

## MP940 - A 1.5 axis machine controller



Integrated Sigma II servo amp with MP940 controller

### Used for a wide variety of functions, including:

- Positioning, speed, synchronous phase or torque control including on-the-fly mode switching
- Includes registration, following, electronic camming and gearing

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\*Sigma II Servo System Product Catalog Supplement G-MI#99001x-Sigma II

## Design Features

### 1. Easy to Use

- Integrated 1.5 axis motion control with a built-in programmable logic control (PLC)
- Any size Sigma II Servo amplifier provides for an add-on MP940 module: reduces wiring and panel space requirements
- Local programmable I/O: eight 24V<sub>DC</sub> inputs/outputs (with auxiliary encoder axis input), two high speed registration inputs, one 16 bit analog input and output
- Standard remote I/O network or optional Devicenet Fieldbus provides the link to distributed control
- A variety of optional remote I/O modules available for distributed control
- Two Memobus serial ports standard

### 2. Simple to Set Up and Configure

- System design, debugging, and maintenance in a single development environment for motion and sequence
- Choice of ladder based programming (MotionWorks™) or an icon graphical (MotionWorks+™) programming environment
- Includes a rich set of motion and sequence programming commands including floating point math and trigonometric functions
- Up to eight simultaneous multitasking programs
- Large programmable memory: 80kB (approx. 2000 lines of user program)

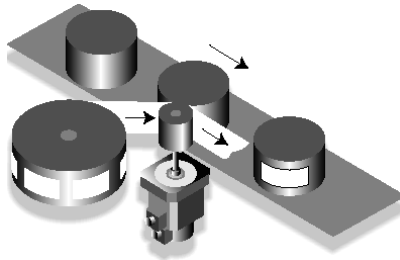
### 3. Application Emphasis

- Feed-to-length, flying cut-offs, roll feeding, bag making, press feed
- Packaging, form, fill, seal and random infeeds
- Linear motors, linear slides, indexing conveyors and rotary tables
- Pick and place systems

### 4. UL, c-UL recognized (File # E165827) and CE compliance tested

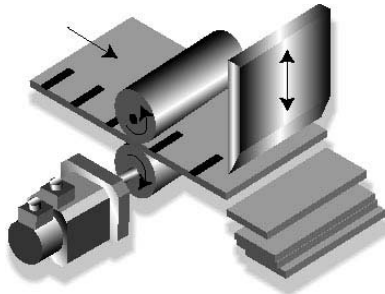
## Functional Features and Capabilities

### Labeling Application



In this application, a roller or set of pinch rollers feed labels through a labeling head. The product approaching a labeling head triggers a sensor, which initiates the MP940 profile. The predefined profile causes the label to be pulled through the labeling head and applied to the product. The servo must provide low acceleration to prevent tearing the labels and quick deceleration to stop between tightly placed labels. The control can compensate for variation in package separation and changes to conveyor speeds.

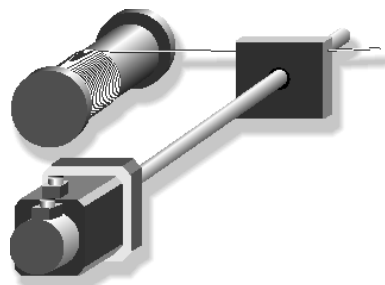
### Cut-To-Length



The performance of many applications, in particular those requiring conditional indexing, can be improved by obtaining real-time position information. In order to improve thru-put, the MP940 utilizes dedicated high speed input for capturing registration marks at the highest possible process speeds. This input can acquire and store the position of the motor or external encoder in less than 30 microseconds.

A system that is synchronized by an MP940 provides faster and more accurate cut lengths exactly placed on the registration marks or adjustable offsets.

### Coil Winding



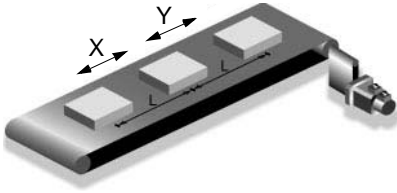
The product is wound onto a bobbin that rotates at a constant speed. The filament will be laid onto the bobbin by a ball screw driven guiding mechanism that will slowly decrease its travel rate as the winding diameter is increased.

With an MP940 servo system, complex changes of ratio based on master position are possible. In addition, the arm must reverse quickly at the end of the move.

These processes are done at a very high speed and precise motion control is required for consistency and quality in high production environments. Product changeover is easily programmable with an MP940 servo system.

## Functional Features and Capabilities

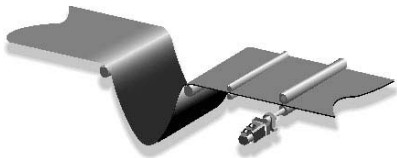
### Random Timing In-feed - Conveying



Frequently, a product at a particular point in a process arrives with non-repeatable, or random timing. In this application, a product needs to be placed on an exit conveyor with perfect spacing to ensure it can be wrapped and packaged accurately.

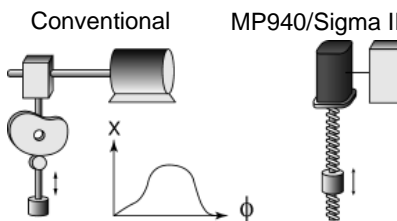
The MP940 servo system regulates the spacing on an output conveyor by advancing and retarding conveyor position and speed to obtain the required shift and then matching speed with the feeding conveyor for a smooth transition.

### Feed To Length



Many process lines that unwind a roll continuously and feed a converting process in discrete moves use an MP940. The servo feeds a variable length of material to the process and can include an optional external encoder to compensate for material slippage. In addition, an MP940 analog output varies the speed of the unwind roll as the depth of the material accumulator and the diameter of the unwind roll changes.

### Electronic Cam



Machines that previously required mechanical cam changes for product or process changes may now be settable and reconfigured electronically. The servomotor is linked to a master encoder with synchronized phase control mode. With synchronized phase control mode, the AC servo system moves the same way as with a mechanical cam.

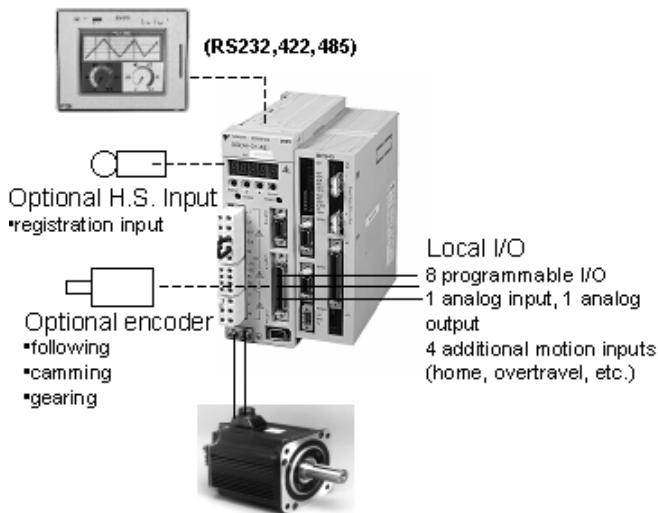
With an MP940, each cam profile can have as many as 20 definable segments with each segment curve shape settable with 21 available shapes including straight line, parabolic, simple harmonic, cycloidal, modified trapezoidal, modified sine, asymmetrical cycloidal, etc.

The electronic cam is an ideal mode for periodic operation, especially those requiring varying gear ratios along the motion cycle. Such applications include flying shears, rotating knives, and packaging systems.

## Control System Architecture

The MP940 provides solutions for applications that previously required more wiring and additional controllers. It is designed to plug in to any size Sigma II servo amp and share a common back-plane. All servo loops, trajectory planning, sequential and I/O control are included in a self contained servo/motion controller package. This reduces system bottlenecks, simplifies control and programming and boosts overall system performance. High performance MP940 motion control moves your machines and/or parts quickly and precisely to increase productivity and business profit.

### Standalone Motion Control Applications

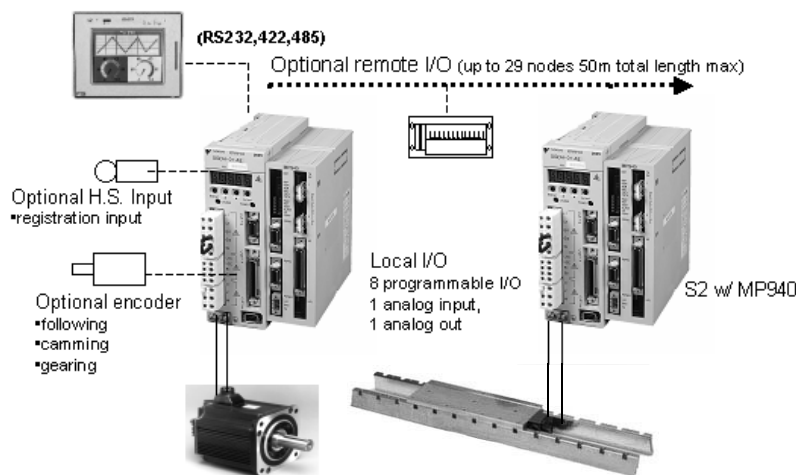


For applications with a fixed amount of I/O requirements, the MP940 includes a rich instruction set of ladder, math, and motion functions with 80kB of memory and 32-bit processing power for several motion programs, conditional logic, fault handling and power-up routines.

One serial RS232 interface port and one serial RS422/485 interface port utilize an industry standard Memobus protocol making digital adjustments of machine set-ups, parameters, and process variables easy to set up from an operator panel. HMI vendors include; Exor, Red Lion, Eason, Cimrex, TCP, etc.

System voltages (VAC): 100, 200 or 400  
 35 servo sizes: 13.5 in. oz. to 6120 in. lbs. peak torque.

### Standalone Distributed Control Applications

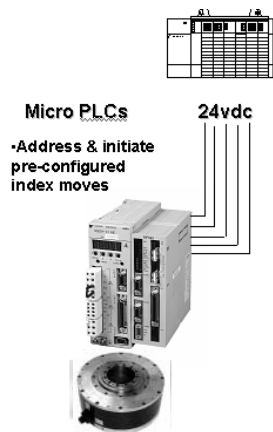


Larger systems link (no additional MP940 hardware requirements) remote I/O modules, and Sigma II/MP940 axes. Up to 8 bytes of input and 8 bytes of output data can be shared with each node in real time with up to 14 MP940 nodes per system. **Multiple servo axes can be synchronized within 2 ms.**

Eight standard panel mounted remote I/O modules:

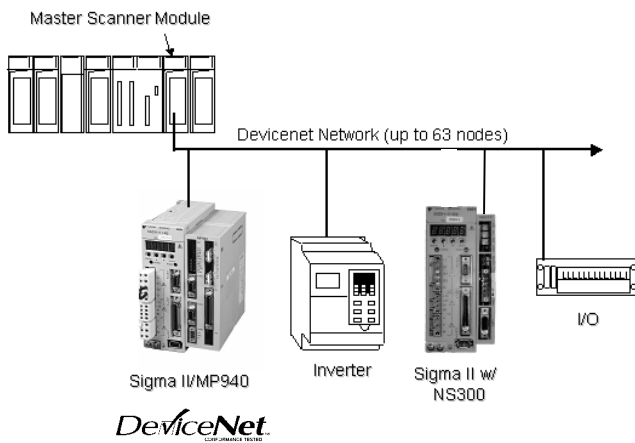
- 16 pt. 12/24 VDC inputs
- 16 pt. 12/24 VDC outputs
- 8 pt. 100 VAC inputs
- 8 pt. 200 VAC inputs
- 8 pt. 100/200 VAC outputs
- 8 pt. relay outputs
- 4 pt. A/D inputs
- 4 pt. D/A outputs

## Peripheral Connection to a PLC



A PLC is the most common type of machine control. However, suppliers have difficulty maintaining state of the art high performance motion control. The MP940 has unique features to help integrate it easily with an existing PLC control system:

- functions controlled via discrete I/O
- DeviceNet fieldbus interface



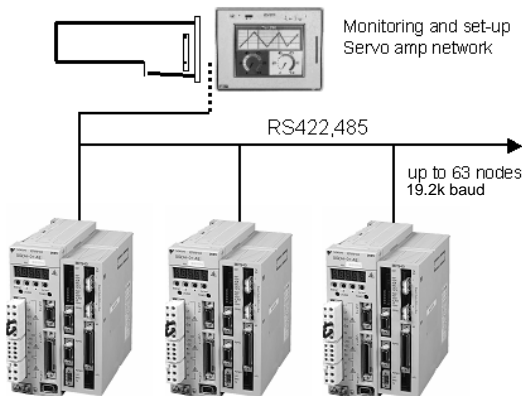
Recent advances in fieldbus increase the flexibility of communications with many different elements of the control system. MP940 allows high performance motion control wider accessibility from cell and process controllers. This simplifies monitoring, set-up and troubleshooting of the machine and process.

