

M2 Series AC Servo System

Quick Setup Guide Manual



SHANGHAI AMP & MOONS' AUTOMATION CO.,LTD.

Safety

Only qualified persons may perform the installation procedures. The following explanations are for things that must be observed in order to prevent harm to people and damage to property.

 **The M2 utilizes hazardous voltages. Be sure the drive is properly grounded.**

Before you install the M2, review the safety instructions in this manual.

Failure to follow the safety instructions may result in personal injury or equipment damage.

Safety Symbols

Safety symbols indicate a potential for personal injury or equipment damage if the recommended precautions and safe operating practices are not followed.

The following safety-alert symbols are used on the drive and in the documentation:

 Caution  Warning. Dangerous voltage.  Protective earth  Caution, Hot surface

Safety Instructions

Installation

	Do not subject the product to water,corrosive or flammable gases,and combustibles.
	Don't use the motor in a place subject to excessive vibration or shock.
	Never connect the motor directly to the AC power supply.
	Don't use cables soaked in water or oil.
	Don't extrude or pull-off the cable,nor damage the cables as electrical shocks,damages may resul
	Don't block the heat dissipating holes. Please prevent any metal filings drop into the drive when mounting.
	Don't switch the power supply repeatedly.
	Don't touch the rotating shaft when the motor is running.
	Don't strike the motor when mounting as the motor shaft or encoder may be damaged.
	In order to prevent accidents, the initial trial run for servo motor should be conducted under no load conditions (separate the motor from its couplings and belts).
	Starting the operation without matching the correct parameters may result in servo drive or motor damage, or damage to the mechanical system.
	Don't touch either the drive heat sink or the motor and regenerative resister during operation as they may become hot.
	Don't hold the motor cable during the transportation or mounting.

Wiring

	Don't connect any power supplies to the U,V,W teminals.
	Install the encoder cable in a separate conduit from the motor power cable to avoid signal noise.
	Use multi-stranded twisted-pair wires or multi-core shielded-pair wires for signal,encoder cables.
	As a charge may still remain in the drive with hazardous voltage even after power has been removed, Don't touch the terminals when the charge led is still light.
	Please observe the specified voltage.
	Make sure both the drive and the motor connect to a class 3 ground.
	Please ensure grounding wires are securely connected when power up.

Standards Compliance

The M2 Series AC servo drive has been designed according to standards:

* Electromagnetic compatibility
Standard EN 61800-3 (2004)

* Electrical Safety: Low voltage directive
Standard IEC 61800-5-1 (2007)

Contents

1	Product Description	5
1.1	Unpacking Check.....	5
1.2	Servo Drive Model Introduction	5
1.2.1	Drive Name Plate Description	5
1.2.2	Drive Model Description	5
1.3	Servo Motor Model Introduction	6
1.3.1	Motor Name Plate Description	6
1.3.2	Motor Model Description	6
1.4	Servo Drive and Servo Motor Combinations	6
2	Installation	7
2.1	Storage Conditions	7
2.2	Installation Conditions.....	7
2.3	Drive Dimensions(Unit: mm).....	7
2.4	Installation Space	8
2.5	Motor Installation	8
3	Connections and Wiring	9
3.1	Connecting to Peripheral Devices	9
3.1.1	System Configuration.....	9
3.1.2	Servo Drive Connectors and Terminals.....	10
3.1.3	Connections and Wiring Notes.....	10
3.2	Wiring Methods.....	11
3.2.1	Single-Phase Power Supply Connection(AC220V).....	11
3.2.2	Three-Phase Power Supply Connection(AC220V)	11
3.2.3	Recommend Cable Specifications	12
3.3	Wiring to the Connector,P2.....	12
3.3.1	Motor Power Cable Configuration	12
3.3.2	Motor Power Cable Connector Specifications	13
3.3.3	Wiring Diagram of Motor extend Cable	13
3.4	Electromagnetic Brake	14
3.4.1	Wiring Diagram.....	14
3.4.2	Notice for the Brake Motor	14
3.4.3	The timing charts of the electromagnetic brake	14
3.5	Regenerative Resister	15
3.6	Connect to Host Computer,CN1	15
3.7	Input and Output Signal Interface Connector,CN2	15

3.7.1	Input and Output Interface Diagram	16
3.7.2	Signals Description of Connector CN2	17
3.7.2.1	The Layout of CN1 Connector	17
3.7.2.2	Input Signals	17
3.7.2.3	Output Signals.....	19
3.7.3	Encoder Feedback Ouput	19
3.7.3.1	A/B/Z Wiring Method	19
3.7.3.2	Phase Z Open Collector Output	20
3.8	Encoder Connector CN3.....	20
3.8.1	Motor Encoder Feedback Cable Configuration	20
3.8.2	The Layout of CN3 Connector.....	20
3.8.3	Descriptions of Encoder Connector CN3	21
3.8.4	Connect to Motor Encoder	21
3.8.5	Specifications of Encoder Connector	22
3.8.6	Wiring Diagram of Motor Encoder Extend Cable	22
4	Control Block Diagram.....	23
4.1	Position Mode	23
4.2	Speed Mode	24
4.3	Torque Mode.....	25
5	Display and Operation	26
5.1	Description of Operation Panel.....	26
5.2	Key Lock	26
5.3	Key Operation Flowchart	27
6	Preoperational mode	28
6.1	Inspection Before Trail Tun	28
6.2	Trail Run Procedure	28
6.3	Motor Configuration Manually.....	29
6.4	Operations of JOG Mode.....	29
7	Troubleshooting	30
7.1	Drive Alarm List.....	30
7.2	Drive alarm reason and solutions	31
8	Configuration by Personal Computer	33
9	Appendix	34
10	Contacting MOONS'	35

1 Product Description

1.1 Unpacking Check

Please refer to this section to confirm the model of servo drive and servo motor .

A complete and workable AC servo system should include the following parts:

1. Matched Servo drive and Servo motor
2. A power cable connect the drive to the servo motor(Optional)
3. An feedback encoder cable connect the drive to the motor (Option)
4. A mini USB cable connect the port CN1 to PC for communication.(Option)
5. 50-PIN connector (For I/O connections, Port CN2) Option
6. 26-PIN connector(For encoder feedback,Port CN3) Option
7. 6-PIN connector(IEEE1394,Option)
8. RJ-45 connectors (For RS-485 or CANopen communication,Port CN6 and CN7)Option
9. 5-PIN connectors (For L1,L2,L3,L1C,L2C)
10. 6-PIN connector(For U,V,W,B1+,B2,B3)

1.2 Servo Drive Model Introduction

1.2.1 Drive Name Plate Description

MOONS' *moving in better ways* Designed in California by Applied Motion Products Assembled in China

M2 AC SERVO DRIVE

Model No. XXXX-XXXXX

Serial No. 09450001

	INPUT	OUTPUT
VOLT.	200-240VAC	0-240VAC
PHASE	1 φ/3 φ	3 φ
F.L.C	2.6 A/1.5A	1.8 A
FREQ.	50/60Hz	0-400Hz
POWER		200W

1.2.2 Drive Model Description

M2DV - □ □ □ **2** □ *******

M2 Series AC Servo Drive

Current Code	Continuous Current (RMS)	Boost Current (RMS)
1D8	1.75A	5.25A
3D0	3.00A	9.00A
4D5	4.50A	13.50A

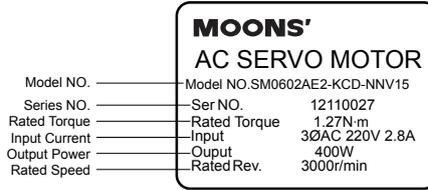
If Applicable

Communication Type	Configuration	Description	Communication
S	Mini USB	Basic Type	---
Q		Q Type	RS-232
R		Q Type(Modbus/RTU Type)	RS-485
C		CANopen Type	CANBus
IP		EtherNet/IP Type	EtherNet
E		eSCL Type	EtherNet

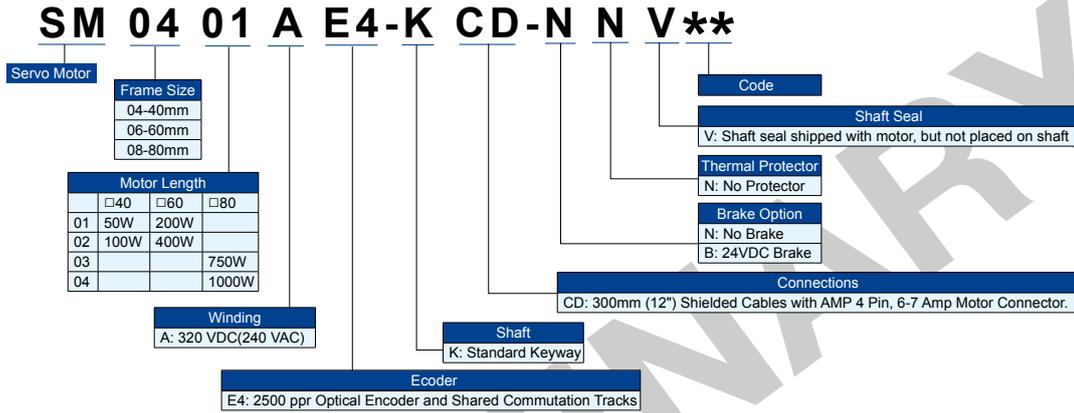
Voltage Code	Input Voltage
2	Single/Three-Phases 200~240VAC ± 10%, 50/60Hz

1.3 Servo Motor Model Introduction

1.3.1 Motor Name Plate Description



1.3.2 Motor Model Description



1.4 Servo Drive and Servo Motor Combinations

Specification			50W	100W	200W	400W	750W	
			Motor Model Numbers					
AC Servo Motor	2500ppr Increment Encoder (9PIN AMP connector)	Without Brake	SM0401AE4-KCD-NNV09	SM0402AE4-KCD-NNV09	SM0601AE4-KCD-NNV09	SM0602AE4-KCD-NNV09	SM0803AE4-KCD-NNV09	
		With Brake	SM0401AE4-KCD-BNV09	SM0402AE4-KCD-BNV09	SM0601AE4-KCD-BNV09	SM0602AE4-KCD-BNV09	SM0803AE4-KCD-BNV09	
	Rated Speed	(RPM)	3000					
	Maximum Speed	(RPM)	6000					
	Rated Torque	(N·m)	0.19	0.32	0.64	1.27	2.4	
	Maximum Torque	(N·m)	0.48	0.93	1.9	3.8	6.9	
	Rated Current	(A)	0.7	1.2	1.5	2.75	4.5	
	Maximum Current	(A)	1.75	3.6	4.5	8.3	13.5	
	Rotor Inertia	Kg·m ²	0.0232 × 10 ⁻⁴ *0.0298 × 10 ⁻⁴ (*With Brake)	0.0428 × 10 ⁻⁴ *0.0494 × 10 ⁻⁴ (*With Brake)	0.165 × 10 ⁻⁴ *0.22 × 10 ⁻⁴ (*With Brake)	0.272 × 10 ⁻⁴ *0.326 × 10 ⁻⁴ (*With Brake)	0.89 × 10 ⁻⁴ *0.97 × 10 ⁻⁴ (*With Brake)	
	Insulation Class		Class B					
Protection Class		IP65(except shaft through hole and cable end connetor)						
Oil Seal		With Oil seal						
AC Servo Drive	Pulse&Direction Type	USB Mini	Basic Type	M2DV-1D82S	M2DV-1D82S	M2DV-1D82S	M2DV-3D02S	M2DV-4D52S
			Q Type	M2DV-1D82Q	M2DV-1D82Q	M2DV-1D82Q	M2DV-3D02Q	M2DV-4D52Q
	Fieldbus Type	RS-485	SCL	M2DV-1D82R	M2DV-1D82R	M2DV-1D82R	M2DV-3D02R	M2DV-4D52R
			Modbus RTU	M2DV-1D82R	M2DV-1D82R	M2DV-1D82R	M2DV-3D02R	M2DV-4D52R
		CAN	CANopen	M2DV-1D82C	M2DV-1D82C	M2DV-1D82C	M2DV-3D02C	M2DV-4D52C
	Ethernet	Ethernet/IP	Ethernet/IP	M2DV-1D82IP	M2DV-1D82IP	M2DV-1D82IP	M2DV-3D02IP	M2DV-4D52IP
			eSCL	M2DV-1D82E	M2DV-1D82E	M2DV-1D82E	M2DV-3D02E	M2DV-4D52E
			Drive Model Numbers					

