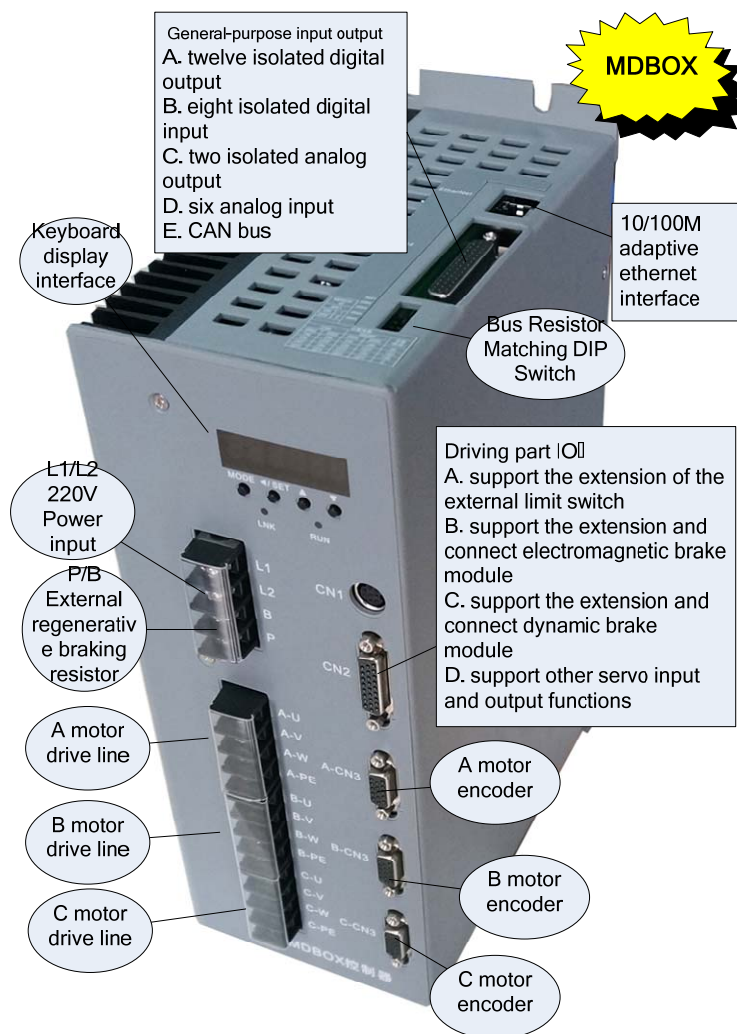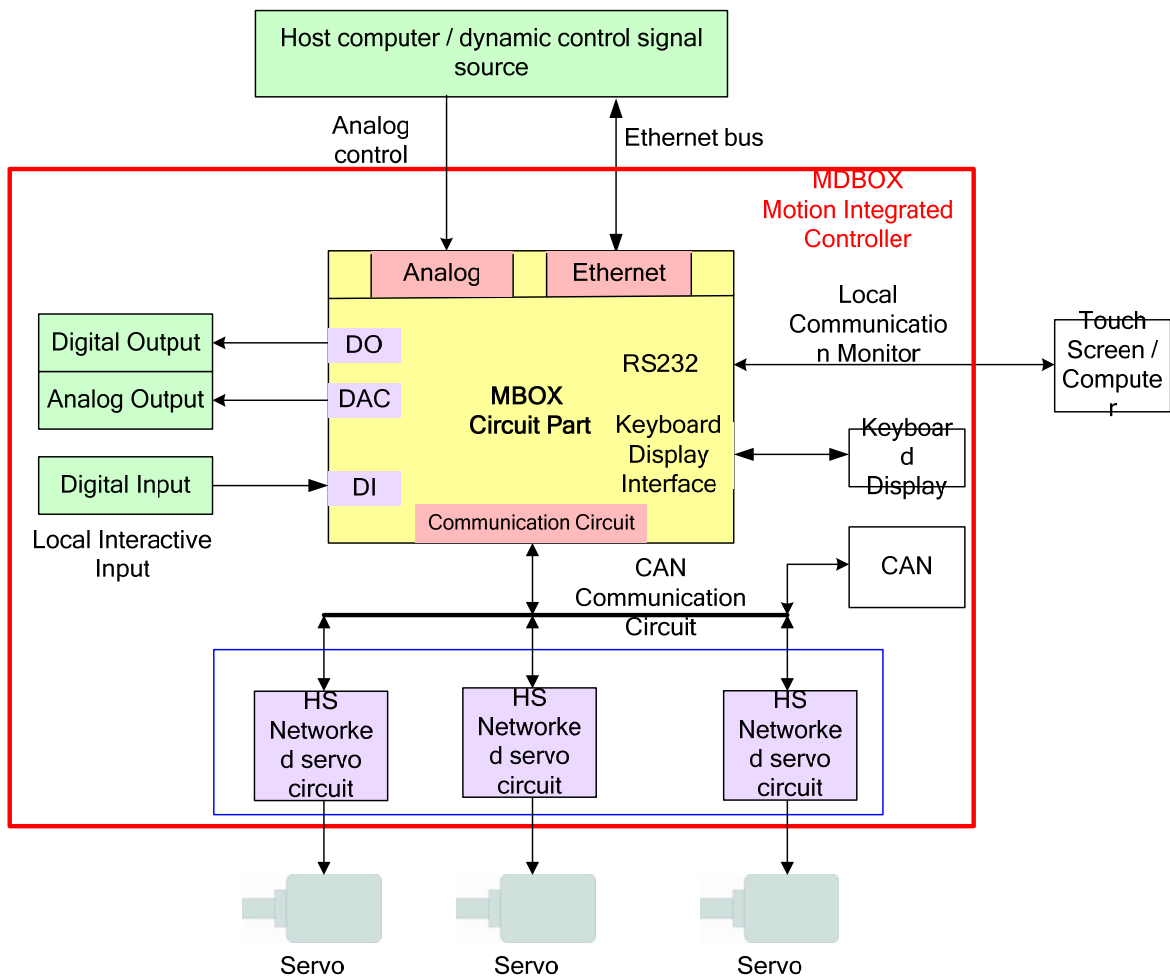# SYNTRON