VA conformance tested  
 /ice type: communication  
 orts DeviceNet poled I/O

- Baud rates: 125k, 250k or 500k (dip switch settable)
- Input/output packet size: 256 bytes

NOTE: The MP940 can be a master for other DeviceNet components, replacing the PLC in some applications.

## Peripheral to an Operator Interface or PC



Each MP940 contains its own application(s) programs. They are enabled via interface and multiple servos. PC and operator interfaces facilitate monitoring and configuring processes, parameters, fault history, machine set-ups, offsets, overspeed setpoints, etc.

MP940 controllers mount on any Sigma II amp. Specifications shown are for packages of MP940 and Sigma II amp.

MP940

## Programming Environment

Yaskawa provides a choice of programming environments with the MP940.

1. MW+ is an intuitive icon based programming environment. -- part# CP717 Plus
2. LadderWorks provides a familiar PLC-style language. -- part# MPE720

Most local and distributed control applications that include sequential and process logic can easily be developed in the flow charting MW+ environment. In addition, an MW+ program can be opened within the Ladderworks environment for convenient shop floor monitoring and troubleshooting. Both MW+ and Ladderworks contain servo setup, tuning and troubleshooting utilities for charting position, I/O status, torque transitions, etc. during operation.

### MotionWorks+™ (MW+) Software Features

Create programs by arranging motion and control icons in a visual flow chart. Setup wizards and simple menus guide you through controller setup, servo setup and tuning, variable management, and communications options. Monitoring tools for start-up and troubleshooting are included.

#### Drag and drop programming tools

**Motion**

- Cam
- Change Dynamics
- Gear Ratio
- Jog Axis
- Move Axis
- Scale Cam
- Stop Motion
- Cam Shift
- Gear
- Home Axis
- Latch Target
- Slave Offset
- Torque

**Logic**

- IF Event
- Input
- Set Variable
- IF Fault
- Programmable Limit Switch

**Flow**

- Call Subroutine
- Suspend Program
- Launch Program

**General**

- Define Position
- Reset Fault
- Text Box
- Latch
- Servo Enable / Disable
- Timer

#### Visual Basic™ like front end\*

- Tool box properties**
- definable program priorities (high/low scan rates)
  - real world tag names definable for I/O and variables

- Project explorer**
- up to 8 multi-tasking program files per project
  - up to 62 subroutines for each program

The screenshot shows the MotionWorks+ software interface. The main window displays a ladder logic diagram with blocks for START, SERVO, INPUT, RATIO, ON, OFF, DECEL, LOOP, and END. A 'Watches' window is open, showing a table of variables and their values:

Expression	Value
mAlarm_Servo_Code	153
master	1
mPosition_Actual	10.00012
mPosition_External	10
mState_Gearing	0
slave	1

The 'Project - Gearing' explorer on the right shows a tree view of the project structure, including folders for Programs, Parameters, Data, and Monitoring. The 'Properties - Gearing' window is also visible, showing details for a specific block.

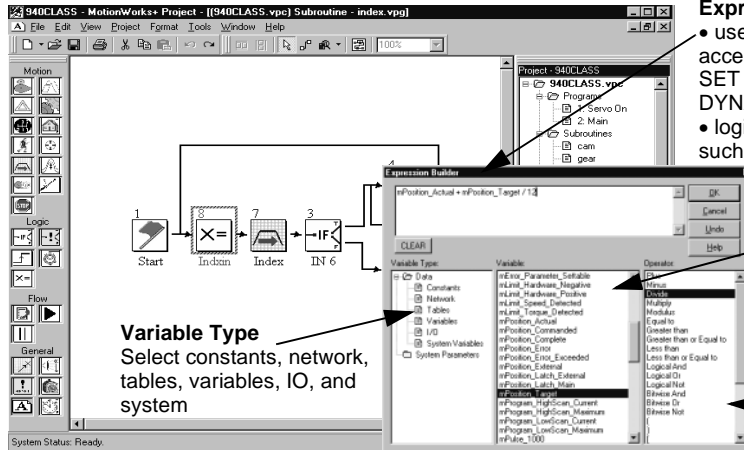
Choice of ON or OFF-line programming

Brief property descriptions  
Complete on-line help  
manual included

\* Visual Basic is a trademark of Microsoft

## Capabilities and Performance

Object-based flow-charting language



**Variable Type**  
Select constants, network, tables, variables, IO, and system

### Expression Builder

- used for any object property that accepts an expression (examples; SET VARIABLE, MOVE AXIS, CHANGE DYNAMICS, etc.)
- logic expressions can be created for blocks such as IF EVENT and IF FAULT

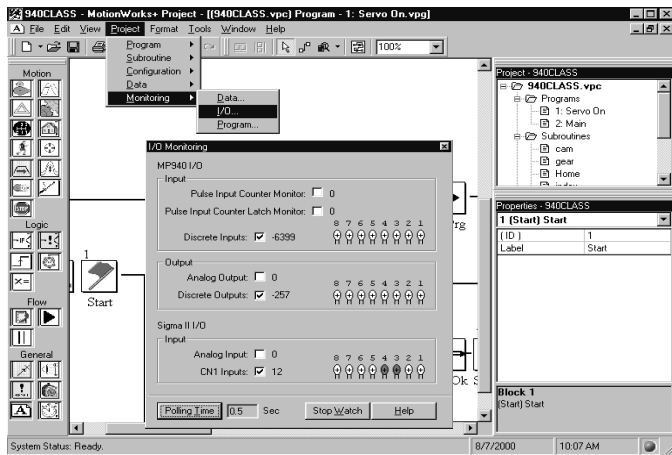
### Variables

- Includes accessible system data
- Up to 72 readable system variables including actual position, speed, torque, network and controller variables, etc. that can be updated at run time

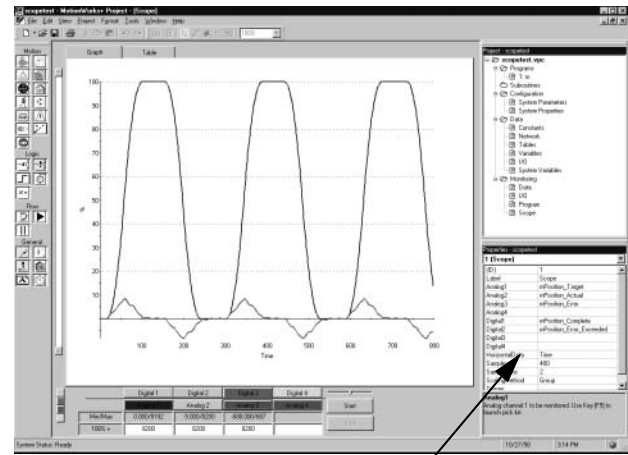
### Math functions

- select from this list that also includes trigonometric, square root, etc.

## I/O Monitoring



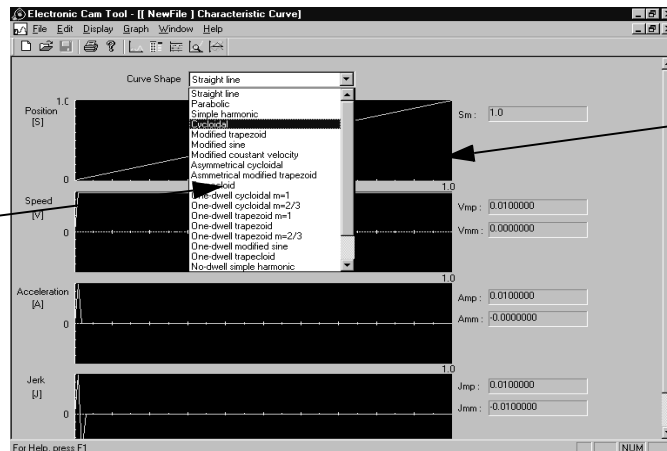
## Troubleshooting Scope



Choose data to be recorded and duration in the properties window  
Up to 8 separate data elements can be displayed simultaneously

## Electronic Cam Tools

- A cam profile can be divided up to 20 definable sections with 4096 points
- Automatic interpolation between points
- Select cam curve shape for each section from 21 available shapes



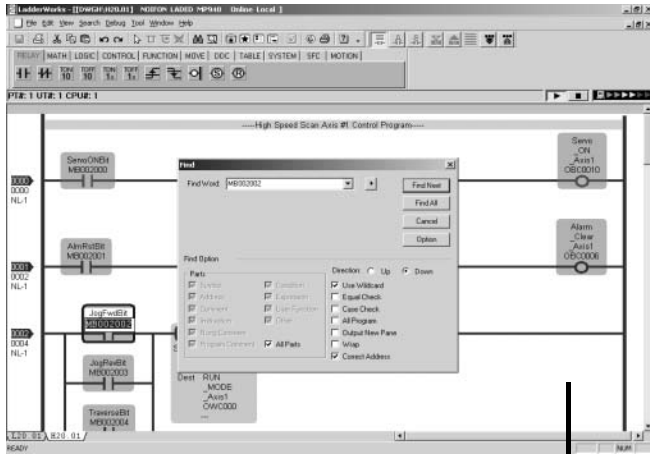
Data graph shows resulting cam profile from the information set provided from the parameter set-up window

MP940

## MotionWorks™ (MW) Software Features

MotionWorks integrates motion, sequence, and process control within the widely accepted PLC programming environment. The Ladder works editor is ideal for those applications with larger amounts of ladder logic and I/O processing requirements within a motion control application. MotionWorks will upload a machine program developed in the MW+ environment for editing, monitoring, and/or debugging within a ladder environment.