2 Installation

2.1 Storage Conditions

Some Storage suggestions are followed:

- Correctly packaged and store in a clean and dry ,avoid direct sunlight
- Store within an ambient temperature range of -20°C to +65°C
- Store within a relative humidity rang of 10% to 85% and non-condensing
- Dont store in a place subjected to corrosive gasses

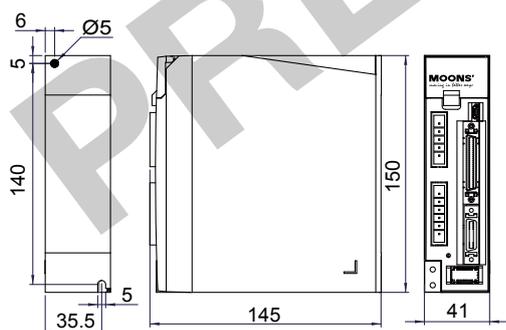
2.2 Installation Conditions

The operation ambient conditions are followed:

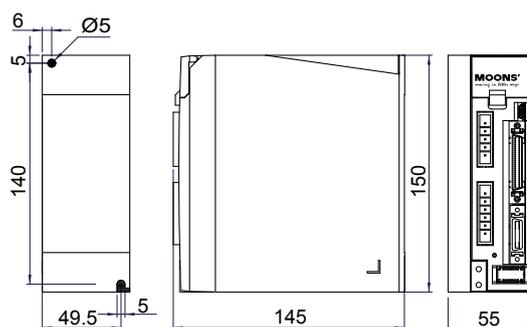
- Temperature range of 0°C to 50°C. If the ambient temperature of servo drive is greater than 45°C, please install the drive in a well-ventilated location
The ambient temperature of servo dive for long-term reliability should be under 45°C.
- The servo drive and motor will generate heat. If they are installed in a control panel, please ensure sufficient space around the units for heat dissipation.
- Operation within a relative humidity rang of 5%to 85% and non-condensing
- The vibration lower than 5.88m/s², 10-60Hz(Do not continuously use the drive for along time at resonance point.)
- Dont mount the servo drive and motor in a location subjected to corrosive gasses or flammable gases, and combustibles.
- Please mount the servo drive and motor to a indoor electric control cabinet without liquid and direct sunlight
- Dont mount the servo drive and motor in a location subjected to airborne dust.

2.3 Drive Dimensions(Unit: mm)

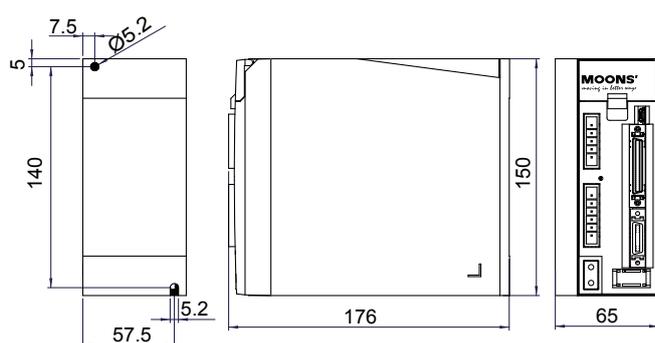
50W、100W、200W Type



400W Type

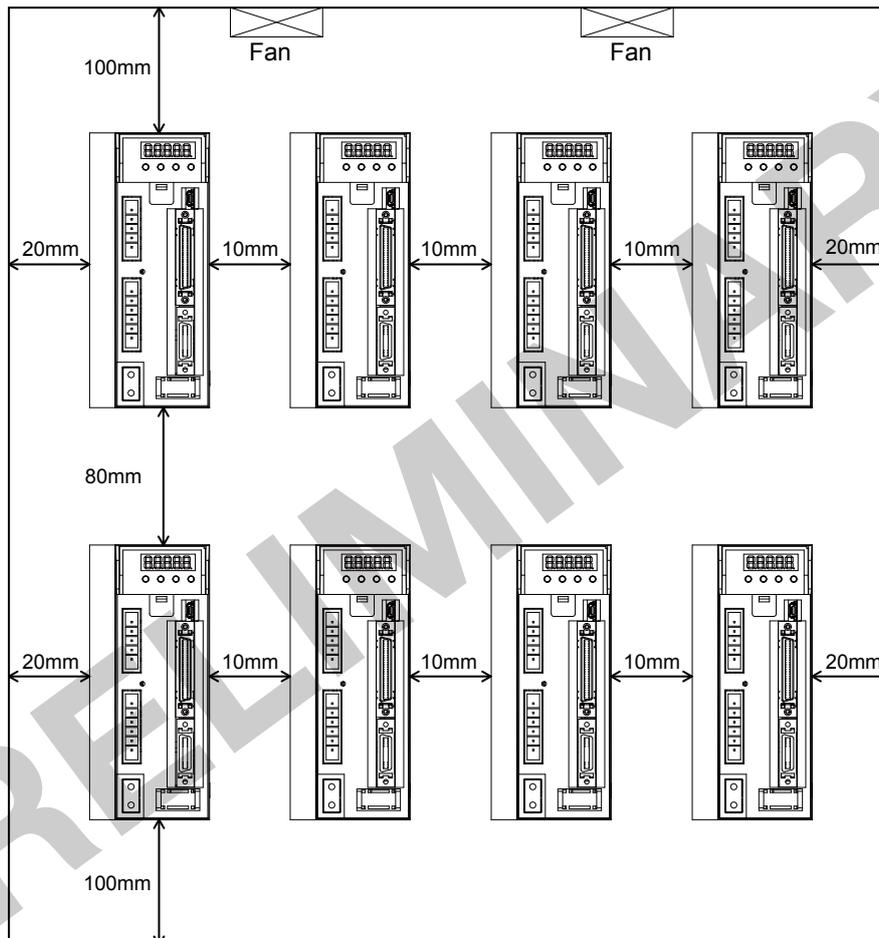


750W Type

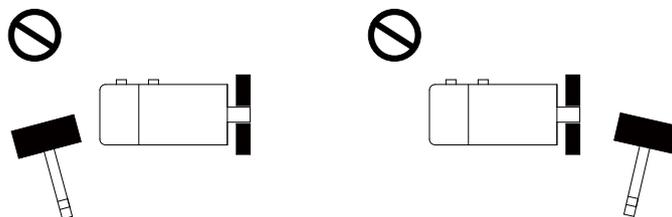


2.4 Installation Space

- Incorrect installation may result in a drive malfunction or premature failure of the drive and or motor. Please follow the guidelines in this manual when installing the servo drive and motor.
- The M2 servo drive should be mounted perpendicular to the wall or in the control panel.
- In order to ensure the drive is well ventilated, ensure that the all ventilation holes are not obstructed and sufficient free space is given to the servo drive, and a cooling fan is mounted in the control panel.
- Please ensure grounding wires are securely connected



2.5 Motor Installation

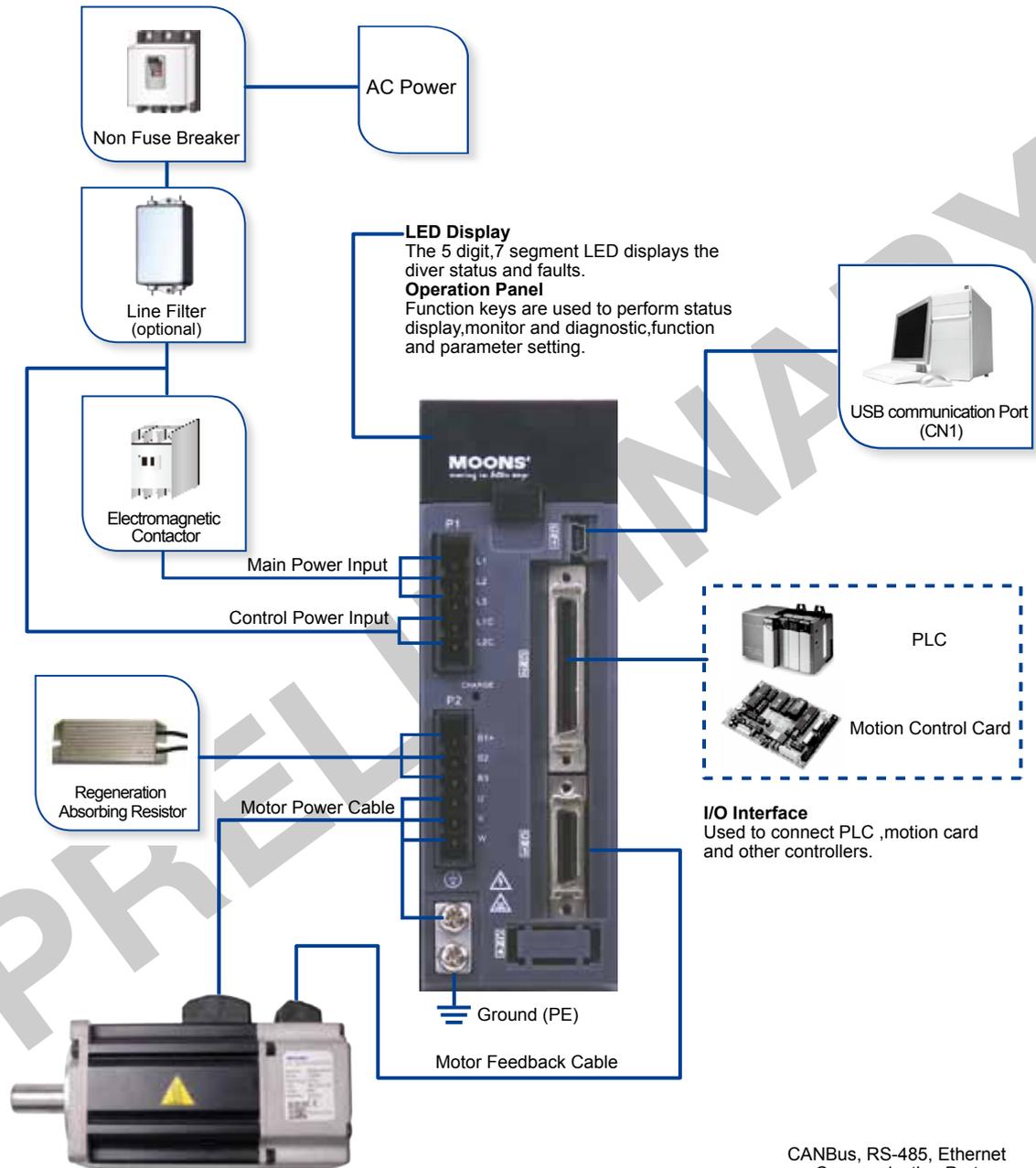


- Don't strike the motor when mounting as the motor shaft or encoder may be damaged.
- Don't use cables soaked in water or oil.
- Avoid a stress application to the cable outlet and connecting portion by bending
- Please use flexible cables when using cable carrier, make sure the minimum cable bending radius is 200mm
- The shaft through hole and cable end connector is not IP65 design. Make sure to prevent any liquid or oil into the motor from these parts.

