diagnostic tool. AcroVIEW can be used to enter in customized software programs and test the controllers on a bench before implementing the controller into a real world application. AcroVIEW permits the user to send and receive files to and from the controllers. In addition, AcroVIEW provides an on-screen real time display of the input and outputs status while the desired program is being executed.

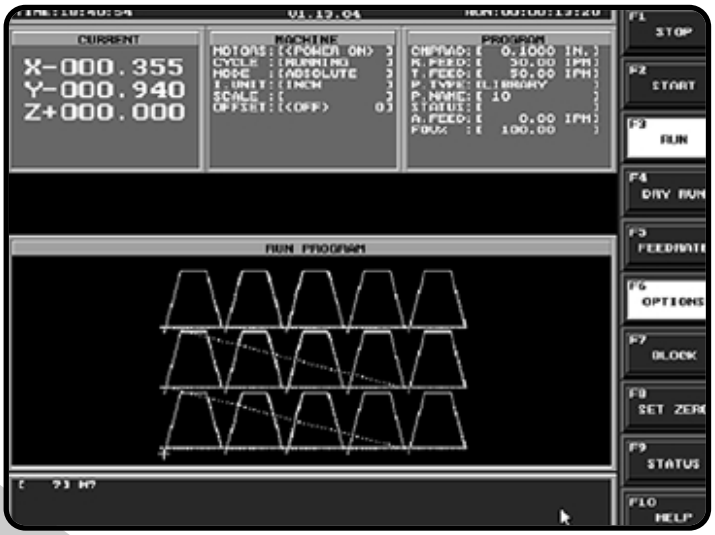




AcroVIEW-Graphical Tuning

Possibly the most important aspect of AcroVIEW is to allow the user to graphically tune the servo system. AcroVIEW provides a built-in oscilloscope so that the servo system can be tuned on the computer screen. This could either be accomplished through the parallel port or via a laptop computer at the installation site. Even if other development tools are being used (i.e. C++ Libraries or DLL's), AcroVIEW can be run separately to insure that the system is tuned properly.

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AcroMILL PC Software

AcroMILL is a 1-8 axis machine tool software package and is designed to work with the motion controller. AcroMILL software is specifically designed to handle machine tool applications. Acroloop has extensive CNC machine tool experience and we have put our CNC experience to work to create an off-the-shelf software package that can easily be integrated into CNC's.

AcroMILL FEATURES

G Codes - AcroMILL works with standard EIA RS-274 G codes. The basic G codes designed around the GE Fanuc OM Controller works directly with AcroMILL. AcroMILL is also directly compatible with standard CAM packages and appropriate post files for machine execution.

M Codes - AcroMILL also uses standard M codes. The M codes in AcroMILL are completely programmable. M codes simply send customized files to the controller. The files could be PLC files or another complete multi-tasked motion program.

PC-Based - Implement an open architecture solution with the latest PC-Based CNC motion controllers and incorporating standard off-the-shelf industrial PC Components available from Acroloop.

PLC - Use the on-board PLC to create customized automatic tool changer(ATC) operations. The AcroMILL software uses the built-in PLC supplied with the motion controller complete with optical-isolation operating at 24VDC.

Home - Built-in homing routine for all axes (programmable).

Jog - Continuous or Incremental jog modes (programmable).

Handwheel - External handwheel operation. Handwheel can be programmed to any encoder input with the particular axis selected through AcroMILL.

Library Parts - Built-in user definable library parts. Library parts are parametric G and M code files that can be customized(sized) by the user on the screen.

File Transfer- Transfer files to AcroMILL via RS-232 communications, from the hard disk drive, from a floppy disk drive, or automatically convert DXF posts into the appropriate G and M codes automatically with AcroMILL.

Run/Dry Run - Ability to run or dry run a program. Programs can also be started from a user programmable block number.

Feedrate Override - Built-in feed-rate override function. The feedrate override can be executed through software or from an external BCD input.

Spindle Override - Built-in spindle override function. The spindle override can be executed through software or from an external BCD input.

MDI - Manual data input operation for immediate execution of blocks.

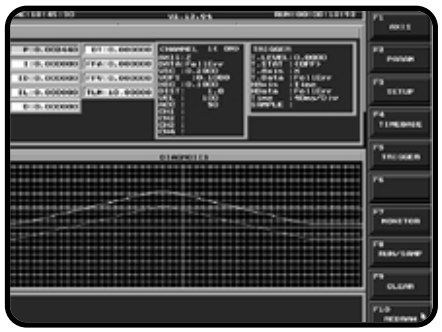
Displays - AcroMILL can display the user programmable information including current position, program status information and a graphical display of the part being processed.

Diagnostics - Use AcroMILL to diagnose electrical input/output conditions or to dynamically tune the servo system with AcroMILL's built-in 4 channel oscilloscope.

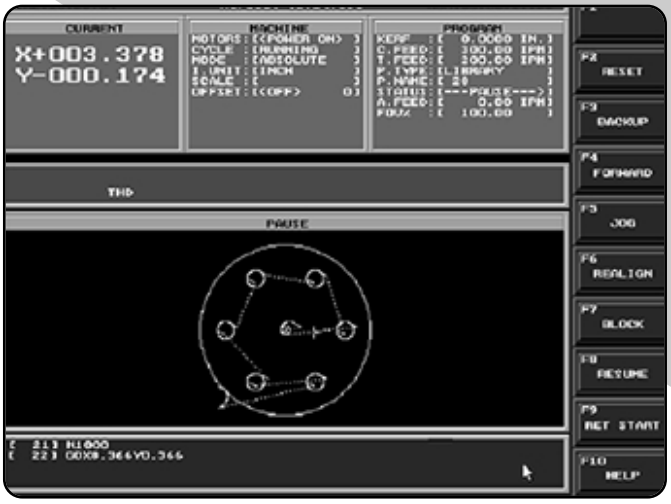
Error Correction - Implement AcroMILL's programmable ballscrew compensation, backlash compensation, tool radius compensation, and tool offset registers.

