

MITY-SERVO VEA type

User's manual

MODEL : VEAS- , VEA- , VEA-

~ AC200V Series ~

Please ensure that this user's manual is delivered to the final customer who will be operating this product.

MS-TECHNO, Inc.

Safety Precautions

Before installation operation, maintenance, or inspection, be sure to read and follow this user's manual and supplemental in detail use only after becoming familiar with the unit, safety information, and precautions.

This user's manual categorizes safety precaution as a **DANGER** or **CAUTION**.

Safety symbols used in this manual

The text uses the following symbols to represent various safety precautions.



DANGER

Used where improper action can lead to hazardous conditions that may result in severe injury or death.



CAUTION

Used where improper action can lead to hazardous conditions that may result in moderate damage or minor injuries, or strictly material damage only.

However, under certain conditions, even items categorized marked with **CAUTION** can also lead to serious injuries / damage.

Therefore, strict compliance with all **CAUTION** warnings is urged.

Below are the symbols used to mark items marked as **PROHIBITED** and **REQUIRED**, followed by brief explanation of each category.



PROHIBITED

Marks prohibited items. For example, in cases where open sparks/fires are prohibited, the following mark is used:



REQUIRED

Marks item where compliance is required. For example, where an item must be grounded this symbol is used:



This manual will also appropriately note items that the user is recommended to follow, although they are not classified as **DANGER** or **CAUTION**.

1. On Installation



CAUTION

Operate in environments specified in catalog and user's manual (refer to Section 3).

Avoid usage in areas of high temperature or humidity; or exposure to excessive dirt, corrosive gases, vibration, or shock. These conditions may risk electrocution, fire, or malfunction.

Specific conditions to avoid:

- Avoid direct sunlight or areas with temperatures below -10 or above 40 .
- Avoid areas with humidity over 90% or where rapid temperature changes may lead to condensation.
- Avoid exposure to corrosive or flammable gases.
- Avoid areas where direct vibration or shock may affect the MITY-SERVO.
- Avoid areas where the unit may be exposed to water, oil or other chemicals.
- Avoid areas in close proximity to flammable materials.

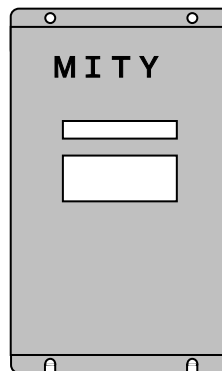
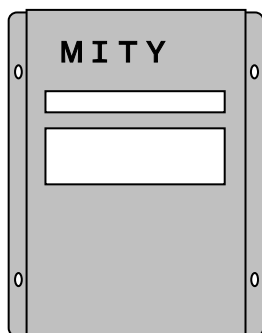
Follow the manual to secure and attach the unit (refer to Section 3).

Improper installation can lead to falling of the unit, machine failure, or malfunction.

1. Please ensure the proper and secure tightening of attachment screws.

Confirm the proper tightening of MITY-SERVO attachment screws and terminal securing screws to prevent loosening. The loosening of screws can cause the unit to fall or unit malfunction.

2. Make sure that unit is properly oriented when being secured!



Do not allow refuse such as wire scraps inside of the unit.

Failure to do so may lead to fire, machine failure or malfunction.

2. On Wiring



REQUIRED

Be sure ground the grounding terminal, maked with the name plate E (refer to Section 3).

Failure to ground the unit may lead to electrocution or malfunction.

Connect the MITY-SERVO power terminal box terminal "E" to the ground electrode (type 3 ground) with a wire 2mm² or more.

Do not share this grounding conductor with other powered equipment.



CAUTION

Connect to a rated power source (refer to Section 3).

Connecting to a power source of an incorrect rating may lead to fire or machine failure.

Based on the model series of the MITY-SERVO on the following 2 power ratings will be used.

Be sure to use the correct power source.

AC 200V / AC 400V

VEA type is AC200V. (VEAH type is AC400V)

Wiring operations should be performed by an electrician or other specialist.

Improper wiring may lead to fire, machine failure, or electrocution.

Be sure that the all connectors to the MITY-SERVO are connected properly.

Failure to do so may lead to malfunction of the MITY-SERVO.

Countermeasures for Power Source Noise

Connect an insulating transformer or filter to the external power source when noise becomes a problem (refer to Section 5).

This will prevent malfunction of the MITY-SERVO and its peripheral devices.
Insufficient noise countermeasures may result in malfunction.

Proper Laying of External Wiring

Consider the following conditions when selecting the input/output wires (external wiring) from the MITY-SERVO to external devices (refer to Section 3).

- Mechanical strength
- Affect of noise
- Wiring distances
- Signal voltage and current

Wiring and housing of input/output wiring should be separated from power lines both inside and outside of the control panel.

This will reduce noise affects. Insufficient separation may lead to malfunction.

Use twisted pair shielded wires for the MITY-SERVO encoder wires (refer to Section 3).

This will reduce the affect from noise, preventing malfunction.

Usage of cables other than those specified may lead to malfunction.

3. Precautions Before Usage



DANGER

Do not touch terminal when powered.

This may lead to electrocution.

Do not touch the regenerative resistor or resistor terminal when powered.

This may lead to electrocution.

Emergency stops and interlock circuits should be external to the MITY-SERVO unit.

Malfunction or machine failure of the MITY-SERVO may lead to machine damage or accidents.

Safety countermeasures external to the MITY-SERVO!!!

An external interlock circuit should be set up when MITY-SERVO machine failure may risk Bodily injury or damage to products or accessory devices.

(EX.) When using in motorized carts or cargo hauling equipment (such as cranes):

MITY-SERVO machine failure may allow motors to run freely, possibly leading to loss of cart control, or dropping of cargo. These may in turn result in damage to products or accessory devices, or bodily injury.

Normally, mechanical brakes are attached to the motor, and an interlock circuit built into the MITY-SERVO QMCL program.

An external relay should be set up with a similar interlock circuit.

Ensure safety before testing the input/output signals.

Movement of the device can lead to bodily injury or damage products or accessory devices.

Safety First when confirming input/output signals

When testing brakes on moving units:

Devices going in motion may lead to bodily injury or cause damage to accessory devices, use temporary measures such as stop blocks or catches (to prevent the dropping of objects).



CAUTION

Use extreme caution when changing parameters or using keyboard control while MITY-SERVO is in motion. Improper operation may lead to equipment damage or accident.

Remove power in the order specified. Malfunction may lead to equipment damage or accidents.

1. Turn on power starting with sub machines.

When operating using MITY-SERVO's communications system (multiple main/subsidiary operation or host computer control), turn on the subsidiary machine of MITY-SERVO.

If the main machine is turned on first, malfunction or damage may result due to the input/output signal delay from the subsidiary machine.

2. Ensure interlock between the main and subsidiary machine when stopped.

Failure to do so may lead to malfunction or damage.

Attach protective fuses (such as circuit breakers) between load and output.

Overloads or short circuits can cause damage or fires.

Protective fuses are not included in MITY-SERVO's output.

Attach temperature control unit to motor.

Heat buildup may lead to scorching, damage or even fires.

Attach cooling device to motor.

Heat buildup may lead to scorching, damage or even fires.

When using the motor continuously at low speeds, use a motor rated for continuous use.

Otherwise, use a cooling device as specified.

Do not touch MITY-SERVO unit or motor-regenerative resistor directly after operating or removing power from the unit.

Heat buildup may lead to scorching/burning, damage or even fires.

Confirm that operating signals and input are off before attempting to reset system or restoring power.

Sudden unexpected motions may result, leading to equipment damage or accidents.

Keyboard Operations During Operation Requiring Special Care

Do not exceed the range when changing System parameter or User parameters.

Malfunctions may lead to equipment damage and accidents.

Only those thoroughly familiar with the contents and method of operation should manipulate the System parameter or user parameters.

Do not change System parameter No. 71 (encoder correction) after it is first set.

Malfunctions can lead to equipment damage and accidents.

System parameters are set based on the motor and the encoder pulse numbers.

Source Program of QMCL

MITY-SERVO controls the motor according to the program (QMCL).

The program is written in the RAM or ROM on the CPU board.

It is recommended that a file of source program be obtained for use in emergencies.

4. On Maintenance



DANGER

Avoid miswiring, removing, or shortcircuiting the power source; disassembling the MITY-SERVO unit, or exposing unit to heat or open flames.

This may lead to explosion or fire.



PROHIBITED

Do not disassemble or modify the MITY-SERVO unit.

This may result in fire, machine failure, or malfunction.



CAUTION

Turn off power and wait over 5 minutes, confirming that terminal box P-N voltage is below DC24V before connecting or disconnecting the MITY-SERVO unit.

Misoperation may lead to electrocution, equipment damage, or accidents.

The voltmeter used to measure the voltage of the terminal box P-N voltage should be able to measure above DC 400V.

The P-N voltage measure DC280V ~ DC400V immediately after shutting down power.

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Section 1 : Functions and characteristics of the MITY-SERVO

1-1 On the MITY-SERVO

- 1-1-1 Outline of the MITY-SERVO
- 1-1-2 Characteristics of the MITY-SERVO

1-2 Function and Operation of MITY-SERVO

- 1-2-1 Structure
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1-1 On the MITY-SERVO

This section will outline the MITY-SERVO unit and explain characteristics.