3 Connections and Wiring

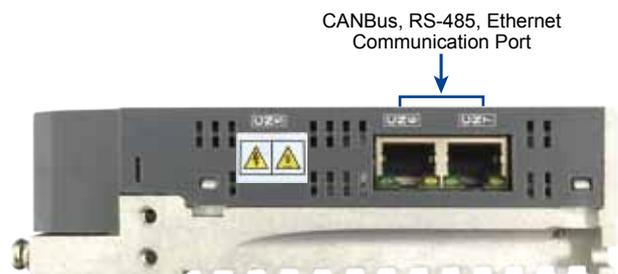
3.1 Connecting to Peripheral Devices

3.1.1 System Configuration



Line Filter

AC Power	Part No.	Vendor
Single phase 240Vac	10ET1	Tyco
Three phase 240Vac	DF300-10A-01	Dephir



3.1.2 Servo Drive Connectors and Terminals

Terminal Identification	Description	Details		
P1	L1、L2、L3	Used to connect three-phase AC main circuit power		
	L1C、L2C	Used to connect single-phase AC for control circuit power		
P2	U、V、W	Used to connect servo motor		
		Terminal Symbol	Wire color	Description
		U	Red	Connecting to three-phase motor main circuit cable
		V	Yellow	
	W	Blue		
	B1+、B2、B3 Regenerative resistor terminals	Internal Resister	Ensure the circuit is closed between B2 and B3, and the circuit is open between B1+ and B3.	
External Resister		Ensure the circuit is open between B2 and B3, and connect the external regenerative resistor between B1+ and B2.		
CN1	Communication Port	User to connect personal computer		
CN2	I/O Connector	Used to connect external controllers.		
CN3	Encoder Feedback Connector	Used to connect encoder of servo motor.		
CN4	Reserved			
CN5	Reserved			
CN6	RS-485/CANopen *RS-232 Communication Port	RJ45 connector, Daisy Chain, Used for RS-485/CANopen *RS-232 Communication Port (-Q Type Only)		
CN7	RS-485/CANopen Communication Port	RJ45 connector, Daisy Chain, Used for RS-485/CANopen Communication		

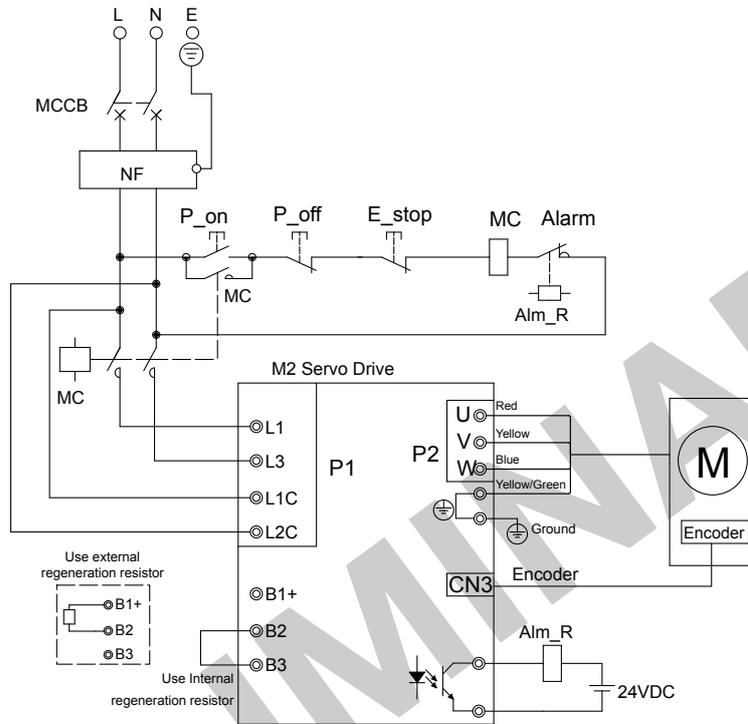
3.1.3 Connections and Wiring Notes

- Please ensure grounding wires are securely connected, wires with more than 2.0mm² on width is recommended.
- Grounding method must be single point grounding.
- Ensure L1/L2/L3 and L1C/L2C are correctly wired, and voltage supply are within the specification range.
- Ensure U/V/W are following the order of RED/YELLOW/BLUE. Wrong connections will cause motor stop rotation, or wrong rotatory directions.
- Isolation transformer or EMI filter is recommended on drive's power supply to ensure drive's safety and improve its anti-interference level.
- Please setup a emergence stop circuitry to switch off the power supply when fault occurs.
- Please DO NOT touch drive or motors's connector terminals 5 minutes after drive and motor is powered off. There are electrical charge components in the circuitry. Therefore, even power is off, there might still be hazardous voltages within the circuitry, before its total discharge.
- Install the encoder cables in a separate conduit from the motor power cables to avoid signal noise. Separate the conduits by 30cm (11.8inches) above.
- Use multi-stranded twisted-pair wires or multi-core shielded-pair wires for signal, encoder feedback cables.
- The maximum length of signal input/output cable is 5m, and the maximum length of encoder (PG) feedback cables is 15m

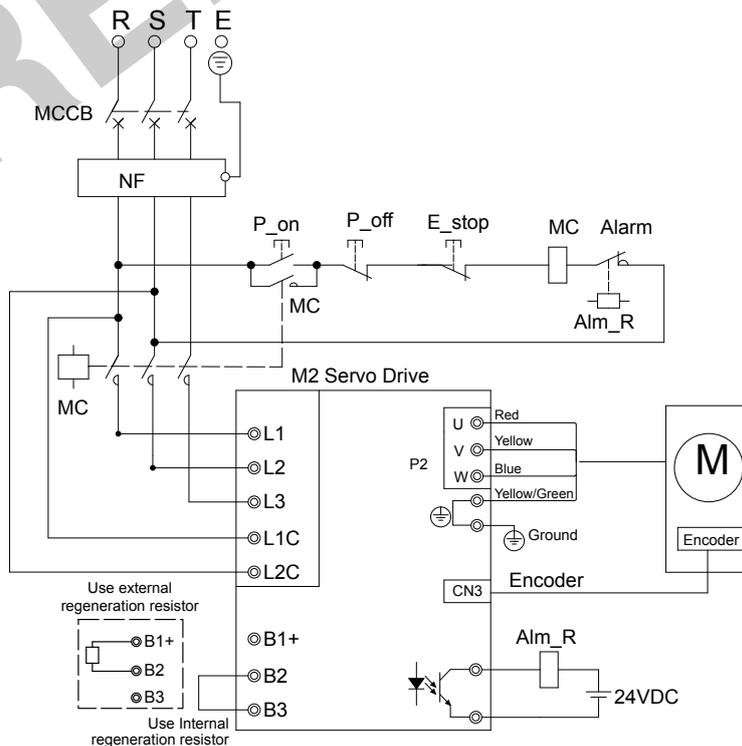
3.2 Wiring Methods

220V AC servo drive supports single phase or three phase wiring method. Three phase wiring method for 750W or above drives is recommended.

3.2.1 Single-Phase Power Supply Connection(AC220V)



3.2.2 Three-Phase Power Supply Connection(AC220V)



Note:

Symbol	Description
MCCB	Circuit Breaker
NF	Noise Filter
P_on	Power On Switch
P_off	Power Off Switch
E_stop	Emergency Stop Switch
MC	Magnetic Contactor
Alm_R	Alarm Relay
Alarm	Alarm Relay Contactor

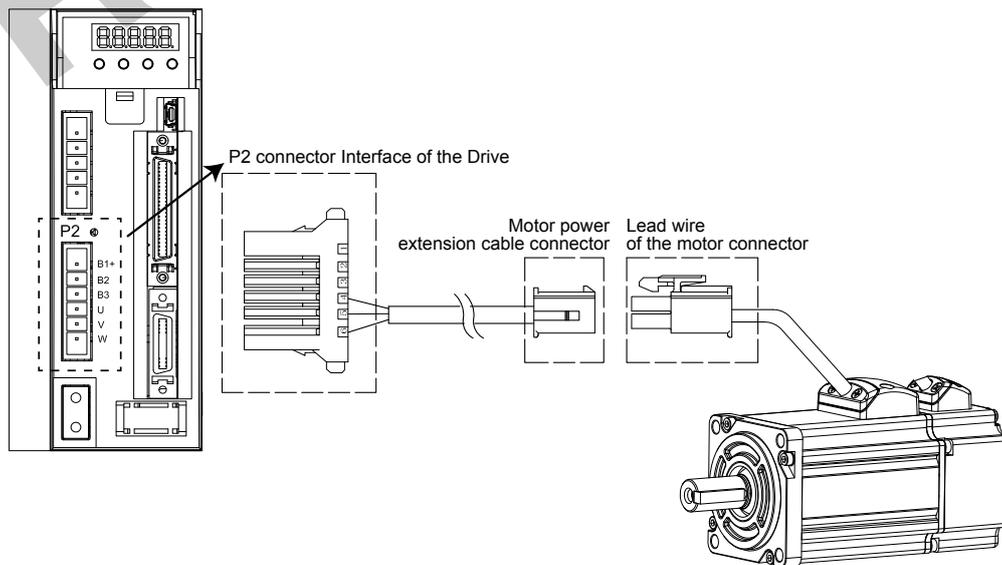
3.2.3 Recommend Cable Specifications

- For drive's main circuit, please use wires withstands at least 600Vac.
- Please select wires with sufficient allowance for parameters such as operating current, and ambient temperature.
- Recommended wire selections are as follows:

Matched Servo Drive and Motor		Wire Diameter mm ² (AWG)			
		L1/L2/L3	L1C/L2C	U/V/W	B1+,B3
M2DV-1D82*	SM0401AE4-KCD-*NV	1.25 (AWG16)	1.25 (AWG16)	1.25 (AWG16)	2.0 (AWG14)
	SM0402AE4-KCD-*NV	1.25 (AWG16)	1.25 (AWG16)	1.25 (AWG16)	2.0 (AWG14)
	SM0601AE4-KCD-*NV	1.25 (AWG16)	1.25 (AWG16)	1.25 (AWG16)	2.0 (AWG14)
M2DV-3D02*	SM0602AE4-KCD-*NV	2.0 (AWG14)	2.0 (AWG14)	2.0 (AWG14)	2.0 (AWG14)
M2DV-4D52*	SM0803AE4-KCD-*NV	3.5 (AWG12)	3.5 (AWG12)	3.5 (AWG12)	3.5 (AWG12)

3.3 Wiring to the Connector,P2

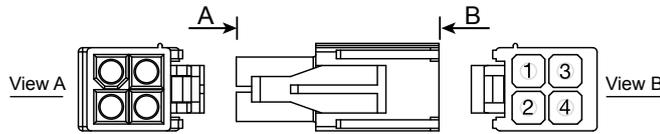
3.3.1 Motor Power Cable Configuration



NOTE: Please refer to section 3.3.2 Motor Power Cable Connector Specifications for details

3.3.2 Motor Power Cable Connector Specifications

◆ PIN Assignment

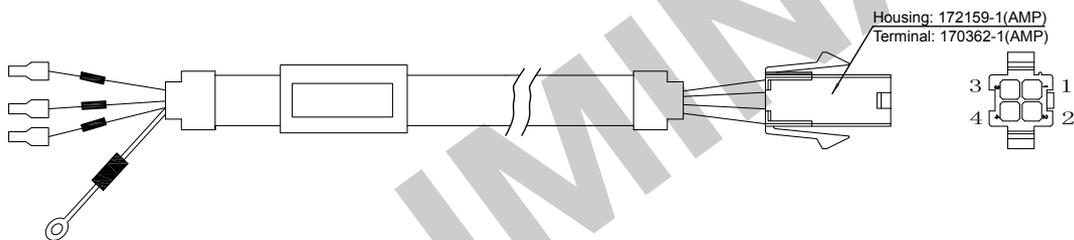


PIN	1	2	3	4
Signal	U	V	W	PE
Colour	Red	Yellow	Blue	Yellow/Green

◆ Model of Motor Connector

Type	Motor Side(Plug)	Plug-in(Housing)
Housing	AMP 172167-1	AMP 172159-1
Crimp	AMP 170360-1	AMP 170362-1

3.3.3 Wiring Diagram of Motor extend Cable



Drive Side(P2)	Signal	Colour	Motor Side(Housing)
(JST) S06B-F32SK-GGXR			AMP 172159-1
4	U	Red	1
5	V	Yellow	2
6	W	Blue	3
Grounding Screw	PE	Yellow/Green	4

NOTE: Ensure U/V/W are following the order of RED-YELLOW-BULE. Wrong connections will cause motor stop rotation, or wrong rotatory directions.