### Programming Environment



#### Traditional Relay Logic



#### Comparison Functions



#### Controlling Program Flow



#### Standard Math Instructions



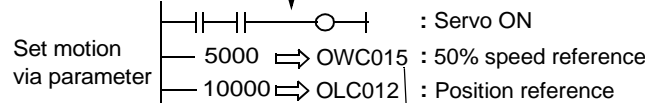
#### Advanced Math Instructions



#### Additional instructions include:

- Controlling memory registers - 9 instructions
- Advanced control algorithms - 9 instructions
- Data table controls - 9 instructions
- System - 6 instructions

### Register based motion programming



Engineering Manager - [SVA 940CLASS TESTIT MP940 Online Local]

PT#: 1 UT#: 1 CPU#: 1 RACK#01 SLOT#04 CIR#01 C000-C3FF

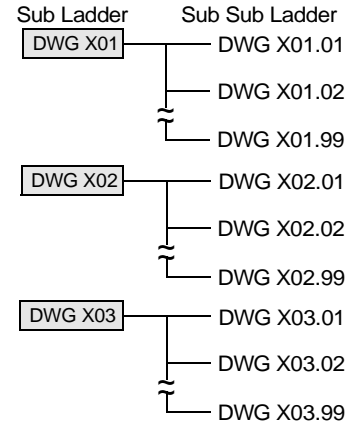
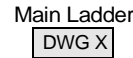
No.	Name	Reg-No.	Input Data	Unit	Current V/s
1	Run Mode	DW/C000	0000 0001 0000 0100	0104 H	0000 0001 0000
2	Run Commands	DW/C001	0100 0000 0000 0000	4000 H	0100 0000 0000
3	Forward Torque Limit	DW/C002		300.00 %	300.00
5	Forward Speed Limit	DW/C004		150.00 %	150.00
6	Reverse Speed Limit	DW/C005		150.00 %	150.00
7	Zero Point Offset	OLC006		0 Command Unit	
11	Home Approach Speed	DW/C00A		0 10 <sup>-3</sup> m Command Unit/s	
12	Home Creep Speed	DW/C00B		0 10 <sup>-3</sup> m Command Unit/s	
13	Linear Acceleration Time	DW/C00C		0 ms	
14	Linear Deceleration Time	DW/C00D		0 ms	
15	Positioning Completed Range	DW/C00E		10 Command Unit	
16	Following Error Limit	DW/C00F		0 pulse	
17	Position Loop Gain	DW/C010		30.0 /s	30.0
18	Feed-forward Gain	DW/C011		0 %	
19	Position Reference Type	OLC012		0 Command Unit	
21	S-Curve Acceleration Time	DW/C014		0 time	
22	Speed Reference	DW/C015		0.00 %	0.00
23	Phase Compensation	OLC016		0 pulse	

## Program Management and Documentation

Programs are managed in drawing unit (DWG). Drawings are hierarchically ordered at the basic, detailed, and expanded levels, and are grouped by program process to clarify the structure of the program. There are three types of drawings; initialization, high-speed scanning, and low-speed scanning.

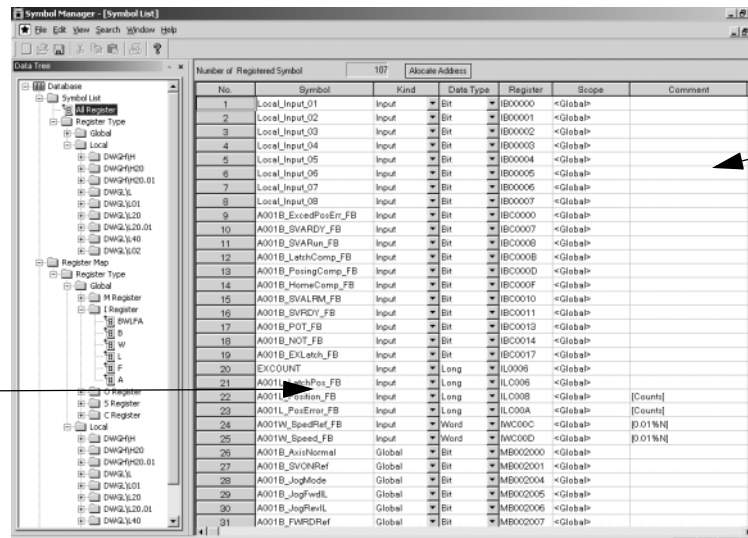
The advantages are:

- Programs are standardized as drawings, making reuse possible.
- Using merge and copy reduces design time.
- Drawings can be managed by regrouping them by processes, functions, and designers. This reduces scan time by only executing the programming for a required drawing.
- Password protection at the drawing level



## System configuration

The File Manager program provides the administrative functions for all MotionWorks files (hardware configuration, register files, I/O, communication functions, etc.)



Symbolic and tag list data base

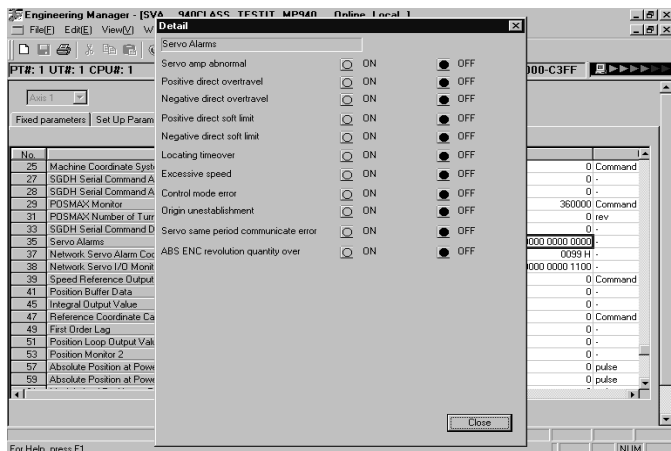
Manage all symbols used in drawings

Data types: bit, integers, double length integers, real number, and address

Approximately 40 standard system monitor parameters can be utilized with user definable tag names.

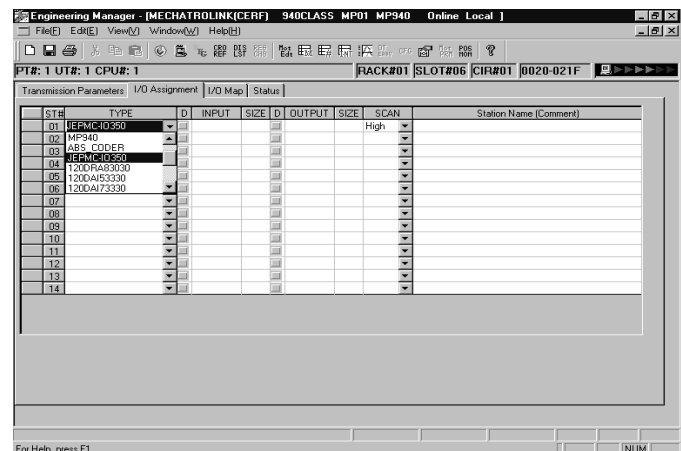
## Monitoring

Register list  
Tuning Panel for adjustments



## Network Configuration

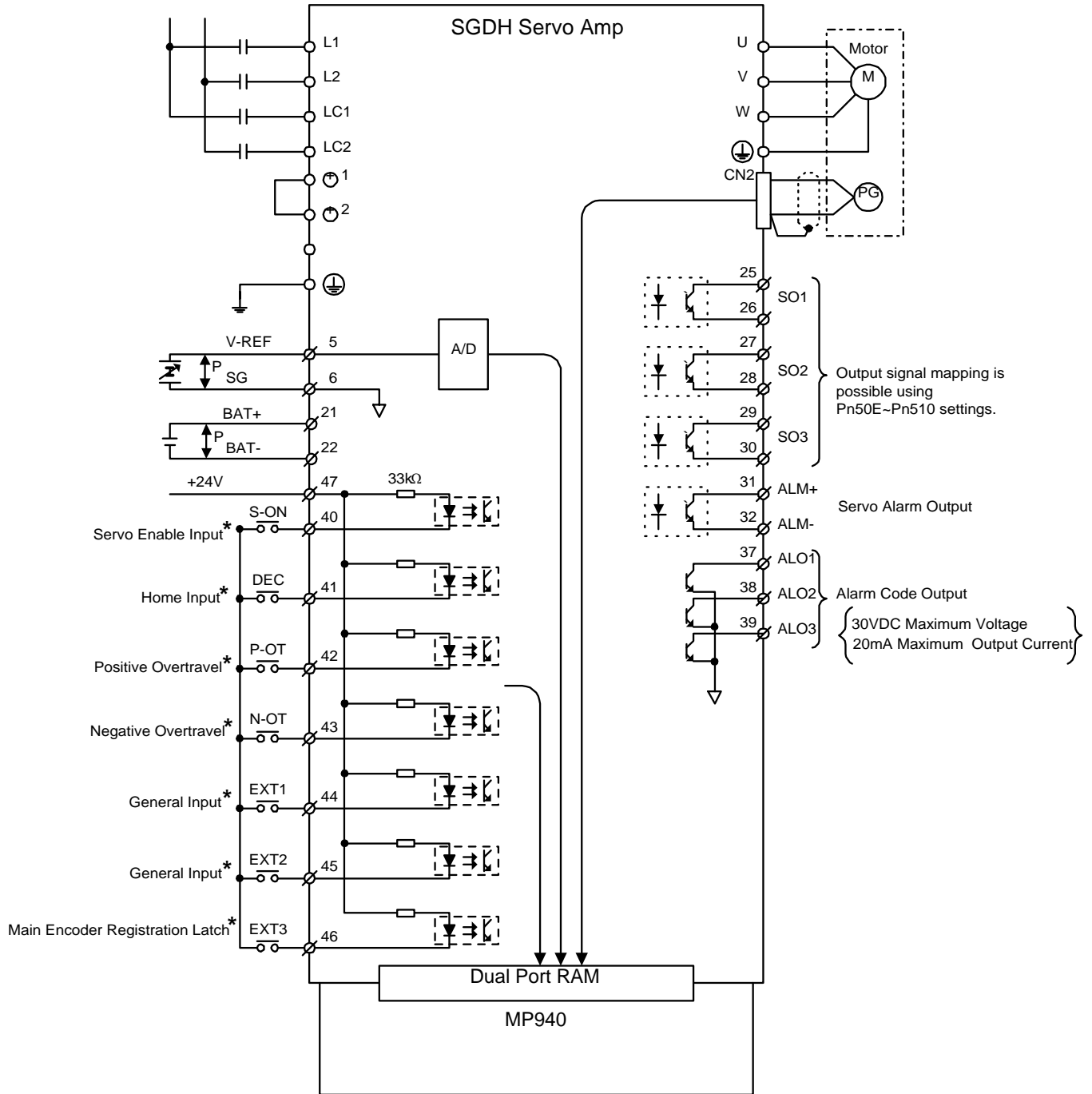
Serial port, network, I/O counter module