1-1-1 Outlines of the MITY-SERVO

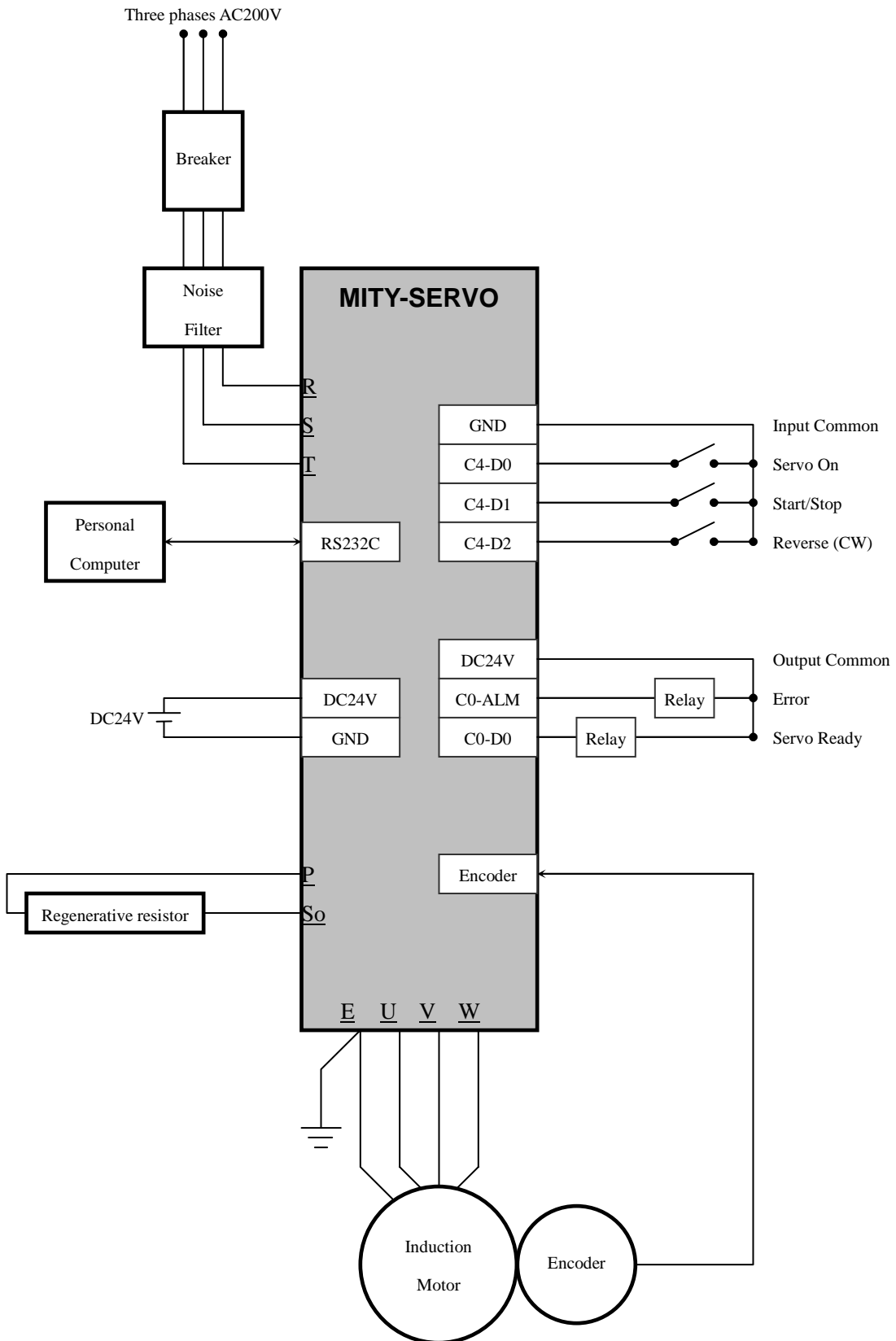
The MITY-SERVO is a programmable controller capable of controlling the revolutions and torque output for induction motors.

Rotary encoder positioning with standard 12 input / 8 output sequence function (analog input) allow a high level of control.



Example of a Common MITY-SERVO Connection Setup

The following is an example of the wiring and connection of the MITY-SERVO.



1-1-2 Characteristics of the MITY-SERVO

The MITY-SERVO programmable controller has the following characteristics.

Digital control using 32bit CPU + MS techno original LSI.

Simple programming, using the MITY-SERVO dedicated “QMCL”. *1

Low speed operation. (approximately 1 rpm)

Standard locating and sequencer functions included, making it unnecessary to prepare separately.

Communication function (optional) makes it possible to control the unit via personal computer, and run diagnostic programs.

*1 QMCL : “**Quick Motion Control Language**”, a language created by MS techno to facilitate motor control.

A variety of input and output functions

Digital input	12
Digital output	8
Analog input (DC0-5V)	1
Encoder input (L/D)*2	1
Communication function	RS232C/RS422

*2 L/D : Line driver method

Creating and Editing Programs

The “QMCL System 98” makes easy the creation and edition of programs.

Programs created can be transferred from personal computer into the MITY-SERVO, using the QMCL System 98 and the optional communication board. (sold separately).

“FLASH-A-QM” is the writing of programs and parameters to ROM.

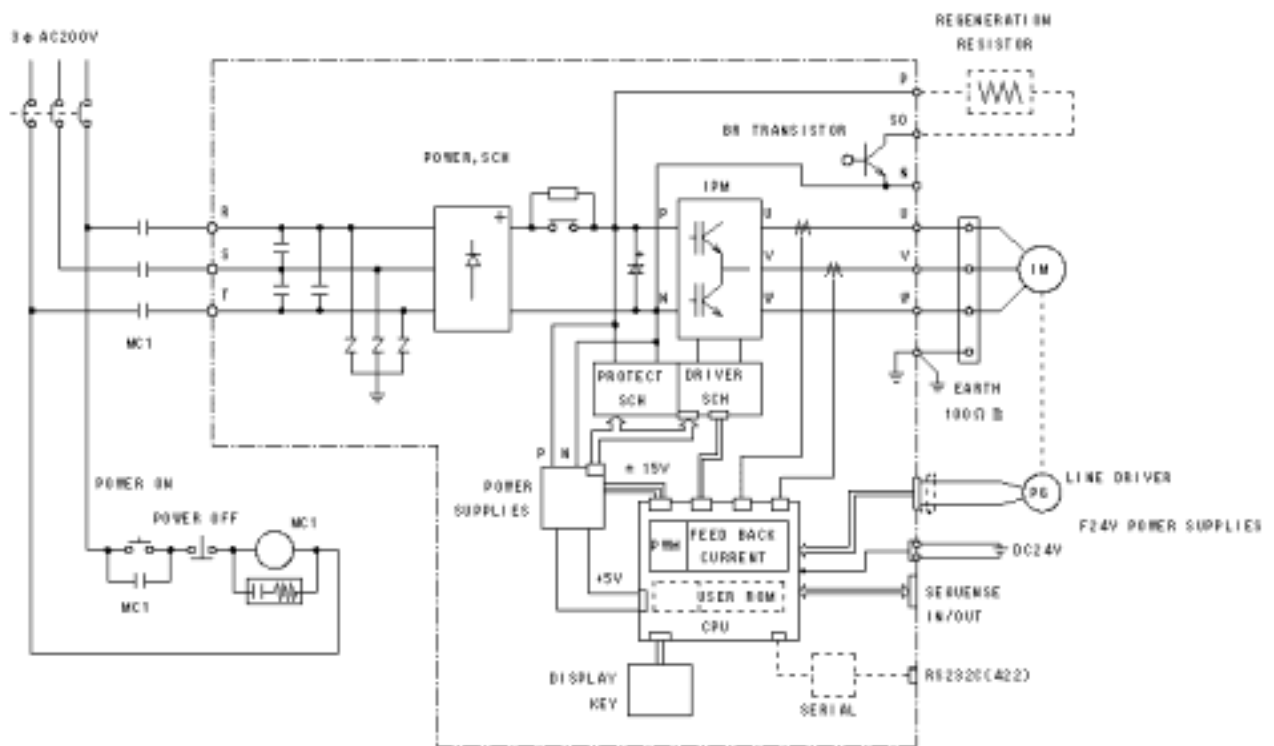
“FLASH-A-QM” is a MITY-SERVO optional that writes to ROM.

1-2 Function and Operation of the MITY-SERVO

This section will outline MITY-SERVO function and operation.

1-2-1 Structures

The MITY-SERVO is comprised of the following areas, including the CPU, driver, power source, and main circuit, as shown below:



CPU

The CPU is comprised of the processor (IMC-04), control circuit, and I/O.

- Processor House the MITY-SERVO operating system (OS).
Control parameter memory. RAM and ROM reside here.
- RAM Houses the QMCL and used as data area, with 3.2KB capacity.
- ROM Houses the QMCL and used as data area, with 8KB × 4 zone.
- Control circuit Outputs motor control signals / PWM signals.
- I/O Manages external input and output signals, encoder input and analog input signals.

Driver

The driver processes output motor control signals from the CPU and transmits it to the main Circuit.

Power source

Using the specially designed switching regulator, the power source provides regulating power to the CPU and the driver.

Main circuit

The main circuit consists of a rectification, smoothing, and inverter circuits.

The power source (3 phase AC 200V) and the motor are connected the main circuit.



The driver power source and main circuit are of very high voltage. Do not touch any of these parts.
Failure to comply may lead to bodily injury or electrocution.

1-2-2 Backup of CPU Board

The CPU is equipped with read/write able memory (RAM), with a Ni-Cd battery that preserves memory in case of power loss.

Check battery power loss when not using the MITY-SERVO for prolonged periods of time.

Take note that memory contents may be altered in the following cases:

- When battery voltage drops below 2.5 V.
- When the MITY-SERVO has not been used for 3 months or more.
- After the CPU board has been removed or contents were manipulated.

IMPORTANT !!

The MITY-SERVO's System parameters and User parameters are stored in the RAM.
Note that low battery levels dead batteries will reset the System parameters to their default values.

· Contact MS techno for further information when replacing batteries due to normal wear or in case of problems.