MDBOX Motion Platform Integrated Control System

MDBOX Motion Platform Integrated Control System and Principle Diagram

MDBOX motion platform integrated control system is designed and developed for motion platform industry by Beijing Hollysys Electric Technology Co., LTD. It maintains all the features of first-generation MBOX products and is subtly combined with HS servo drive. It is widely used for motion simulation, robotics, four D dynamic seat, six-degree platform and other occasions.

General-purpose input output
A. twelve isolated digital output
B. eight isolated digital input
C. two isolated analog output
D. six analog input
E. CAN bus

MDBOX

Keyboard display interface

10/100M adaptive ethernet interface

Bus Resistor Matching DIP Switch

Driving part IO
A. support the extension of the external limit switch
B. support the extension and connect electromagnetic brake module
C. support the extension and connect dynamic brake module
D. support other servo input and output functions

L1/L2 220V Power input

P/B External regenerative braking resistor

A motor drive line

B motor drive line

C motor drive line

A motor encoder

B motor encoder

C motor encoder

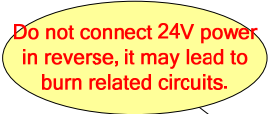## Technical Features of MDBOX Motion Platform Integrated Control System

◆ **Servo Drive**

➢ CAN bus motion control functions: position / speed / torque control, mode switch

➢ Fast CLA kernel processor of current loop floating point, good dynamic response

➢ Built-in grid voltage compensation control, automatically adapt to the fluctuations of grid voltage.

➢ Built-in two selectable resonant low pass filtering and two resonant notch filter.

➢ Built-in intelligent regenerative braking control technology

➢ Built-in torque observer technology, automatically adapt to load changes

➢ Gain control or internal adaptive matching

➢ With automatic load shedding algorithm

➢ Support MODBUS protocol RS485 communication interface

➢ Support CAN bus interface for customization

- Control ports support software distribution methods, logic settings, programmable filter
- Two analog outputs can observe internal status of drive, it is convenient for on-site commissioning
- Built-in electromagnetic brake control, to provide security for motion platform
- Built-in over-current, over-voltage protection, ensure reliable drive
- With reliability management functions of fault record

◆ Networked Motion Control

- 100M Ethernet interface, highly scalability and simply field wiring
- Flexible and convenient networking
- With six ADC input interface, realizes analog motion control
- Twelve digital outputs, supports the digital effects control of programmable parameters
- Two analog output, supports continuous analog effects control
- Eight digital input signal interface multifunctional applications
- Supports full unlimited switch mode
- Easy monitoring and diagnosis
- With RS232 interface, support MODBUS protocol devices
- With a keyboard display interface, can monitor and modify motion control status parameters in real time
- The information about position, speed, load rate and control status from each servo motor can be fed back to the host computer. Depending on the specific conditions, set the operating parameters of the application communication controllers.
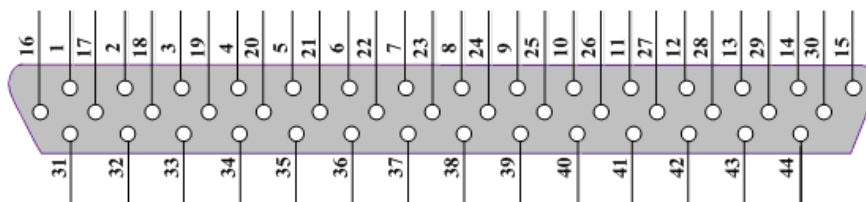- Support emergency stop
- High reliability and cost-effective

Wiring for MDBOX power terminals

Name		Function	Note
L1 / L2		220V single-phase AC input terminal	Recommend an external independent air switch, easy to use in the field
P / B		P/B connect an external braking resistor	Capacity standard configuration for external braking resistor is 100W/50 Ohm
A	U / V / W	A motor drive output terminals	Be consistent with motor sequence while wiring
	PE	A motor grounding terminal	Ground Resistance ≤ 4Ω
B	U / V / W	B motor drive output terminals	Be consistent with motor sequence while wiring
	PE	B motor grounding terminal	Ground Resistance ≤ 4Ω
C	U / V / W	C motor drive output terminals	Be consistent with motor sequence while wiring
	PE	C motor grounding terminal	Ground Resistance ≤ 4Ω

Interface CN2 of MDBOX

RELAY1   RELAY2   RELAY3

+24v X+   Y+   Z+   XO+ YO+ ZO+
GND   X-   Y-   Z-   XO- YO- ZO-

Intermediate relay driving circuit board Relay 3

Product Code: 001673

Do not connect 24V power in reverse, it may lead to burn related circuits.

24V Power supply
24V+
24V-

Internal control

Digital Output One   CN2

X Axis Digital Output

24V+
24V-

X-axis winding motor with brake

I / O Interface CN4 of MDBOX

16 1 17 2 18 3 19 4 20 5 21 6 22 7 23 8 24 9 25 10 26 11 27 12 28 13 29 14 30 15

31 32 33 34 35 36 37 38 39 40 41 42 43 44

◆ Twelve Digital Output Signal Interfaces and Usage

Definition	Pin	Notes
M-SOUT1	CN4-6	Digital Output One
M-SOUT2	CN4-7	Digital Output Two
M-SOUT3	CN4-5	Digital Output Tree
M-SOUT4	CN4-22	Digital Output Four
M-SOUT5	CN4-4	Digital Output Five
M-SOUT6	CN4-21	Digital Output Six
M-SOUT7	CN4-3	Digital Output Seven
M-SOUT8	CN4-20	Digital Output Eight
M-SOUT9	CN4-2	Digital Output Nine
M-SOUT10	CN4-19	Digital Output Ten
M-SOUT11	CN4-1	Digital Output Eleven
M-SOUT12	CN4-18	Digital Output Twelve
M-COM-	CN4-23	Digital Output Common Cathode

Number	Description
Fn 080	Digital output mode: -1: Working Mode; 0: Test Mode for Output Logic 0; 1: Test Mode for Output Logic 1; 2: Switching Output Logic Test Mode
Fn 08x	DOx Digital Output Selection: 1: Forced Output; 0: Forced Closure; -1~-16: UdpDout Corresponding Bit Signal; -17~-32：UdpFifoDout Corresponding Bit Signal
Fn 08D	Output or Negated Control Bit Output 1 indicates negated.
Fn 08E	Initial Value of Digital Output
Fn 08F	Safety Value of Digital Output

◆ Two Analog Output Signal Interface and Usage

Definition	Pin	Notes
M-ISODAC1	CN4-44	Isolated Analog 1
M-ISODAC2	CN4-43	Isolated Analog 2
ISO-15V	CN4-42	Isolated Analog Output 15V Power（50mA Drive）
ISO-GND	CN4-41	Isolated Analog Output Reference Ground

MDBOX includes two analog output signals:

DAC Output can be used for Ethernet remote analog control and the output range of DAC is 0V～+10V。

Number	Description
Fn 011	DAC and PlayData synchronized operation flag is 1, and update DOUT data from the PlayData.

◆ Eight Digital Input Signal Interface and Usage

Definition	Pin	Notes
M-COM+	CN4-17	Digital Input common anode
M-SIN1	CN4-32	MBOX Digital Input 1
M-SIN2	CN4-33	MBOX Digital Input 2
M-SIN3	CN4-34	MBOX Digital Input 3
M-SIN4	CN4-35	MBOX Digital Input 4
M-SIN5	CN4-36	MBOX Digital Input 5
M-SIN6	CN4-37	MBOX Digital Input 6
M-SIN7	CN4-38	MBOX Digital Input 7
M-SIN8	CN4-39	MBOX Digital Input 8

Number	Description
Fn 09D	Input or Negated Control Bit Input。
Fn 090	Emergency stop input control, 0: Forced Closure; 1: Forced Enable; -1~-8: the enable is determined by the eight digital inputs.
Fn 091	Emergency stop method: 0: return to the initial position origin; 1: maintain the current position; 2: maintain X,Y,Z current average position; -n: maintain level Number n axis position. N=1,2,3

Definition	Pin	Notes
M-ADCIN1	CN4-8	Analog Position Command Input 1
M-ADCIN2	CN4-9	Analog Position Command Input 2
M-ADCIN3	CN4-10	Analog Position Command Input 3
M-ADCIN4	CN4-11	Analog Position Command Input 4
M-ADCIN5	CN4-12	Analog Position Command Input 5
M-ADCIN6	CN4-13	Analog Position Command Input 6
M-GND	CN4-24	Analog Signal Reference Ground
M-GND	CN4-25	Analog Signal Reference Ground
M-GND	CN4-26	Analog Signal Reference Ground
M-GND	CN4-27	Analog Signal Reference Ground
M-GND	CN4-28	Analog Signal Reference Ground
M-GND	CN4-29	Analog Signal Reference Ground
M-GND	CN4-30	Analog Signal Reference Ground
M-REF10V	CN4-14	10V Analog Reference Power

MDBOX includes six analog interfaces which can realize the analog signal from 0~10V to control each axis position independently.

Number	Description
Fn 0FF	Low-pass filtering time interval of analog position（Unit: ms）
Fn 100	Sampling interval of analog position（Unit: ms）
Fn 101	Analog input position 1 channel ADC zero drift
Fn 102	Analog input position 2 channel ADC zero drift
Fn 103	Analog input position 3 channel ADC zero drift
Fn 104	Analog input position 4 channel ADC zero drift
Fn 105	Analog input position 5 channel ADC zero drift
Fn 106	Analog input position 6 channel ADC zero drift
Fn 107	The corresponding motor hundred pulses / V of analog input 1 channel
Fn 108	The corresponding motor hundred pulses / V of analog input 2 channel
Fn 109	The corresponding motor hundred pulses / V of analog input 3 channel
Fn 10A	The corresponding motor hundred pulses / V of analog input 4 channel
Fn 10B	The corresponding motor hundred pulses / V of analog input 5 channel
Fn 10C	The corresponding motor hundred pulses / V of analog input 6 channel

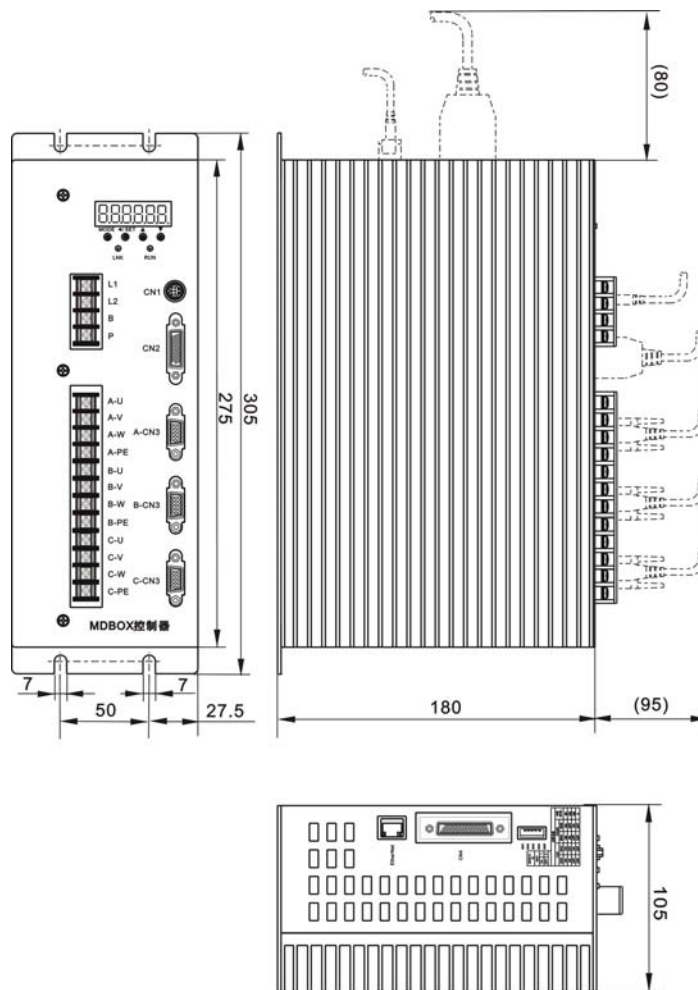◆ **CAN Bus Expansion Interface and Protective Ground PE of MDBOX**

Definition	Pin	Notes
CAN-H	CN4-31	CAN bus high
CAN-L	CN4-16	CAN bus low
PE	CN4-15	Drive Shell Protective Ground

Termination Resistor and Jumper Settings of MDBOX

Termination resistor and jumper settings of MDBOX				
CAN BUS		RS485 BUS		Total Resistance (ohms)
SW2	SW3	SW4	SW5	
ON	ON	ON	ON	60
ON	OFF	ON	OFF	120
OFF	ON	OFF	ON	120
OFF	OFF	OFF	OFF	NONE

Dimensions   [Unit：mm]

⦿ SYNTRON

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