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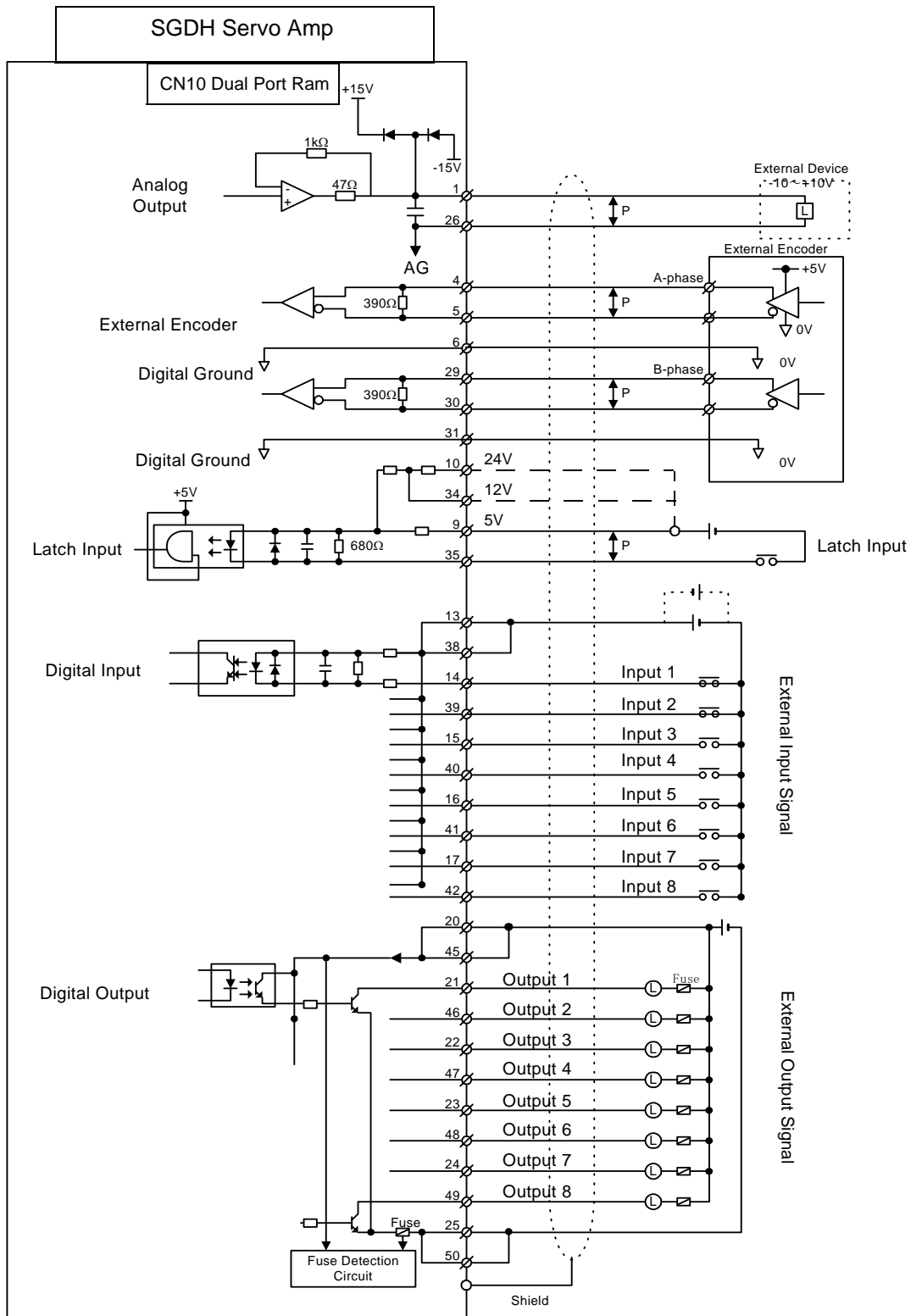
## I/O Connections

### Example of I/O Signal Connector



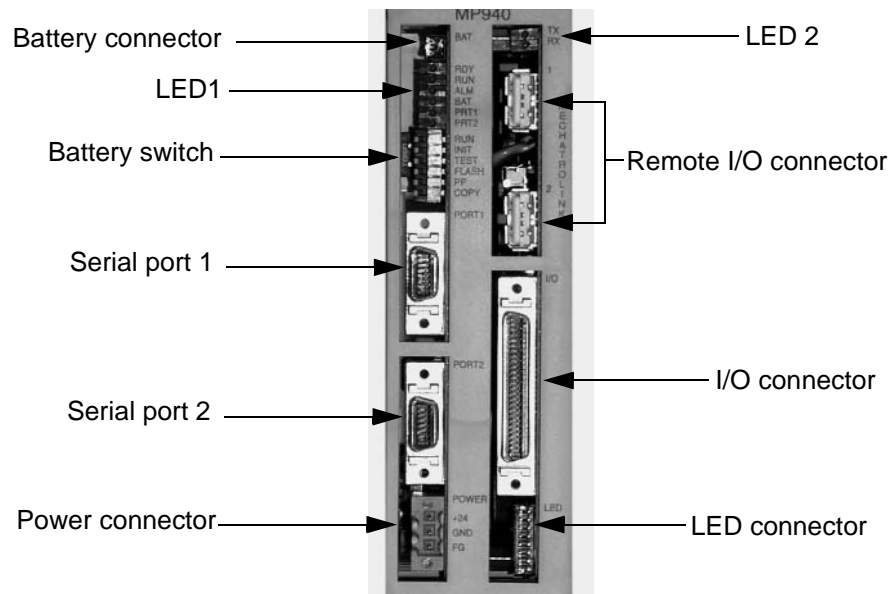
MP940

# MP940 Application Module I/O



MP940 controllers mount on any Sigma II amp. Specifications shown are for packages of MP940 and Sigma II amps

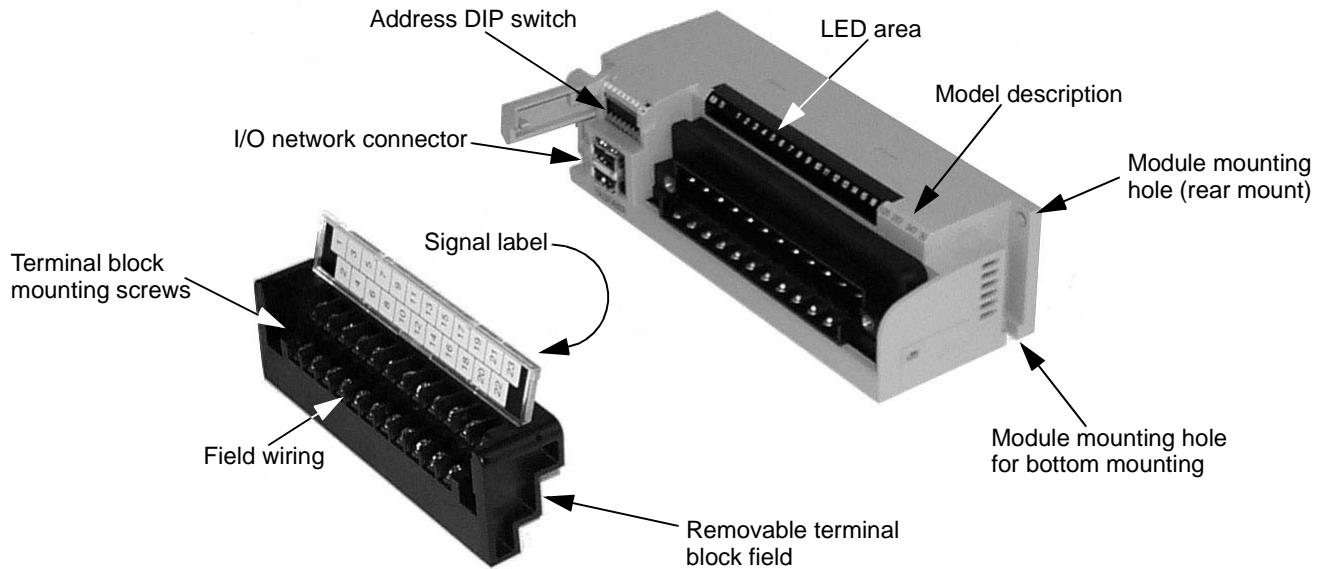
## MP940 Ratings and Specifications



Specifications	
Microprocessor	486DX2, 64MHz, 32-bit, floating decimal
System / programmable memory	2 mB RAM, 2 mB flash / 80kB, approx. 2000 user program lines
Inputs*	
— Analog	1 @ +/- 12V, 16 bit resolution
— Digital - programmable	8
— Digital - programmable	7 (typically dedicated for Home, Overtravel, Servo-ON, etc.)
— H. S. Digital (Registration)	2 @ 30µs
Outputs*	Standard
— Analog	1 @ +/- 10V, 16 bit resolution
— Digital - programmable	8
Network communications	Remote IO standard (Mechatrolink™) or optional DeviceNet™
Position	
— Position loop update period	500µs
— Resolution	32-bit (+/- 2,147,483,648 encoder counts)
Velocity	
— Velocity loop response	400Hz
— Resolution	0.01%
Control input power	24VDC, 0.4A
Servo System Specifications	
Motor feedback resolution / standard (post quadrature)	13-bit incremental encoder (8,192PPR) for motors below 1hp 17-bit incremental encoder (131,768PPR) for motors above 1hp
Motor feedback resolution / optional	16-bit absolute encoder for motors below 1hp 17-bit incremental/absolute for motors above 1hp
Linear motor feedback resolution / standard	0.078 micron (using 20 micron linear scale pitch)
Amplifier sizes	115 V <sub>ac</sub> single-phase, 30 to 200W
	230 V <sub>ac</sub> single-phase, 30W to 1.5kW
	230 V <sub>ac</sub> three-phase, 500W to 15kW
	480 V <sub>ac</sub> three-phase, 500W to 55kW
Environmental	
Ambient/Storage Temperature	0° to 55°C / -20° to 85°C
Global Safety Certifications	UL, CUL, CE, TUV

\* Including those used on SGDh amplifier

## Remote I/O Ratings and Specifications



Type	Items	Specifications
<b>INPUT</b>	<b>12 / 24 VDC MODULE</b>	
	Model	JAMSC-120DDI34330
	Input points, Common	16 points, 8 points/common, 2 common
	Rated voltage / Range / Max.	12/24 VDC / Min. ON voltage: 9 VDC, Max. OFF voltage: 5 VDC / 30 VDC max.
	Rated current	2.5 mA (12VDC) Sink/source / 5 mA (24VDC) Sink/source
	Input delay time / Impedance	OFF to ON: 5 ms max., ON to OFF: 5 ms max. / 3.0 kΩ
	External power requirements	For module: 24 VDC (20.4 to 26.4 V), 90 mA (when all points ON)
	<b>ANALOG INPUT MODULE</b>	
	Model	JAMSC-120AVI02030
	Input signal range / delay time	-10 to +10 V rated, ±20 V - 20 mA max. load / 4 ms or less
	Number of input channels	4 input channels (isolated), 1 MΩ or more input impedance
	Digital resolution / error	16 bits / ± 0.5% F. S. (25° C), ± 1.0% F. S. (0 to 60° C)
	Sampling cycle	Every communication cycle with watch dog timer
	Status display	Module normal: RDY illuminates Connection waiting: green light blinks (communication cables are connected or master stopped communication) Sending data: TX (green) illuminates, receiving data: RX (green) illuminates Communication error: ERR (red) blinks, setting error, hardware error: FLT (red) illuminates Overrange detected at each channel: CH1 to CH4 illuminates (overrange: +10.02 V < each channel input signal or each channel input signal < -10.02)
	External power requirements	24 VDC 120 mA or less
	<b>INPUT MODULES - 100VAC / 200VAC</b>	
	Model - 100VAC / 200VAC	JAMSC-120DAI53330 / JAMSC-120DAI73330
	Input points, Common	8 points/common, 1 common
	Rated voltage / frequency / range (100VAC)	100 VAC, 132 VAC max. / 50/60 Hz / ON range: 74 to 132 VAC, OFF range: 30 VAC or less
	Rated voltage / frequency / range (200VAC)	200 VAC, 246 VAC max. / 50/60 Hz / ON range: 159 to 264 VAC, OFF range: 40 VAC or less
	Inrush / rated current (100VAC)	160 mA / 7 mA (100 VAC 50 Hz)
	Inrush / rated current (200VAC)	320 mA / 7 mA (200 VAC 50 Hz)
	Input delay time	OFF to ON: 20 ms max., ON to OFF: 35 ms max.
Impedance - (100VAC) / (200VAC)	14.3 kΩ (50 Hz), 12.5 kΩ (60 Hz) / 28.6 kΩ (50 Hz), 23.1 kΩ (60 Hz)	
External power requirements	80 mA or less (when all points ON)	