DANGER

Do not expose dead batteries or CPU boards to fire . This may result in explosion.

Ni-Cd battery used : GS / 3GB-60MX 3.6V 50mAh

SECTION 2 : System structure of the MITY-SERVO

2-1 Standard specifications of the MITY-SERVO

2-1-1 CPU

2-1-2 Encoder Input

2-1.3 A/D Input

2-1-4 I/O Input

2-1-5 I/O Output

2-2 MITY-SERVO Options

2-2-1 RS232C / RS422

2-2-2 FLASH-A-QM

2-1 Standard Specifications of the MITY-SERVO

This section will explain standard specifications of the MITY-SERVO.

2-1-1 CPU

The QMCL program for motor control can be written to RAM and ROM aria.

·RAM aria	3.2 KB	Max 423 lines
·ROM 0 aria	8 KB	Max 1023 lines
·ROM 1 aria	8 KB	Max 1023 lines
·ROM 2 aria	8 KB	Max 1023 lines
·ROM 3 aria	8 KB	Max 1023 lines

Edit and change the QMCL program and parameter values using the keyboard.

Program contents, parameter settings and other values can be seen on the display (using line 10, segment 7).

2-1-2 Encoder

1 channel is made available for encoder input. (Feed back pulses)

A line driver type (DC5V) encoder can be used.

Use pulse settings in the 200Kpps range, at 2000C/T or higher.

When using settings other than those shown above, confirm that they are within the encoder's specified ranges.

MS-techno uses standard stock of **2500C/T**.

Generally, the encoder is connected directly to the motor.

Follow precautions listed in the encoder catalog or user's manual when making connections.

Connector number

CN7

Housing

MOLEX5251-08 (5051 N-08)

Crimp-Style terminal

MOLEX 5659 (5159)

IMPORTANT !!

Be sure to the QMCL parameter number 71 "Encoder correction" to the encoder pulse settings.

IMPORTANT !!

The encoder input is connected directly to the CPU power source.

Take care to avoid short circuiting and improper wiring.

2-1-3 A/D Input

1 channel is available for analog input.

Input are DC0V-5V signal.

Connector number	CN6	
Housing	MOLEX5251-03	(5051 N-03)
Crimp-Style terminal	MOLEX 5659	(5159)

IMPORTANT !!

If input may exceed DC5V when turning on power, insert a clamping diode or take other precautions.

IMPORTANT !!

Analog input signal is connected directly to the CPU power source.
Be sure to avoid short circuiting and improper wiring.

2-1-4 I/O Input

Input ports C4 have 8 inputs and C5 have 4 inputs. (Total : 12 inputs).

The GND ports are common with an I/O power source of GND(0V).

The inputs are insulated by photocoupler.

Power source specification : DC24V 5mA dynamic current type.

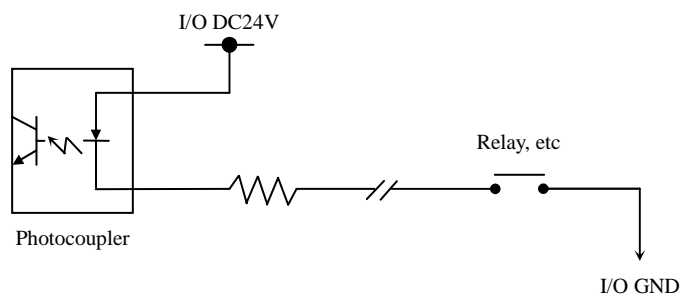
Connector number	C4 : CN14
	C5 : CN15

Housing	C4 : MOLEX5251-10	(5051 N-10)
	C5 : MOLEX5251-06	(5051 N-06)

Crimp-style terminal	MOLEX5659	(5159)
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For DC24V, prepare an appropriate I/O power source.

Electric Circuits:



2-1-5 I/O Output

Output ports C0 have 8 outputs.

The DC24V ports are common with an I/O power source of DC24V.

The output are insulated by photocoupler.

Power source specification : DC24V open collector current type (emitter COM) 40mA.

Be sure not to surpass the output current range.

(The output is not protected from over current).

Use a surge protection diode for the relay control coil.

Pay attention to the polarity of the diode when making connection.

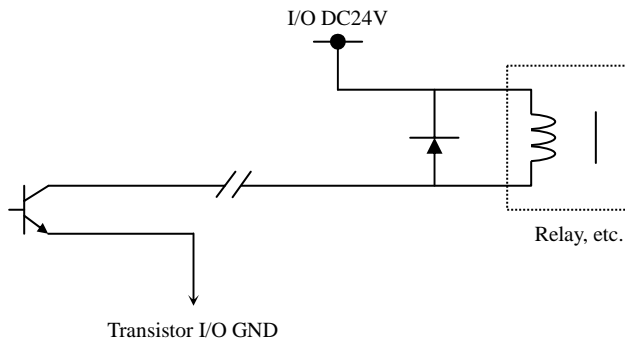
Connector number	CN10
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Housing	MOLEX5251-11	(5051 N-11)
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Crimp-style terminal	MOLEX5659	(5194)
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For DC24V, prepare an appropriate I/O power source, separately.

Electric Circuits:



2-2 MITY-SERVO Options

This section will explain MITY-SERVO's options.

2-2-1 RS232C / RS422

Establishes communications between the MITY-SERVO and PC, PLC, or with another MITY-SERVO unit.

RS232C	dedicated cable:	1m;25-pin or 9-pin D-sub connector. (25-pin connector No: JF3P-255, 9-pin connector No: DE-9S-UL).
	dedicated cable:	inter-MITY-SERVO connectors available upon order.
RS422	dedicated cable:	1m;Non-treated ends.
	dedicated cable:	inter-MITY-SERVO connectors available upon order.

Be sure to remove power before connecting or disconnecting the MITY-SERVO.

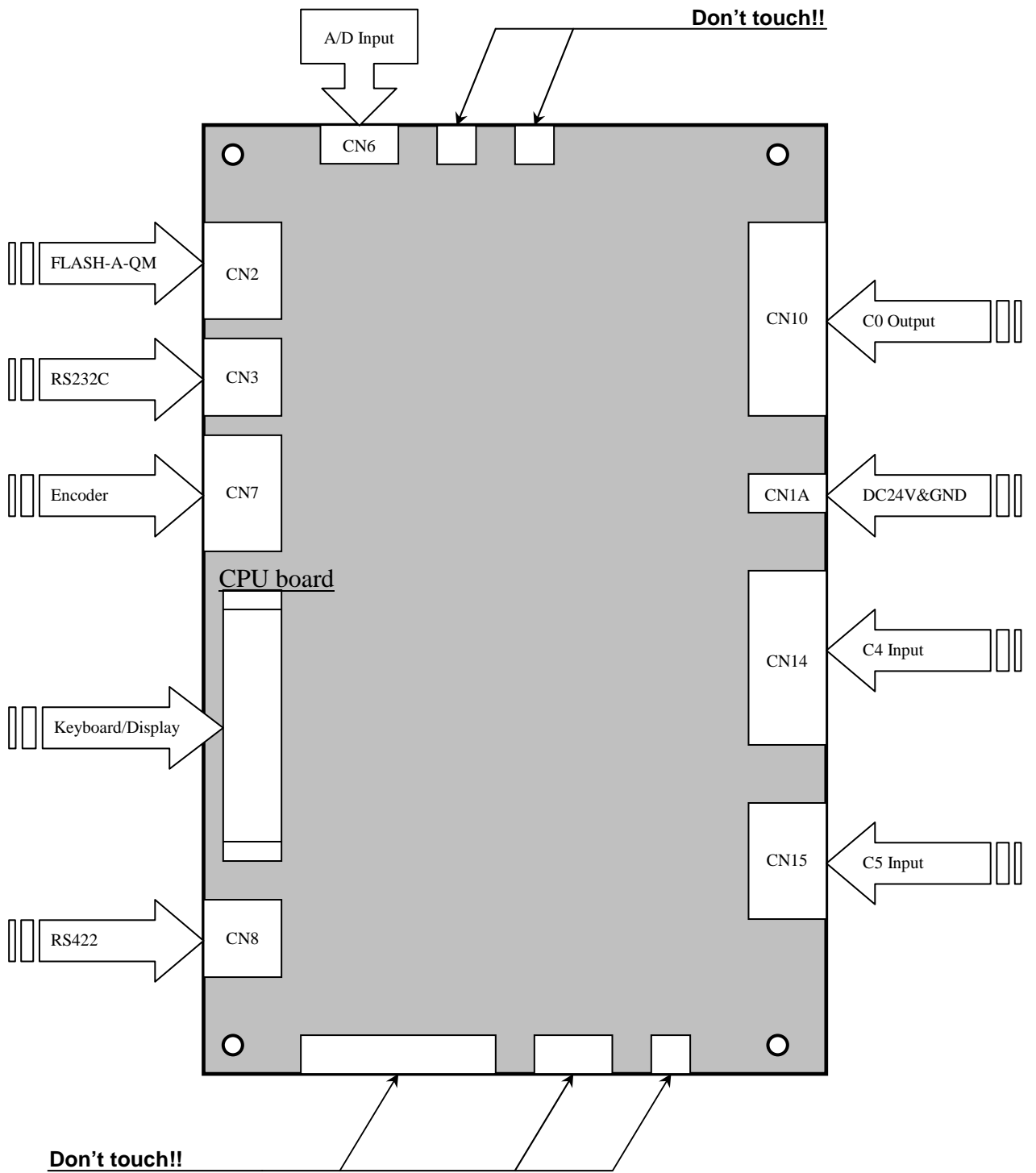
2-2-2 FLASH-A-QM

Connecting FLASH-A-QM to the MITY-SERVO makes it easy to write program and parameter to ROM.

