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The *LEGEND* Motion Control System For The Complete Automation Solution With Comprehensive Software



Economical, State-of-the-Art Performance From The LEGEND Digital Torque Amplifier

More than just a cost-effective amplifier solution, the ***LEGEND*** delivers the kind of performance and reliability you expect from the world's number one supplier of AC servos. As a component used with other controls or as part of a complete Yaskawa system, the ***LEGEND*** is an exemplary product.

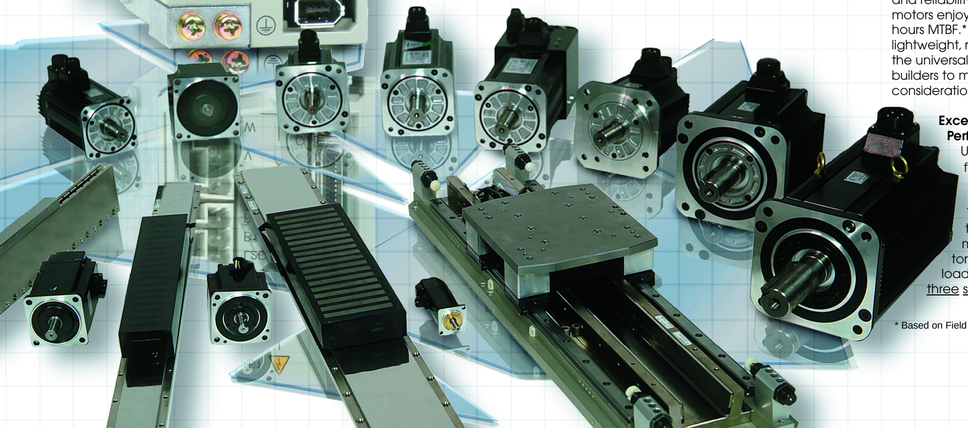
100% Digital Design
From the encoder to the amplifier outputs, this design eliminates 'drift,' makes setup virtually automatic, and provides comprehensive diagnostics.

Yaskawa Quality
The world's leading TQM culture insures consistent operation to specification, whether you purchase one or a thousand units, all at once or one at a time.

Intelligent Serial Encoder
The key to Plug-and-Play operation, this proven digital link is also easy to wire using industrial USB connectors. Incremental encoders need only 4 wires to enable automatic setup, protection, and operation for all motors.

Full Features
Dynamic braking is built in. Operation on single-phase or three-phase power with a wide AC and DC input range makes it easy to use, worldwide. Simple switch settings for motor direction, input filter, and encoder scaling completes the package for most applications. Four amplifier sizes (100W-1,500W) and 23 motor choices cover a wide range of needs.

- ***4 Amplifier Sizes***
- ***30 Motors to 1.5kW***
- ***Universal Input Voltage***
- ***Sinusoidal Commutation***



Ethernet Motion Control Functionality From The LEGEND-MC

The new ***LEGEND-MC*** is an optional, snap-on motion control card for ***LEGEND*** torque amplifiers, providing a complete motion solution. The ***LEGEND-MC*** motion control module adds the functionality and features required by more demanding motion control applications. Beyond 1 axis of motion control functionality, the ***LEGEND-MC*** also offers virtual point-to-point, multi-axis motion control capability up to 4 axes.

Ethernet Connectivity
The built-in connection enables connectivity to other ***LEGENDS***, clients, and Ethernet I/O.

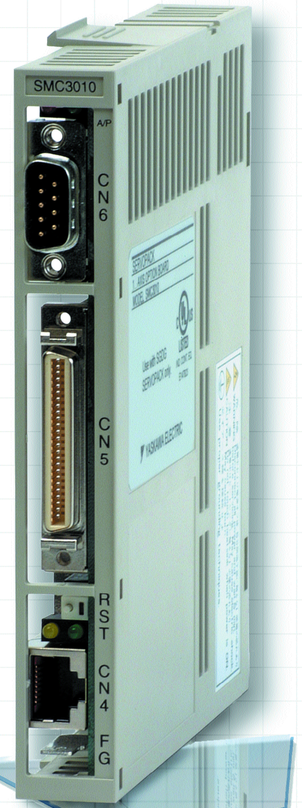
Field-Upgradable Firmware
You can take advantage of new technology easily! Future product enhancements and upgrades will be made available via a network download or from your PC into flash memory.