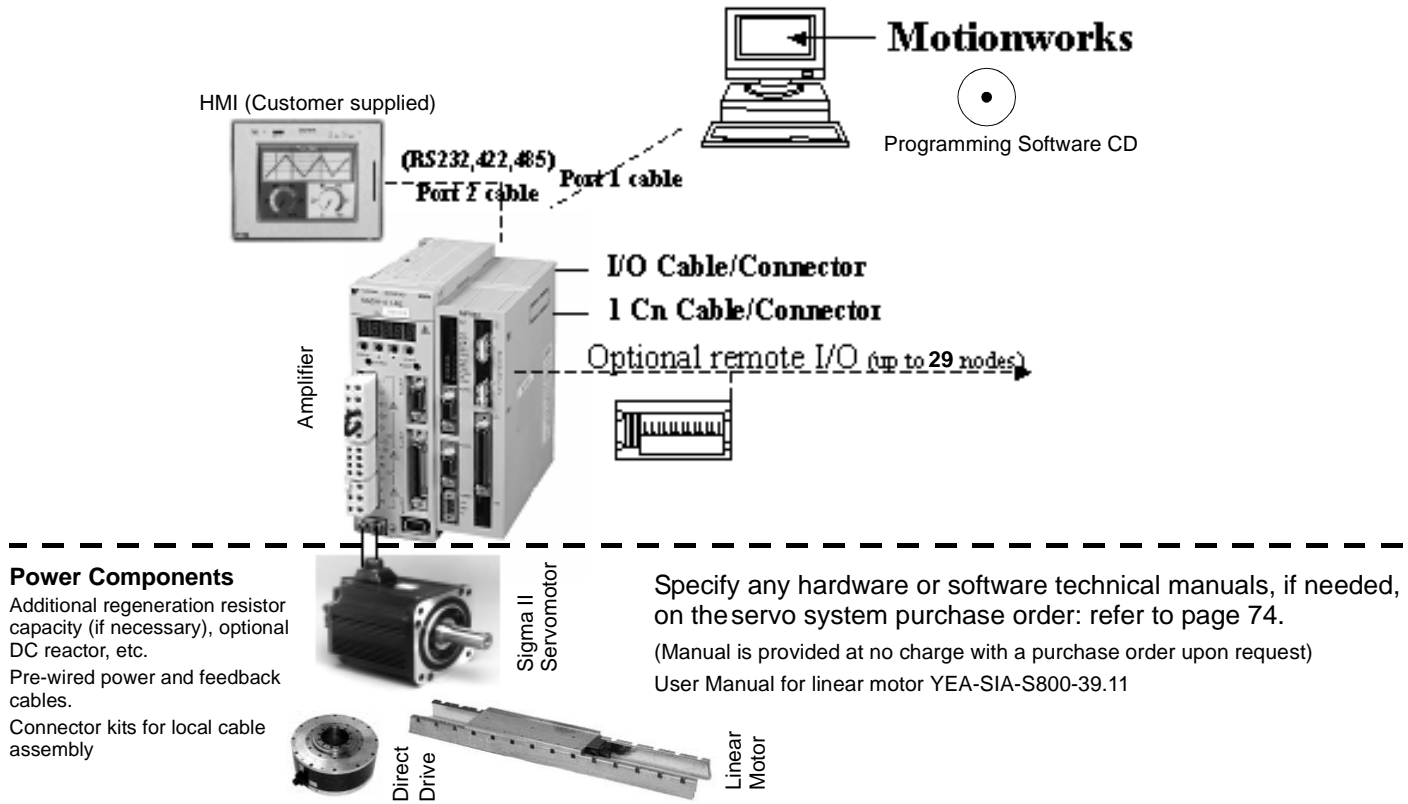
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Type	Items	Specifications
OUTPUT	<b>12 / 24 VDC MODULE</b>	
	Model	JAMSC-120DDO34340
	Output points	16 points, 8 points/common, 2 common
	Rated / allowable voltage / drop	12/24 VDC / 10.2 to 30 VDC / 1.5 V max. (0.3 A)
	Max. load current / output delay time	0.3 A/point / OFF to ON: 1 ms max., ON to OFF: 1 ms max.
	Output type, leakage current (OFF)	Transistor, 1 mA max. (24 VDC) Sink output
	Built-in fuse	3.5 A, 2 fuses, 1/common, burn out time: within 5 sec. @ 200% rated current
	External power requirements	For driving load: 110 mA (when all points ON)
	<b>ANALOG OUTPUT MODULE</b>	
	Model	JAMSC-120AVO01030
	Output signal range / delay time	-10 to +10 V / 1 ms or less
	Max. allowable load current	±5 mA (2 kΩ)
	Digital resolution / error	16 bits / ± 0.2% F. S. (25° C), ± 0.5% F. S. (0 to 60° C)
	Output at CPU stop	Select mode with the dip switch: <ul style="list-style-type: none"> <li>• clear output (0 V output)</li> <li>• holding the previous output</li> </ul>
	Status display	Module normal: RDY illuminates Connection waiting: green light blinks Sending data: TX (green) illuminates, receiving data: RX (green) illuminates Communication error: ERR (red) blinks, setting error, hardware error: FLT (red) illuminates
	External power requirements	24 VDC 120 mA or less
	<b>OUTPUT MODULE - 100VAC / 200VAC</b>	
	Model	JAMSC-120DAO83330
	Output points, Common	8 points/common, 1 common
	Rated / allowable voltage / frequency	100/200 VAC / 80 to 264 VAC / 50/60 Hz
	Max. load current / output type	0.6 Arms/point, 2.4 A/common / triac output w/varister surge suppressor
	Output voltage drop / delay time	1.0 Vms / OFF to ON: 10 ms max., ON to OFF: 1/2 max. cycle +5 ms
	Min. open/close current leakage	10 mArms
	Built-in fuse	3 A 1 fuse, 1/common (burn out time: within 1 sec @ 200% rated current)
	External power requirements	100 mA or less (when all points ON)
	<b>RELAY OUTPUT MODULE</b>	
	Model	JAMSC-120DRA83030
	Output points	8 relay contacts/module; each point independent
	External power supply voltage	+24 VDC (+19.2 to +30 VDC)
	Internal power supply voltage	+5 to +24 VDC, isolation DC/DC converter
	Load voltage	24 VDC, 100/200 VAC
	Min. open/close capability	100 mVDC, 0.1 mA
	Max. open/close voltage	264 VAC, 125 VDC
Contact resistance	100 mΩ or less	
Relay life (life varies according to current level and ambient temperature)	Electrical life: 150,000 times or more (250 VAC, 3A), 100,000 times or more (30 VDC, 5A) Mechanical life: 20,000,000 times or more	
Response time	ON to OFF: 15 ms or less, OFF to ON: 10 ms or less	
INPUT/ OUTPUT	<b>64-Point I/O MODULE</b>	
	Model	JEPMC-IO350
	I/O signal ratings	Input: 64 points, 24 VDC, 5mA, sink/source Output: 64 points, 24 VDC, 100 mA per point (50mA when all points ON, sink output)
	Module power supply requirements	24 VDC (20.4 V to 28.8 V), Rated current: 0.5 A, Inrush current: 1 A

# Selecting Your Sigma II MP940 Motion System

Use the tables beginning on the following page to specify choice of MP940 cables, mating connectors only, set-up and monitoring tools, and software.

## System Configuration



**Power Components**  
 Additional regeneration resistor capacity (if necessary), optional DC reactor, etc.  
 Pre-wired power and feedback cables.  
 Connector kits for local cable assembly

Specify any hardware or software technical manuals, if needed, on the servo system purchase order: refer to page 74.  
 (Manual is provided at no charge with a purchase order upon request)  
 User Manual for linear motor YEA-SIA-S800-39.11

## Power Components (motor, amplifier, and connections for power and feedback)

Select the required power components (servomotor, power and feedback connectors or pre-wired cables, amplifier, regenerative packs, etc.) from the following catalog pages.

Use this table or the Yaskawa publications referenced below to determine which catalog section describes the best servomotor for the application.

Application Requirements (Maximum)			Number of Motor Sizes	System Voltage and Sigma II Servomotor Series				Selection Guide for Power Components Page Number *
Speed (rpm)	Rated Torque oz • in [lb • in]	Peak Torque oz • in [lb • in]		100V <sub>ac</sub> Single-phase	200V <sub>ac</sub> Single-phase	200V <sub>ac</sub> Three-phase	480V <sub>ac</sub> Three-phase	
5000	338	1010	6	SGMAH	SGMAH	—	—	11
5000	676	2027	5	SGMPH	SGMPH	—	—	29
3000	[845]	[1988]	10	—	—	SGMGH	—	57
5000	[140]	[422]	6	—	—	SGMSH	—	85
3000	[845]	[1988]	10	—	—	—	SGMGH	127
5000	[140]	[422]	6	—	—	—	SGMSH	139
6000	[43]	[190]	2	—	—	—	SGMUH	139
2000	[1240]	[6120]	5	—	—	—	SGMBH	165

\* Yaskawa publication: *Sigma II Servo System Product Catalog Supplement G-MI#99001x-Sigma II, Linear Motor Catalog KAE-S800-39.10, Direct Drive Motor Catalog YEA-KAA-DDM-1.*

MP940

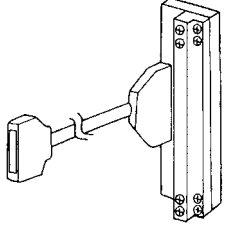
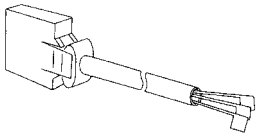
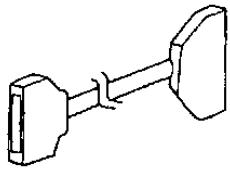
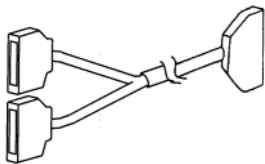
## MP940 System Selection

Component Description	Part Number	Item Class
MP940 Application Module*	JEPMC-MC400	Stock
MP940 with DeviceNet	JEPMC-MC410	

\* Includes optional remote I/O network interface as standard

Use the Sigma II Application Module Mounting Dimensions on pages 75 to 82 for determining overall MP940 panel space requirements. For 480VAC large capacity amplifiers (22 - 55kW), refer to the Sigma II catalog for amp dimensions.

## I/O Interface Cable Selection

Component Description (E)	Part Number	Comments	Item Class
1CN and I/O Cable & Transition Terminal Block 	JUSP-TA50P	35mm DIN rail mountable; the cable length is 0.5m.	Stock
1CN and I/O Cable with Pigtail Leads 	JZSP-CKI01-□(A)*	Use the following key to specify required cable length (last digit of the part number): 1: 1m (standard) 2: 2m 3: 3m	
Input/Output 1CN Cable Cable with Female D-Sub output Connector 	JZSP-CKI0D-□□**	Use the following key to specify required cable length (last two digits of the part number): D50: 0.5m 01: 1m (standard) 02: 2m 03: 3m	
Cable with Female D-Sub* output Connector Applicable only for SGDH-1E (15 kW) and below. 	CKI-MP940D-□□□**	Use the following key to specify required cable length (last two or three digits of the part number): D50: 0.5m 01: 1m (standard) 02: 2m 03: 3m	

\* The "(A)" at the end of the cable part number indicates the revision level. Revision level may be subject to change prior to the catalog reprinting.

\*\* 50 pin female D-Sub output connector mates to customer supplied third party terminal block. (e.g., Wago #289-449, Weidmuller #919658, Phoenix #2283647, Amphenol/Sine #20-51039, and many others).

## Mating Connector Selection

Component Description (E)	Part Number	Comments	Item Class
1CN and I/O Mating Connector	JZSP-CKI9	for SGDH I/O 50-pin	Stock
4CN Mating Connector	DP-9420007	Solder type with cover	
DeviceNet mating connector (for JEPMC-MC410 only)	YDN-1*	Alternate source: USA Phoenix Contact part number: MSTB2.5/5-STF-5.08AU	
Port 1 and 2 Mating Connector only	YSC-1	—	
5CN Analog Monitor Connector	DE9404559	—	

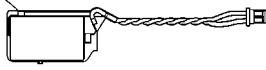
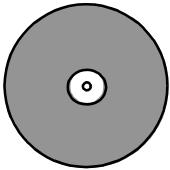
\* This mating connector is already included w/the JEPMC-MC410 application module

## Optional Remote I/O Modules

Up to 14 modules can be connected. Use cables that are not longer than 50m total network length. Reference detail specifications and dimensions starting on page 75.

Component Name	Description	Model JAMSC-	Item Class
64-Point I/O Module	24 VDC, 64 point inputs, 64 point outputs	(JEPMC-IO350)	Stock
DC Input Module	12/24 VDC, 16 point inputs, 5 mA / point	120DDI34330	
DC Output Module	12/24 VDC, 16 point outputs, 0.3 A / point, sink type	120DDO34330	
AC Input Module	100 VAC, 8 point inputs, 7 mA / point	120DAI53330	
AC Input Module	200 VAC, 8 point inputs, 7 mA / point	120DAI73330	
AC Output Module	100/200 VAC, 8 point inputs, 0.6 A / point 2.4 A / 8 points	120DAO83330	
Relay Module	Wide range voltage relay contact: 8 point outputs, 1A / point	120DRA83030	
A/D Module	A/D -10 to +10 V, 4 channels	120AVI02030	
D/A Module	D/A -10 to +10 V, 2 channels	120AVI01030	
Mechatrolink Network Cable	0.5 meter USB-USB	JEPMC-W6000-A5	
Mechatrolink Network Cable	1.0 meter USB-USB	JEPMC-W6000-01	
Mechatrolink Network Cable	3.0 meter USB-USB	JEPMC-W6000-03	
Mechatrolink Network Cable	5.0 meter USB-USB	JEPMC-W6000-05	
Mechatrolink Network Cable	10.0 meter USB-USB	JEPMC-W6000-10	
Mechatrolink Network Cable	20.0 meter USB-USB	JEPMC-W6000-20	
Mechatrolink Network Terminator Plug	-----	JEPMC-W6020	

## Peripheral Device Selection

Component	Description (E)	Part Number	Comments	Item Class
Battery		BA000518	3.6V, 2000mAh (lithium battery) Battery backup for current values of motion program variables and axis position. Programs are stored in non-volatile memory.	Stock
Interface Cable	Port 1	YS-15	Pre-wired 3.0m cable with 9-pin connector (RS232)	
	Port 2	YS-14	Pre-wired 3.0m cable with pig tail leads	
MotionWorks™ Software w/ Ladder Editor  MotionWorks+ Icon Graphic Programming Software		MPE720*  CP717 Plus**	System setup, programming, debugging, and maintenance software. Choose one. If there is no clear preference for either Icon or Ladder-based programs, Yaskawa recommends Ladder-based MotionWorks. MotionWorks provides a wider selection of debugging tools, program controls, and flexibility to solve applications requirements.	Stock

\* Use the following publications for MotionWorks (MPE720) and Ladderworks Programming environments:

- MP940 Reference Manual - YEA-SIA-C887-4.2x
- MotionWorks File Manager/Engineering Manager Manual (Chapters 4 & 5) - SIEZ-C887-2.2-1
- Ladder Works Programming Manual - YEA-SIA-C887-2.1
- Ladder Editor Operator's Manual - YEA-SIA-C887-2.3x

\*\* Use the following publications for MotionWorks (CP717 Plus) Programming environments:

- MP940 Hardware Manual - YEA-SIA-C887-4.1x
- Icon based Programming Manual - YEA-SIA-C887-1.5x

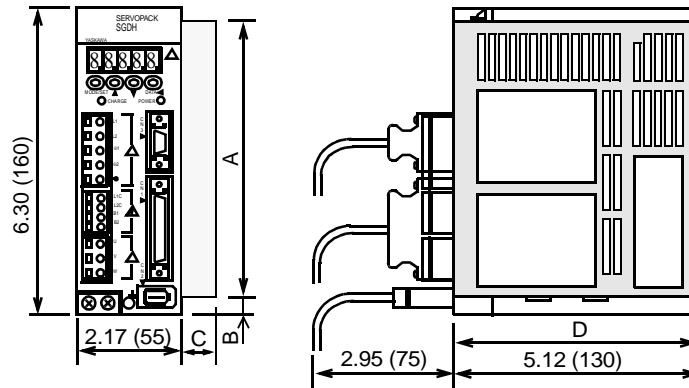
Use the following publication for R - network I/O modules:

- YEA-SIA-C887-5.1

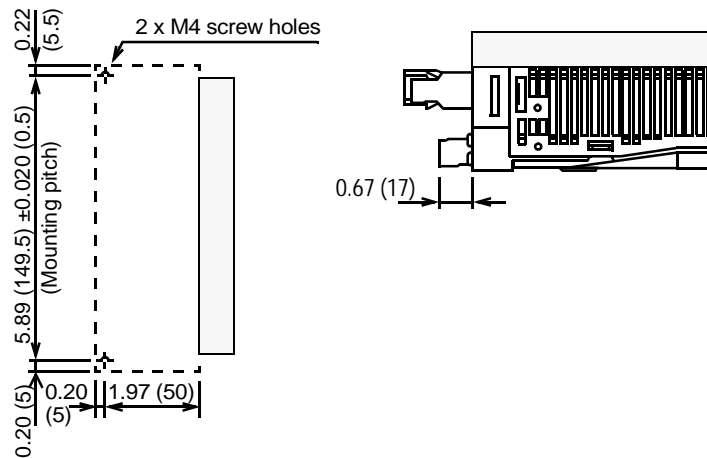
## Dimensions in inches (mm)

### SGDH Servo Amplifier/Application Modules

- SGDH-A3AE to -02AE (200V Single-phase, 30 to 200W) and
- SGDH-A3BE to -01BE (100V Single-phase, 30 to 100W)



Mounting Hole Diagram



Part Number	SGDH Option Description	A	B	C	D	Approximate Mass** lb (kg)
JUSP-NS100	Mechatrolink	5.59 (142)	0.35 (9)	0.79 (20)	5.08 (129)	0.44 (0.2)
JUSP-NS300	Indexer with DeviceNet™				5.24 (133)**	
JUSP-NS310	Indexer with DeviceNet™	5.67 (144)	0.32 (8)		5.08 (129)	0.7 (0.32)
JUSP-NS500	Profibus	5.59 (142)	0.35 (9)	1.22 (31)***	5.08 (129)	0.44 (0.2)
JUSP-NS600	Indexer					
JUSP-FC100	Full Closed Loop					
MP940	Single Axis Control					0.89 (0.40)

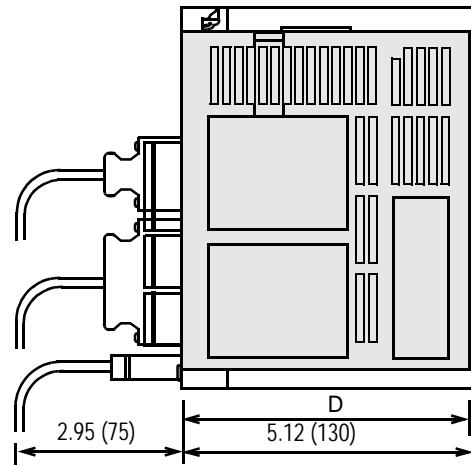
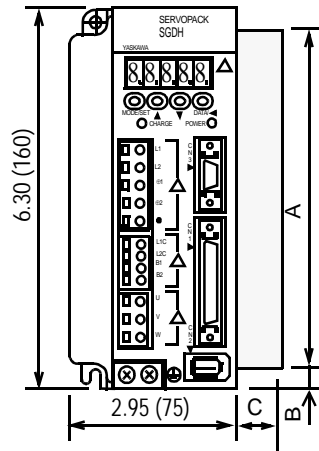
\* Option card only.

\*\* Add 0.75in (19mm) to front end of card for micro connector.

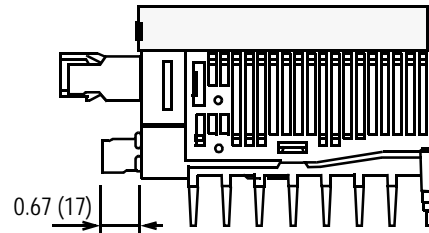
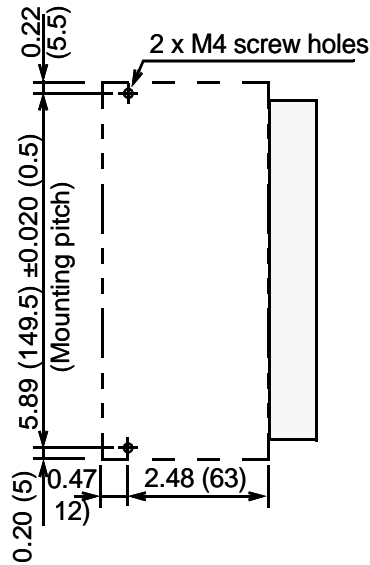
\*\*\* Add approx. 0.75in (19mm) for optional back-up battery.

# Sigma II Application Modules

- SGDH-04AE (200V Single-phase, 400W),
- SGDH-02BE (100V Single-phase, 200W) and
- SGDH-04FE (100V Single-phase, 400W)



Mounting Hole Diagram



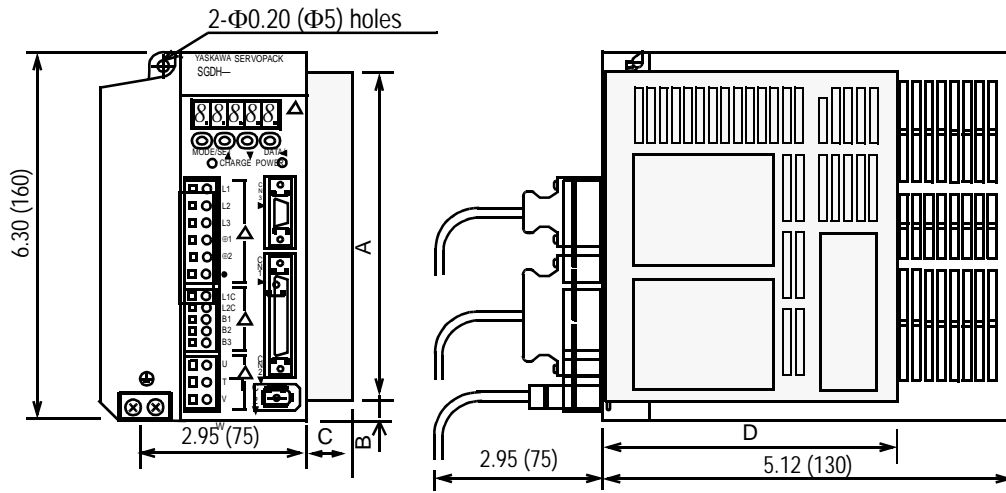
Part Number	SGDH Option Description	A	B	C	D	Approximate Mass** lb (kg)
JJSP-NS100	Mechatrolink	5.59 (142)	0.35 (9)	0.79 (20)	5.08 (129)	0.44 (0.2)
JJSP-NS300	Indexer with DeviceNet™				5.24 (133)**	
JJSP-NS310	Indexer with DeviceNet™				5.24 (133)**	
JJSP-NS500	Profibus	5.59 (142)	0.35 (9)	0.79 (20)	5.08 (129)	0.44 (0.2)
JJSP-NS600	Indexer					
JJSP-FC100	Full Closed Loop					
MP940	Single Axis Control			1.22 (31)***		0.89 (0.40)

\* Option card only.