Be sure to remove power before connecting or disconnecting the MITY-SERVO.

For more details, refer to the FLASH-A-QM user's manual.

I/O connectors on the CPU board <V3E840>



Section 3 : MITY-SERVO Installation and Wiring

This section explains how to install and wire MITY-SERVO.

3-1 Installation

- 3-1-1 Location**
- 3-1-2 Ambient Temperature**
- 3-1-3 Relative Humidity**
- 3-1-4 Vibration**
- 3-1-5 Environment**

3-2 Wiring

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- 3-2-3 Peripheral Equipment**
- 3-2-4 Adapters**
- 3-2-5 Input/Output and Encoder Wiring**
- 3-2-6 Input/Output and Encoder pulse Check**

3-3 MITY-SERVO Operation

- 3-3-1 Operating Precautions**
- 3-3-2 Source Program (Source QMCL)**
- 3-3-3 CPU Battery**

3-1 Installation

Install MITY-SERVO at that meet the following conditions below to ensure proper operation and maximum performance.

3-1-1 Location

Select a location that meet the following conditions:

- a. Inside a building with o water leakage or water intrusion and relatively low humidity.
- b. Explosion-proof environment with no flammable gasses or liquids and little dust.
- c. No flammable objects nearby.
- d. Easily accessible for inspection and servicing.
- e. Heat generated by MITY-SERVO or peripheral equipment can be released.
- f. Install at a location where MITY-SERVO may be isolated from equipment that emits noise or is affected by noise.

3-1-2 Ambient Temperature

Monitor the ambient temperature to ensure performance of MITY-SERVO long-term.

Normal operation range for MITY-SERVO is -10 ° C to 40 ° C. Keep the ambient temperature in this range at all times. Install a cooling system to lower the temperature if the temperature may exceed 40 ° due to the heat generated by MITY-SERVO.

3-1-3 Relative Humidity

Install MITY-SERVO at a location where relative humidity stays below 90 % and ensure MITY-SERVO is free from condensations. High humidity causes oxidation and corrosion of metal areas on MITY-SERVO, leading to improper insulation.

3-1-4 Vibration

Install MITY-SERVO at a location with little vibration. Follow are guidelines below:

For Vibration acceleration 20Hz Vibration 1.0 G

For Vibration acceleration 20 – 50 Hz Vibration 0.2 G

Use rubber cushions to vibration proof MITY-SERVO if it will be installed at location where MITY-SERVO will be subjected to severe vibrations, such as on a conveyor.

3-1-5 Environment

Select a location that is free from flammable or corrosive gasses, oil and water. Make sure MITY-SERVO is protected from electrically conductive dust, such as metal shavings. If necessary, install a filter on the control panel to prevent dust from coming inside.

3-2 Wiring

3-2-1 Connecting and Wiring MITY-SERVO

The table below shows MITY-SERVO terminals and their usage.

Terminal Codes	Terminal Name	Usage
R, S, T	AC power source connectors	Connect to AC
U, V, W	Motor connectors	Connect to U, V, and W wires on motor
E	Ground	Connects to ground
P	DC positive terminal	Connects to regenerative resistor; DC positive terminal
So	Regenerative resistor terminal	Connects to regenerative resistor
N	DC negative terminal	DC negative terminal

Connect main circuit wires according to the table above.



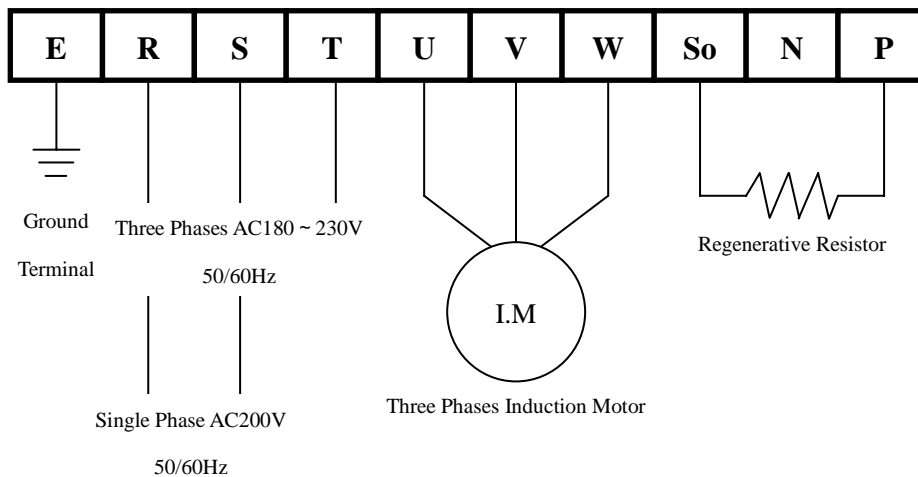
CAUTION

Use only the standard rated power source (AC200V) ; failure to do so may cause fire or damage to the unit.

Only qualified electricians may wire MITY-SERVO; incorrect wiring may cause fire, damage to the unit, or lead to electrocution.

Wait five (5) minutes after turning the power source off before proceeding any work on power source terminal blocks. Make sure the voltage between P and N terminals has dropped below DC 24V. Failure to observe these precautions may result in electrocution, malfunction of MITY-SERVO,

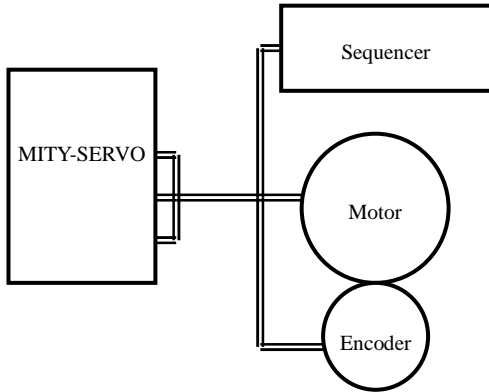
Power Source Terminal Wiring Diagram



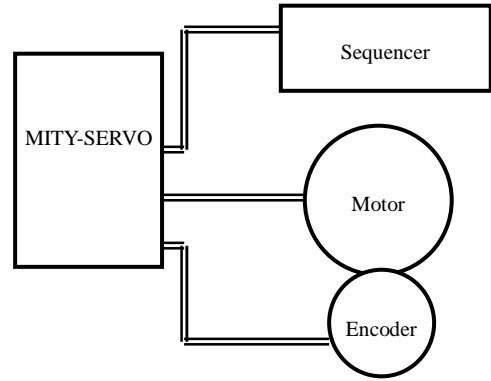
REQUIRED

Make sure the ground terminal, E, displayed on the power source terminal block nameplate, is connected to the ground. Failure to ground may cause electrocution or malfunction of MITY-SERVO. Use wires of 2 mm² or larger to connect MITY-SERVO power source terminal block E to the ground (Type 3 ground). Do not use the same wire for other power equipment.

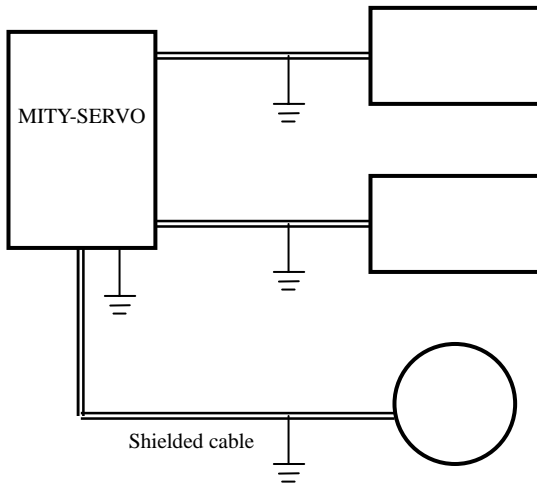
Poor Example : Main circuit and I/O are the same



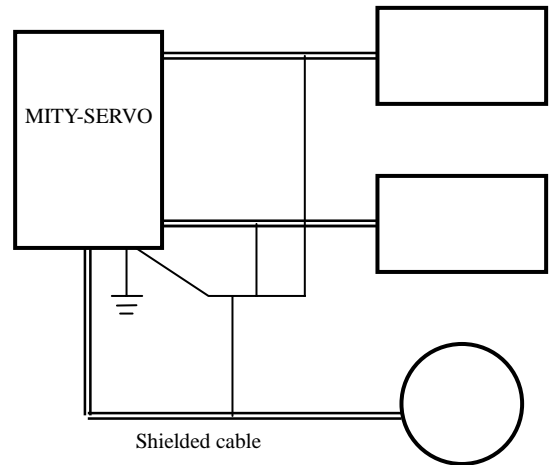
Good Example : Main circuit and I/O are separate



Poor Example : There is more than one ground



Good Example : There is only one ground



3-2-2 Wiring Precautions

Follow the guidelines below to ensure MITY-SERVO will stay problem-free.

1. Take current capacity, voltage drop, and other relevant factors into account to select main circuit cable size.
2. Make sure the main circuit and signals, such as input/output and encoder, are separately wired.
3. Use twisted-pair shielded wire or instrumentation shielded wire for encoder RS232C and RS422 signal.
4. Minimize the cable length.
5. Ground shielded cable at one point only.

6. Use an effective means of insulation, such as the use of conduits, if signals may be affected by noise interference.
7. Please contact MS techno to extend display or keyboard cable length.
8. Make sure connectors to MITY-SERVO are securely attached.

Peripheral equipment must be selected carefully to ensure proper operation and optimum performance of MITY-SERVO.

Cables

Power:

Consider the following to select appropriate size cable: power source capacity, short-circuit protection, temperature increase, voltage drop, and terminal structure. Apply the same criteria used to select general power cables.