Block Processing Speed - AcroMILL PC software package has a 2-4 millisecond block processing speed depending on the number of axis being controlled.

Customized - Don't see what you need? Have Acroloop customize the PC software specifically to meet your application requirements.



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AcroCUT/AcroJET PC Software

AcroCUT software is specifically designed to handle PLASMA, OXY-FUEL, LASER, and WATERJET machine tool cutting applications. Acroloop has worked extensively with manufacturers and machine tool operators to create a state-of-the-art PC cutting control software package. The PC software can be customized for the OEM or used to retrofit old cutting machines.

AcroJet is identical to AcroCut with the exception of special M-Codes added to AcroJet to handle WaterJet control.

AcroCut & AcroJet FEATURES

Turnkey Solution - Implement AcroCUT with the Acroloop motion controllers, chassis, operator interfaces, enclosures, and customized front panels for a complete OEM solution for PC based Plasma, Oxy-Fuel, Laser, and WaterJet machine tool control.

PC-Based - Implement an open architecture solution with the latest PC-Based CNC motion controllers and incorporating standard off-the-shelf industrial PC components available from Acroloop.

G Codes - AcroCUT works with standard EIA RS-274 G codes. AcroCUT is also directly compatible with standard CAM packages.

M Codes - AcroCUT also uses standard M codes. The M codes in AcroCUT are completely programmable. M codes simply send customized files to the controller. The files could be PLC files or another complete multi-tasked motion program.

Gantry Control - Built-In gantry control (2 servos on a single axis).

Home - Built-in homing routine for all axes (programmable).

Jog - Continuous or Incremental jog modes with optional joystick control.

Library Parts - Built-in user definable library parts. 30 shapes provided free of charge. Additional library parts can be created by the user.

Retrace - Retrace of the cut path to back up all the way to the beginning.

Kerf Compensation - Automatic kerf compensation.

Cornering - Automatic corner slowdown based on acute angle threshold.

Dripfeed Function - Allows large part files to be executed on-the-fly from an off-line PC using the serial link minimizing download time and maximizing machine cut time.

Pause and Resume - On and Off path pause and resume feature. Machine can retrace, skip, resume, jog, or home after the pause.

Plate Alignment - Automatic plate alignment feature for sheet placement.

Feedrate Override - Built-in feedrate override function. The feedrate override can be executed through software or from BCD input.

Mechanical Compensation - Use AcroCUT's built-in ballscrew or backlash compensation.

Displays - AcroCUT can display the user programmable information including current position, program status information and a graphical display of the part being processed. All of the displays are programmable(size, color, location) by the user.

Diagnostics - Use AcroCUT to diagnose electrical input/output conditions or to dynamically tune the servo system with AcroCUT's built-in 4 channel oscilloscope.

Customized - Don't see what you need? Have Acroloop customize the PC software specifically to meet your application requirements.



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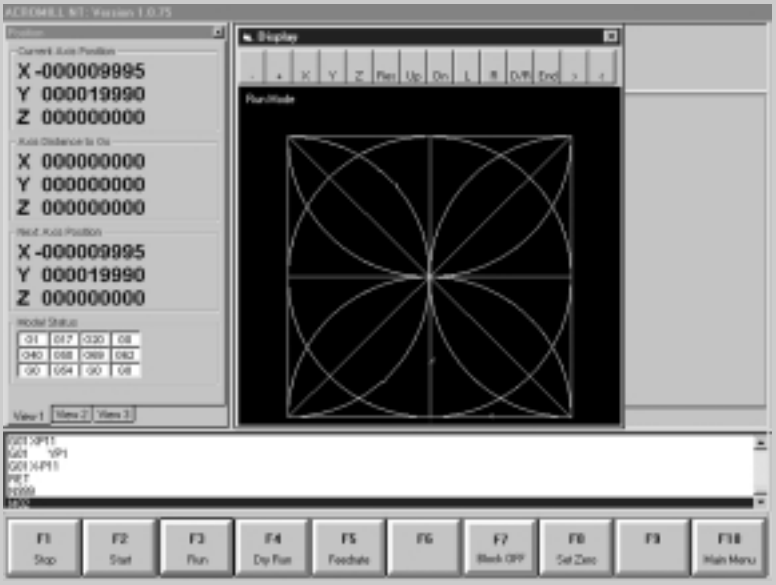
AcroMill NT

AcroMill and AcroCut are also offered in a Windows NT based version. The main features are very similar to the DOS versions of these programs but because of the multitasking ability of the operating system, many enhancements are offered. The following screens show some of the features. AcroMill for Windows NT is designed to work with a touch screen or a mouse. Therefore, all the menu selections are large enough to allow easy finger control and selection. New programs can be created while the machine is running a program. Full compliments of Can Cycles and Macro and Modal Macro ability is offered.

Probing cycle as well as NURBS, Splines and three dimensional 3 point arc generation is offered.

OEM users can access and pass variables in the SYSVAR storage area in the CNC from their own independent software application in case a custom installation is required.

This means that the OEM can externally affect machine operation from their own piece of software on the fly. This can be very handy in applications like vision, grinding, welding….etc.

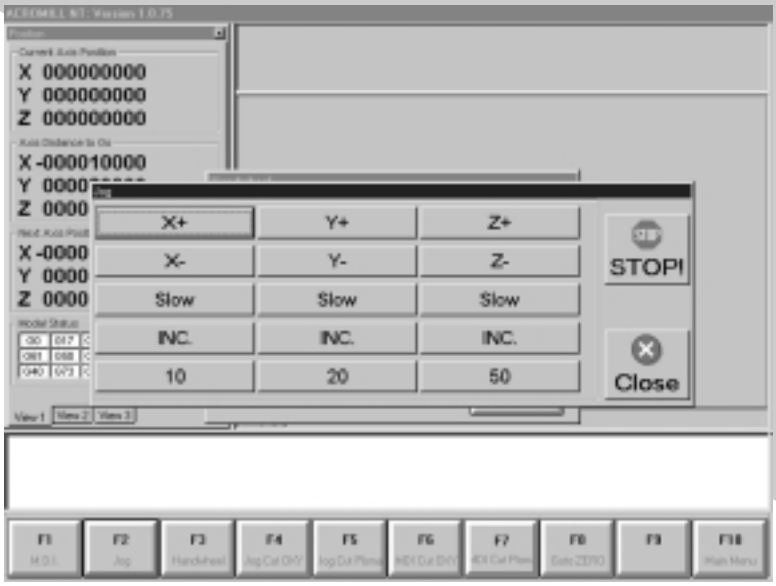


Main screen while running program.



