

FUJI PROGRAMMABLE CONTROLLER

MICREX-F

ANALOG OUTPUT TYPE
POSITIONING MODULE

Type FGU120B

1. Precautions

Check the articles for any missing items or damage. If you notice any defects, advise the FUJI branch office where you purchased it from.

Please read this manual thoroughly before handling.

(1) Appearance check

Are there any defects or cracks?

(2) Accessories (Provided)

	Name	Type	Manufacturer	Amount	Use
1	Connector	MR-20F	Honda	2	Connector for X, Y axis servo system (P1) (P2)
	Cover	MR-20L	Honda	2	
2	Connector	FCN-361J024-AU	Fujitsu	1	External output signals (P3)
	Cover	FCN-360C024-E	Fujitsu	1	
3	Connector	FCN-361J008-AU	Fujitsu	1	For manual pulser (P4)
	Cover	FCN-360C008-E	Fujitsu	1	

2. Outline

When combining with the servo motors and this module, it performs the highly accurate actuation of positioning so that it can be vastly applied with FA, FMS and robot, etc.

The FGU120B is mounted on the base of the MICREX-F F80H / F120H series, and performs positioning with the servo motors.

By directing the distance of positioning and the rotational speed of the motor, that controls the positioning.

3. Specifications

3-1 Component Names and Functions

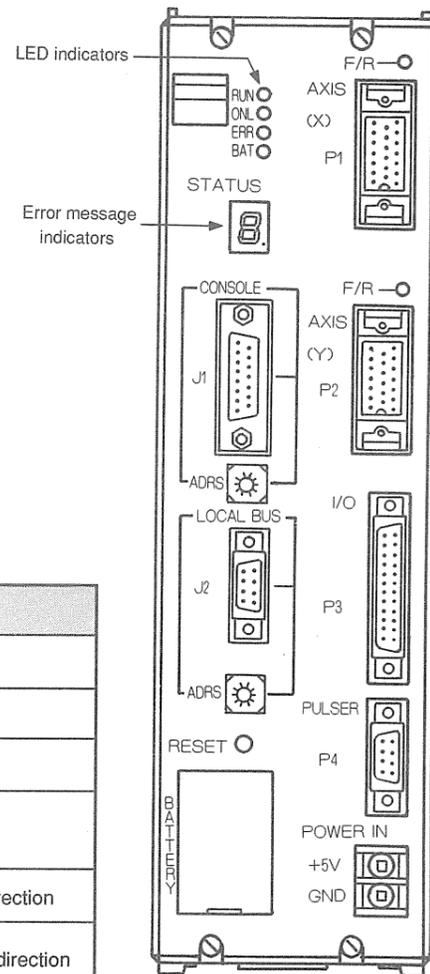
(1) Indicators

LED indicators

Name	Color	Description
RUN	Green	ON : CPU of FGU120B operates normally OFF : CPU of FGU120B does not operate
ONL	Green	ON : Program of FPU is in progress OFF : In operation from the positioning loader (ONLINE/OFFLINE)
ERR	Red	ON : CPU of FGU120B is abnormal OFF : (Normal)
BAT	Red	ON : Battery voltage is low (or unused) OFF : Battery voltage is normal
F/R	Green Red	Green : Motor is in clockwise rotation Red : Motor is in counterclockwise rotation

Error Message Indicators

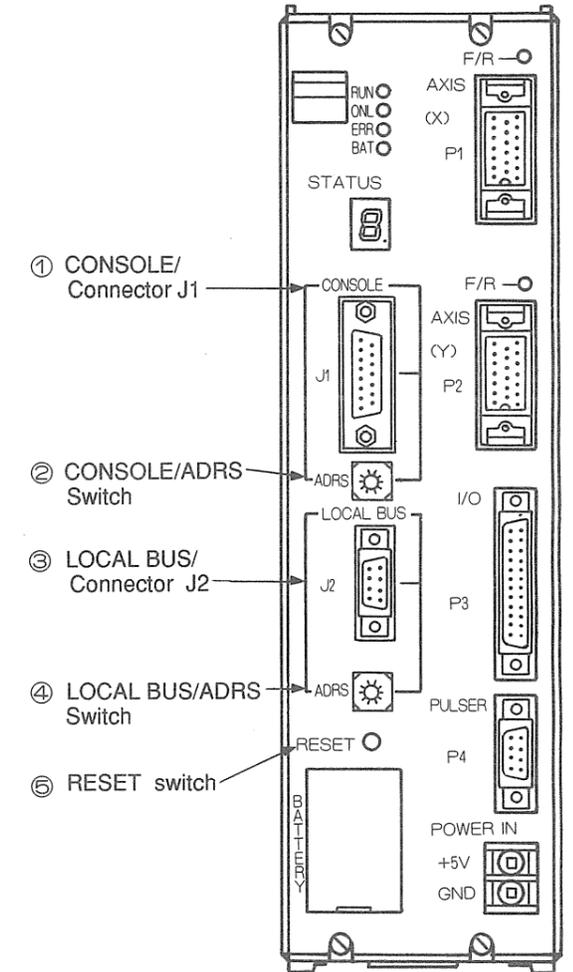
Indication	Error message	Indication	Error message
	(Normal)	<i>P</i>	System parameter is abnormal
<i>0</i>	Parameter is broken	<i>E</i>	Encoder is abnormal
<i>1</i>	Program is broken	<i>R</i>	Servo is not ready
<i>2</i>	Offset is over than 255 (over the limit of unit amount)	<i>L</i>	Loader communication error
<i>3</i>	Indirect data is broken	<i>U</i>	Over travel is detected in plus direction
<i>4</i>	Program does not exist in start step	<i>L</i>	Over travel is detected in minus direction
<i>5</i>	End is required on Program	<i>U</i>	Soft OT is detected in plus direction
<i>6</i>	Program is incorrect	<i>L</i>	Soft OT is detected in minus direction
<i>7</i>	Subroutine nesting is over than 10 levels	<i>o</i>	Deviation-over is detected
<i>8</i>	Prohibit direction of actuation is instructed	<i>F</i>	Simultaneous actuation is abnormal
<i>9</i>	Program is started without restoring origin	<i>P</i>	Clock is abnormal
<i>H</i>	Hardware-error of the FGU120B	<i>b</i>	Speed is abnormal
Radix Point	OFF : X axis is error ON : Y axis is error Flicks : Simultaneous error in both axes X and Y are detected	<i>d</i>	Communication error
		<i>≡</i>	Other error is detected



3. Specifications

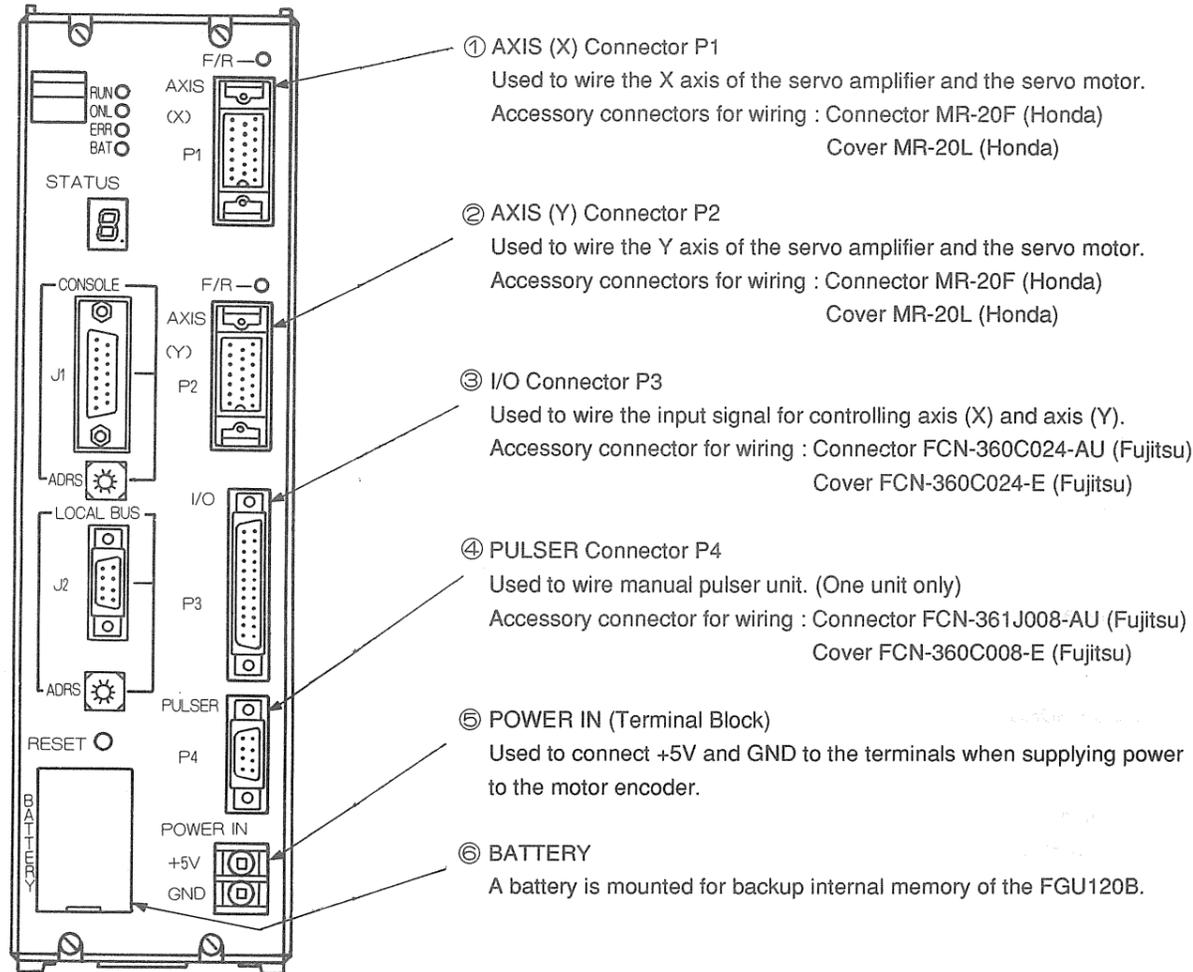
(2) Connectors

- ① CONSOLE/Connector J1
Used to connect the positioning loader FGD012A.
- ② CONSOLE/ADRS switch
Used to set self-diagnostic mode. (Use on "0")
- ③ LOCAL BUS/Connector J2
Used to connect the local-bus cable (optional) for simultaneous operation.
 (1) 2 units/4 axes simultaneous (Type FLC082AR5)
Length between connectors is 0.5 m.
 (2) 2 Units/4 axes simultaneous (Type FLC082A1)
Length between connectors is 1.0 m.
 (3) 3 Units/6 axes simultaneous (Type FLC083A1)
Length between connectors is 1.0 m.
 (4) 4 Units/8 axes simultaneous (Type FLC084A1)
Length between connectors is 1.0 m.
- ④ LOCAL BUS/ADRS switch
Used to set an address of FGU local bus.
- ⑤ RESET switch
Used to reset FGU120B system.



3. Specifications

(3) Connectors for wiring



3. Specifications

3-2 Specification List

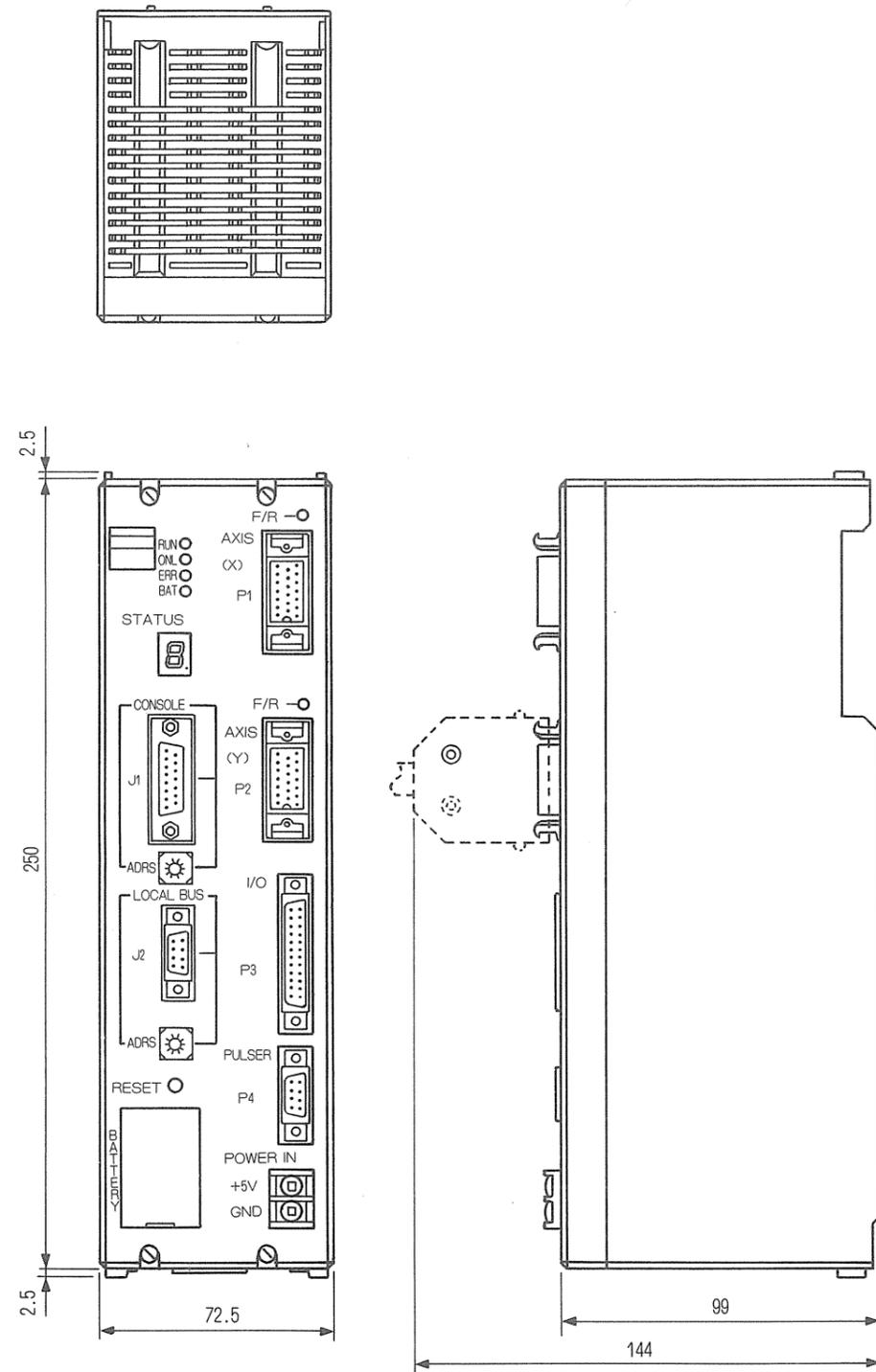
(1) Standard Specifications

Item	Specification
Construction	Panel-mounting type
Cooling	Self-cooling type
Ambient temperature	0 to +55°C
Ambient humidity	20 to 90% RH (No-condensation)
Storage temperature	-20 to +70°C
Atmosphere	Free from corrosive gases
Vibration	Conforming to JIS C 0911 (frequency 57Hz, 9.8 m/s ² {1G})
Shock	Conforming to JIS C 0912 (test method 1-NO.3)
Noise immunity	1500 Vp-p, rise 1ns, pulse width 1μs (noise simulator)
Insulation resistance	10MΩ (500V DC megger)
Grounding	Grounding resistance of 100Ω or less
Surge immunity	5kV;1.2x50μs (excluding DC power supply)

(2) Function Specifications

Item	Specification	Remarks
Appearance	FTU style (2 slots type)	
No. of control axes	2 axes (Independent simultaneous, interpolation control)	
Peripheral device	Positioning loader (Console)	Besides editing program, displaying of current position is possible.
Program capacity	Total of 1000 steps for 2 axes	Backup battery is provided.
Operational method	1) Single operation per step 2) Multioperational of consecutive steps	Direct M output function is available.
Positioning control	1) Feedback control by software 2) Feedforward control software deviation counter	
Characteristics of acceleration / deceleration	1) S pattern, 2) Linear, 3) Index	
Interpolation function	1) Linear interpolation of 2 axes 2) Circular arc interpolation of 2 axes	During interpolation control, index is accelerated or decelerated.
Position data	Max. ±79999999 (8 digits)	
Response frequency	Max. 500Hz <i>120kHz</i>	
Control output	Analog voltage can be set within ±3V to ±12V. Max.	For the servo speed command.
Position detector	Encoder (Phase A, B and Z) with line driver	
Internal function	1) Origin restoring, origin shifting 2) Override (Notch of 10%, 15 pattern) 3) Pulse revision (A/B: each 1 to 79999999, however 0.05<A/B<1) 4) Back rush revision (0 to 255) 5) Magnification of manual pulser (x1, xn) 6) Others	

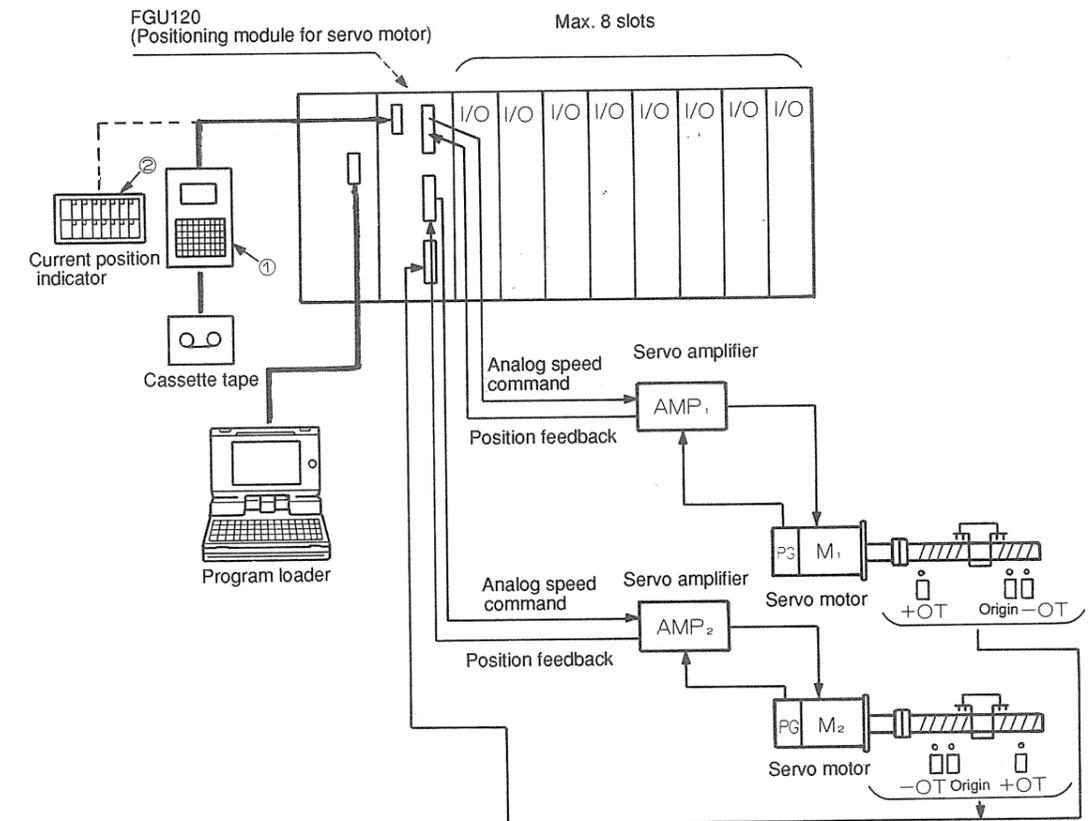
4. Outline Dimensions



5. Installation/Wiring

5-1 System Configurations

Basic systems of this module is shown below. This module occupies 2 slots of FTU type I/O module. The No. of words are 12 (16 bits length) for one FGU120B.



Structural device	Type	Remarks
MICREX-F	F80H, F120H	Servo module occupies 12 words
Program loader for F80H, 120H	FLT-SES-A10 (Lite) FLD520A-A10	Program loader for MICREX-F
Servo module	FGU120B	One module controls 2 axes
Positioning loader for FGU120B	FGD012A	Program loader for FGU120B
Connecting cable for FGU120B	FLC051A	Connecting cable for FGU120B to FGD012A
Case for FGU120B	FCS010A	Carring case for positioning loader
Current position indicator	FGD013A	One device indicates current position of 2 axes
CMT connecting cable	FLC013A	Connecting cable for positioning loader to CMT

5. Installation/Wiring

5-2 Limitations on Mounting Module

Mounting amount of the FGU120B module is limited by the power supply capacity of each base. Calculate the load amount by the following list.

(1) Supply current

Type		Supply current
FPU080H	Standard	5.5A
FPU120H		
FDL120A	Type N	8.0A
FTL010A		

(2) Current consumption

Type		Current consumption
FPU080H		0.9A
FPU120H	Basic	1.1A
	P-Link	0.5A
	T-Link	0.5A
	SUMINET	0.7A
FLD120A		0.7A
FTL010A		0.9A
Loader (D10)		0.6A
FGU120B		1.6A
FGD012A		0.6A

* Refer to the manual F80H (No.LEH913) for the current consumption of the I/O module

* Example calculation of the FGU120B mounting amount

The example calculation as shown below was calculated by using a standard type FPU080H with a D10, FGD012A and FPU080H.

$$\frac{5.5A - (0.9A + 0.6A + 0.6A)}{1.6A} = 2.125$$

As shown above, two FGU120B modules can be used on one base.

5. Installation/Wiring

5-3 Applications of servo motors

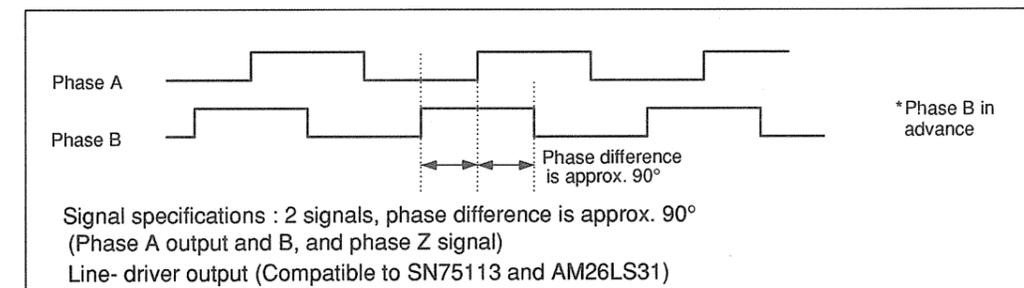
Apply the servo motors as listed below for connecting the FGU120B.
(Use module FGU130B for the stepping motor.)

(1) Inputting the Speed Command of the Servo Amplifier (driver)

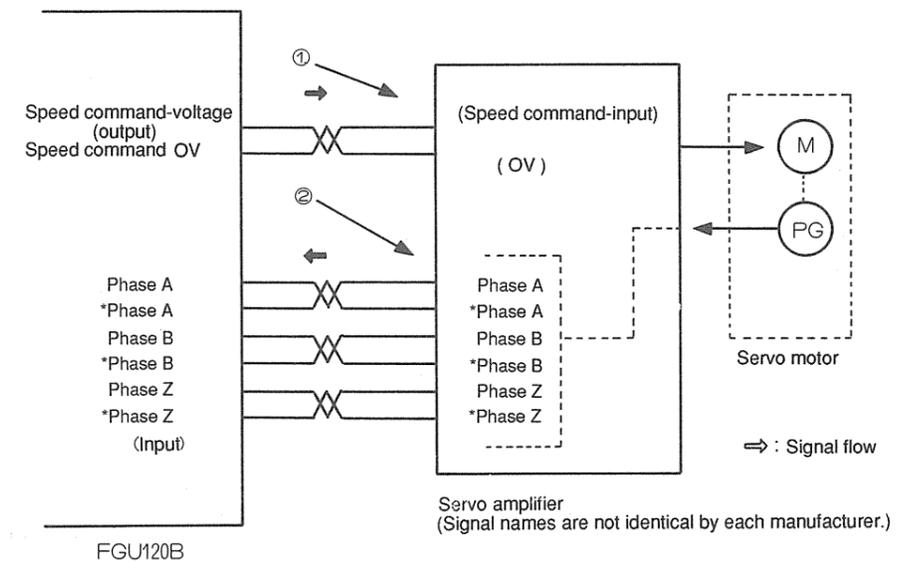
Adjustment can be done for the voltage of the FGU120B speed command (Output : -12V to 0V to +12V) to rotate the motor in both opposite directions. ($\pm 12V$ to $\pm 3V$)

(2) Encoder Output Signal of the Servo Motors

The output signal PG (encoder) of the servo motor is output in waveform as shown below to speed command of output voltage (+).
(Phase input order can be converted by setting the jumper pin.)



*Fuji servo motors need no adjustment.



5. Installation/Wiring

5-4 Setting Position Detecting Switch

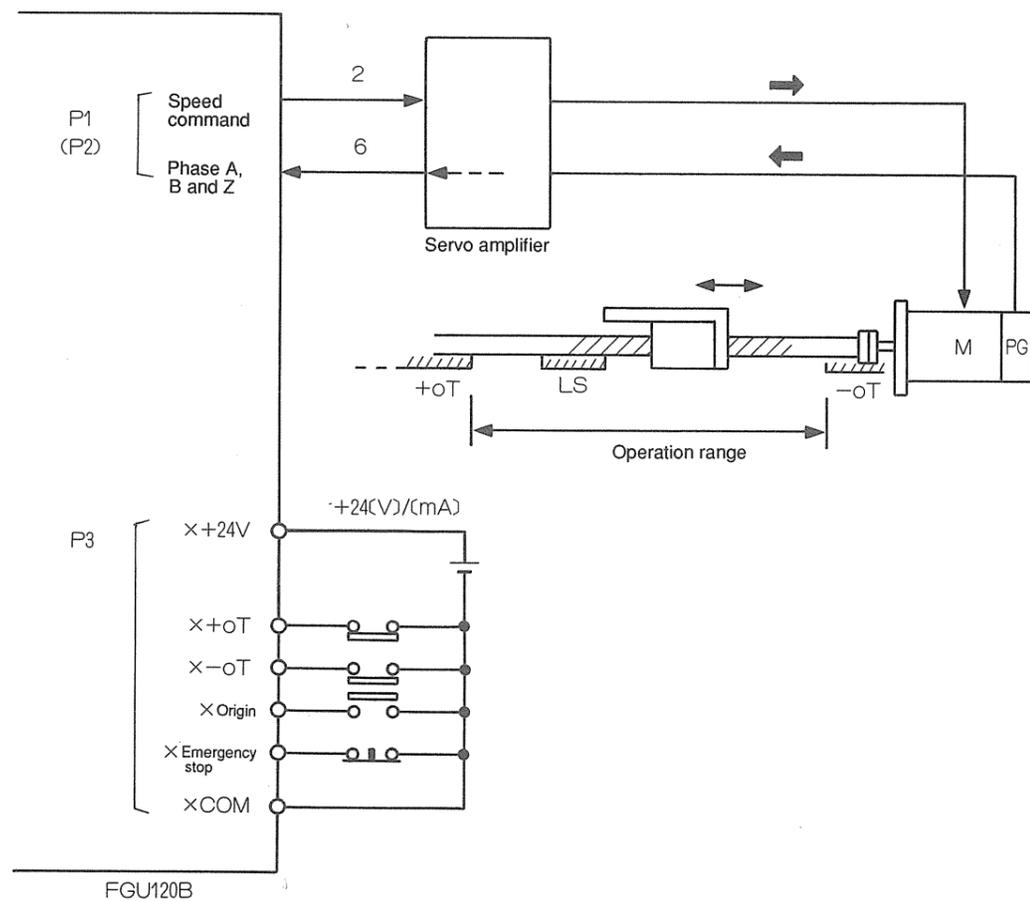
The switches listed below are required on the FGU120B system.

- For inputting over travel-prevention in plus direction (NC-contact)
- For inputting over travel-prevention in minus direction (NO-contact)
- For inputting limit switch to set the origin (NO-contact)
- For inputting emergency stop (NC-contact)

When the signal of contact NC input terminals is unnecessary, shorten the circuit externally.

Supply +24V externally for inputting/outputting each signal.

— An example for wiring —



Even if signal of contact NC is unnecessary, shorten circuit.

5. Installation/Wiring

5-5 Connector pins allocation

(1) Connector P1

Used to connect X axis of the servo motor and the servo amplifier.

14	(Unused)	8	COM	(input)	1	(Unused)
15	* Phase A	9	Servo ON	(output)	2	Phase A
16	* Phase B	10	(Unused)		3	Phase B
17	* Phase Z	11	(Unused)		4	Phase Z
18	* Speed command ON	12	Servo ready	(input)	5	Voltage of speed command
19	GND	13	+24V	(input)	6	GND
20	+5V				7	+5V

(view from the wiring side)
Pin number

+5V and GND. is for the power source of the FGU120B terminal block.

Supply 24V DC between +24V and COM.

GND. (6, 19 pin) : insulated.

COM. (8 pin) : insulated.

Connector : MR-20F (Honda communications industries)

Connector case : MR-20F (Honda communications industries)

(2) Connector P2

Used to connect Y axis of the servo motor and the servo amplifier.

14	(Unused)	8	COM	(input)	1	(Unused)
15	* Phase A	9	Servo ON	(output)	2	Phase A
16	* Phase B	10	(Unused)		3	Phase B
17	* Phase Z	11	(Unused)		4	Phase Z
18	* Speed command ON	12	Servo ready	(input)	5	Voltage of speed command
19	GND	13	+24V	(input)	6	GND
20	+5V				7	+5V

(view from the wiring side)
Pin number

Supply terminals
or the encoder +5V

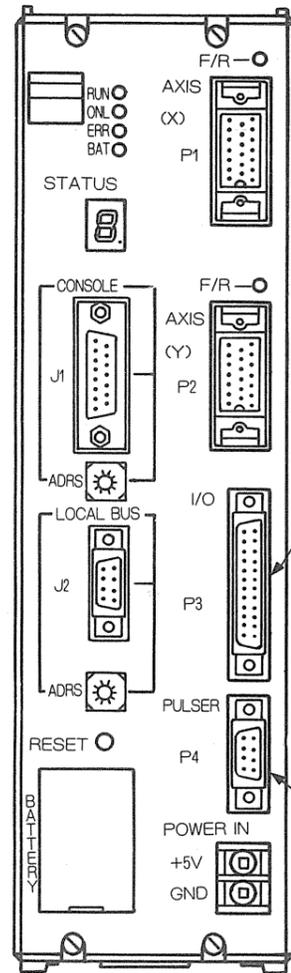
Signals are the same as for connector P1.

Connector : MR-20F (Honda communications industries)

Connector case : MR-20L (Honda communications industries)

<For inputting>

5. Installation/Wiring



(3) Connector P3

Used to connect each I/O signal

A1	X+24V	(input)	B1	Y+24Y	(input)
A2	X+OT	(input)	B2	Y+OT	(input)
A3	X-OT	(input)	B3	Y-OT	(input)
A4	X is at origin LS	(input)	B4	Y is at origin LS	(input)
A5	X external marker	(input)	B5	Y external marker	(input)
A6	X external trigger	(input)	B6	Y external trigger	(input)
A7	X prohibits count	(input)	B7	Y prohibits count	(input)
A8	X emergency stop	(input)	B8	Y emergency stop	(input)
A9	FG		B9	FG	
A10	X brake cancellation	(output)	B10	Y brake cancellation	(output)
A11	(Unused)		B11	(Unused)	
A12	XCOM	(input)	B12	YCOM	(input)

Pin number

Supply +24V DC in between +24 and COM.
All O V of I/O signals are COM.
Connector : FCN-361J042-AU (Fujitsu)
Connector Case : FCN-360C024-E (Fujitsu)

(4) Connector P4

Used to connect the manual pulser unit.

A1	Manual pulser power source	(input)	B1	(Connected internally to terminal A1)
A2	Manual pulser phase A	(input)	B2	(Connected internally to terminal A2)
A3	Manual pulser phase B	(input)	B3	(Connected internally to terminal A3)
A4	Manual pulser power source OV	(input)	B4	(Connected internally to terminal A4)

Pin number

Supply power source +5V to +12V of the manual pulser between A1 and A4 (B1 and B4).
Connector : FCN-361J008-AU (Fujitsu).
Connector case : FCN-360C008-E (Fujitsu).

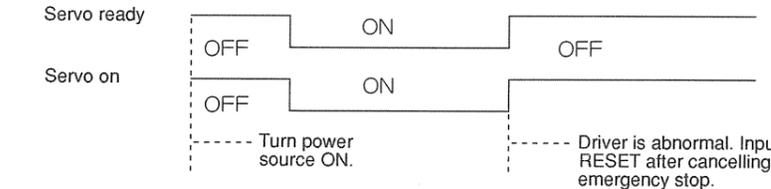
(5) Connector J2

Used to connect the specified cable for simultaneous operation.
(Optional)

5. Installation/Wiring

5-6 Signal Names and Functions

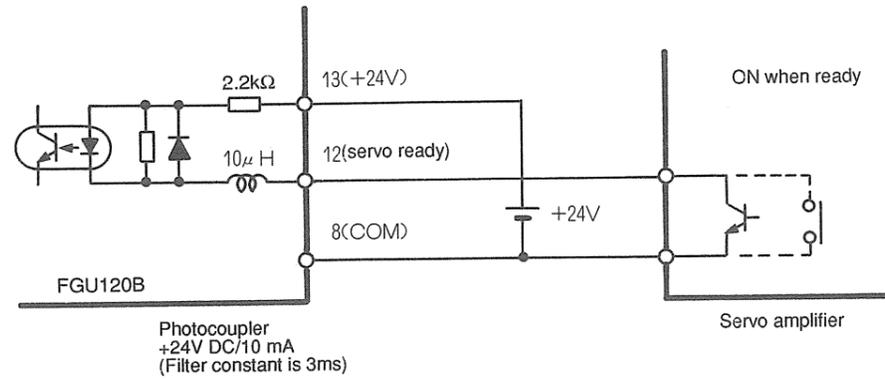
(1) Connect X axis and Y axis of the servo motor amplifier.

Name	Pin	Function
Servo Ready (input)	12	Connect ready signal of the servo amplifier (driver). <u>I/F circuit diagram A.</u>
Servo On	9	Connect to an input signal to be able to rotate motors such as "Operation Command" (RUN) signals, etc.  <u>I/F circuit diagram B.</u>
+24V COM (input)	13 8	Supply I/F power source for signals of servo ready and servo on. Supply externally +24V to this terminal.
Voltage of speed command Speed command OV (output)	5 18	Output voltage of speed command to the servo amplifier. <u>I/F circuit C.</u>
Phase A (input) Phase A (input) Phase B (input) Phase B (input) Phase Z (input) Phase Z (input) +5V (output) GND (output)	2 15 3 16 4 17 7 20 6 19	Input encoder signals (Phase A, B and Z). Max. input frequency is 500 kHz. Line driver (Corresponded SN75115) Output the input terminal +5V to GND on the input terminal base of the FGU120B. Connect when supplying power source to the encoder. <u>I/F circuit diagram D.</u>

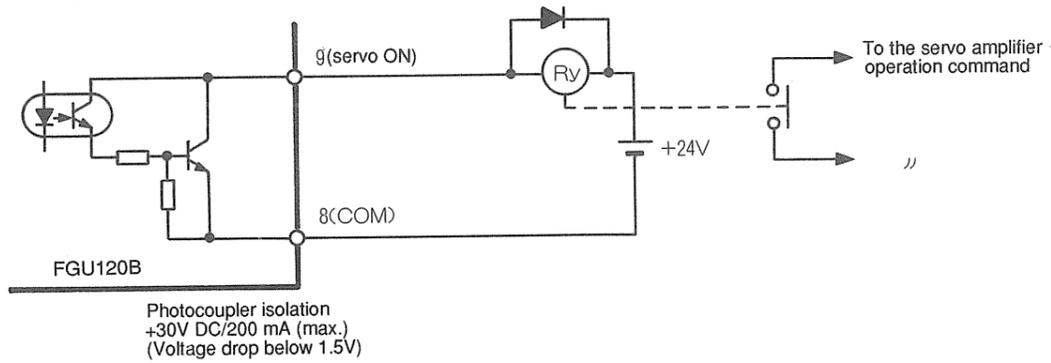
All * marks should be connected in any situation.

5. Installation/Wiring

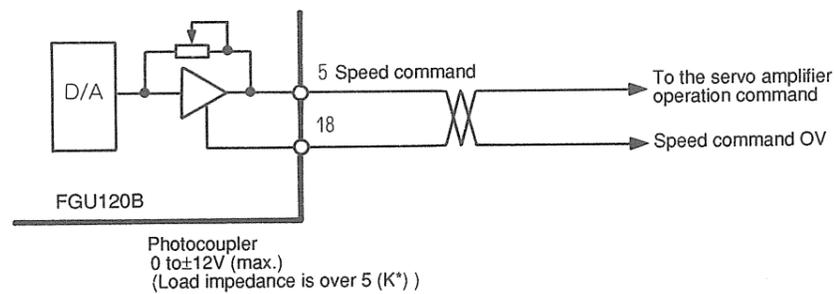
I/F circuit diagram A.



I/F circuit diagram B.



I/F circuit diagram C.



5. Installation/Wiring

(2) Connector P3

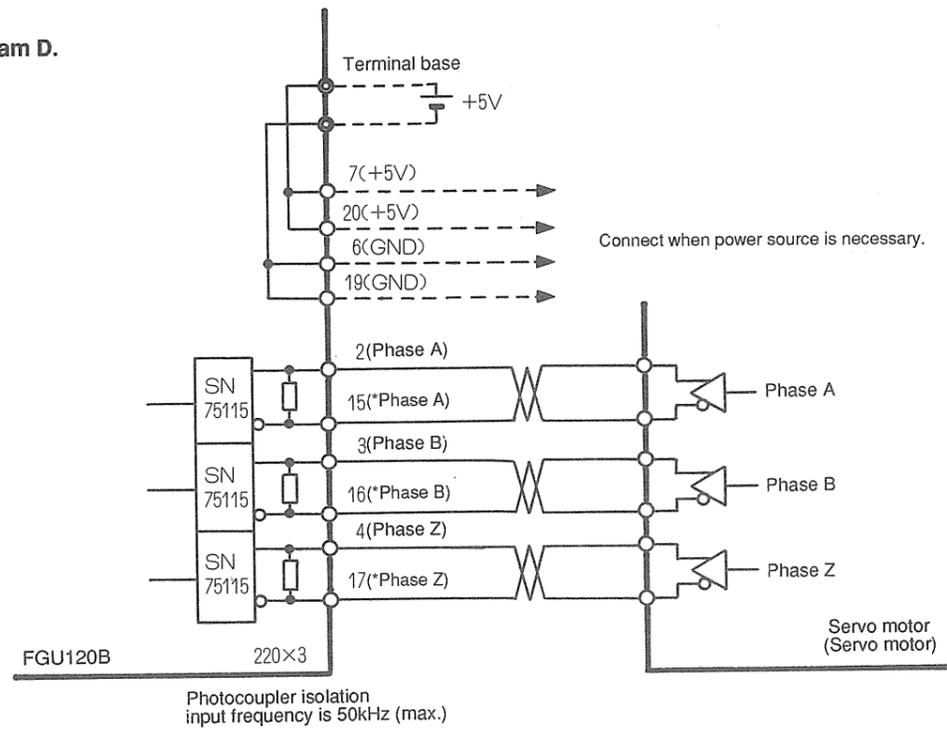
Used to connect I/O signals

Name	Pin	Function
X+24V XCOM X+24V XCOM (input)	A1 A12 B1 B12	I/F power source of X axis I/O signals. +24V. Supply externally when using X axis. I/F power source of Y axis I/O signals. +24V. Supply externally when using Y axis.
X+OT X-OT Y+OT Y-OT (input)	A2 A3 B2 B3	Over travel can be avoided by inputting limit switch of the edge of moving direction. Use contact (N.O.) to output the switch. I/F circuit diagram E.
X origin LS Y origin LS (input)	A4 B4	Input by limit switch to define the origin for returning to the origin. Use contact (N.O.) to output switches. I/F circuit diagram F.
X external marker Y external marker (input)	A5 B5	Mark signal input to define the origin for returning to the origin. (Usually unused) I/F circuit diagram F.
X external trigger Y external trigger (input)	A6 B6	Interruption signal input is used for positioning interruption. (Used for positioning interruption only.) I/F circuit diagram F.
X count prohibit Y count prohibit (input)	A7 B7	Signal input is used when positioning the count prohibit. (Used for positioning the count prohibit only) I/F circuit diagram F.
X emergency stop Y emergency stop (input)	A8 B8	Signal input for stopping the motor immediately. I/F circuit diagram E.
X brake cancellation Y brake cancellation	A10 B10	Signal output to electronically cancel the brake of the motor axis Turn it OFF after inputting emergency stop and setting parameter time. I/F circuit diagram B.

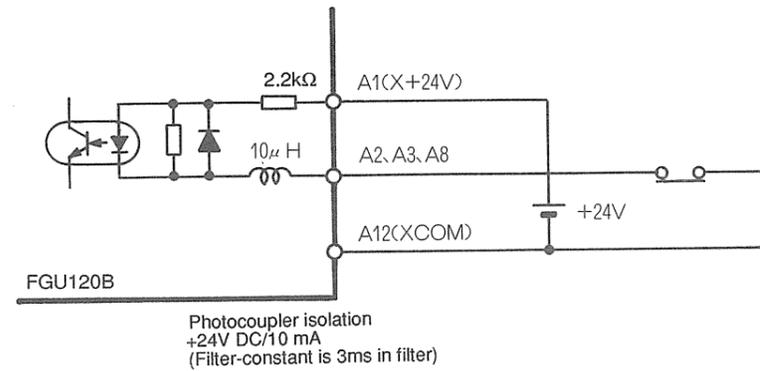
All * marks should be connected in any situation.

5. Installation/Wiring

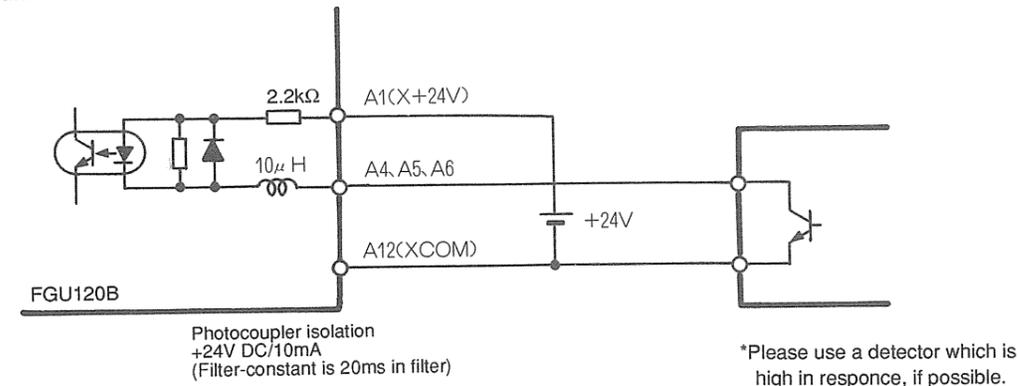
I/F circuit diagram D.



I/F circuit diagram E.



I/F circuit diagram F.



5. Installation/Wiring

(3) Connector P4

Used to connect the manual pulser unit.

Name	Pin	Function
Power source of manual pulser (Power source of manual pulser)	A1	Input a external power sourcefor the manual pulser unit. Supply +5 to 15V determined by the manual pulser unit.
Power source of manual pulser OV (Power source OV)	B1	
	A4	
	B4	
Phase A manual pulser (Phase A manual pulser)	A2	Input signals phase A and B of the manual pulser unit. I/F circuit diagram G.
Phase B manual pulser (Phase B manual pulser)	B2	
	A3	
	B3	
(input)		

The long distance to the manual pulser may cause a voltage drop. In this case, wire each terminals as A1-B1, A2-B2, A3-B3 and A4-B4 in parallel.

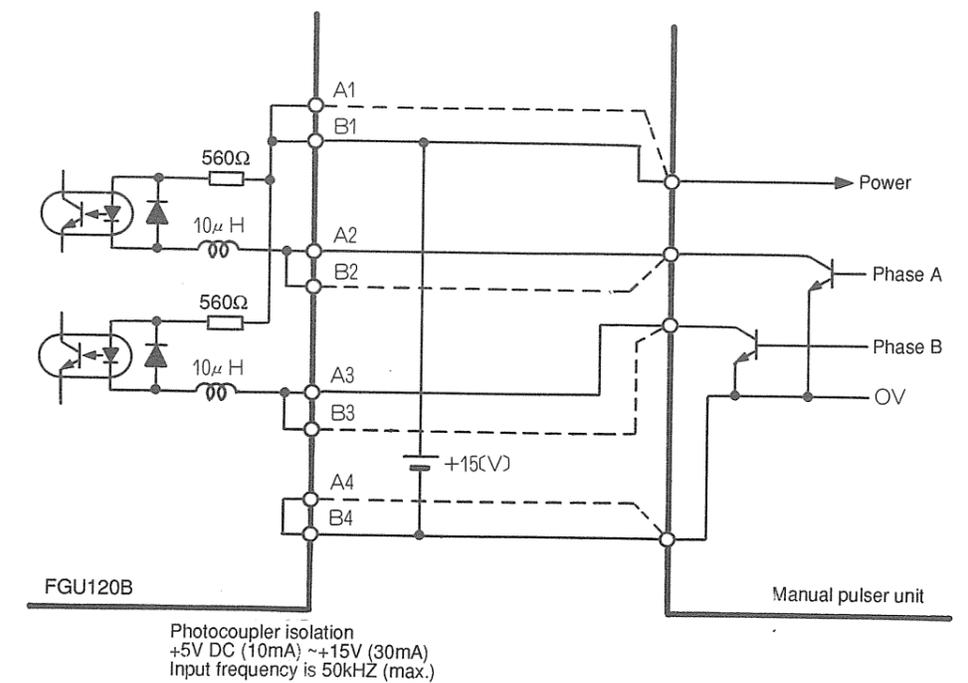
(4) Connector J1

Used to connect the positioning loader (FGD012A).

(5) Connector J2

Used to connect the local-bus cable (optional) of simultaneous operation.

I/F circuit diagram G.



5. Installation/Wiring

5-7 Notes on wiring

Notes on wirings for the FGU120B and the external devices as follows.

(1) Speed Command of FGU120B

Use a wire within 1 to 3m to input voltage of both speed command of the FGU120B and the servo motors.
Use a twisted cable with shield. (If none are available twist two wires.)

(2) Wiring Encoder

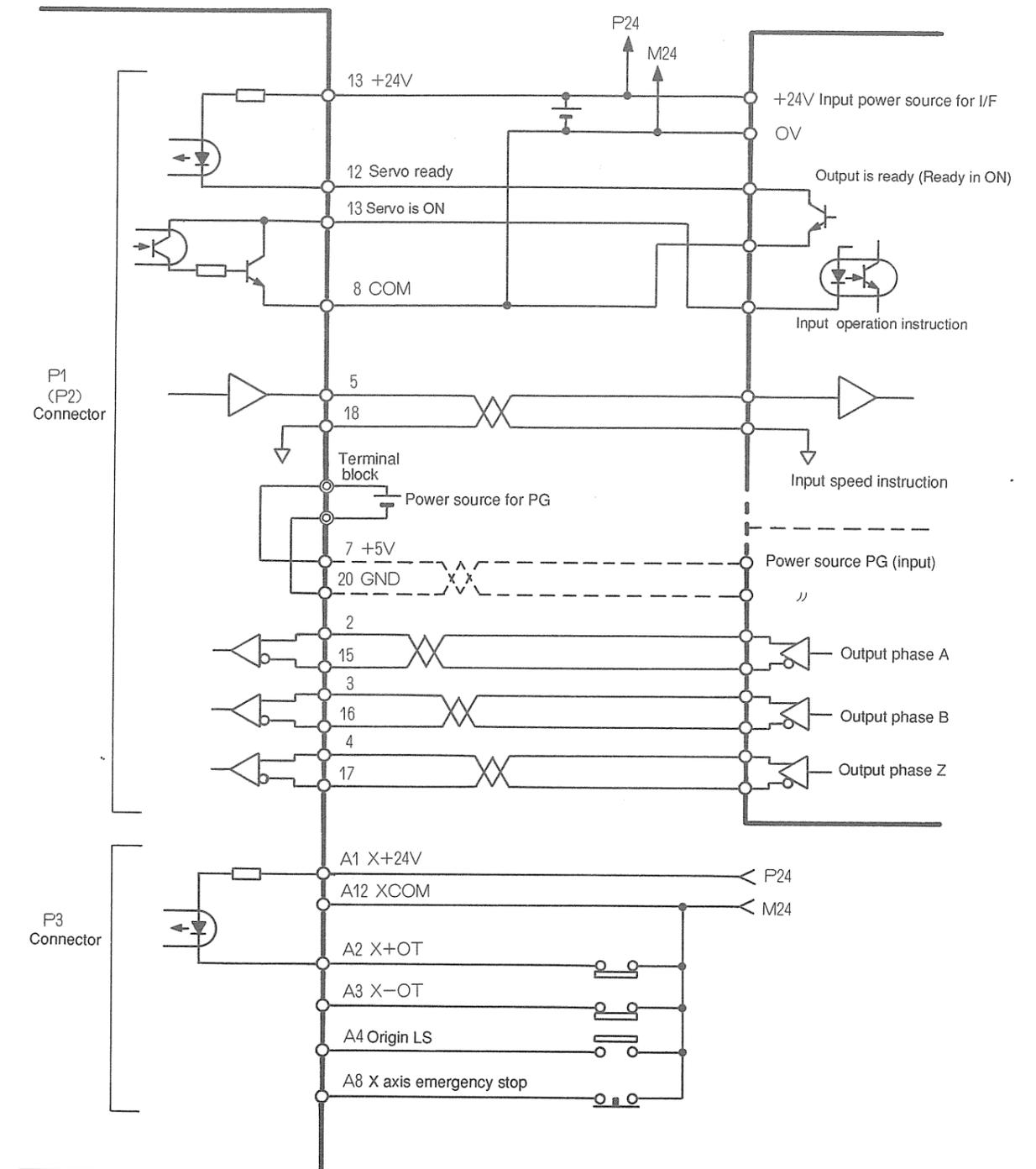
Length of wires from the servo motor to the FGU120B, is normally within 10m (max. 30m). If the wiring distance is longer, wire in parallel. (To avoid a voltage drop.)
Depending on a type of servo, a power source is supplied from the servo motor amplifier to the motor. In this case, supplying power from the FGU120B to the encoder is unnecessary.

(3) General Wiring

- Do not wire in parallel or combine the power line and the main circuit.
- Note that the encoder signals are especially weak.
- The E (earth) terminal of the servo motor and the servo amplifier should be grounded.

5. Installation/Wiring

5-8 Entire Schematics



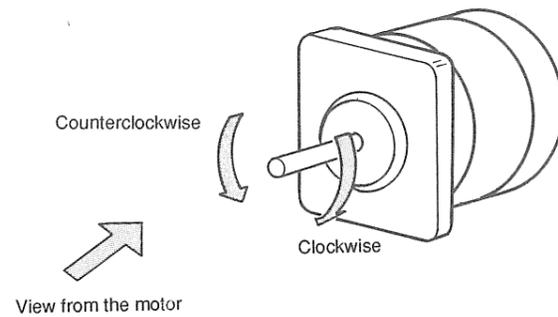
6. Sample Schematics

6-1 List of applicable driver

- Servo motor (with positioning function of analog input)
Fuji manufactures the series as follows.
- AC servo F series
- A series
- DC servo

6-2 Rotatory Direction of the Servo Motor

The rotatory direction of the servo motor (initial-values of parameter) is as follows by the schematic shown on the next page.



6-3 Related manual

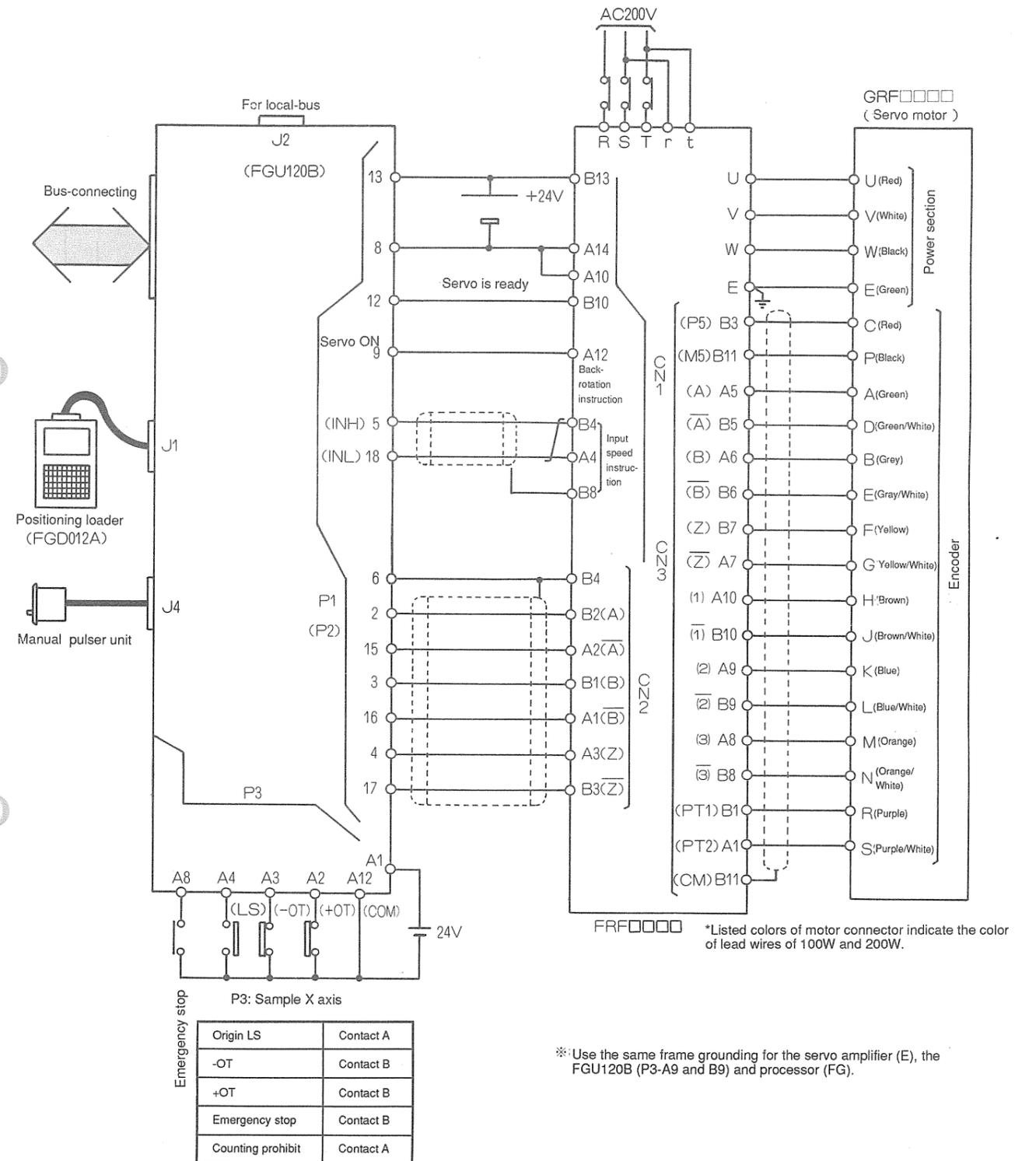
If need be, when using FGU120B, refer to the manuals as listed below.

Related to MICREX-F

User's manual Program Loader Lite	LEH915
User's manual MICREX-F F80H/120H (Software)	LEH914
User's manual MICREX-F F80H/120H (Hardware)	LEH913

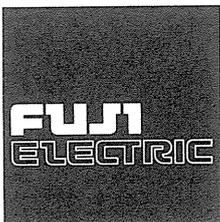
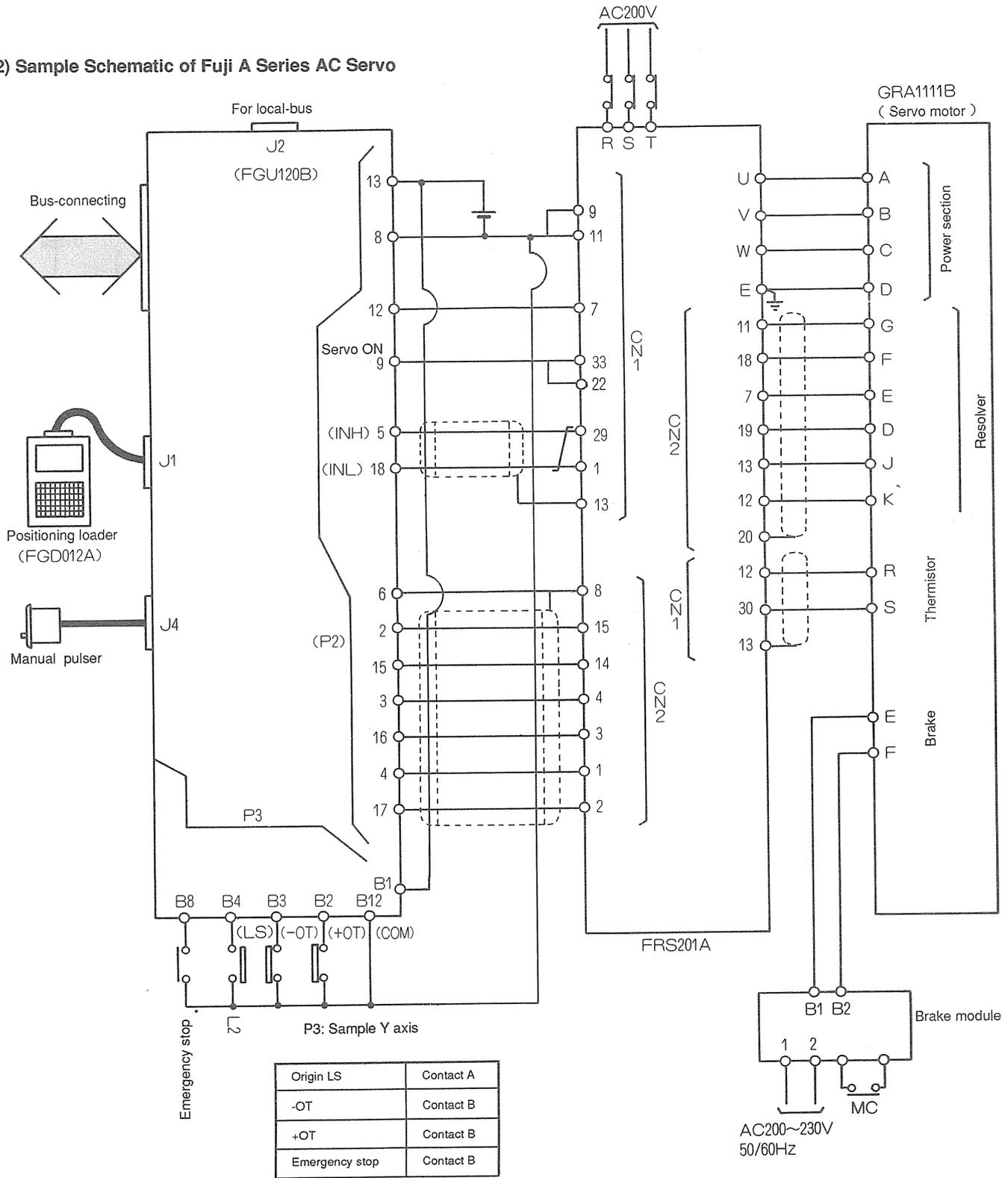
6. Sample Schematic

(1) Sample Schematic of Our F Series and AC Servo



6. Sample Schematic

(2) Sample Schematic of Fuji A Series AC Servo



Fuji Electric Co.,Ltd.

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