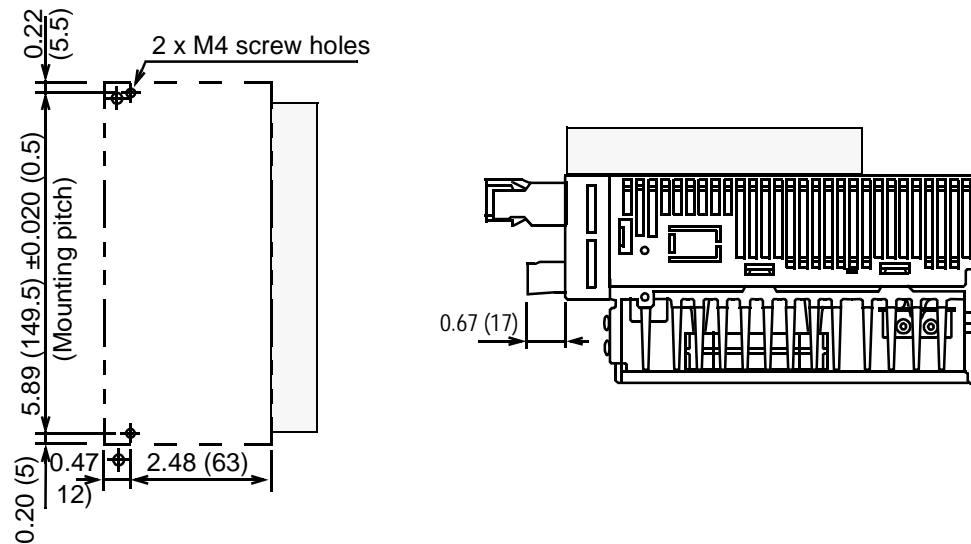
\*\* Add 0.75in (19mm) to front end of card for micro connector.

\*\*\* Add approx. 0.75in (19mm) for optional back-up battery.

- SGDH-05AE to -10AE (200V Three-phase, 0.5 to 1.0kW)
- SGDH-08AE-S (200V\* Single-phase, 750W)



Mounting Hole Diagram



Part Number	SGDH Option Description	A	B	C	D	Approximate Mass* lb (kg)
JJSP-NS100	Mechatrolink	5.59 (142)	0.35 (9)	0.79 (20)	5.08 (129)	0.44 (0.2)
JJSP-NS300	Indexer with DeviceNet™				5.24 (133)**	0.7 (0.32)
JJSP-NS310	Indexer with DeviceNet™	5.67 (144)	0.32 (8)		5.08 (129)	0.44 (0.2)
JJSP-NS500	Profibus	5.59 (142)	0.35 (9)			
JJSP-NS600	Indexer					
JJSP-FC100	Full Closed Loop			1.22 (31)***	0.89 (0.40)	
MP940	Single Axis Control					

\* Option card only.

\*\* Add 0.75in (19mm) to front end of card for micro connector.

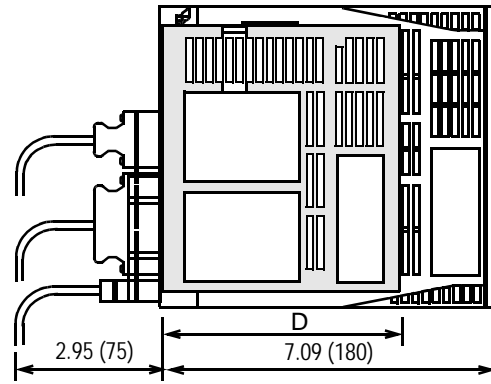
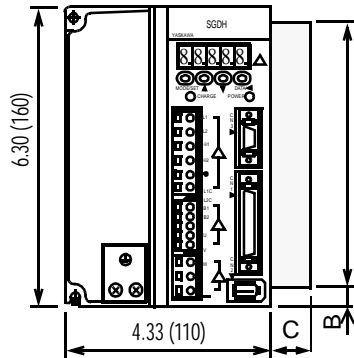
\*\*\* Add approx. 0.75in (19mm) for optional back-up battery.

\* Rating 200 to 230V<sub>ac</sub> +10% -5%

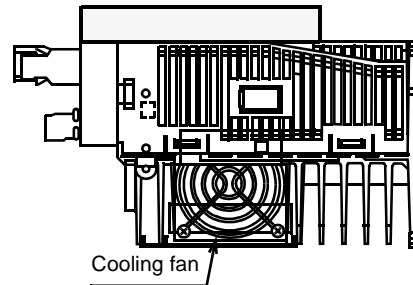
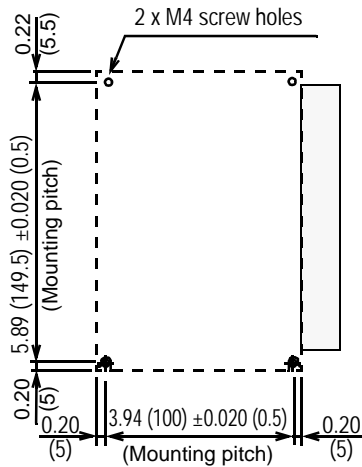
# Sigma II Application Modules

- SGDH-15AE (200V Three-phase, 1.5kW)
- SGDH-05DE (400V Three-phase, 0.5kW to 1.5kW)

Sigma II  
Modules



Mounting Hole Diagram



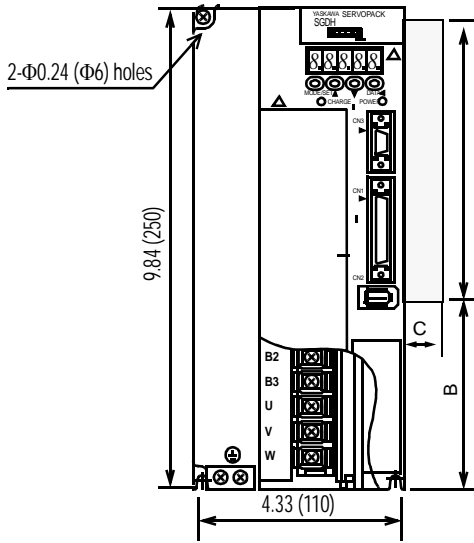
Part Number	SGDH Option Description	A	B	C	D	Approximate Mass** lb (kg)
JUSP-NS100	Mechatrolink	5.59 (142)	0.35 (9)	0.79 (20)	5.08 (129)	0.44 (0.2)
JUSP-NS300	Indexer with DeviceNet™					
JUSP-NS310	Indexer with DeviceNet™					
JUSP-NS500	Profibus					
JUSP-NS600	Indexer					
JUSP-FC100	Full Closed Loop					
MP940	Single Axis Control			1.22 (31)***		0.89 (0.40)

\* Option card only.

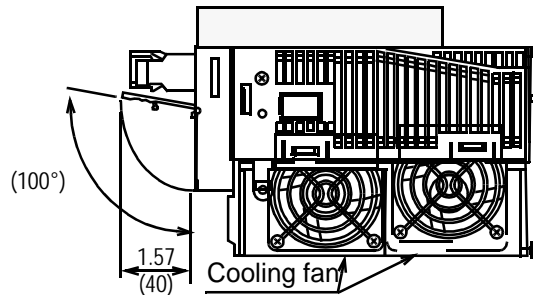
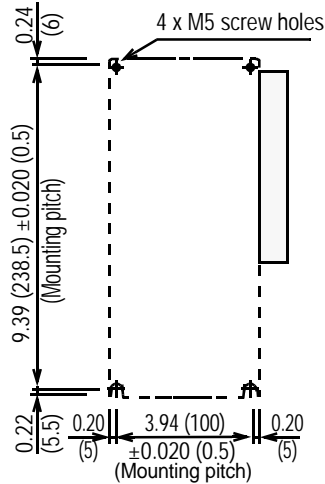
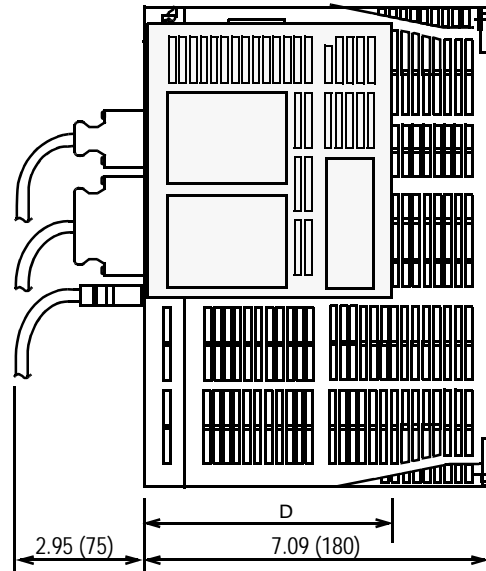
\*\* Add 0.75in (19mm) to front end of card for micro connector.

\*\*\* Add approx. 0.75in (19mm) for optional back-up battery.

- SGDH-20AE, 30AE (200V Three-phase, 2.0kW, 3.0kW)
- SGDH-15AE-S (200V Single-phase, 1.5 kW)\*
- SGDH-20DE, 30DE (400V Three-phase, 2.0kW, 3.0kW)



Mounting Hole Diagram



Part Number	SGDHG Option Description	A	B	C	D	Approximate Mass** lb (kg)
JUSP-NS100	Mechatrolink	5.59 (142)	3.9 (99)	0.79 (20)	5.08 (129)	0.44 (0.2)
JUSP-NS300	Indexer with DeviceNet™				5.24 (133)**	
JUSP-NS310	Indexer with DeviceNet™	5.67 (144)	3.86 (98)		5.08 (129)	0.7 (0.32)
JUSP-NS500	Profibus	5.59 (142)	3.9 (99)	1.22 (31)***	5.08 (129)	0.44 (0.2)
JUSP-NS600	Indexer					
JUSP-FC100	Full Closed Loop					
MP940	Single Axis Control					0.89 (0.40)

\* Option card only.

\*\* Add 0.75in (19mm) to front end of card for micro connector.

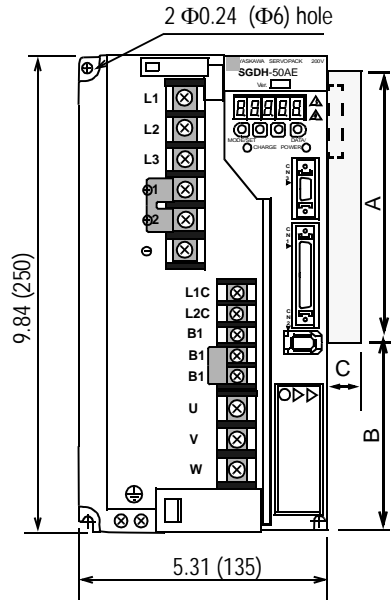
\*\*\* Add approx. 0.75in (19mm) for optional back-up battery.

\* Rating: 200 to 230V<sub>ac</sub> +10%, -5%

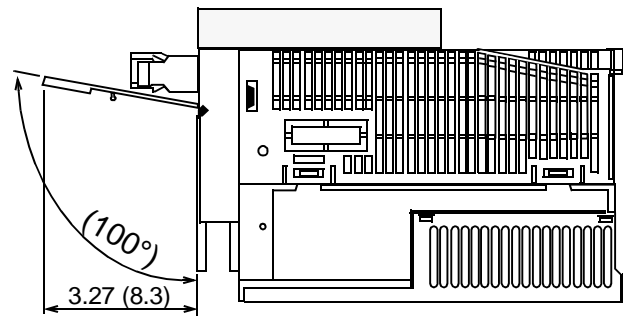
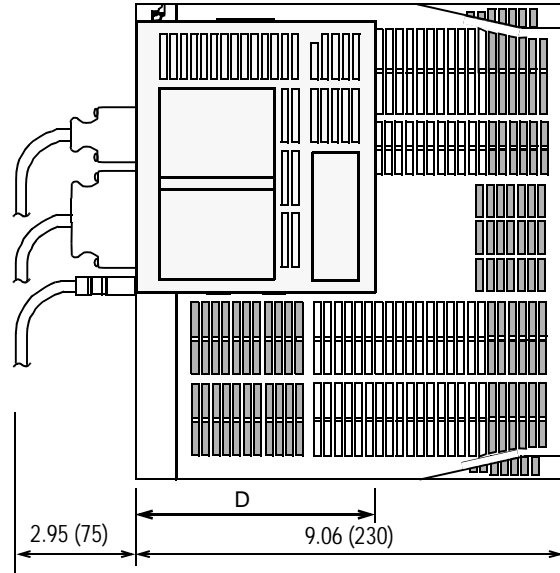
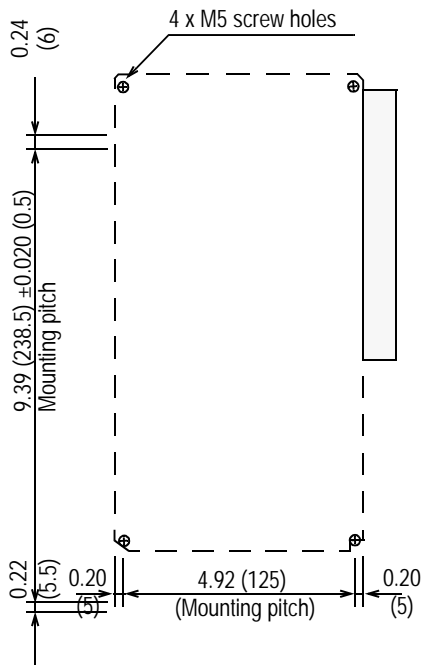
# Sigma II Application Modules

- SGDH-50AE (200V Three-phase, 5.0kW)
- SGDH-50DE (400V Three-phase, 5.0kW to 1.5kW)

Sigma II  
Modules



Mounting Hole Diagram



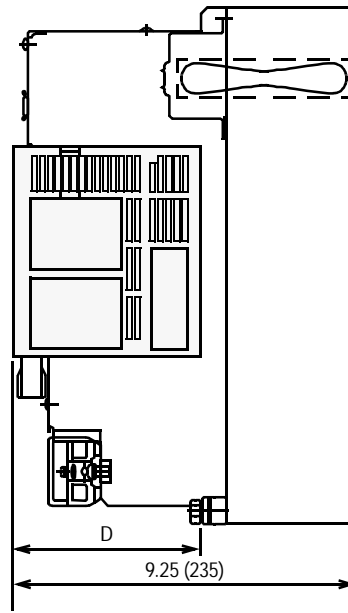
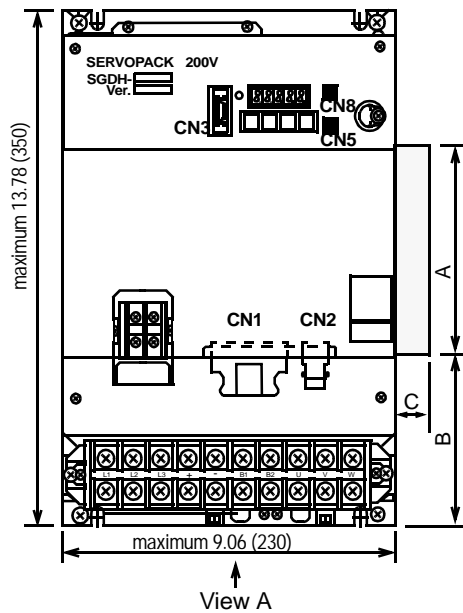
Part Number	Description	A	B	C	D	Approximate Mass** lb (kg)
JUSP-NS100	Mechatrolink	5.59 (142)	3.9 (99)	0.79 (20)	5.08 (129)	0.44 (0.2)
JUSP-NS300	Indexer with DeviceNet™				5.24 (133)**	0.7 (0.32)
JUSP-NS310	Indexer with DeviceNet™					
JUSP-NS500	Profibus	5.59 (142)	3.9 (99)	0.79 (20)	5.08 (129)	0.44 (0.2)
JUSP-NS600	Indexer					
JUSP-FC100	Full Closed Loop					
MP940	Single Axis Control			1.22 (31)***		0.89 (0.40)

\*\* Option card only.

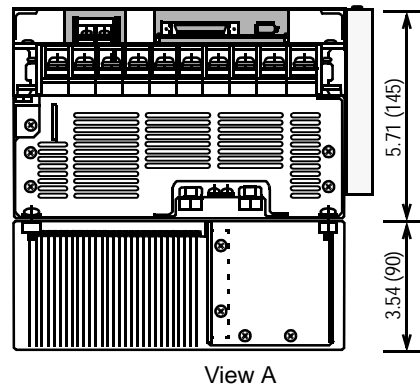
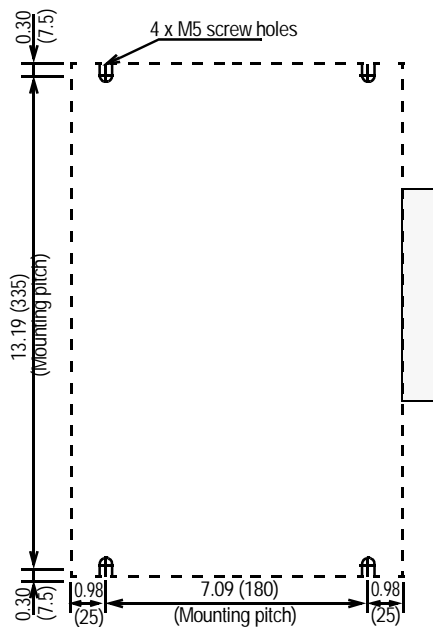
\*\* Add 0.75in (19mm) to front end of card for micro connector.

\*\*\* Add approx. 0.75in (19mm) for optional back-up battery.

- SGDH-60AE, SGDH-75AE (200V Three-phase, 6.0kW, 7.5kW)
- SGDH-60DE, SGDH-75DE (400V Three-phase, 6.0kW, 7.5kW)



Mounting Hole Diagram



Part Number	SGDH Option Description	A	B	C	D	Approximate Mass* lb (kg)
JJSP-NS100	Mechatrolink	5.59 (142)	4.5 (114.5)	0.79 (20)	5.08 (129)	0.44 (0.2)
JJSP-NS300	Indexer with DeviceNet™				5.24 (133)**	0.7 (0.32)
JJSP-NS310	Indexer with DeviceNet™	5.67 (144)	4.47 (113.5)		5.08 (129)	0.44 (0.2)
JJSP-NS500	Profibus	5.59 (142)	4.5 (114.5)			
JJSP-NS600	Indexer					
JJSP-FC100	Full Closed Loop					
MP940	Single Axis Control					

\* Option card only.

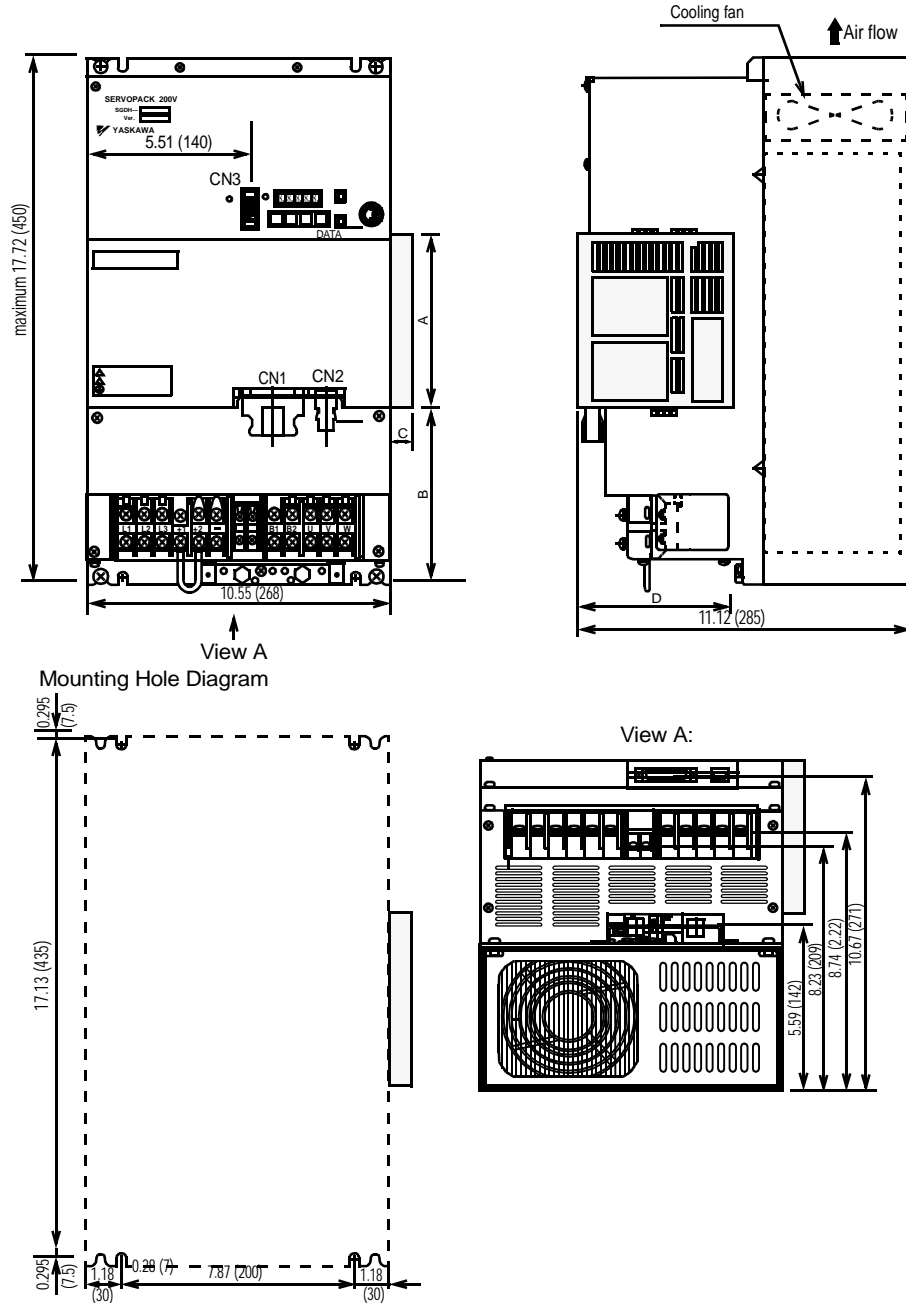
\*\* Add 0.75in (19mm) to front end of card for micro connector.

\*\*\* Add approx. 0.75in (19mm) for optional back-up battery.

# Sigma II Application Modules

- SGDH-1AAE, SGDH-1EAE (200V Three-phase, 11.0kW, 15.0kW)
- SGDH-1ADE, SGDH-1EDE (400V Three-phase, 11.0kW, 15.0kW)

Sigma II Modules



Part Number	SGDH Option Description	A	B	C	D	Approximate Mass* lb (kg)
JUSP-NS100	Mechatrolink	5.59 (142)	4.5 (114.5)	0.79 (20)	5.08 (129)	0.44 (0.2)
JUSP-NS300	Indexer with DeviceNet™					
JUSP-NS310	Indexer with DeviceNet™				5.24 (133)**	0.7 (0.32)
JUSP-NS500	Profibus	5.59 (142)	4.5 (114.5)	0.79 (20)	5.08 (129)	0.44 (0.2)
JUSP-NS600	Indexer					
JUSP-FC100	Full Closed Loop				1.22 (31)***	0.89 (0.40)
MP940	Single Axis Control					


\* Option card only.

\*\* Add 0.75in (19mm) to front end of card for micro connector.

\*\*\* Add approx. 0.75in (19mm) for optional back-up battery.



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