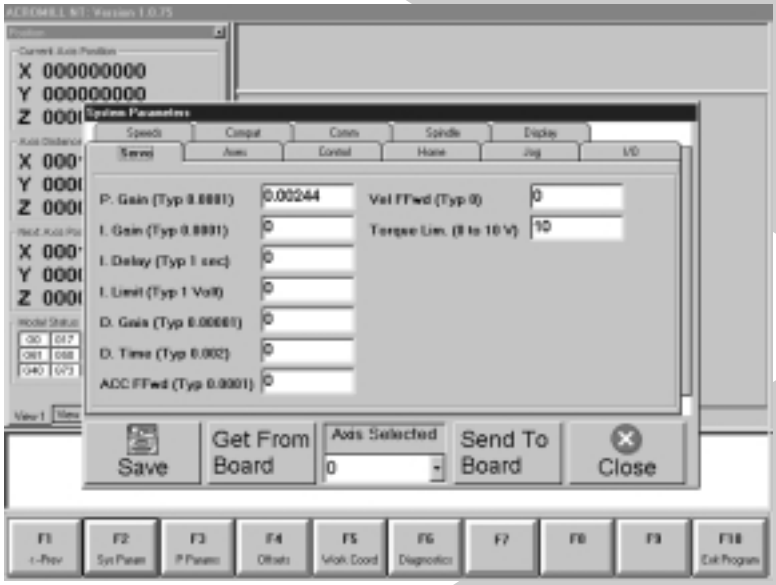
Entering M.D.I. commands.

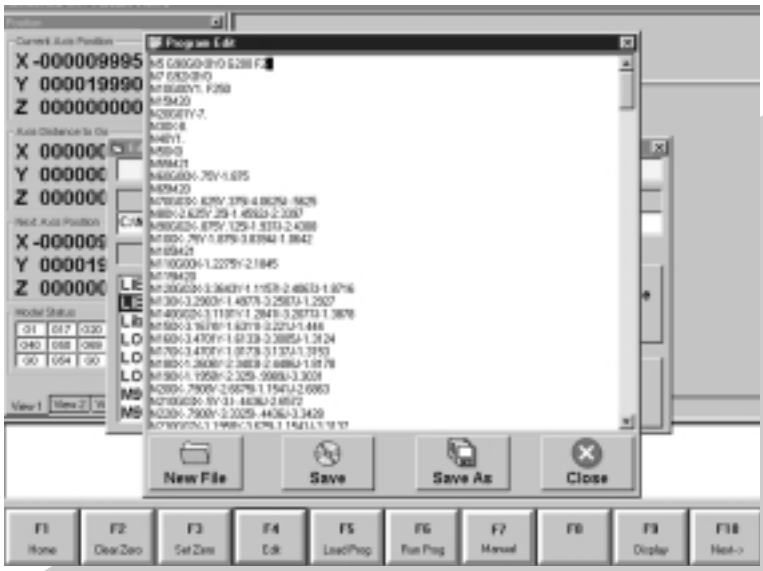
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Jogging Screen.

Setting up system parameters.

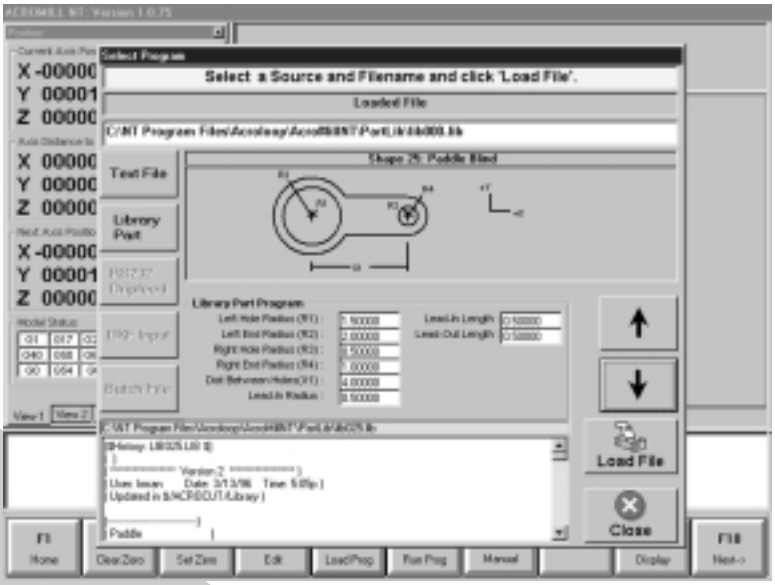


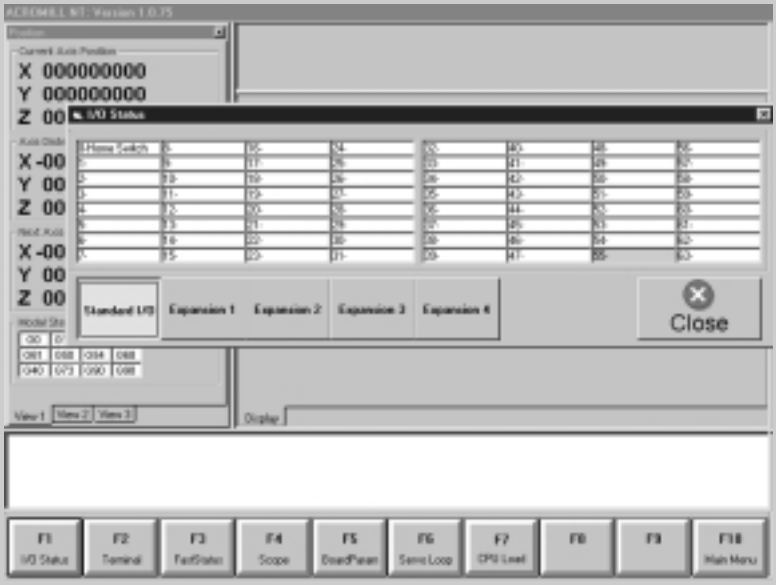


Edit a program even while running a different program.