Plug-and-Play
Just snap-on the ***LEGEND-MC*** to the ***LEGEND*** amplifier and you have powerful motion control capabilities. All the required interface signals and DC power are connected when you snap the modules together. Seamless integration reduces installation time, reduces documentation, and speeds up troubleshooting.

Programming Structure
A basic programming language-like format helps you build complex machine logic.

Modes of Motion
Jogging, point-to-point, electronic gearing, and electronic camming. Create your own custom cam formulas using the comprehensive, built-in math functions.

Integrated Functionality Between Amplifier & Controller
Integration is seamless. The ***LEGEND*** amplifier and ***LEGEND-MC*** controller share a common interface which will minimize troubleshooting time.



World Class Reliability Only Sigma II Motors Can Deliver

Known for its rock-solid performance and reliability, the Sigma II series of motors enjoys an incredible 2,000,000 hours MTBF.* Its compact design and lightweight, rugged construction serve the universal design needs of machine builders to minimize space and weight considerations, yet maximize output.

Exceptional Low Speed Performance
Unique physical design features minimize cogging.

High Overload Capacity
Tolerant of dynamic loads, the Sigma II series of motors can deliver the torque you need in peak load situations – up to 300% for three seconds for superior productivity. In excessive situations, the ***LEGEND*** amplifier will automatically detect the problem and protect the system before any damage is caused.

Motors with NEMA Flanges
NEMA 23 and 34 flanges available to 800 watts.

Choose from four NEMA sizes:
- 100W with NEMA 23 Adapter Flange
- 200W & 400W with NEMA 23 Motor Flange
- 800W with NEMA 34 Motor Flange

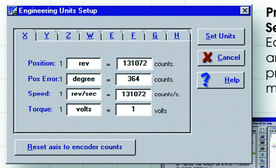
Linear Motors are Easy
Three styles of linear motors up to 1200 N peak force expand your choices.

* Based on Field Performance

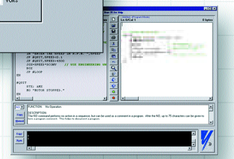
YTerm Software: An Intuitive Programming Package For The LEGEND-MC



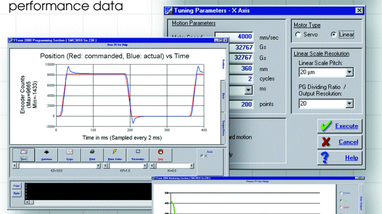
Designed to facilitate programming and problem solving, YTerm is the front-end software package for the Yaskawa series of ***LEGEND-MC*** motion controllers. A user-friendly, Windows interface is used for design, development, and debugging of motion control applications. The software package consists of three easy-to-use main sections:

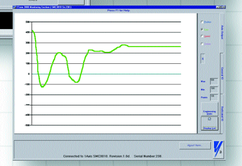


Programming Section
Edit, transfer, and monitor programs for the motion controller



Tuning Section
Tune the ***LEGEND-MC's*** axis and test the servo system's performance using a four-channel scope to graph performance data





Monitoring Section
Monitor motion and I/O on the controller

YTerm Motion Control Command Examples

Motion
38 Commands
Used to specify modes and parameters
AB . . . . . Abort Motion
BG . . . . . Begin Motion
EA . . . . . Select Master Cam Axis
GR . . . . . Gear Ratio

Program Flow
29 Commands
Used to control program sequencing
AI . . . . . After Input
IF . . . . . If Statement
JS . . . . . Jump to Subroutine
TW . . . . . Timeout for In-position
XQ . . . . . Execute Program

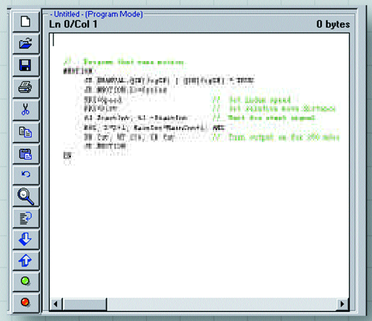
General Configuration
31 Commands
Sets variables and controls unit functions
AL . . . . . Arm Latch
BP . . . . . Burn Program
DA . . . . . Dimension Arrays
MT . . . . . Motor Type Define
II . . . . . Interrupt Input

Control Filter Settings
14 Commands
Set up loop variables and options
FA . . . . . Acceleration Feed Forward
DV . . . . . Dual PID Loop
IL . . . . . Integrator Limit
NF . . . . . Notch Filter

Status
18 Commands
Interrogates the system in operation
RP . . . . . Report Command Position
TD . . . . . Tell Dual Encoder
TV . . . . . Tell Velocity

Errors and Limits
4 Commands
Sets system limits
BL . . . . . Reverse Software Limit
OE . . . . . Off on Error

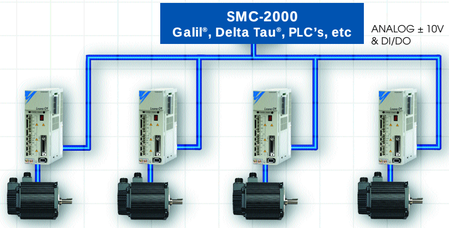
Arithmetic Functions
22 Commands
For program use in complex situations
ACOS . . . . ArcCosine
RND . . . . Round
SQR . . . . Square Root
& . . . . AND

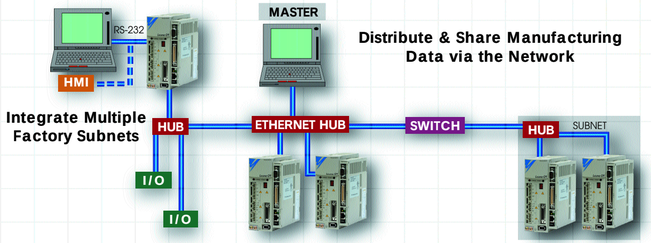


Harnesses The Power Of Ethernet Connectivity

From the boardroom to the shipping dock,Ethernet has become a leading industry standard in enterprise networking. With the ***LEGEND*-MC** motion controller, you can take full advantage of the convenience, flexibility, and power of Ethernet connectivity. This page illustrates only a few scenarios of how the ***LEGEND*** series can be utilized in an Ethernet network scheme or with regular controllers.

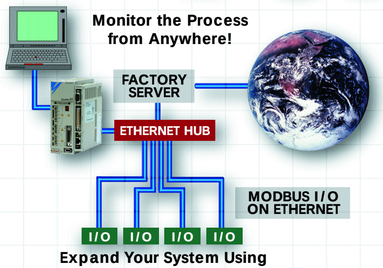
Conventional Motion Controller





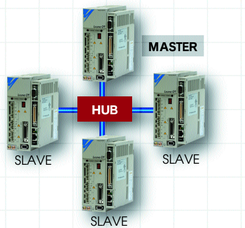
Distribute & Share Manufacturing Data via the Network

Integrate Multiple Factory Subnets



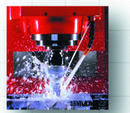
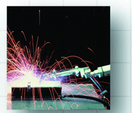
Monitor the Process from Anywhere!

Expand Your System Using Commercially Available I/O

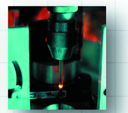


All Programming in the Master

Point-to-Point Four Axis Control via Ethernet





LEGEND Amplifier Models & Motor Summary

BASIC SPECIFICATIONS	Main Circuit Power	Single-Phase: 90 - 253VAC or Three-Phase: 90 - 253VAC or 127 - 357VDC
	Control Power	Single-Phase: 90 - 253V
	Control Method	IGBT Sinusoidal PWM Modulation
	Feedback	Incremental Serial Encoder
	Operating/Store Temperature	0 to 55ºC/ -20 to 85ºC
	Operating/Store Humidity	Less than 90%RH *(Free from condensation)*
	Mounting	Base Mounted
	Anti-Vibration/Anti-Shock	4.9m/s² / 9.8m/s²
I/O SIGNAL	Torque Reference Input	±10V, 16-Bit Resolution
	Digital Inputs, Optically Isolated	12V - 24VDC and TTL (Servo Amplifier Enable, Dynamic Brake Enable
	Digital Outputs, Optically Isolated	12V - 24VDC and TTL (Alarm, Run)
	Encoder Dividing Output	Phase A, Phase B, Phase C Line Driver *(Dividing function is available)*
	Speed Monitor	1V/1000rpm
	Torque Monitor	5V/Max. Torque
BUILT-IN FEATURES	Regenerative Energy Dissipation	100W: Built-In Capacitor 400W: Built-In Circuit, External Resistor Higher than 1kW: Bus-Shunt Resistor Built-In
	Error Detection	Overcurrent, Overvoltage, Undervoltage, Regenerative Error, etc. *(12 total)*
	Display	Main Circuit Power Charge LED, Control Power LED, 7-Segment LED Status Display
SMC3010 MOTION CONTROLLER SPECIFICATIONS	Digital Inputs, Optically Isolated	8 Programmable, 5 dedicated, +24VDC
	Digital Outputs, Optically Isolated	4 Programmable, 2 dedicated, +24VDC
	Analog Inputs	2 Inputs, +/- 10V, 12-Bit Resolution
	Analog Output	1 Output, +/- 10V, 16-Bit Resolution
	External Encoder Input	1 External Encoder Input, Up to 12MHz; A,B Channel
	Power Output	5.15V ± 5% (500mA) ± 12V ± 5% (60mA)
	Serial Communication	1 RS-232 Port, 9600 or 19200 Baud
	Ethernet Communication	1 Port, 10 Base-T, ASCII and Modbus Protocols Supported
	Programming Features	YTerm Software, Multi-Tasking, Math Functions, Simple Command Structure
	Program Memory Size	500 Lines X 80 Characters of Program Code
	Physical Dimensions	5.6" (142mm)H X 0.8" (20mm)W X 5.1" (130mm)D

Amplifier Model: SGDG		01			04				10
Servomotor Model: SGMAH		A3A	A5A	01A	02A	01B	02B	04A	08A
Rated Output	kW	0.03	0.05	0.1	0.2	0.1	0.2	0.4	0.75
Rated Torque	lb-in	0.85	1.41	2.81	5.64	2.81	5.64	11.24	21.15
Maximum Instantaneous Torque	lb-in	2.53	4.22	8.45	16.90	8.45	16.90	33.81	63.37
Rotor Inertia	lb-in-s²x10	0.147	0.195	0.322	0.938	0.322	0.938	1.531	5.948

Amplifier Model: SGDG		01	04				10	15
Servomotor Model: SGMPH		01A	02A	01B	02B	04A	08A	15A
Rated Output	kW	0.1	0.2	0.1	0.2	0.4	0.75	1.50
Rated Torque	lb-in	2.81	5.64	2.81	5.64	11.24	21.15	42.22
Maximum Instantaneous Torque	lb-in	8.45	16.90	8.45	16.90	33.81	63.37	126.57
Rotor Inertia	lb-in-s²x10⁴	0.43	1.71	0.43	1.71	2.93	18.59	35.58

Amplifier Model: SGDG		10					15	
Servomotor Model: SGMGH		03■B	05■A	06■B	09■A	09■B	12■A	13■A
Rated Output	kW	0.3	0.45	0.6	0.85	0.9	1.2	1.3
Rated Torque	lb-in	25.14	78.95	50.27	47.71	76.29	101.78	73.82
Maximum Instantaneous Torque	lb-in	63.46	122.14	124.80	122.14	170.82	247.82	206.22
Maximum Rotation Speed	r/min	2000	3000	2000	3000	2000	2000	3000
Rotor Inertia	lb-in-s²x10⁴	64.08	64.08	123.03	123.03	109.75	280.57	181.44

Amplifier Model: SGDG		10	15
Servomotor Model: SGMSH		10■A	15■A
Rated Output	kW	1.0	1.5
Rated Torque	lb-in	28.15	43.37
Maximum Instantaneous Torque	lb-in	84.44	130.11
Rotor Inertia	lb-in-s²x10⁴	15.40	21.88

Motor Enclosures: SGMPH, SGMGH, SGMSH: IP67
SGMAH: IP55

Max. Rotation Speed: SGMAH, SGMPH, SGMSH: 5000 rpm
SGMGH: 3000 rpm

■ See full catalog for complete information

A full line of linear motors is available for your application success. Ask your Yaskawa Sales Representative for information on the solutions we can provide, or visit us at www.yaskawa.com.

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Breaking Through All The Barriers

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- *Performance*
- *Availability*

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