The effect of voltage fluctuations is greater when the cable length is long between MITY-SERVO and the power source or the motor. This may lead to insufficient motor torque and increase in current, causing the motor or cable to overheat. Use larger size cable than specified in the table on the next page to prevent overheating when the distance is great between MITY-SERVO and the power source or the motor.

Longer cable between MITY-SERVO and the motor may also cause the static electricity to build up between each wire and ground, increasing leakage current. In some cases, this may cause the circuit breaker to operate. Circuit breaker for inverters (Leakage of electricity detection 200mA) may be used to counter this situation.

The shortest possible length of an appropriate size should be used for power source.

Controls:

Use 2mm² or larger size for power source cable in the control circuits. For operations and signal circuits, use cables that are appropriate size for the current in each circuit.

Use shielded cable whenever possible for signal circuits to reduce noise interference.

Make sure to use a separate cable for power source for control and power source from the unit power cable.

Use shielded cables or twisted-pair shielded cables for signal circuit in consideration of cable length and outside noise interference.

Signals may need to be amplified by signal insulator to counter noise interference when a long cable is used.

Conduits may need to be used to isolate noise if may malfunction of MITY-SERVO.

Breakers

The purpose of inserting a breaker on the power source side of inverter is to protect the power circuits from shorting and to protect against overloading.

Select a breaker appropriate for the capacity.

Select guidelines are shown in the table on the following page.

Peripheral Equipment Selection Guidelines

Model	Main circuit Breaker	Electro-Magnetic Contactor	Cable Diameter	
			R, S, and T Cables	U, V, and W Cables
VEAS-01	30 AF/5 AT	8A (S-A10)	2 (mm ²)	2 (mm ²)
VEAS-02	30 AF/5 AT	8A (S-A10)	2 (mm ²)	2 (mm ²)
VEAS-04	30 AF/5 AT	8A (S-A10)	2 (mm ²)	2 (mm ²)
VEAS-08	30 AF/10 AT	8A (S-A10)	2 (mm ²)	2 (mm ²)
VEA-15	30 AF/20 AT	12A (S-A11)	3.5(mm ²)	3.5(mm ²)
VEA-22	30 AF/20 AT	12A (S-A11)	3.5(mm ²)	3.5(mm ²)
VEA-37	30 AF/30 AT	20A (SK-20)	5.5 (mm ²)	5.5 (mm ²)
VEA-55	50 AF/50 AT	35A (SK-35)	5.5 (mm ²)	5.5 (mm ²)
VEA-75	100 AF/60 AT	50A (SK-50)	8 (mm ²)	8 (mm ²)
VEA-110	100 AF/100 AT	65A (SK-80)	14 (mm ²)	14 (mm ²)
VEA-150	225 AF/125 AT	80A (SK-80)	22 (mm ²)	22 (mm ²)
VEA-220	225 AF/175 AT	125A (SK-125)	38 (mm ²)	38 (mm ²)
VEA-300	225 AF/225 AT	150A (SK-150)	60 (mm ²)	60 (mm ²)
VEA-370	400 AF/300 AT	220A (SK-220)	100 (mm ²)	100 (mm ²)
VEA-450	400 AF/400 AT	220A (SK-220)	100 (mm ²)	100 (mm ²)
VEA-550	400 AF/400 AT	300A (SK-300)	100 (mm ²)	100 (mm ²)

Electro-magnetic contactor model names in parentheses are MITSUBISHI model names.

Selecting Peripheral Equipment for VEA series:

Select peripheral equipment for VEA series carefully to avoid overheating or voltage drop since the momentary current may exceed the rated current value by several times, depending on usage conditions.

Large size cable than shown in the table above may be used or large capacity peripheral equipment may be substituted, depending on the usage.

3-2-4 Adapters

Input/Output Signal Connectors:

	CPU Board Wiring Inside MITY-SERVO	Accessory Lead Wire Standard Lead Wire Length 1 m
Input: C4	Molex 5046-10P	5251-10P (Pin 5659) 5051-10P (Pin 5159)
Input: C5	Molex 5046-6P	5251-6P (Pin 5659) 5051-6P (Pin 5159)
Output: C0	Molex 5046-11P	5251-11P (Pin 5659) 5051-11P (Pin 5159)

Encoder Connectors:

	CPU Board Wiring Inside MITY-SERVO	Accessory Lead Wire Standard Lead Wire Length 1 m
Encoder: ENC1	Molex 5046-8P	5251-8P (Pin 5659) 5051-8P (Pin 5159)

Analog Input Connectors:

	CPU Board Wiring Inside MITY-SERVO	Accessory Lead Wire Standard Lead Wire Length 1 m
Analog Input: A/D	Molex 5046-3P	5251-3P (Pin 5659) 5051-3P (Pin 5159)

+24V (I/O) Power Source Connectors:

	CPU Board Wiring Inside MITY-SERVO	Accessory Lead Wire Standard Lead Wire Length 1 m
+24V Power Source: CNP1	Molex 5046-2P	5251-2P (Pin 5659) 5051-2P (Pin 5159)

Note; "Pin" in the tables refer to crimp-style terminals.

3-2-5 Input/Output and Encoder Wiring

MITY-SERVO has a variety of external functions such as sequencer input/output, encoder input, and analog input.

Please refer to appropriate user manuals for cable and connector part numbers.

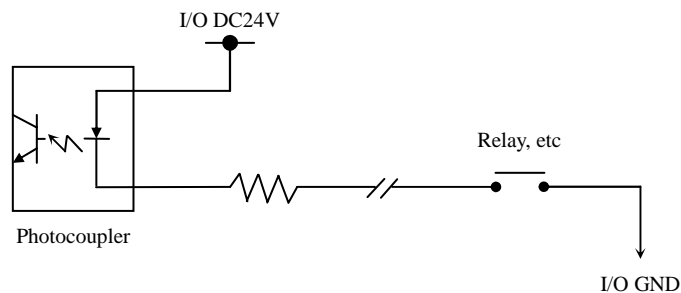
Input/output:

Photocopiers are used to insulate input/output areas.

Output specifications are open collector (emitter COM).

Electric Circuits:

Input: Current limiter resistor is connected inside. Connect relays and limit switches.



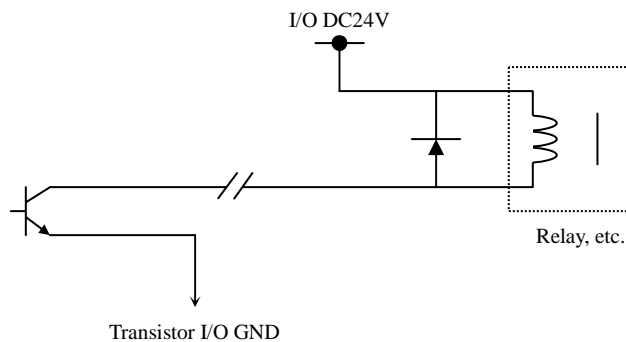
Output: Open collector COM. Maximum current is 40mA.

Connect controls such as relays. Do not exceed the Maximum output current.

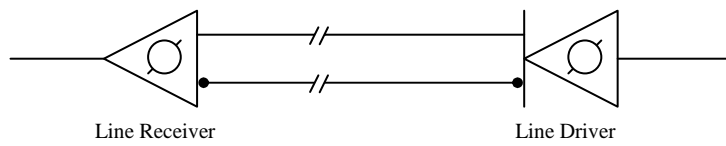
Match the polarity of relays, if applicable.

Some relays may require surge-protective diode.

Use a mini-relay if the control current may exceed the allowable value.



Encoder: For line receiver.



IMPORTANT !!

There are two power sources for outside input/output, depending on specifications: I/O and CPU.

Incorrect wiring of those may cause malfunctions or damage to the unit.

The 0V for I/O and CPU may not be shared.

I/O : I/O +24V, I/O 0V (input/output C4, C0)

CPU : CPU +5V, CPU 0V (A/D, encoder)

Obtain a separate DC +24V I/O power source cable appropriate for capacity.

3-2-6 Input/Output and Encoder Pulse Check

Follow the directions below to check MITY-SERVO input/output and encoder pulse.

Input

Check that outside signals are received by MITY-SERVO. Turn on operation switch and limit switch to verify input signals are received.

MITY-SERVO should be in editor mode for checking.

1. Turn the power on (AC200V) and press the END key on the MITY-Servo's keyboard.



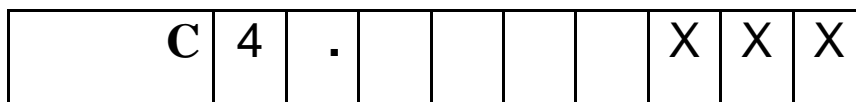
The period “.” will be flashing at the left edge of the display.

MITY-SERVO is now in the editor mode.

2. To check input signal C4:
3. Enter the following from the keyboard:



The display will show as follows:

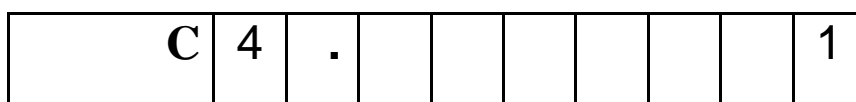


The bits that are on will be displayed in binary.

D0=1, D1=2, D2=4, D3=8,

D4=16, D5=32, D6=64, D7=128

For example, if the operation switch is connected to C4-D0, the display will show as follows when this switch is turned on:



4. Press the CR key to check repeatedly.
5. To check C5 port, input C, 5 and press the CR key.

• Output

MITY-SERVO transmits signals to other devices. Check brake release and sequencer reading.

Produce:

1. Set MITY-SERVO in the editor mode (See Input section on the previous page).
2. To check output C0 port:
3. Enter the following from the keyboard.