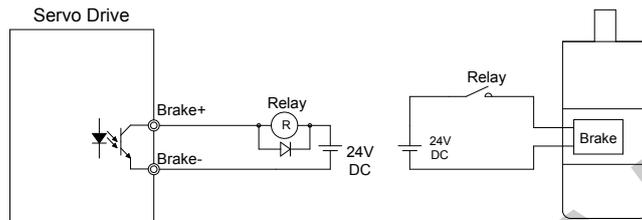
3.4 Electromagnetic Brake

When motor drives the vertical axis, brake should be used to hold and prevent the work (moving load) from falling by gravity while the power to servo is shut off.

NOTE: only use servo motor brake for hold the stalling status, i.e.. motor is in disable or power off.

Never use this for “brake” purpose to stop the load in motion. Wrong use might cause servo motor damage.

3.4.1 Wiring Diagram



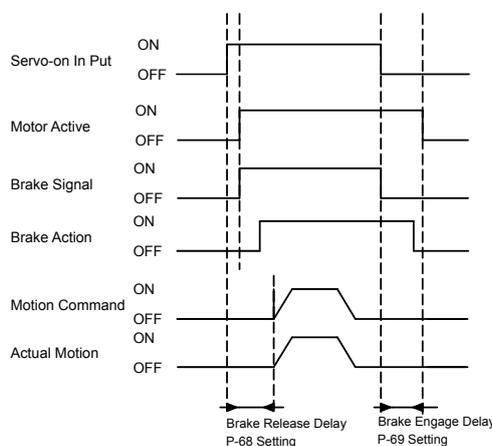
3.4.2 Notice for the Brake Motor

- ◆ When no power is applied to the electromagnetic brake, it is in locked position. Therefore, the motor shaft will not be able to rotate.
- ◆ The brake coil has no polarity.
- ◆ During the brake/release action, there might be “Ka-Da” sounds occurring, this does not effect the use of brake.
- ◆ Specification of brakes are as follows:

Type	Motor Power				
	50W	100W	200W	400W	750W
Holding Torque(N•m)	0.35		2		4.5
Working Current(A)	0.25		0.38		0.61
Rated Voltage(V)	24V ± 10%				
Release Time	<25ms				
Engage Time	<25ms				
Release Voltage(V)	Release Voltage 18.5VDC				

3.4.3 The timing charts of the electromagnetic brake

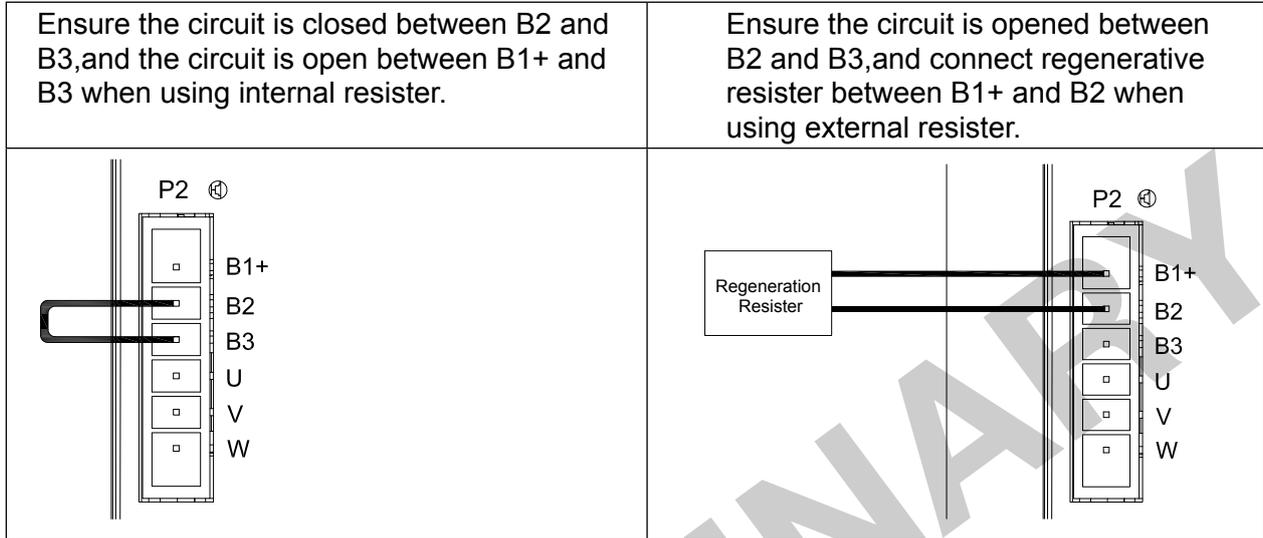
In order to prevent damage to the brake, there are delay sequences during the brake operation. Please be cautious with brake operation sequence.



Brake/release delay time can be set via M servo suite software, or on the drive itself through P function: P-68(BD) or P-69(BE) .

3.5 Regenerative Resistor

In M2 series AC servo drives, there is a pre-installed 40W (M2DV-4D5 model: 60W)regeneration resistor. In some applications, the pre-installed regeneration might not be enough to absorb all fold back current. In these cases, a larger wattage regeneration resistor needs to be connected externally, to prevent drive from over voltage warnings.



- For more detailed information on regeneration resistor selection, please refer to M2 user manual “regeneration resistor” .

3.6 Connect to Host Computer, CN1

Port CN1 is used to connect drive with PC. Use M servo suite software to set control mode, change parameter values, use auto-tuning function and etc.

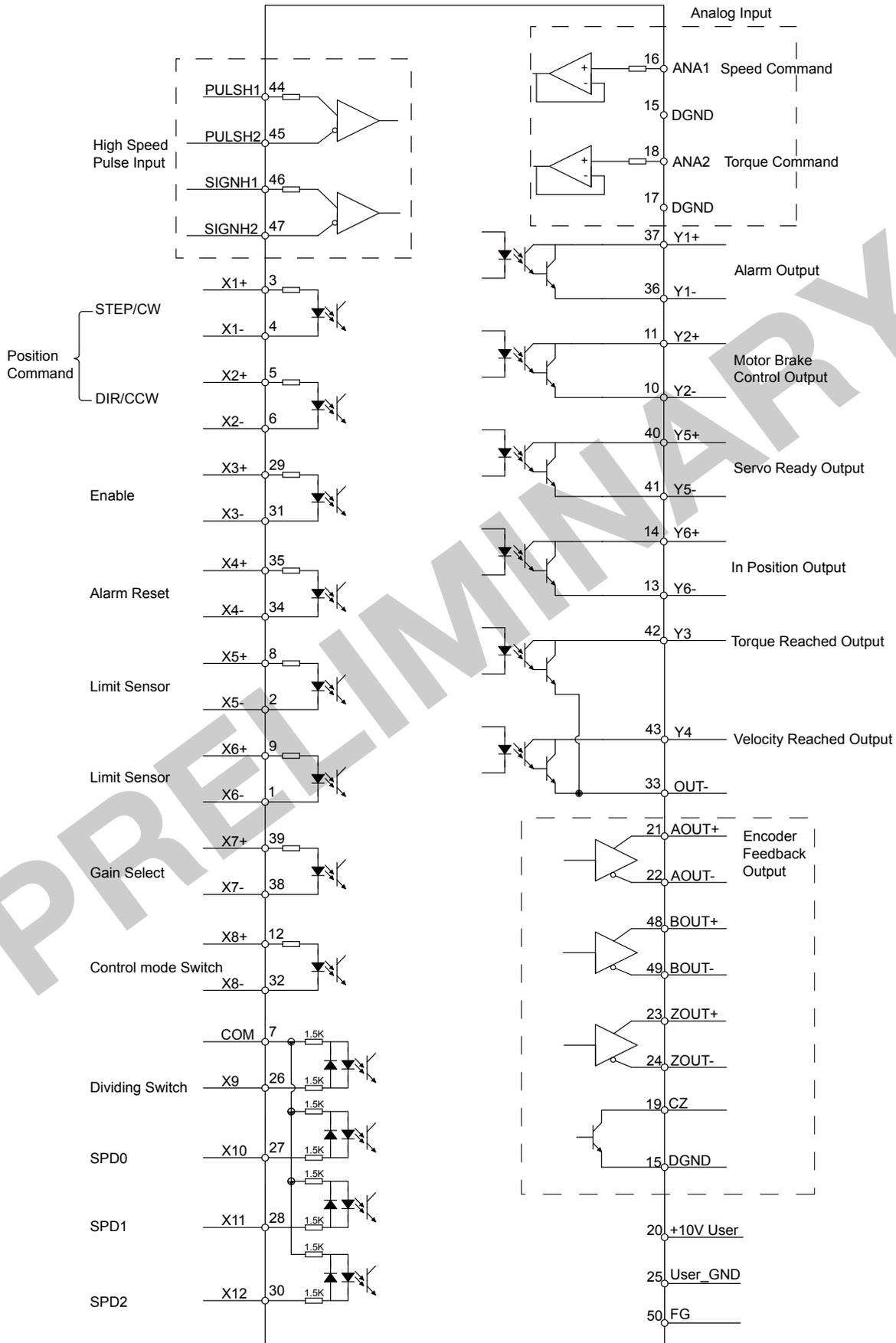
PIN	Symbol	Function
1	+5V	+5V Power Supply
2	D-	Data -
3	D+	Data +
4	—	Reserved
5	GND	Ground

3.7 Input and Output Signal Interface Connector, CN2

The CN2 port on M2 series AC servo drives is used from input/output signals. Details are shown in table below:

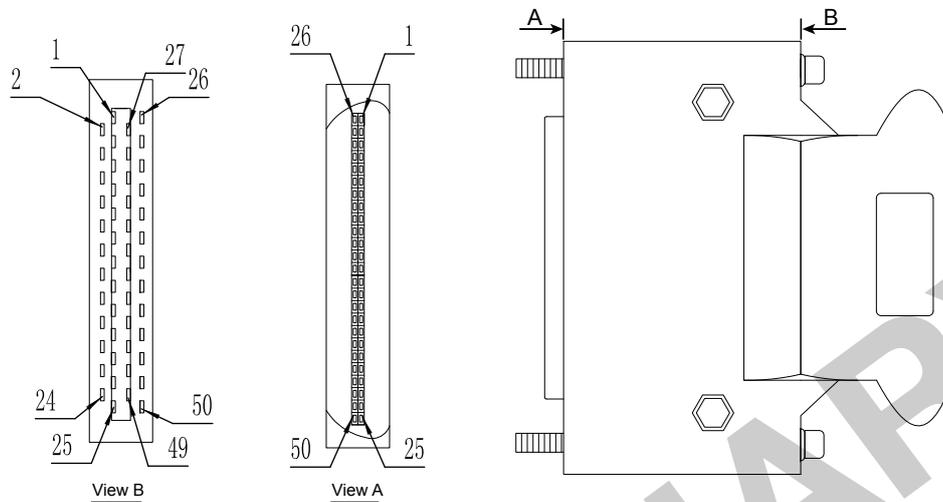
I/O Signals	Digital Signal	Inputs	8 Configurable Optically isolate general High Speed Inputs, 5-24VDC, 20mA 2 Configurable Optically isolate general Inputs
		Outputs	4 Configurable Optically isolate general High Speed Outputs, max 30VDC, 20mA 1 Alarm Output, max 30VDC, 20mA. 1 motor brake control output, max 30VDC, 100mA .
	Analog Signal	Inputs	2 Analog Inputs, with 12bit resolution
	Pulse Signal	Inputs	2 Optically isolated high speed inputs 500Hz(Open collector) 2 high speed differential inputs 2MHz
		Outputs	4 high speed encoder feedback output(3 Line Driver A/B/Z, and 1 open collector OZ)

3.7.1 Input and Output Interface Diagram



3.7.2 Signals Description of Connector CN2

3.7.2.1 The Layout of CN1 Connector



3.7.2.2 Input Signals

M2 series AC servo drive have 12 programmable digital inputs as well as 2 analog inputs.