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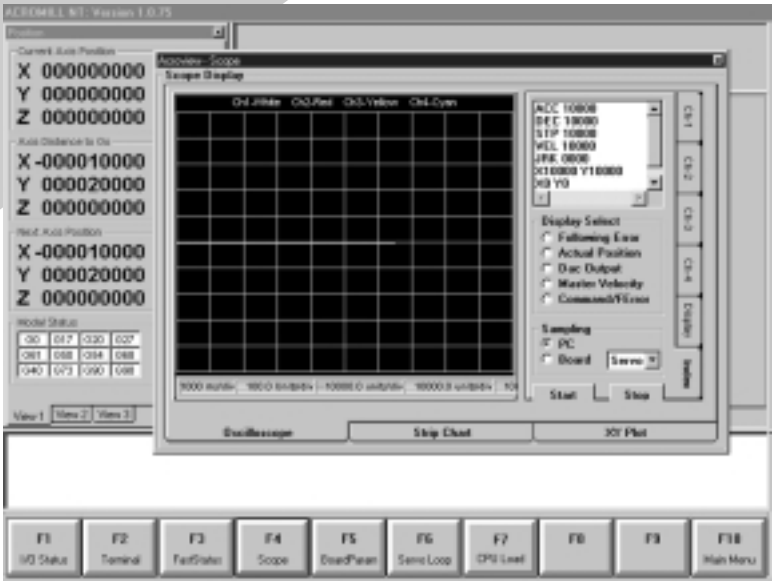
Selecting library parts.





Monitoring I/O status while running a part.

Tuning axis servos using built-in 4 channel oscilloscope.



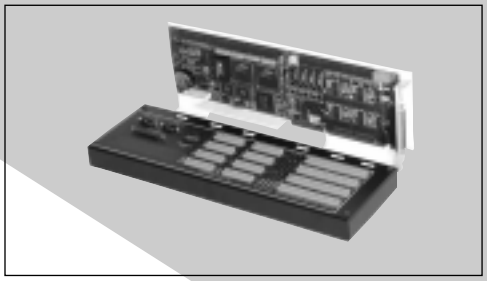
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The main factors in selecting a controller chassis are:

- Type of controller used (ACR1200, ACR1500, ACR2000, ACR8010 or ACR8020)
- Number of chassis slots required
- Interface requirements
- Physical considerations

SPL026 Standalone Bracket

The SPL026 is a standalone mounting bracket for the ACR8010. The SPL026 is designed for integration of the motion controller into an industrial enclosure. Typically, the standalone bracket is ordered with a breakout box.



SPL026 Standalone Bracket with Breakout Box

SPL026 Features

- Use with Standalone ACR8010 controller
- Industrial Metal Bracket (14”W x 5.38”H x 1.63”D)
- Mounts to Industrial Panel



RBD Breakout Box

RBD Breakout Box

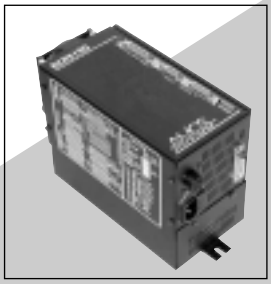
The RBD breakout box is designed to allow integration of the ACR2000, ACR8010, or ACR8020 motion controllers. The breakout box can be used in either standalone or PC-Bus applications. It is typically mounted to an industrial panel next to the motion controller.

RBD Breakout Box Feature

- Use with either the ACR2000, ACR8010 or ACR8020 controllers
- Industrial Breakout Box (4.75”W x 14.75”H x 1.25”D)
- Screw terminations for encoder feedback
- Screw terminations for digital I/O connections
- 2 Serial and 1 Parallel Port DB Connectors
- Status LED’s for encoder, digital I/O, and communication diagnostics

ACH3120 Controller Chassis

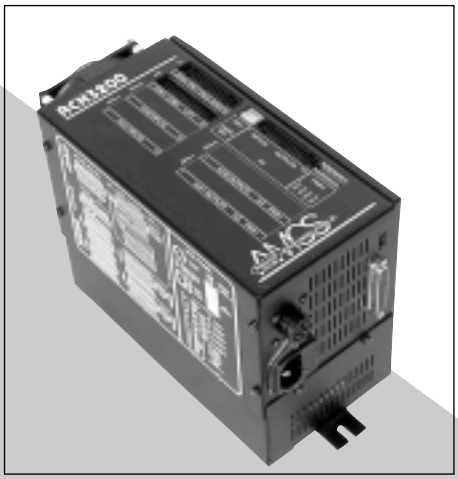
The ACH3120 controller chassis is a standard chassis. It is designed to accommodate a standalone ACR1200 controller. The ACH3120 is designed to support the standard digital I/O and 1 expansion digital I/O board.



ACH3120

ACH3120 Features

- Use with ACR1200 Controller
- Industrial Standalone Chassis
- Encoder Feedback Connector
- Digital I/O Connector
- 2-Sided and 1 Parallel Port Connector
- Heavy Duty Power Connector, 120 VAC
- Integral Power Supply (5VDC, +/- 12VDC)
- Cooling Fan Included



ACH3200

ACH3200 Controller Chassis

The ACH3200 controller chassis is a standalone chassis. It is designed to accommodate a Standalone ACR2000 controller. The ACH3200 is designed to support the standard digital I/O and up to 2 expansion digital I/O boards.

ACH3200 Features

- Use with Standalone ACR2000 controller
- Industrial Standalone chassis (4.38”W x 11”H x 6.75”D)
- Encoder Feedback Connector (34 pin)
- Digital I/O Connector (34 pin)
- 2 Serial and 1 Parallel Port Connector (34 pin)
- Digital I/O Power Supply Connector (4 pin)
- Heavy Duty Power Connector (120VAC Standard)
- Integral Power Supply (5VDC, +/- 12VDC)
- Cooling Fan Included

ACH4800 Controller Chassis

The ACH4800 chassis is a multi-purpose 4 slot chassis. The ACH4800 is designed for both Standalone and PC-Bus motion control for the ACR2000 or ACR8010 controllers. The chassis features industrial screw terminals and status LED’s for the encoder and digital I/O connections.

ACH4800 Features

- Use with either the ACR2000 or ACR8010 controllers
- Industrial 4 slot chassis (4.75”W x 15”H x 11.25”D)
- Screw Terminations for encoder feedback
- Screw terminations for digital I/O connections
- Status LED’s for encoder and digital I/O diagnostics
- On/Off Power Switch with Fused Protection
- Heavy Duty Power Connector (120VAC Standard)
- Integral Power Supply (+/- 5VDC, +/- 12VDC)
- Integral Line Filter
- Built-in Cabinet Fan

Optional Accessories

- CPU and VGA Cards
- Hard Disk Drive
- 3.5” Floppy Drive
- Serial and Parallel Communications Ports



ACH4800

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ACH6200 Controller Chassis

The ACH6200 chassis is also a multi-purpose 4 slot chassis. The main difference is the ACH6200 is designed for half-size PC boards. Therefore, it is ideal for applications where space is critical. The chassis is used with the ACR2000 controller.



ACH6200

ACH6200 Features

- Use with the ACR2000 controller
- Industrial 4 slot chassis (9.12”W x 5.75H x 9”D)
- D-plug connectors for encoder feedback
- D-plug connectors for digital I/O connections
- On/Off Power Switch
- Heavy Duty Power Connector (120VAC Standard)
- Integral Power Supply (+/- 5VDC, +/- 12VDC)
- Built-in Cabinet Fan
- CE Certified

Optional Accessories

- CPU and VGA Cards
- Hard Disk Drive
- 3.5” Floppy Drive
- Serial and Parallel Communications Ports

ACH6800 Controller Chassis

The ACH6800 chassis is a 6-slot multi-purpose chassis. The main difference is it is a full size chassis and the connections are made using D-plug connectors. The ACH6800 is used for either standalone or PC-Bus applications.



ACH6800

ACH6800 Features

- Use with either ACR2000 or ACR8010
- Industrial 6-slot chassis (6.38”W x 6.75”H x 15.5”D)
- D-plug connectors for encoder feedback
- D-plug connectors for digital I/O connections
- On/Off Power Switch
- Heavy Duty Power Connector (120VAC Standard)
- Integral Power Supply (+/- 5VDC, +/- 12VDC)
- Integral Line Filter
- Built-in Cabinet Fan

Optional Accessories

- CPU and VGA Cards
- Hard Disk Drive
- 3.5” Floppy Drive
- Serial and Parallel Communications Ports

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OPS9220 & OPS8220

The OPS9220 is designed specifically for PC-Based CNC Machine Tool applications. It is typically integrated with an Acroloop controller and controller PC chassis. The OPS9220 integrates the PC monitor and keyboard with CNC spindle, feedrate, handwheel, and emergency stop controls.



OPS 9220

OPS9220

- Industrial CNC NEMA 12 Interface Including:
  - Spindle CCW, CW, OFF, and OVERRIDE Controls
  - Feedrate HOLD, START Controls
  - Feedrate Override Control
  - Rapid Override Control
  - E-STOP and RESET Pushbuttons
  - One AUXILIARY Pushbutton
- Use with Acroloop PC Chassis
- 12.1" Active Matrix Color LCD Screen
- NEMA 4 Full-size Keyboard
- 19"W x 17.5"H x 4"D
- Interfaces to Standard CPU and VGA Cards
- Optional Pendant Enclosure
- Optional Manual Pulse Generator Handwheel
- Optional Touchscreen
- Industrial Design for “One Step” Panel Mounting
- Integrated Mouse Pad
- Operates in Windows, DOS Environment

OPS8220

All features of the OPS9220 plus:

- Full 6-Slot PC Chassis Mounted Behind Keyboard
- On/Off switch with Integrated Power, HDD and Reset LED
- 2 RS-232 Serial Ports, 1 Parallel Port
- 32 MEG RAM Standard, Expandable to 128 MEG
- 19"W x 17.5"H x 10.75"D
- Optional CPU and Video Types
- Optional Floppy Disk and Hard Disc Drives



OPS8220

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OPS9000

OPS9000

The OPS9000 is another option for an industrial PC operator interface. The only difference is the size of the monitor and the keyboard configuration. Again, the OPS9000 is integrated with an Acroloop controller and PC controller chassis.

OPS9000 Features

- Use with Acroloop PC Chassis
- Industrial NEMA 12 Design
- 14” Color CRT VGA Monitor
- 84 Key Membrane Keyboard
- 19”W x 15.75”H x 14.5”D
- Panel or Pendant Mounted
- Interfaces to standard CPU and VGA cards
- Optional Pendant Enclosure

OPS8200

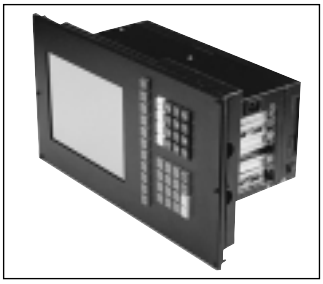
The OPS8200 is a complete PC-Based system. The design features flat panel technology with an integral PC chassis. It is also compact since it is designed for 1/2 size PC cards. The OPS8200 is ideal for applications requiring up to 4 axis of motion control and a compact design.