C **0** **?** **CR**

The display will show as follows:

	C	0	?							
--	----------	----------	----------	--	--	--	--	--	--	--

Pressing the CR key will return MITY-SERVO to the editor screen.

Enter the following to turn off the output signals:

4. The output signal will stay on until it is turned off.
5. Enter the following to turn off the output signal:

C **0** **0** **CR**

6. To check more than one bit at the same time, add the bit numbers and enter.
Example: To check output signals D0 and D7 at the same time, enter 129
(Since D0=1 and D7=128, $1 + 128 = 129$).

C **0** **1** **2** **9** **CR**



DANGER

Check safety before checking input/output signals.

Failures to do so may cause the machine to move, causing bodily injuries or damages to the unit or accessory equipment.

• Encoder Pulse Check

Check that encoder signal is input into MITY-SERVO

Procedure:

1. Set MITY-SERVO in the editor mode (See input section on the previous page).
2. Enter the following from the keyboard.

E	2	CR
----------	----------	-----------

The display will show as follows:

E	2	.		X	X	X	X	X	X
----------	----------	----------	--	----------	----------	----------	----------	----------	----------

Note: XXXXXX = encoder pulse count.

3. Press the CR key repeatedly.

Rotate the motor in the positive direction, counterclockwise (CCW) viewed from the axis, and check that the encoder pulse count increases.

Rotate the motor in the reverse direction, clockwise, and check that the encoder pulse count decreases.

If the pulse count does not change, increases when the motor is rotated in reverse or decrease when it is

Rotated in the positive direction, phase A and phase B signals may be reversed. Check the wiring and

Correct if necessary.

IMPORTANT !!

Make sure to check encoder pulse before operating MITY-SERVO for the first time.

Check encoder phase if pulse does not count correctly.

The reverse and non-reverse signals may be connected wrongly the same phase.

3-3 MITY-SERVO Operation

3-3-1 Operation Precautions

After installing MITY-SERVO, check wiring once again before operating. After the operation, check the following to verify there are no problems:

1. Check that MITY-SERVO unit did not overheat.
2. Check that motor did not overheat.
3. Check that regenerative resistor did not overheat.
4. Check that power cables for motor did not overheat.
5. Check for vibrations or noise caused by MITY-SERVO, motor, or machine.
6. Check that the cables are not pinched.
7. Check that fasteners have not loosened.

Stop the operation immediately and correct the situation if there are any problems.

Friction of the machine may decrease stopping accuracy drastically; for locating operation, run the machine for a sufficient period of time to ensure smooth movements.

Friction may also cause the stop location to change as the machine continues to run. Change the parameters on MITY-SERVO to make any adjustments. (See software manual for details.)

3-3-2 Source Program (Source QMCL)

MITY-SERVO controls the motor according to the program (QMCL). The program is written in the RAM or ROM on the CPU board. It is recommended that a source program file be obtained for use in emergencies.

3-3-3 CPU Battery

The MITY-Servo's CPU has a built-in memory back-up battery. Since the contents of the memory may become outdated when it is not used in a long time, check the battery charge periodically and charge it when it becomes too low. The battery will take approximately one day (24h) to fully charge.

Section 4: MITY-SERVO Programs

4-1 MITY-SERVO Programs

4-1-1 on QMCL

4-1-2 Operating the Motor

4-1-3 Creating Programs

4-1-4 QMCL System

4-1-5 System Parameters and User Parameters

4-1 MITY-SERVO Programs

4-1-1 on QMCL

QMCL stands for Quick Motion Control Language, a programming language which enables quick motor movement.

QMCL controls MITY-Servo's basic motor movement.

4-1-2 Operating the Motor

The MITY-SERVO unit cannot operate on its own.

A program written in QMCL is necessary to run the MITY-SERVO.

4-1-3 Creating Programs

QMCL consists of two separate layers, an easy to comprehend “surface language” and an “intermediary” for direct motor control.

The surface language makes program contents easy to understand during programming (as with HZP [set command frequency]).

The intermediary language inputs directly to the MITY-SERVO and executes the program (E1 [=HZP] is how the above example is represented in the intermediary language).

QMCL consists of the following three components:

- Motor control command language
- Input/output control and display command language
- Memory operation command language

Motor Control Commands

The command language directly relating to movement; includes HZP (set command frequency) and PSG (position gain).

Input/output Control and Display

Controls sequence input/output, and shows values on display; includes C4, C0, and CA.

Memory Operation

Arithmetic computations of memory (variables); also handles condition jumps.

Other

Other commands such as timers and subroutine clocking.

Just as with BASIC, QMCL begins with line 0, and executes in order, 1, 2, 3...

Also, the program may skip lines through executing jump commands.

IMPORTANT !!

In the QMCL control language, some command executions are prioritized.
Take special care with motor control related commands.

Example

SEVCC = 1
HZP = 1920

Power control (output command to motor)
set command frequency (1920=60Hz)
Setting motor revolutions (frequency).

A power control command is sent before initiating motor revolution.

Reversing the order of these commands will send a high starting rush current to the Motor, which may activate the over current tripper.

From program creation to execution

The following explains the QMCL program creation process.

Motor control concept

Evaluate the content and input/output.

Create flowchart

Based on the control concept, create flowchart.
Flowcharts can be omitted, but to help grasp the flow of the program, they are recommended.

QMCL program

Create a program in the surface language, using the QMCL compiler.
Short programs can be written directly in the intermediary language, but compiling makes the program easier to edit.

Compile QMCL

Compiling translates the program written in the surface language into the intermediary language.

Transfer program

Using the compiler, transfer the program to the MITY-SERVO unit.
The destination will be the internal RAM.

* Communication requires the optional RS232C cable and board.

Debug program

Verify the program created.

This can be done in the MITY-SERVO CPU, but having a demo set will be more convenient.

Set program

After verifying the program, copy the program into ROM.

Copying to ROM is made easy using the optional FLASH-A-QM.

Begin execution

The program can be run from RAM. but writing to ROM is

recommended, as this risks losing the program due to battery failure.

4-1-4 QMCL System

QMCL System 98

This tool makes the creation and editing of QMCL program easier.

Specifications: P.C : Windows 95/98/me
 QMCL System 98 : QMCL compile
 Transfer program
 Uncompile program

- * To transfer the program, the optional RS232C cable and board is required.
FLASH-A-QM (internal RAM, ROM writer) is optional.

The QMCL General Program Library

The QMCL General Program Library is a collection of various programs that can be used, making program creation unnecessary, or also can be used for reference.

Motor control is made easy by wiring following the directions of the QMCL General Program Library.

Please contact QM Soft for more further details.

4-1-5 System Parameters and User Parameters

System Parameter mode

Aside from QMCL, the MITY-SERVO has motor control parameters (variables), making it easy to set and change motor controls.

The System parameters, at the beginning of the QMCL program, execute the following system subroutine.

IMPORTANT !!	
System parameters execute command	CALL \$460

User Parameter Mode

MITY-SERVO provides a user parameter mode to make it easy to set the frequency and manipulate other user parameters.

The user parameters, at the beginning of the main program, executes the following system subroutine.

IMPORTANT !!	
User parameters execute command	CALL \$464

Program sample (sample default settings):

(Line No.)	(Surface Language)	(Intermediary Language)	
0	CALL \$466	F7CF0466	Execute System parameters
1	A0 = 0	A0D000	Set A0 memory to 0
2	SEVCC = 1	EFD001	Power ON (Servo ON)
.	.	.	.
.	.	.	.
.	.	.	.

Precautions when using System parameters

The System parameters default settings are listed on the parameters sheet, provided at the time of shipping.
Be sure to set these values to suit the control required.

IMPORTANT !!

- | | | |
|---------------|----------------------|--|
| No. 71 | (encoder correction) | Feeds back the number of motor revolutions.
Be sure to set this based on the number of motor poles and number of encoder pulses. |
| No. 7 | (torque limit) | Controls motor output current.
Lower settings when testing encoder input and motor phase (direction of rotation). |
| No. 15 | (AS-IPM mode) | IPM method select.
VEA-01 ~ 08....." 1 "
VEAS-01 ~ 08....." 2 "
VEA-15 ~ 550....." 0 " |
| No. 16 | (PWM mode) | Motor control select.
v/f control (No encoder)....." 0 "
vector control (use 1 encoder)....." 3 "
vector control (use 2 encoders)....." 1 " |

The correct motor rotation is Counter-Clock-Wise (CCW).

This will increase the number of encoder pulses.

Take care when making significant parameter changes, as this may lead to large changes in the motor movement.

System parameter settings are stored in memory, backed by a battery in the CPU board.

Parameter settings may be changed or altered by battery wear or CPU abnormalities.

Follow the parameters chart when setting System parameter settings.

For more detailed information regarding System parameters, refer to the section on parameter in the User's Manual.

Section 5 : Troubleshooting

This section explains how to troubleshoot MITY-SERVO, read error codes, prevent or correct problems, and service protective functions.

5-1 Error Message

5-2 Protective Functions of MITY-SERVO

5-3 Troubleshooting

5-4 Preventive Measures and Safety

5-5 Servicing MITY-SERVO

5-1 Error Message

An error message will appear on MITY-SERVO display when there is a problem.

The error code is displayed on the right side; the program line number at which MITY-SERVO operation stopped will be on the left side.

?	?	?			E	r	-	9	1
---	---	---	--	--	---	---	---	---	---

Note : ??? is program lines.