Each of the input can be specified with different function via parameter settings. The functions are as follows:

- ◆ Specified function signals: i.e. Pulse/DIR signal, motor enable/disable signals.
- ◆ General purpose signal: In velocity mode, torque mode, Q program mode, or SCL mode,

general purpose signal has no specified functions.

Signal	Symbol	Pin NO.	Details
X1	X1+	3	This input has three functions: <ul style="list-style-type: none"> ● Accept STEP pulse input such as pulse signals, CW pulse, A pulse in position mode. ● Run/Stop input in torque or velocity mode. ● General Input.
	X1-	4	
X2	X2+	5	This input has three functions: <ul style="list-style-type: none"> ● Accept STEP pulse input such as Direction signals, CCW pulse, B pulse in position mode. ● Direction input in torque or velocity mode. ● General Input.
	X2-	6	
X3	X3+	29	<ul style="list-style-type: none"> ● Enable/Disable input. ● General Input.
	X3-	31	
X4	X4+	35	<ul style="list-style-type: none"> ● Alarm Reset Input, used to reset drive alarm. ● General Input.
	X4-	34	
X5	X5+	8	<ul style="list-style-type: none"> ● Limit Sensor Input ● General Input
	X5-	2	
X6	X6+	9	<ul style="list-style-type: none"> ● Limit Sensor Input ● General Input
	X6-	1	
X7	X7+	39	<ul style="list-style-type: none"> ● Gain Select Input in all control mode. ● General Input.
	X7-	38	
X8	X8+	12	<ul style="list-style-type: none"> ● Switch Control mode between Main mode and second mode. ● General Input.
	X8-	32	
X9	X9	26	<ul style="list-style-type: none"> ● Dividing Switch, change the pulses per revolution for electronic Gearing. ● General Input.
X10	X10	27	<ul style="list-style-type: none"> ● Pulse Inhibited Input. Ignore the pulse input when this input is activated in position mode. ● Speed Selecting Input 1 in change Speed mode. ● General Input.
X11	X11	28	<ul style="list-style-type: none"> ● Speed Selecting Input 2 in change Speed mode. ● General Input.
X12	X12	30	<ul style="list-style-type: none"> ● Speed Selecting Input 3 in change Speed mode. ● General Input.
COM	COM	7	X9-X12 COM point.
High-speed pulse inputs	PULSH1	44	High-speed pulse inputs(+5VDC line drive input).The max. input frequency is 2MHz.Three different pulse command can be selected: <ul style="list-style-type: none"> ● Pulse & Direction ● CW Pulse and CCW Pulse ● A Quadrature B pulse (NOTE:DO NOT use it with X1/X2 both.)
	PULSH2	45	
	SIGNH1	46	
	SIGNH2	47	
Analog input signal 1	ANA1	16	<ul style="list-style-type: none"> ● AS velocity command in analog velocity mode. The offset ,dead band, function of analog input 1 can be set by M Servo Suit or parameters P-51, P-55 and P-60. ● Sets or requests the analog Input gain that relates to motor position when the drive is in analog position command mode. ● Sets or requests the gain value used in analog velocity mode. ● General Analog Input in Q mode.
	DGND	15	Digital Ground for Analog input.
Analog input signal 2	ANA2	18	<ul style="list-style-type: none"> ● AS torque command in analog torque mode. The offset ,dead band, function of analog input 2 can be set by M Servo Suit or parameters P-53,P-57 and P-61. ● General Analog Input in Q mode
	DGND	17	Digital Ground for Analog input.

3.7.2.3 Output Signals

M2 series AC servo drive has 6 programmable digital outputs available, each of the output can be specified with different function via parameter settings.

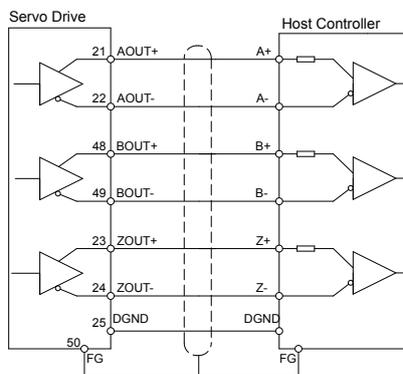
Signal	Symbol	Pin NO.	Details
Y1	Y1+	37	This output has two functions: ● Alarm Output ● General Output
	Y1-	36	
Y2	Y2+	11	This output has two functions: ● Motor brake control output ● General Output
	Y2-	10	
Y3	Y3+	42	● Torque Reached Output ● General Output
	Y3-	33	
Y4	Y4+	43	● Moving signal output, output signal when dynamic position error less than set value in position mode. ● Velocity reach output. Output signal when actual speed is same as the target speed and the speed ripple less than ripple range. ● General Output.
	Y4-	33	
Y5	Y5+	40	● Servo ready output. Output servo ready signal when the drive is ready to be controlled and without alarm. ● General Output.
	Y5-	41	
Y6	Y6+	14	● In position signal output, output signal when in position, and the position error less than set value in position mode. ● Tach out output. Tach output, produces pulses relative to the motor position with configurable resolution. ● General Output.
	Y6-	13	
Encoder pulse feedback Output	AOUT+	21	The encoder feedback phase A line drive output.
	AOUT-	22	
	BOUT+	48	The encoder feedback phase B line drive output.
	BOUT-	49	
	ZOUT+	23	The encoder feedback phase Z line drive output.
	ZOUT-	24	
ZOUT	19	The encoder feedback phase Z output.(Open collector)	
+10V Output	+10V User	20	+10Vdc user ,max 100mA
	USER_GND	25	+10Vdc user Ground

3.7.3 Encoder Feedback Output

M2 series AC servo drive can output encoder A/B/Z phase as differential output signals through line driver. The output signal is 5V, A/B signals are 10000 pulse/rev, Z signal is 1pulse/rev.

The host must use line receiver to receive the signals. Please use twist pair wires for signal transfers.

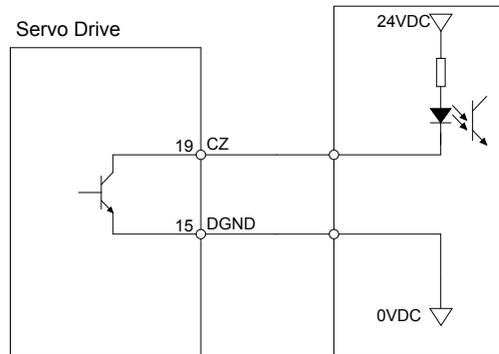
3.7.3.1 A/B/Z Wiring Method



NOTE:Please make sure the host controller and the servo drive have a same ground.

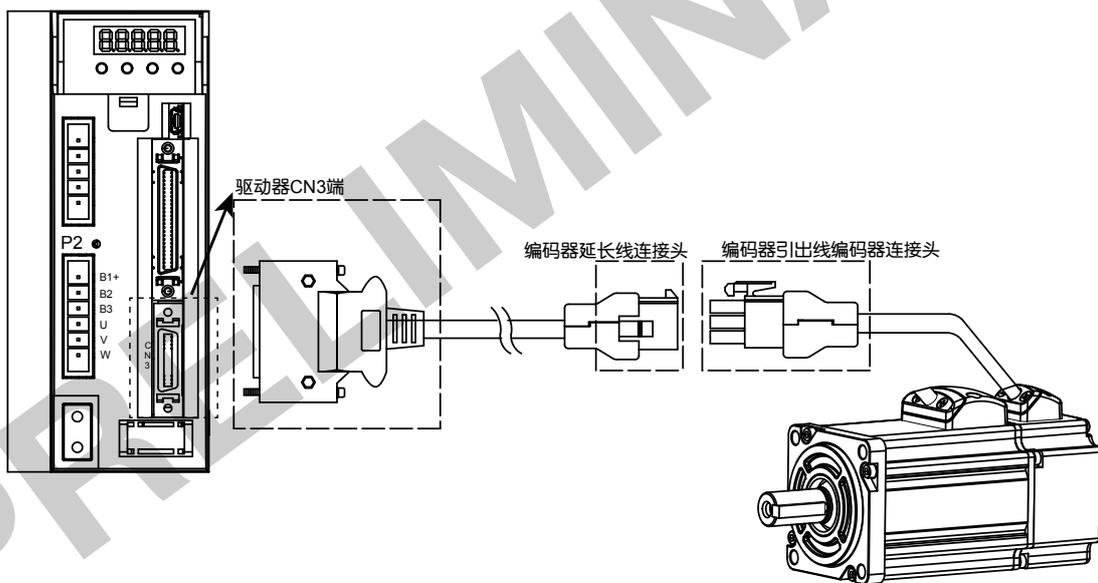
3.7.3.2 Phase Z Open Collector Output

In M2 series AC servo drive, encoder signal Z uses open collector output circuitry. Due to the narrow bandwidth of encoder signal Z, please use high speed optocoupler circuitry for the host receiver.



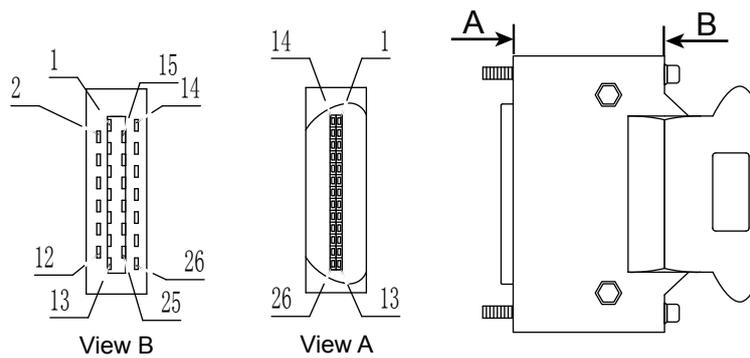
3.8 Encoder Connector CN3

3.8.1 Motor Encoder Feedback Cable Configuration



NOTE: Please refer to section 3.8.4 Encoder Connector Specifications for details.

3.8.2 The Layout of CN3 Connector

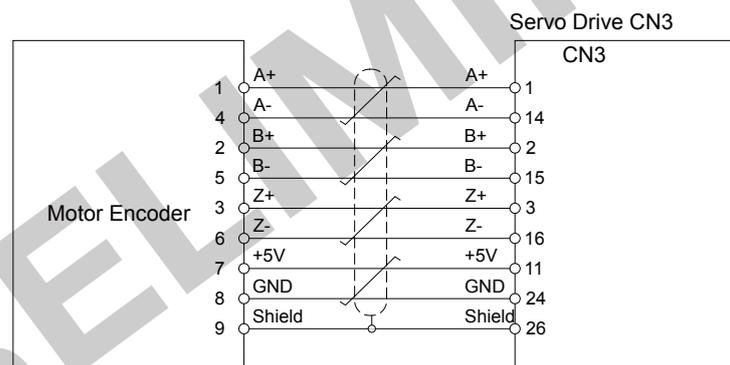


3.8.3 Descriptions of Encoder Connector CN3

Pin NO.	Symbol	Description
1	A+	Encoder A+
2	B+	Encoder B+
3	Z+	Encoder Z+
4	U+	Hall U+
5	W+	Hall W+
6	U-	Hall U-
7	W-	Hall W-
11	Encoder +5V	Encoder power supply +5V
13	Encoder +5V	Encoder power supply +5V
14	A-	Encoder A-
15	B-	Encoder B-
16	Z-	Encoder Z-
17	V+	Hall V+
19	V-	Hall V-
24	GND	Encoder power supply ground
26	Shield	Shield

3.8.4 Connect to Motor Encoder

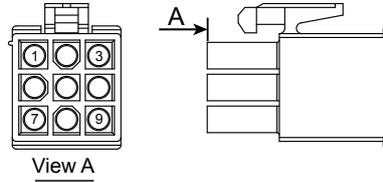
A. Connect to 2500ppr Increment Encoder (9PIN AMP connector)



3.8.5 Specifications of Encoder Connector

A. 9PIN AMP Connector

◆ PIN Assignment



PIN#	Signal	Colour
1	U+/A+	Blue
2	V+/B+	Green
3	W+/Z+	Yellow
4	U-/A-	Yellow/Black
5	V-/B-	Green/Black
6	W-/Z-	Yellow/Black
7	+5V	Red
8	GND	Black
9	Shield	Shield

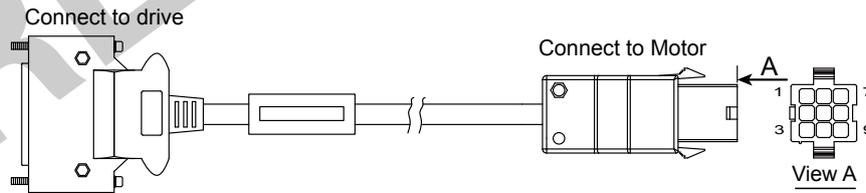
NOTE: HALL signal U/V/W will only appear for 1.5 seconds when encoder power is applied, and it will switch to A/B/Z signals after.

◆ Specification of 9PIN AMP Connector

Type	Plug of the Motor	Housing for the motor
Housing	AMP 172169-1	AMP 172161-1
Crimp	AMP 770835-1	AMP 770834-1

3.8.6 Wiring Diagram of Motor Encoder Extend Cable

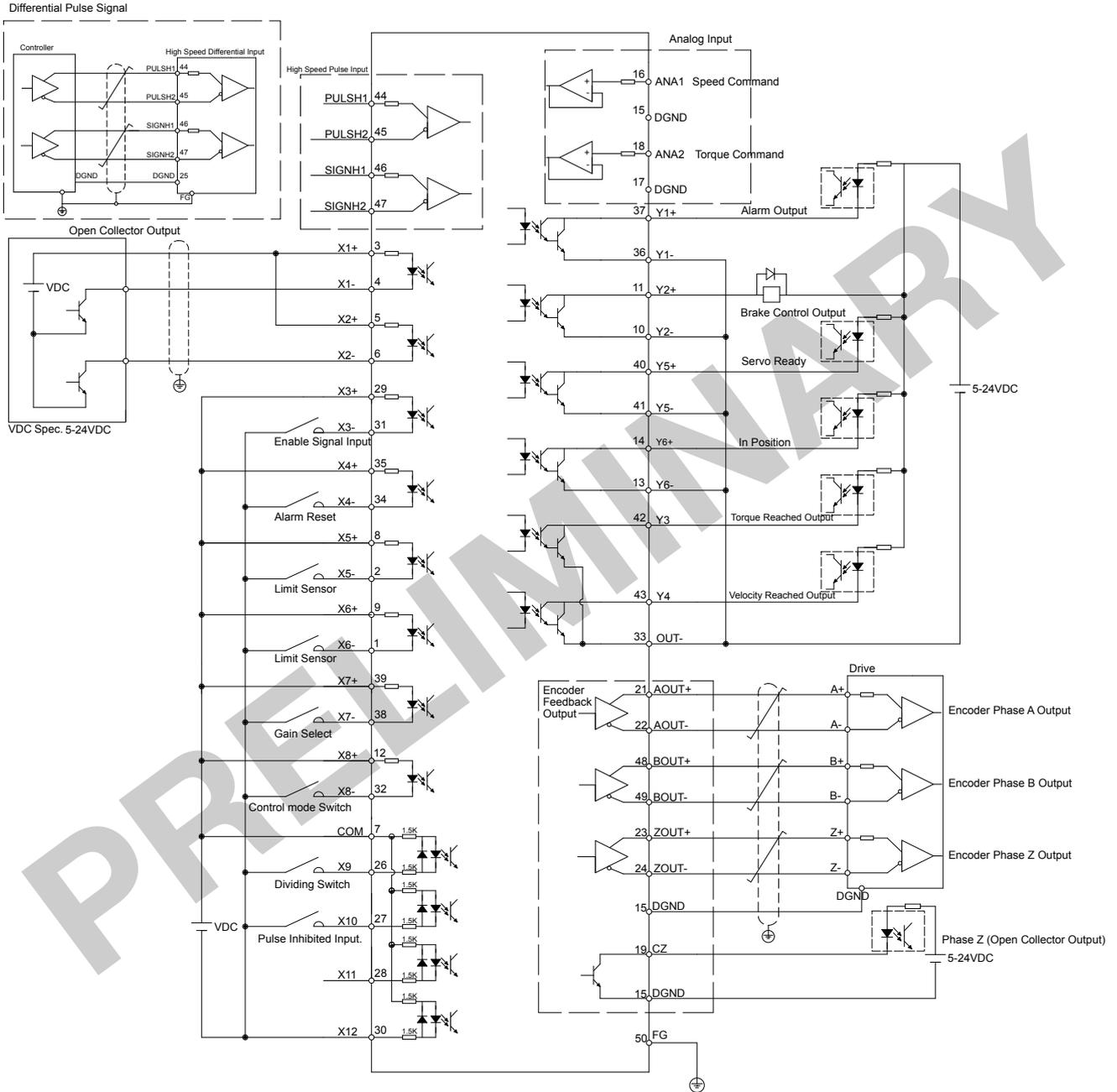
A. Diagram of 9PIN Encoder Cable



Drive Side	Signal	Colour	Housing for the motor
3M 26PIN PIN脚			AMP 172161-1
1	A+/U+	Blue	1
2	B+/V+	Green	2
3	Z+/W+	Yellow	3
14	A-/U-	Yellow/Black	4
15	B-/V-	Green/Black	5
16	Z-/W-	Yellow/Black	6
11	+5V	Red	7
24	GND	Black	8
26	Shield	Shield	9

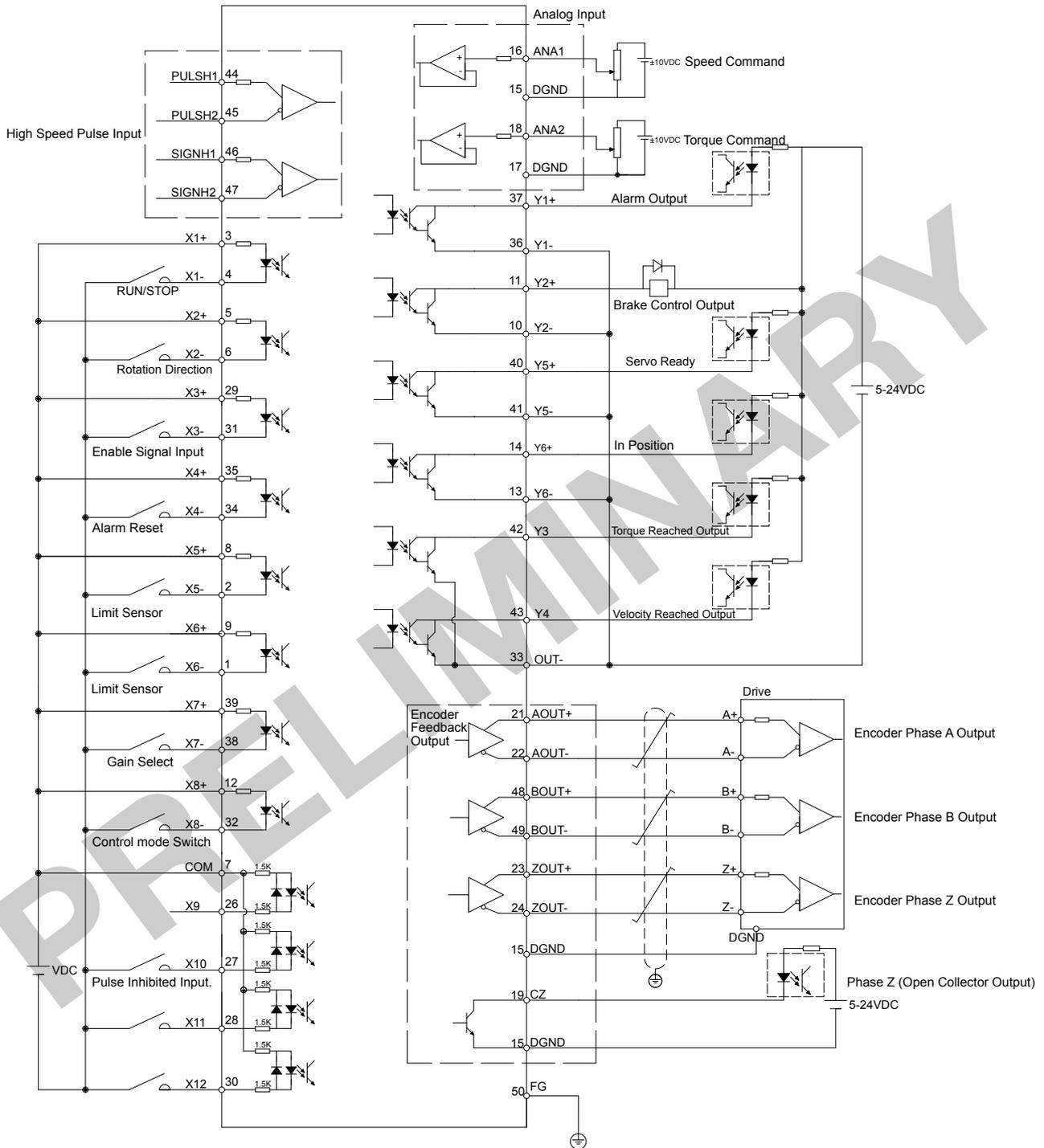
4 Control Block Diagram

4.1 Position Mode



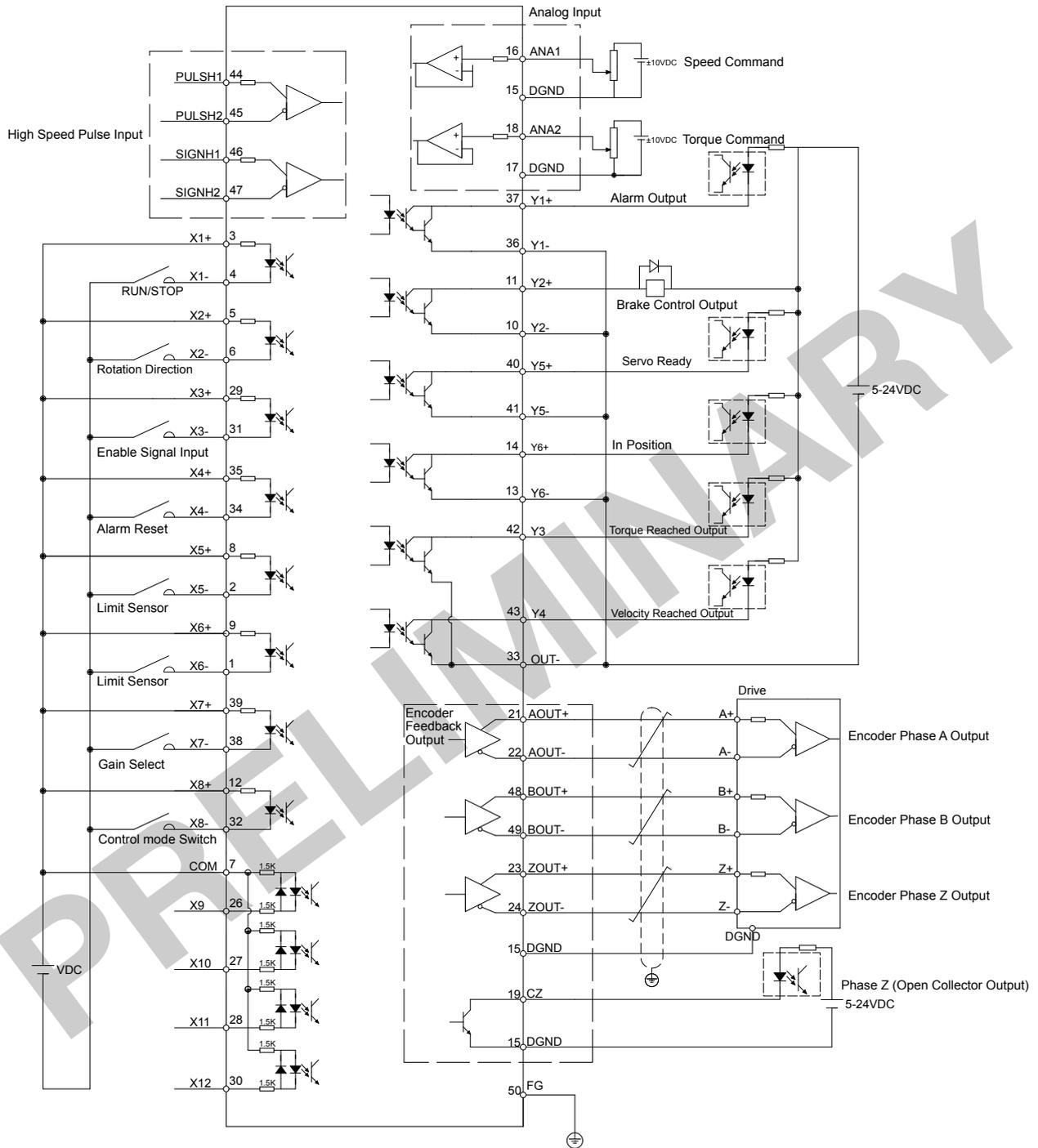
Note:VDC Spec. 5~24VDC

4.2 Speed Mode



Note:VDC Spec. 5~24VDC

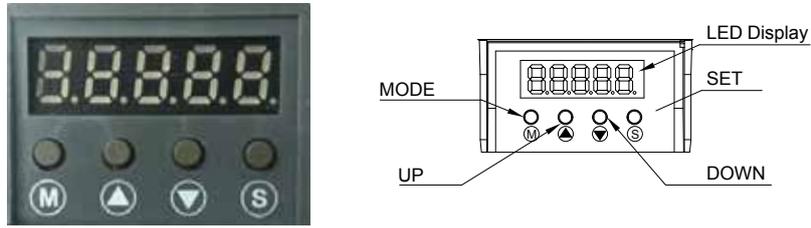
4.3 Torque Mode



Note:VDC Spec. 5~24VDC

5 Display and Operation

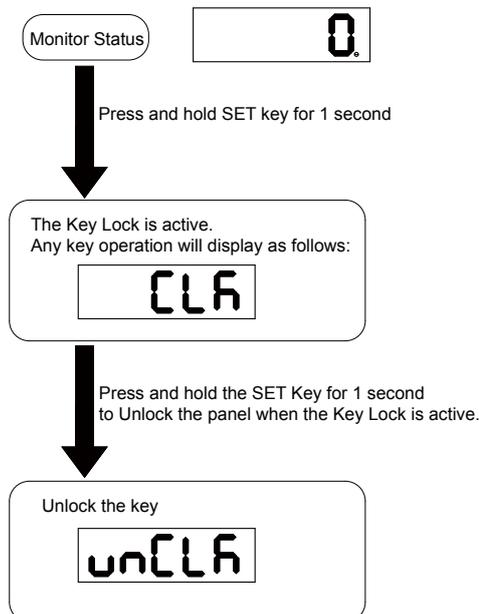
5.1 Description of Operation Panel



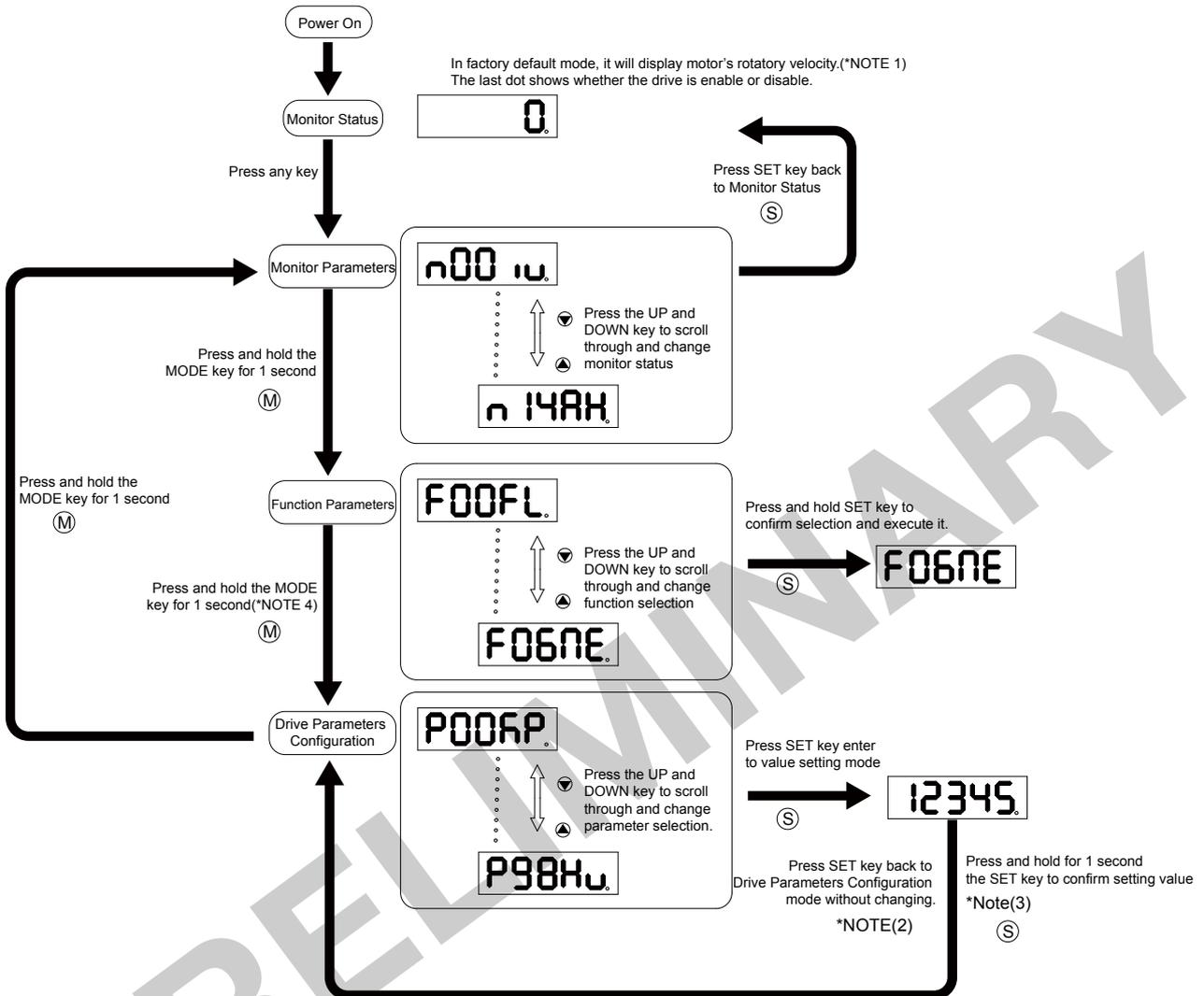
Symbol	Name	Details
	LED Display	The LCD display (5 digits, 7 segments) show the drive's operating condition and warning codes, parameters and settings values.
	MODE Key	Press and hold on mode button to switch LED display mode a). monitoring mode b). monitoring selection mode c). function selection mode d). parameter setting mode When editing the parameters, press on MODE button can move the cursor to the left and then change parameters by using arrow keys.
	UP/DOWN Key	UP and DOWN Key. Pressing the UP and DOWN key can scroll through and change monitor codes, parameter groups and various parameter settings.
	SET Key	Press to entering mode Press and hold to save parameters/settings

5.2 Key Lock

M2 series AC servo drive has Key Lock function to prevent unexpected operation. When the key is locked, the panel can not be operated or set any parameters.



5.3 Key Operation Flowchart



***NOTE:**

- 1) When power is applied, drive's display will show customer defined monitoring mode. In factory default mode, it will display motor's rotatory velocity.
- 2) In parameter setting mode, press set **[S]** key will quit from parameter setting mode, and return back to parameter selection mode, and changes will not be saved.
- 3) In parameter setting mode, press and hold set **[S]** button will confirm and save current parameter setting. This will effect immediately, however, this change will not save to drive's Flash. If parameter is required for permanent use, please go to function mode "F04ER", and then press and hold set **[S]** button to save the parameter change.

6 Preoperational mode

When preoperational mode is working, please disconnect servo motor from any mechanical system to prevent any damages and accidents. Please performs this operation under no load condition.

6.1 Inspection Before Trail Tun

In order to avoid any accidents and damages to servo drive and mechanical systems, we strongly recommend following safety checks before you turn on the drive.

1) Connection inspections

Please ensure secure wirings for power connector P1, motor connector P2, Encoder connector CN3, communication connector CN1. Ensure wirings corrections, and wires are correctly insulated(not short circuit) for all connectors.

Ensure ground wire from power connector P1, and motor connector P2 are securely connected(screwing) to the shield ground.

2) Power supply inspection

Check and ensure voltage supplies between L1/L2/L3, meets drive's power supply specifications. Check and ensure voltage between L1C/L2C are within the correct supply voltage range.

3) Ensure secure installation of servo drive and motor.

4) Ensure no load is installed on the servo motor.

6.2 Trail Run Procedure

Step	Details	Description
1	Please fix and sure the motor as well as possible 	1) The motor can be installed on the machine. 2) Ensure no load is installed on the servo motor.
2	Please ensure the wiring between the drive and motor is correctly.	1. Terminal U,V,W and FG must connect to Red, Yellow, Blue and Yellow/Green cable separately(U:Red,V:Yellow,U:Blue,FG:Yellow/Green).If not connect to the specified cable and terminals,then the drive cannot control motor. 2.Ensure to connect encoder cable to CN2 connector correctly.
3	Please make sure the main power circuit wiring connect correctly.	Refer to Section 3.1 Connecting to Peripheral Devices to confirm the main power circuit wiring connect correctly.
4	Supply the Power	Don't supply 380VAC power supply into the servo system.
5	The LED Display will show as follows without alarm:  When the alarm occurs, it will display:  	1. When the power is on ,the normal display should be shown without any alarm codes and the drive is disabled. 2. If display shows alarm codes such as r-08 and r-09.It means that the encoder feedback connection is incorrectly. Check if the encoder wiring of servo motor is loose or incorrect.
6	User need to setup a motor brake control circuit when using a electromagnetic brake motor.	Please refer to Section 3.4 Electromagnetic Brake for more details.
7	Motor Configuration	Configure the correct motor that has been used with the M2 Servo Suit or the operation panel.
8	JOG Trail Run without Load	You can continue to do JOD trail run if all the steps above mentioned are correct.

6.3 Motor Configuration Manually

Before JOG mode operation, M2 series AC servo drive requires motor configuration setup. To confirm your motor specification, please refer to chapter 2.3.

For more MOONS' motor information, please refer to appendix 1.

For example: To setup a drive for model: SM0402AE4-KCD-NNV09 motor. these are the following steps:

Step	Display	Details
1	FOOFL	Press M into the Function Parameters mode at the Monitor Status mode
2	F07NC	Press the ▲ and ▼ key to select F07(MC)
3	200-9	Press S key into value setting mode.
4	100-9	Press ▲ 、 ▼ key to change value.
5	≡RUEd	Press and hold S key for 1 second to confirm motor configuration.
6	F07NC	
7		Parameter is effective only after the servo drive is restarted.

6.4 Operations of JOG Mode

Step	Display	Details
1	POORP	Press M to switch the Monitor Status mode into the Drive Parameters Configuration mode
2	P61E.	Scroll ▲ 、 ▼ key to select parameter P61(SI)
3	2	Press S key into value setting mode
4	3	Scroll ▲ 、 ▼ key to change values.
5	≡Et	Press and hold S key for 1 second to confirm the setting value.
6	FOOFL	Press M key into the Function Operation mode.
7	F06NE	Scroll ▲ 、 ▼ key to select Function F06(MC) to enable the motor.
8	F06NE	Press and hold SET key for 1 second, the drive will be enabled. The last dot will light to shows the drive is enabled.
9	FOICJ	Scroll the ▲ 、 ▼ key into function F01(CJ) to run JOG mode.
10	JoG	Press the S key into JOG mode
11	J--CH	Press the ▲ key ,the motor will rotate at CW direction with the speed 1rps.
12	J-CCB	Press the ▼ key ,the motor will rotate at CCW direction with the speed 1rps.
13	JoG	Press the S key to stop the motor
14	FOICJ	Press the M key back to the Function Operation mode.

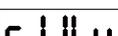
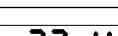
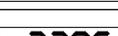
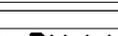
7 Troubleshooting

When power is applied, if any of the following warnings are detected, the LED display of the drive will switch into warning or fault display mode immediately.

If more than one warning is detected, you can scroll through by press  up /down  button.

Press  m/s  button will clear the warnings and back to pervious display mode.

7.1 Drive Alarm List

LED display	Description	Alarm type	Drive status after alarm occurs
	Drive over temperature	Fault	Servo off
	Internal voltage fault	Fault	Servo off
	Over voltage	Fault	Servo off
	Over current	Fault	Servo off
		Fault	Servo off
		Fault	Servo off
	Bad hall sensor	Fault	Servo off
	Encoder error	Fault	Servo off
	Position error	Fault	Servo off
	Low voltage	Fault	Servo off
	Velocity limited	Warning	No change to drive's staus
	CW limit or CCW limit activated	Warning	No change to drive's staus
	CW limit is activated	Warning	No change to drive's staus
	CCW limit is activated	Warning	No change to drive's staus
	Current limit	Warning	No change to drive's staus
	Communication error	Warning	No change to drive's staus
	Parameter save failed	Warning	No change to drive's staus
	Phase loss of the main circuit	Warning	No change to drive's staus
	STO is activated	Warning	Servo off
	Regeneration failed	Warning	No change to drive's staus
	Low voltage	Warning	No change to drive's staus
	Q program is empty	Warning	No change to drive's staus
	Move when the drive is disabled.	Warning	No change to drive's staus

7.2 Drive alarm reason and solutions

LED display	Description	Alarm type	Processing method
r01ot	Drive over temperature	Temperature of the heat sink or power device has been risen over the specified temperature. 1. Ambient temperature has risen over the specified temperature. 2. Over-load	1. Improve the ambient temperature and cooling condition. 2. Increase the capacity of the driver and motor. Set up longer acceleration/ deceleration time. Lower the load
r02ur	Internal voltage fault	Drive internal voltage failure.	1. Please check supply power voltage 2. Please replace the drive with a new one, and contact MOONS
r03uH	Over voltage	Drive DC bus volatage is too high 220V series : 420V 1. Power supply voltage has exceeded the permissible input voltage. 2. Disconnection of the regeneration discharge resistor 3. External regeneration discharge resistor is not appropriate and could not absorb the regeneration energy. 4. Failure	Measure the voltage between lines of connector (L1, L2 and L3). 1. Enter correct voltage. 2. Measure the resistance of the internal regeneration resistor. 3. please measure the external resistor, Replace the external resistor if the value is ∞ . 4. Please contact MOONS or replace the driver with a new one.
r04HC r05LC r06rC	Over current	1. Failure of servo driver (failure of the circuit, IGBT or other components) 2. Short of the motor wire (U, V and W) 3. Burnout of the motor 4. Poor contact of the motor wire. 5. Input pulse frequency is too high. 6. Motor is over load, command output torque is larger than specified torque, for a long operating time. 7. Poor gain adjustment cause motor vibration, and abnormal nosie. 8. Machine has collided or the load has gotten heavy. Machine has been distorted. 9. Welding of contact of dynamic braking relay due to frequent servo ON/OFF operations.	1. Turn to Servo-ON, while disconnecting the motor. If error occurs immediately, replace with a new driver. 2. Check that the motor wire (U, V and W) is not shorted, and check the branched out wire out of the connector. Make a correct wiring connection. 3. Measure the insulation resistance between motor wires, U, V and W and earth wire. In case of poor insulation, replace the motor. 4. Check the balance of resister between each motor line, and if unbalance is found, replace the motor. 5. Check the loose connectors. If they are, or pulled out, fix them securely. 6. Adjust gain value settings. 7. Measuring brake voltage 8. Check drive and motor encoder and power wires. 9. please contact MOONS.
r08Hb	Bad hall sensor	Hall sensor fault	1. please check encoder connection 2. please check your drive motor configurations.
r09Eb	Encoder error	Encoder signal fault	please check encoder connection.
r10PL	Position error	Position error value exceeds the position error range set by parameter P-43 (PF).	1. Please check parameter P-43 (PF). 2. Please check drive gain value settings. 3. Please check the load factor of the regeneration resistor, increase the capacity of the driver and the motor, and loosen the deceleration time
r11Lu	Encoder error	1. Power supply voltage is low. Instantaneous power failure has occurred 2. Lack of power capacity...Power supply voltage has fallen down due to inrush current at the main power-on. 3. Failure of servo driver (failure of the circuit)	Measure the voltage between lines of connector and terminal block L1,L2,L3. 1. Increase the power capacity. Change the power supply. 2. please check connections between L1,L2,L3. Please refer to 4.1.5 drive power connection 3. please cpntact MOONS

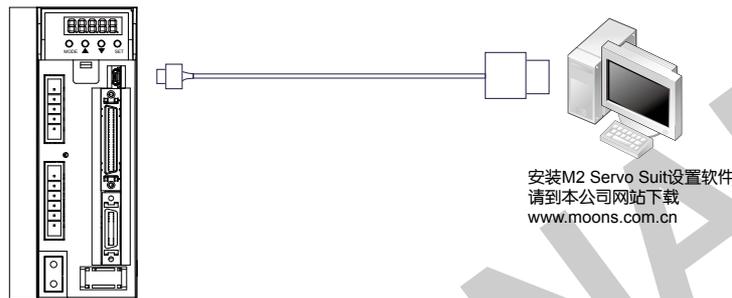
r120u	Position error	Motor rotary velocity exceeds parameter P-19 (VM) setting value.	Please check motor velocity command if it is within the P-19 (VM) range. 1. Avoid high velocity command 2. Check the command pulse input frequency and division/multiplication ratio. 3. Make a gain adjustment when an overshoot has occurred due to a poor gain adjustment. 4. Make a wiring connection of the encoder as per the wiring diagram.
r13Ll	CW limit or CCW limit activated	CW and CCW limit is ON	1. External limit switch is triggered. 2. Check x5 and x6 limit settings, please refer to chapter7.1.3 Cw/ccw limit.
r14LL	CW limit is activated	CCW limit triggered	1. External limit switch is triggered. 2. Check x5 and x6 limit settings.
r15JL	CCW limit is activated	CW limit triggered	
r16CL	Current limit	Driver's output current exceeds setting value P-18 (CP) 1. Load was heavy and actual torque has exceeded the rated torque and kept running for a long time. 2. Oscillation and hunching action due to poor gain adjustment. Motor vibration, abnormal noise. 3. Machine has collided or the load has gotten heavy. Machine has been distorted.	1. Make a gain re-adjustment. 2. Increase the capacity of the driver and motor. Set up longer acceleration/ deceleration time. Lower the load. 3. Check motor wirings for U/V/W as red/ yellow/bule.
r17CE	Communication error	Drive and host communication error.	Please check wiring connection, and drive's communication address and baud rate setting.
r18EF	Parameter save failed	Saving parameter failure.	1. Please try to save again. 2. if problems is not solved, please contact MOONS
r19LP	Phase loss of the main circuit	---	---
r20to	STO is activated	Safety torque off function is activated. Either or both safety input 1 or 2 is ON.	Please confirm safety input 1 and 2 wiring configuration. Please check Safety sensor setting.
r21rf	Regeneration failed	Regenerative energy has exceeded the capacity of regenerative resistor. 1. Due to the regenerative energy during deceleration caused by a large load inertia, converter voltage has risen, and the voltage is risen further due to the lack of capacity of absorbing this energy of the regeneration discharge resistor. 2. Regenerative energy has not been absorbed in the specified time due to a high motor rotational speed.	1. Internal resistor value is smaller than required, cannot absorb the regeneration energy. 2. Please check external regeneration resistor connections. 3. Reduce rotary velocity and decrease acceleration and deceleration value.
r22uH	Low voltage	Drive voltage lower than 170VDC 1) Power supply voltage is low. Instantaneous power failure has occurred 2) Lack of power capacity...Power supply voltage has fallen down due to inrush current at the main power-on. 3) Failure of servo driver (failure of the circuit)	1) Increase the power capacity. Change the power supply. 2) Please check I1, I2, I3 power connections, please refer to 4.1.5 P1 drive power connection. 3) please contact moons.
r239E	Q program is empty	Drive in Q mode, but Q program is empty.	1. Please check Q program. 2. Please check operation mode correction. 3. Please check Q program coding, make sure no faults to stop the program running.
r24dd	Move when the drive is disabled.	Motion command is received while motor is disabled.	Please enable the motor, and send the command again.

8 Configuration by Personal Computer

In order to ensure servo drive and motor meets your operation requirements, we strongly recommend customers to use “M servo suite” for following configuration setups:

1. Servo Motor model selection and configuration
2. Operational mode selection
3. Define drive's input/output mode
4. Apply auto tuning function on PID parameters for optimized motor performance.

Connect to Personal Computer



Interface of M2 Servo Suit

Configuration Steps	Details
Step 1	Motor Configuration
Step 2	Select Control Mode
Step 3	Further configuration 1
Step 4	Further configuration 2
Step 5	I/O configuration

9 Appendix

Appendix 1: Motor Model Display

LED Panel	Model
50-F	SM0401AE2-KCD-NNV
100-F	SM0402AE2-KCD-NNV
200-F	SM0601AE2-KCD-NNV
400-F	SM0602AE2-KCD-NNV
250-F	SM0801AE2-KCD-NNV
500-F	SM0802AE2-KCD-NNV
750-F	SM0803AE2-KCD-NNV
50-9	SM0401AE4-KCD-NNV
100-9	SM0402AE4-KCD-NNV
200-9	SM0601AE4-KCD-NNV
400-9	SM0602AE4-KCD-NNV
250-9	SM0801AE4-KCD-NNV
500-9	SM0802AE4-KCD-NNV
750-9	SM0803AE4-KCD-NNV

Appendix 2: LED Character Reference

1	2	3	4	5	6	7	8	9	0
1	2	3	4	5	6	7	8	9	10
A	b	C	d	E	F	G	H	I	J
A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T
K	L	M	N	O	P	Q	R	S	T
U	v	W	X	Y	Z				
U	V	W	X	Y	Z				

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