OPS8200 Features

- Use with ACR2000 Controller
- Industrial NEMA 12 Design
- 10” Flat Panel LCD Screen
- Touchscreen Interface
- Integral 4 slot chassis includes:
    - Industrial CPU Card with RAM
    - Industrial 64-bit VGA Driver
    - 3.5” Industrial Floppy Drive
    - 1 Gigabyte Industrial Hard Drive
    - 150 Watt Power Supply
- Compact Design (12”W x 10.5”H x 8.5”D)
- Optional EL, Passive or Active Color Displays



OPS8200



OPS8100

OPS8100

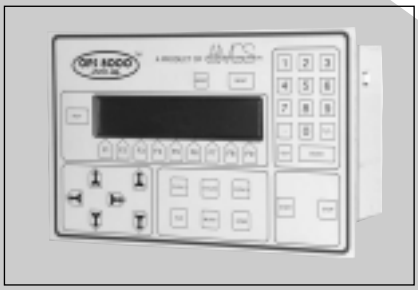
The OPS8100 is similar to the OPS8200 except that it includes a PC keyboard and a full size PC chassis. The OPS8100 is ideal for applications requiring up to 8 axis of PC-Based motion control all in a compact package.

OPS8100 Features

- Use with ACR2000 or ACR8010 Controller
- Industrial NEMA 12 Design
- 10” Flat Panel LCD Screen
- 83 or 43 Key Keyboard
- Integral 6 slot chassis includes:
    - Industrial CPU Card with RAM
    - Industrial 64-bit VGA Driver
    - 3.5” Industrial Floppy Drive
    - 1 Gigabyte Industrial Hard Drive
    - 150 Watt Power Supply
- Compact Design (19”W x 10.5”H x 10.5”D)
- Optional EL, Passive or Active Color Displays
- Optional Touchscreen Interface

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Smart Terminals



OPS8000

OPS8000

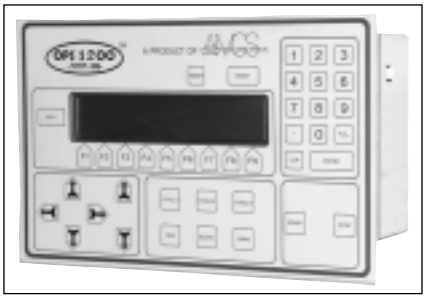
The OPS8000 is a functional smart terminal with a built-in interpreter. The interpreter allows easy customizing of applications requiring 1 to 16 axes of motion control. The OPS8000 smart terminal talks to the Acroloop motion controllers via one of its RS-232 ports. A second RS-232 port can be used to automatically request files from a host computer if a host is used in the application.

- NEMA 12 Design
- 4 x 40 Supertwist LCD Display
- 43 membrane keys
- 9 programmable function keys
- 2 RS-232 ports
- 10.3”W x 6.6”H x 3.1”D
- Optional custom overlay

COMPLETE MOTION BOX

OPS1200

- Offers a LED backlit 4 line x 40 character display. (used on the OPS8000)
- Offers 40 key, Motion Control Sealed keyboard with 3 hidden keys. 9 Programmable function keys.
- Tactile feel on the keys.
- Panel Mounting.
- Nema 12 Design
- 2-Axis of Stepper or Servo DAC outputs.
- 3 Feedback Encoder input with 20MHz counting rate.
- Built in hardware Encoder fault detection.
- 16 Inputs, 16 Output. All 24 Volts Optically Isolated.
- Expandable to 48 Inputs and 48 Outputs.
- PRINT, INKEY$ functions in ACR1200 firmware to interface to KBD/Display.
- All the features of the ACR1200 and the OPS8000 combined into cost effective package.
- Complete "Motion Box" for 1 or 2 Axes of Motion with ACR1200 as the main engine.
- Canned Software for various applications.
- Power requirements +5V , +12V, -12V
- Small package. 10.3"W x 6.6"H x 3.1" D
- Optional Custom Overlay.
- 1 Parallel port, 2 Serial Ports RS232/RS422



OPS1200

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BRUSHED MOTORS & AMPLIFIERS

Acroloop carries a wide variety of brushed type motors. Brushed type DC motors are the oldest type of technology used in industrial feedback servos. The advantages of brushed type motors are time proven technology, construction, and low cost. The main disadvantage is brush wear, although in many applications, this is not a consideration.



BRUSHED MOTORS

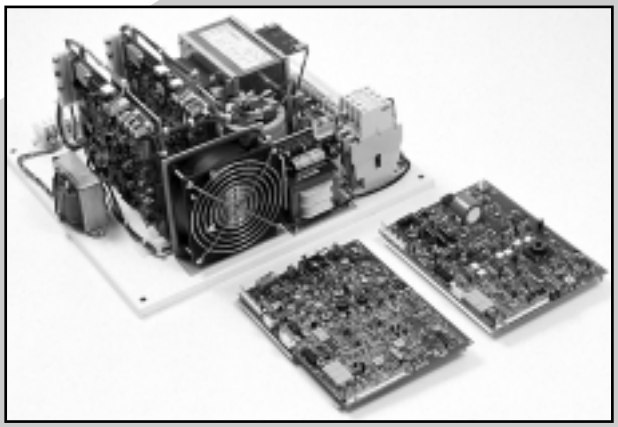
Part Number	Continuous Stall Torque	Peak Torque	Maximum Speed	Face Size	Length
MT2230	10 in./oz.	65 in./oz.	5000	2.25” sq.	4.6”
MT30F4-25	13 in./lb.	66 in./lb.	4000	5.0” sq.	8.65”
MT30M4-38	26 in./lb.	124 in./lb.	3700	5.0” sq.	10.2”
MT30U4-36	40 in./lb.	195 in./lb.	4000	5.0” sq.	11.95”
MT30U4-57	40 in./lb.	195 in./lb.	2500	5.0” sq.	11.95”
MT40W4-68	75 in./lb.	440 in./lb.	4000	5.9” sq.	17.9”

BRUSHED MOTOR AMPLIFIER CHASSIS

PART NUMBER	#AXIS	VOLTAGE	TYPE	CONT AMPS	PEAK AMPS
SA412	1. 2. or 3	40VDC	Linear	4	12
SA1020	1, 2, or 3	100VDC	PWM	10	20
SA1525	1, 2, or 3	100VDC	PWM	15	25
SAFP1525	1, 2, or 3	160VDC	PWM	15	25
SA3060	1	160VDC	PWM	30	60

Brushed Motor Servo Amplifier Chassis are supplied with:

- Servo Amplifier
- Inductors
- Noise Suppressors
- Buss/Bias Power Supply
- Terminal Blocks
- Main Buss Relay
- 115 VAC Transformer

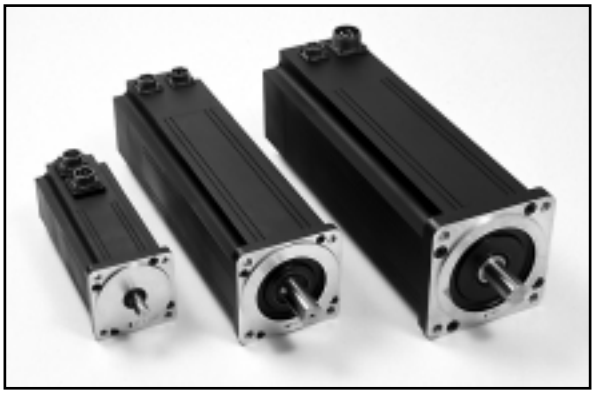


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Product Catalog

BRUSHLESS MOTORS & AMPLIFIERS

Acroloop also carries a wide variety of brushless motors. Typically, lower rotor inertia and efficient thermal dissipation result in faster acceleration and better volumetric efficiency.



Part Number	Stall Torque	Peak Rating	Max Speed	Volts/KRPM	KT
SMR104	13 in./lb.	27 in./lb.	5400 RPM	31	4.67
SMR202	22 in./lb.	62 in./lb.	2500 RPM	79.5	11.64
SMR204	42 in./lb.	90 in./lb.	3600 RPM	51.2	7.50
SMR402	58 in./lb.	118 in./lb.	3000 RPM	67.2	9.84
SMR404	112 in./lb.	238 in./lb.	2500 RPM	81.2	11.88
SMR602	151 in./lb.	306 in./lb.	2000 RPM	104.5	15.29
SMR604	278 in./lb.	560 in./lb.	1500 RPM	95.8	14.02

BRUSHLESS MOTOR AMPLIFIERS

Part Number	Amps	Peak Amps	Cont. KVA	Peak KVA
AM203	3	6	1.2	2.4
AM206	6	12	2.4	4.8
AM210	10	20	4.0	8.0
AM220	20	40	8.0	16.0

Brushless Amplifiers include amplifier, industrial enclosure, 1024 PPR encoder output, resolver input, 230VAC PWM output to motor, and all connectors. Completely wired and tested at the factory.

BRUSHED MOTOR AMPLIFIER POWER SUPPLIES

Part Number	Cont. Amps	Peak Amps	Cont.Power	Peak Power
PS212	12	24	40 Watts	5.6 KW
PS220	20	40	40 Watts	11.2 KW

160 to 250 VAC single or three phase 50/60 Hz input. 325 VAC nominal buss @230 VAC input voltage. Transformer is not required.

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All closed loop motion requires feedback devices to inform the control of the axis position. Acroloop carries an extensive line of motor shaft or remote mounted encoders. These encoders can be mounted right on the motor shaft (rotary encoders) or on another part of the machine (rotary or linear encoder).



Acroloop Rotary Encoders

Model	PPR	Mounting Type	Connections	Output Type
EC500	500	Motor Shaft	Pigtails	Open collector
EC1000	1000	Motor Shaft	Pigtails	Open collector
EC1024R	1024	Remote	MS-connector	Line driver
EC012	100	Remote or panel	Screw terminals	Line driver

Consult Acroloop for other configurations. Acroloop can also supply linear encoders, resolvers, interferometers, and analog feedback devices.

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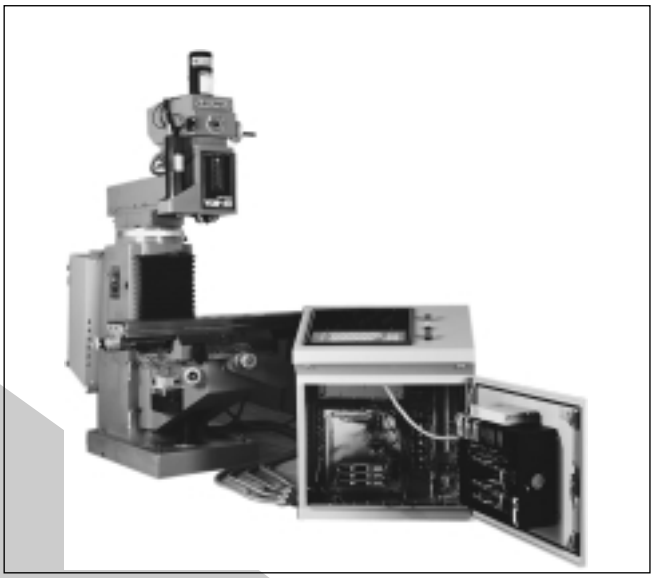
TURNKEY PACKAGES

Put the Acroloop production team to work for you by letting Acroloop create a turnkey package specific to your application. You supply the requirements and we'll supply everything else.

Acroloop can supply any or all of the following:

- Motion Controller(s)
- Operator Interface
- Controller Chassis
- Motor(s), Amplifier(s), and Feedback Device(s)
- Software Tools
- Complete integration hardware including: enclosure, cables, and supporting hardware.

We'll package all the electronics in an industrial enclosure complete with all interconnecting cables. Because this system is a "bolt-on" package, you can integrate them easily into your motion control application. Both single and multi-axis turnkey packages are available.



The fully-automated 3-axis mill cuts polypropylene orthotic supports. The supports are used to correct pediatric problems within the medical industry. Acroloop's multi-axis turnkey package provides the control, speed and precision needed to meet the most demanding requirements.



Want to automate a single axis? Acroloop can provide you a single axis turnkey package.

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AcroWire (based on IEEE-1394) high speed serial bus communications option is offered for the ACR1200, ACR2000, ACR8010 and the ACR8020. IEEE-1394, also known as FireWire, replaces the slower RS232/RS422/ RS485 and USB serial communication methods for communicating between the PC and the Motion Control system.

AcroWire currently communicates at 400Mbits/sec (downward compatible with the older 200Mbits/sec chips) and will upgrade to 800Mbits/sec and 1.6Mbits/sec as the newer medium becomes available.

Unlike USB, AcroWire is deterministic in nature. It is supported by Windows98 and Windows 2000 (NT V5) operating systems.

This means the the user can remove the motion controller from inside the PC without loss of throughput. This avoids the fight to find open slots, port addresses and unused interrupts.

Further, newer PC's are getting smaller and making it harder for users to get inside the box itself. Instead, the PC's offer USB ports for mouse, keyboard, display monitor and printer and IEEE-1394 for the higher speed video and motion control applications.

Another benefit is that the size of the Operator Station reduces substantially and allows the industrial user to tuck away the motion and other wiring in a remote controls enclosure.

Phase 1 of the AcroWire offering is to connect the ACH3120, ACH3200, ACH4800, ACH6200 and ACH6800 chassis' to the PC. Multiple chassis' can be cascaded on the same AcroWire port. Up to 63 nodes can be accessed.

Phase 2 of the AcroWire offering will be to connect to remote I/O and Motor Amplifiers. This phase will allow different types of motor amplifier to co-exist on the same cable loop. This will substantially simplify wiring and labor costs.

AcroWire protocol is intended to be an open standard and will be shared with different vendors to allow mixing of multiple sources components in a total system.

Windows DLL's and Drivers, supplied by Acroloop, make it a transparent switch for users that are currently plugging the controllers into the PC to switch to AcroWire, and remote mount the motion controller chassis from the PC.



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ACROLOOP in Action

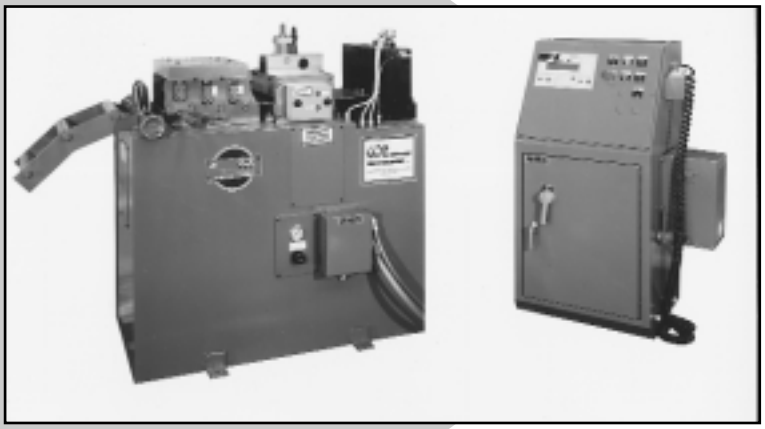


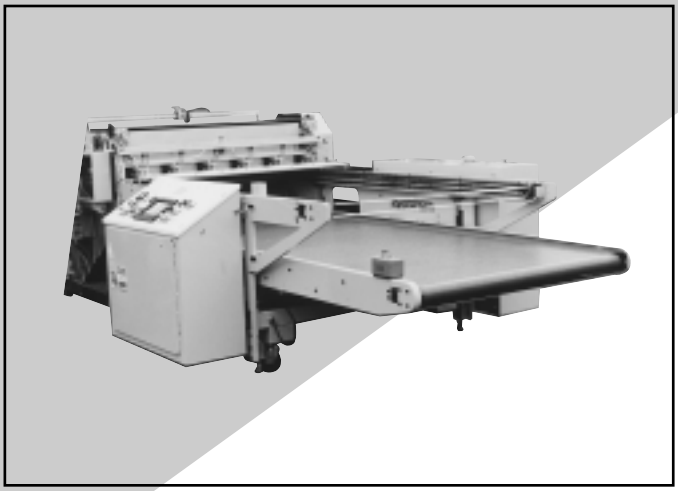
ADE Corporation
Westwood, MA

ADE's Galaxy AFS-300 is the first automated production 300mm wafer flatness measurement system. The AFS-300 is capable of accurate and precise measurements at the 0.12 µm site flatness specification level, which supports both 0.25 µm and 0.18 µm design rules, as defined by the NTRS road map. The AFS-300 offers the optimal combination of measurement accuracy, contamination-free handling and throughput for production wafer flatness and shape measurements.

Coe Press Equipment Corporation
Sterling Heights, MI

Coe Press Equipment Corporation has built a reputation on manufacturing Roll Feed machines that get the job done quickly, efficiently, and economically. Coe Press consistently and continually designs and engineers press equipment whose performance keeps metal stampers running at full speed. Acroloop helps Coe Press Roll Feed machines maintain that reputation in performing precisely controlled operations with lightning speed.





Design Service Corporation
Yakima, WA

Design Service Corporation (DSC) is a specialty equipment designer for factory automation machinery. In this bag making machine application, DSC has integrated the Acroloop Motion Controller and the ACH4800 chassis. DSC engineered the web handling, flying knife, and a heated seal bar into the design. By implementing the Acroloop controller, DSC achieved a 30% increase in production and a 10% reduction is scrap material offering substantial value for their customer.

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