Hard wear Errors:

Er- 0	Allowable Current exceeded, overheat protection, power source low voltage protection, (IPM error)
Er- 2	Allowable voltage exceeded
Er-10	Feed back pulse error.
Er-11	Over load
Er-P0	PWM mode (System parameter No. 16) error

Program Errors:

Er-7	Divided by 0.
Er-8	Trap error, CPU machine language error, noise interference error.
Er-9	Watch dog time: Subroutine inserted in timer or machine language subroutine does not reach the return command.
Er-80	Jump command error when the number of lines to be jumped exceeds 2048 (512 in case of BRA).
Er-81	Data includes CA or CB command.
Er-82	Data input error.
Er-83	First line of program includes D1 –DB, CE, or CF command.
Er-84	Display command program error.
Er-85	“=” command missing.
Er-86	First line of program includes a numerical value between 0 and 9.
Er-87	Base-16 A – F mixed with Base-10.
Er-88	Display parameter setting error.
Er-90	Subroutine program has no return command.
Er-91	Program return missing.

Serial Communication Error:

Er-96	Serial communication data input error.
-------	--

5-2 Protective Functions of MITY-SERVO

MITY-SERVO is equipped with the following protective functions:

- | | |
|---|---|
| 1. IPM Error | Error code : Er- 0 |
| Over current | Activated when the allowable current is exceeded to protect power transistor inside MITY-SERVO. |
| Temperature protection | Activated when the heat release fin in the power transistor exceeds the allowable temperature. |
| Low voltage protection | Activated when control power source voltage drops below the specified value. |
| 2. High voltage protection | Error code : Er- 2 |
| | Activated when the voltage inside MITY-SERVO exceeds the allowable value. |
| 3. Feed back pulse error | Error code : Er- 10 |
| | Activated when the pulse signal was unusual. |
| 4. Over load | Error code : Er- 11 |
| | Activated when the over load.
Activated when the pulse signal was unusual. |
| 5. Momentary power outage protection | Display turns off.
Activated when the power outage continues for 80 ms or longer. |

An error code will be displayed (except in case of power outage error) when the protective function is activated. I/O output alarm will turn off at the same time.

Take action to correct the situation immediately when the protective function is activated.

(See chapters on troubleshooting in this section.)

The protective functions described above are built into MITY-SERVO.

Note: MITY-SERVO will display an error message (Er-0 or Er-2) when a protective function is activated.

Restart the unit to reset.

IMPORTANT !!

Repeated occurrences of over current (error code Er-0) will increase the wear on the power transistor and may cause malfunctions. Please turn the power off immediately when the over current error is detected. Do not restart the unit, replace MITY-SERVO, or motor until the cause of the error has been determined and proper countermeasures have been taken. Restarting or replacing the unit before the cause of the error is eliminated may damage the unit or components.

Sensor signals may be incorporated in MITY-SERVO I/O input to detect errors other than those listed above. Please refer to the QMCL user manual for I/O input and output and software.

5-3 Troubleshooting

MITY-SERVO may malfunction when the power switch is turned on or during operation due to the malfunctions in peripheral equipment, wrong wiring setup. This section lists types of malfunctions and possible causes, and explains how to troubleshoot.

1. MITY-SERVO display does not light up when the power switch is turned on. (MITY-SERVO does not start)

Is the power source
connected correctly?

- 1) Check the power cable.
Connect the power cable to power terminal blocks R, S,
and T (See Section 3).

Is the power source Voltage
correct?

- 1) Measure voltage of the power source.
Measure the voltages between power terminal blocks R, S,
and T with a tester. Verify that it is AC180 V ~ 230V (See
Section 3).

Is the LED on CPU board
lit up?

If YES:

- 1) Check that program is written correctly into ROM.
- 2) Check that the display cable connector is securely
inserted.

If NO:

- 1) Control power source or CPU hard ware may be at fault;
check the following:
 - a. Check that encoder wiring is correct.
 - b. Check that analog input wiring is correct.
 - c. Check that RS232C and RS422 wiring is correct.

Are input/output signal
functioning properly?

- 1) Check that input/output signal wiring is correct.
- 2) Check that power source DC +24V for input/output signals
is correctly wired.
- 3) Check that peripheral equipment is functioning correctly.

2. Motor does not rotate properly.

Is the motor wiring correct?	<ol style="list-style-type: none">1) Check that motor cables (U, V, and W) are connected to U, V, and W power source terminals, respectively. (See Section 3)
Has the motor brake has been released?	<ol style="list-style-type: none">1) Check that the brake has been released.2) Check I/O output to see brake release signals are functioning properly.
Has the machine lock been released?	<ol style="list-style-type: none">1) Release the machine lock.
Is MITY-SERVO in the operational range (not in the interlock zone)?	<ol style="list-style-type: none">1) Move MITY-SERVO to the proper location.
Are input/output signals functioning properly?	<ol style="list-style-type: none">1) Check that input/output signal wiring is correct.2) Check that power source DC +24V for input/output signals is correctly wired.3) Check that peripheral equipment is functioning correctly.
Check MITY-SERVO protective functions.	<ol style="list-style-type: none">1) Investigate why protective function has been activated; take a countermeasure to correct the error.
Is the start-up torque sufficient?	<ol style="list-style-type: none">1) Change the System parameter setting to increase torque, if necessary.
Is the power source voltage correct?	<ol style="list-style-type: none">1) Measure voltage of the power source. Measure the voltages between power terminal blocks R, S, and T with a tester. Verify that it is AC180V ~ 230V (See Section 3).
Check encoder Input pulse.	<ol style="list-style-type: none">1) Check that the encoder is attached to the motor to be operated.2) Check that encoder input signal is correctly connected to the encoder input connector on the CPU board (CN7).3) Check that encoder wiring is correct; check that the cable is not cut off (See references at the end of the manual).4) Check encoder input pulse (See Section 3).5) Check encoder coupling is securely attached (not loose).6) Check system parameter settings.

Are parameter settings correct?

- 1) Check that System parameter No. 71, encoder compensation, is set correctly (See QMCL user manual).
- 2) Check that System parameter settings are not out of range.
- 3) Change the System parameter settings to be closer to the initial value if the set values are excessively greater or smaller.

IMPORTANT !!

Encoder signal cut-off, incorrect wiring, motor cable cut-off, incorrect wiring, or incorrect parameters may cause the motor to rotate in the wrong direction at wrong rpm or otherwise malfunction.

Continuing to operate the motor in this condition may cause damage to the motor or the machine, MITY-SERVO hardware error trip, and /or damage to the components.

Stop the operation immediately and check wiring and parameter settings when a motor error is detected.

3. Motor stops.

Check MITY-SERVO protective functions.

- 1) Investigate why protective function has been activated; take a countermeasure to correct the error.

Check for machine contact or mechanical lock-up.

- 1) Check that machine and moving parts.

Check that limits such as overrun, are not exceeded.

- 1) Recheck the operational range.

Is the torque in low speed sufficient?

- 1) Change the System parameter setting to increase torque, if necessary.

Check encoder input pulse.

- 1) Check encoder input pulse (See Section 3).
- 2) Check that encoder input signal has not been cut-off.

Check that the power has not been turned off.

- 1) Turn the power switch off and on to reset.
- 2) Check that the program is executed.

4. Locating operation cannot be performed.

Is the encoder functioning properly?

- 1) Check that encoder connectors are connected securely.
- 2) Check encoder input pulse (See Section 3).
Check encoder pulse value of parameter No. 0 if encoder 1 is used, parameter No. 1 if encoder 2 is used.

Check locating parameters.

- 1) Set parameters to correct values; see the QMCL user manual.
- 2) Check QMCL "POS," "PLS," and "PSG" settings.

Is the PLS response within the correct range?

- 1) Check that the top speed and PLS values are within the correct range; see the QMCL user manual for reference.

Is the PLS count within the correct range?

- 1) Check that the PLS count is within the correct range; see the QMCL user manual for reference.

5. Positioning is off.

Check locating parameters.

- 1) Set parameters to correct values; see the QMCL user manual.
- 2) Check QMCL “POS,” “PLS,” and “PSG” settings.

Check encoder coupling.

- 1) Check that coupling is connected securely.
- 2) Check that encoder is attached securely.

Check the home position.

- 1) Check that there are no play in the machine and structure.
- 2) Adjust the home position if necessary.

Is the encoder signal free from noise interference?

- 1) Use shielded cable for encoder to protect from noise.

6. Er- 0 (IPM error) is detected.

Check that the motor is not overloaded.

- 1) Do not overload the motor.

Is the motor continuously subjected to rapid acceleration and deceleration?

- 1) Do not operate under rapid acceleration or deceleration for a prolonged period of time.

Check for the motor short circuiting between phases.

- 1) Eliminate the ground or replace power cable.

Check that motor cable is not on the ground.

- 1) Correct the ground or replace power cable.

Check that the motor has not seized up; check that insulation is proper.

- 1) Check that resistance between phases is the same; check that the resistance between motor frame and each phase is the same. Mismatched resistance values will cause the motor to seize up.
- 2) Check that there are no unusual odors from the motor.

Check that the motor is not vibrating.

- 1) Recheck the System parameters and make adjustments, if necessary, to prevent vibration.

Check that MITY-SERVO unit is not overheating

- 1) MITY-SERVO has overheat protection. Check that the cooling system is functioning properly.
- 2) Cool the MITY-SERVO unit.

IMPORTANT !!

Repeated occurrences of over current (error code Er-0) will increase the wear on the power transistor and may cause malfunction. Please turn the power source off immediately when the over current error is detected.

Do not restart the unit, replace MITY-SERVO, or motor until the cause of the error has been determined and proper countermeasures have been taken. Restarting or replacing the unit before the cause of the error is eliminated may damage the unit or components.

7. Er- 2 (excess voltage) is detected.

Is the power source voltage correct?

1) Measure voltage of the power source.

Measure the voltages between power terminal blocks R, S, and T with a tester. Verify that it is AC180 V ~ 230V (See Section 3).

Check that there are no surges current in power source lines from peripheral equipment?

1) Use varistors to eliminate surge currents.

Is the deceleration time too short?

1) Extend the deceleration time.

Check that there is no line cut-off in regenerative resistor; check that wiring is correct.

1) Recheck.

Check that resistance in the regenerative resistor is correct.

1) Check that resistance and capacity are appropriate.

Is the regenerative amount too great?

1) Regenerative amount tends to be too high in machines such as recoilers. Check that resistance and capacity are appropriate.

8. Other error messages

Determine whether the error is a protective function or not.

1) Error code Er-0 or Er-2 will be displayed when a protective function has been activated. All others are software errors. Use the QMCL user manual to recheck the program.

Numbers are displayed at the left side.

There is a command to stop program in the QMCL program. Noise may have caused this error.

Display turns off.

1) Momentarily power shut-off has been detected. Check power source voltage.

9. The system does not reset.

The system does not start even after the power switch has been turned off and on.

1) Shut the power off until the CPU LED or display has turned off, then turn the switch back on.

Please use the repair request from below for service on your MITY-SERVO after the problem has been determined. Send the form with the MITY-SERVO unit to the dealer where the unit was purchased or to the Engineering Section of MS techno, Inc.

Repair Request Form

Date:	Customer Name:		
Customer Address:			
Telephone/Fax Nos.:		Contact Person:	
Model No.:		Manufacture No.:	
Date Purchased:	Uptime per Day:	Hours	Number of Years:
Usage and Machine Structure:			
Motor Used:	KW	P	V A rpm
Description of the Problem (Please give details)			
Frequency of Problem:	Approximate Hour and Timing		Times / Day
Power Source Voltage:	Voltage Measured		V
Ambient Temperature:	Temperature Measured		
Motor insulation	Insulation Measured		
Ground	Between MITY-SERVO terminal block E-terminal and ground And		
Regenerative Resistor	YES / NO		W
Encoder	Count and coupling attachment and wiring		
Outside input/output	Input/output check, wiring		

5-4 Preventive Measures and Safety

5-4-1 Preventive Measures

MITY-SERVO may malfunction or missoperate depending on usage and/or environment.

Root causes of the problems must be eradicated and appropriate countermeasures must be taken in case of malfunctioning.

Outside Noise

A noise source located close to the MITY-SERVO may cause MITY-SERVO to malfunction when noise radiates or intrudes through power source lines. The following countermeasures are recommended:

- | | |
|--------------------------------|---|
| a. Electro-magnetic contactor: | Surge killer is inserted into control coil to control open-close surge currents. |
| b. Input/output | Minimize cable length and separate from power lines.
Use shielded cables where specified (e.g., for encoder). |
| c. Ground | Make sure MITY-SERVO is grounded. The ground pole must be separate from the ground for equipment that generate noise, filter in the power line to prevent noise from intruding. |
| d. Power source | |

B. Installation Location

Since MITY-SERVO may be considered an electronic device, environment must be selected carefully.

- | | |
|------------------------------|--|
| a. Vibration: | Use vibration-proof rubber cushions to minimize mechanical stress on parts. |
| b. Corrosive gasses and dust | Sealed control panel and dust-proof measures are required to prevent parts from corroding and causing poor contact.
Temperature affects life and reliability of electronic components. In particular semiconductor parts may be damaged in a high temperature environment. Install a cooling system to maintain a moderate temperature. |
| c. Temperature | Use a dehumidifier to maintain relative humidity to 90% or lower if the unit is installed in a high-humidity location. |
| d. Humidity | |

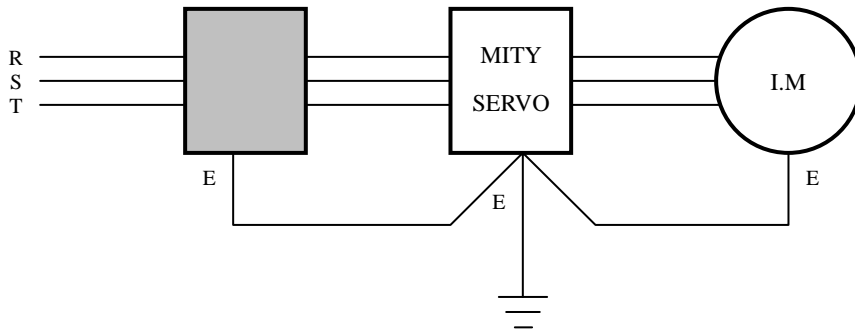
C. Radio Noise

MITY-SERVO may interfere with radios since it generates extremely high-frequency noises due to the switching elements. Noise is transmitted by radiation or through power lines.

The following countermeasures are recommended.

- a. Separate power source circuits of the unit and radio by using different power lines from radio cables.
- b. Place MITY-SERVO in a metal box and ground the box.
- c. Place power lines in a conduit and ground it.
- d. Insert a noise filter on the primary side of MITY-SERVO.
- e. Insert a shielded transformer on the primary side of MITY-SERVO.

Examples of Noise Filter and Insulating Transformer



D. Deterioration in Motor Insulation

Inverter switching may cause motor coil insulation to deteriorate. Conduct motor insulation check at periodic inspections to detect deterioration at an early stage.

Measure insulation of the motor by itself. Measuring with MITY-SERVO connected may cause malfunction or damage to the unit.

5-4-2 Safety

Follow the guidelines below to ensure safety of MITY-SERVO operation.

◆ Ground

MITY-SERVO must be grounded to prevent electrocution and/or malfunctioning. This is very important since MITY-SERVO uses high voltage. Follow the electrical standards to ground the unit (Type 3 Ground). Do not share the ground with other power equipment.

◆ Circuit Breaker

Use a circuit breaker in the MITY-SERVO main circuits (Leakage of electricity detection 200mA) for emergencies.

Leakage detection may malfunction in some cases, depending on the sensitivity setting, because a filter is inside the MITY-SERVO unit.

◆ Free-Run Measures

The motor will run free when the MITY-SERVO protective circuit is activated or CPU function stops. Use mechanical brakes on machines that must be stopped quickly, such as a coiler or cart, to ensure safety.

Output alarm signal will turn on when MITY-SERVO stops.

◆ Overrun Stop

Use limit switches to make sure operational range will not be exceeded. Machines and motors will become overloaded and may cause the MITY-SERVO itself to malfunction when the system is mechanically locked. B-contact is recommended for the detector.

◆ Emergency Stop

An emergency stop is recommended to ensure safe operations. B-contact. Is recommended for switch contact.

Measures taken for overrun and emergency stop not only ensure safe operations but also protect the machines, peripheral equipment, and MITY-SERVO itself. Read input for switches from MITY-SERVO I/O input terminals.

IMPORTANT !!

Use protective devices (such as over current protection) to protect MITY-SERVO and motors, as necessary.

A separate coiling system may be required if the motor will be operated continuously at low speeds.

5-5 Servicing MITY-SERVO

MITY-SERVO consists of many electronic and other components, such as ICs , resistors, condensers, and transistors. These components are not permanent parts but will need to be replaced periodically even when used under the best of conditions. Parts deteriorated by age may cause malfunctions.

Periodic inspections and maintenance are necessary to detected early signs of problems and replace aged parts or those that have exceeded their life.

MS techno will be happy to overhaul your MITY-SERVO at your request. Please contact us for details.

Maintenance Schedule

System	Components	Inspection Items
General	Environment	Check ambient temperature, relative humidity dust, gas, and oil mist.
	Overall condition of the equipment Power source voltage	Check that there no excessive vibrations, unusual noises; check for loose parts. Check that power and control power source voltage is normal.
Main Circuit	General	Check that fasteners are secure. Check each part for signs of overheating or discoloration. Clean inside.
	Cables	Check that Internal cables (e.g., bus bars) are free from sharp bends and deflections. Check cables for insulation, V-cap tears, aging, and discoloration.
	Terminal Blocks	Check for damages; check that fasteners are secure.
	Condenser	Check for any fluid leakage; check safety valve condition and deformation of the case.
	Electro-magnetic Timer	Check for normal operation; check that fasteners are secure; check timer settings. Check there are no abnormal noises.
	Resistors	Check for any damage in covers, discoloration, cut-off wires, and damage to terminal.
Control Circuit	Input/Output Circuit	Check I/O and encoder operations.
	Keyboard Display	Check for keyboard operation and panel film damage. Check display conditions and clean the display window.
	Printed board	Check for damages, contact, discoloration, rust, or fallen components. Check that the board is attached securely. Check for connector and lead wire attachment and fasteners. Check for dust and oil mist.
Cooling System	Fans and Heat Shield	Check for damages, unusual sound, excessive vibration, loose fasteners; clean the mponents.

SAFETY PRECAUTIONS

- ◆ Read the user manual and other reference manuals carefully before operating the equipment
- ◆ Make sure this manual is provided to the end-user of this product.
- ◆ MITY-SERVO is a motor controller for use in general industry. Use of MITY-SERVO in equipment must be discussed on a case-by-case basis if malfunction or misoperation of such equipment may contribute to the cause of great bodily harm or endanger human lives (control in nuclear devices, aerospace equipment, various safety devices).
- ◆ This product may not be used in medical equipment. Safety devices must be used if MITY-SERVO may endanger human lives or cause great losses in equipment.
- ◆ Only the qualified electricians may wire this product.
- ◆ Do not modify MITY-SERVO. MS techno, Inc., is not liable for any failures or damages caused by MITY-SERVO as a result of modifications made by the customer.
- ◆ The photos and diagrams provided in this manual are for reference only.

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This product may be subject to restrictions in export as specified by the foreign currency and trade laws if the end-user is military body or a defense contractor or if this product will be used to manufacture military equipment. Please obtain an export license from the Japanese government if this is the case; otherwise contact MS techno for required export documents.

Specifications of the product are subject to change without notice.

Dealer: