YASKAWA ELECTRIC

TOE-C717-12.1C
INSTRUCTIONS

DC SERVOMOTOR CONTROLLERS

Servopack™

TRANSISTORIZED/PWM CONTROL REVERSING

TYPE CPCR-MR01C TO 07C

Before initial operation read these instructions thoroughly, and retain for future reference

When properly installed, operated and maintained, this equipment will provide a lifetime of optimum operation. It is mandatory that the person who operates, inspects, and maintains this equipment thoroughly read and understand this manual.

IMPORTANT

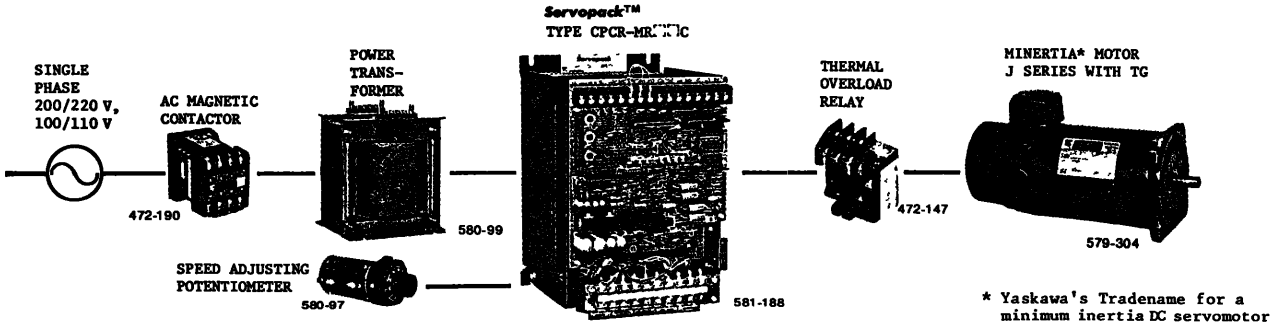
ON OPERATION OF SERVOMOTORS, SEE THE INSTRUCTION MANUAL ACCOMPANYING THE MOTOR. MAKE NO WITHSTAND VOLTAGE TEST NOR MEGGER TEST TO THIS EQUIPMENT.

RECEIVING

This unit has been put through severe test at factory before shipped. After unpacking, however, check and see the following.

- Servopack and Servomotor ratings meet your requirement. See **Table 1.**
- Optional components are furnished. See **Table 1.**
- They have sustained no damage while in transit.
- Bolts and screws are not loose.

If any part of the units is damaged or lost, immediately notify us giving full details and nameplate data.



* Yaskawa's Tradename for a minimum inertia DC servomotor

Table 1 Combination of Servopack and Servomotors and Optional Components

Servopack Type	Servomotor Type with TG	Optional Components to be Combined				
		Thermal overload Relay	Power Transformer	Speed Adjusting Potentiometer	Magnetic Contactor	Protection Device
CPCR-MR01C	UGPMEN-08	RHP-15/4.9	CPT8585 (300 VA)	25HP-10B 2 kΩ	HI-10E	JESP-PT101
	PMES-09(10-pole)	RHP-15/5.7				
	UGPMEN-09					
CPCR-MR01CJ	UGJMED-10M	RH-18/2.2PV	CPT8589 (300 VA)			JESP-PT201
CPCR-MR02C	PMES-12(10-pole)	RHP-15/6.6	CPT8624 (500 VA)			JESP-PT102
	UGPMEN-12					
CPCR-MR02C-M	UGMMEM-06	RH-35/6.2HV				
CPCR-MR02CJ	UGJMED-40M	RH-18/5.0PV	CPT8630 (500 VA)			JESP-PT202
	UGJMED-40L	RH-18/5.5PV				
CPCR-MR05C	PMES-16(10-pole)	RHP-15/7.5	CPT8660 (1 kVA)			JESP-PT203
	UGPMEN-16					
CPCR-MR05C-C	UGCMED-04A	RH-35/7.8HV				
	UGCMEM-04					
CPCR-MR05C-H	UGHMED-03G					
CPCR-MR05C-M	UGHMEM-13	RH-35/6.9HV				
CPCR-MR07C	UGMMEM-25	RH-35/12.5HV	CPT8665 (1.5 kVA)		HI-15E for 100 V	JESP-PT204

Note:
1. Servomotor type names denote the following tradenames conventionally used for the Yaskawa servomotors.
   - PM: Print Motor Standard Series
   - JM: Minertia Motor J Series
   - MM: Minertia Motor Standard Series
   - CM: Cup Motor
   - HM: Hi-Cup Motor
2. Servomotors with type name CM, HM and MM are accompanied with a thermal overload relay as a standard component.

PRECAUTIONS

INSTALLATION

Servopack Type CPCR-MR is to be mounted on a base as standard.

Location

(1) When installed in a panel:

Keep the temperature around Servopack at 60°C or below. Avoid blowing cooling air directly against the transistors on the printed circuit board. (Fig. 1)

(2) When installed near a heat source:

Keep the temperature around Servopack below 60°C. (Fig. 2)

(3) If subjected to vibration:

Mount the unit on shock absorbing material.

(4) If corrosive gases prevailing:

Avoid the location where corrosive gases exist as it may cause extensive damage with long use, especially:

- Poor commutation of the motor commutator.
- Defective switching operation of contactors and relays.

(5) Where unfavourable atmospheric conditions considered:

Select a location with minimum exposure to oil, water, hot air, high humidity, excessive dust or metallic particles.

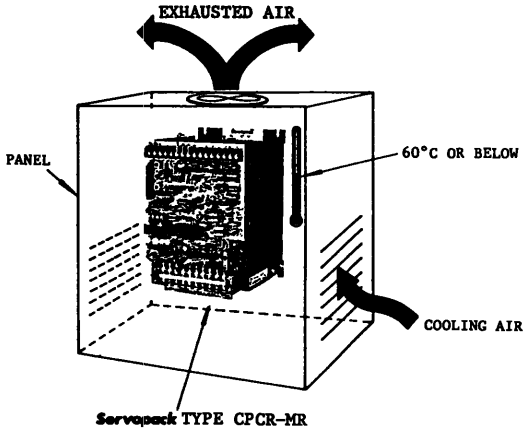


Fig. 1 Typical Layout for Panel Mounting

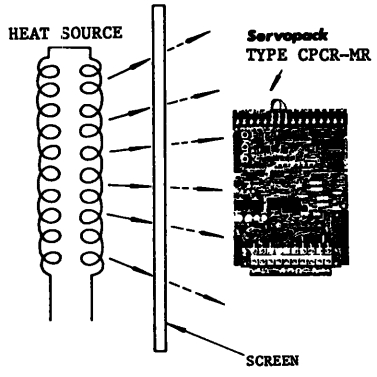


Fig. 2 Protection against Heat Radiation

Type Designation

CPCR-MR□□C□-□□

- Servopack Series
- Transistorized/PWM Control, Reversing
- Motor Output
  - 01: 100 W
  - 02: 200 W
  - 05: 500 W
  - 07: 770 W
- Design Revision Order
- Servomotor to be Applied
  - Blank: Standard Motor (Tables 6 and 7)
  - C: Cup Motor (CM)
  - M: Minertia Motor Standard Series (MM)
  - H: Hi-Cup Motor G Series (HM)
  - Blank: Standard Motor
  - J: Minertia Motor J Series (JM)

Mounting

(1) Direction

Mount the unit vertically on the wall using the mounting holes (4) on the base plate, with main terminals at the bottom. (Fig. 3)

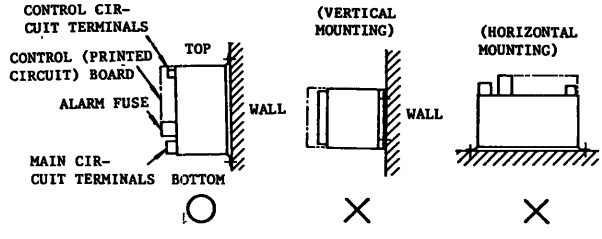


Fig. 3 Mounting Direction of Servopack

WIRING

Selection of Cable Size

Cable size should be determined according to the rated currents of each Servopack type shown in Table 2. Table 3 shows recommended cable sizes for the use at ambient temperature of 40°C, with 3 cables harnessed in a bundle, and at the rated current of Servopack, shown in Table 2.

Wiring Precautions

Fig. 4 shows an example of connecting Servopack type CPCR-MR, with a servomotor and ancillary Components.

(1) Power and control lines

Do not run the power line and the control line in the same duct or in a bundle.

(2) Grounding

- Terminal E of Servopack is a junction terminal for grounding. Ground the signal 0 V terminal 2 by connecting to the terminal E.
- Grounding resistance should be 100 Ω or below.
- Connection with the protection device. See Section 5 "PROTECTION DEVICE."

Table 2 Rated Current of Servopack

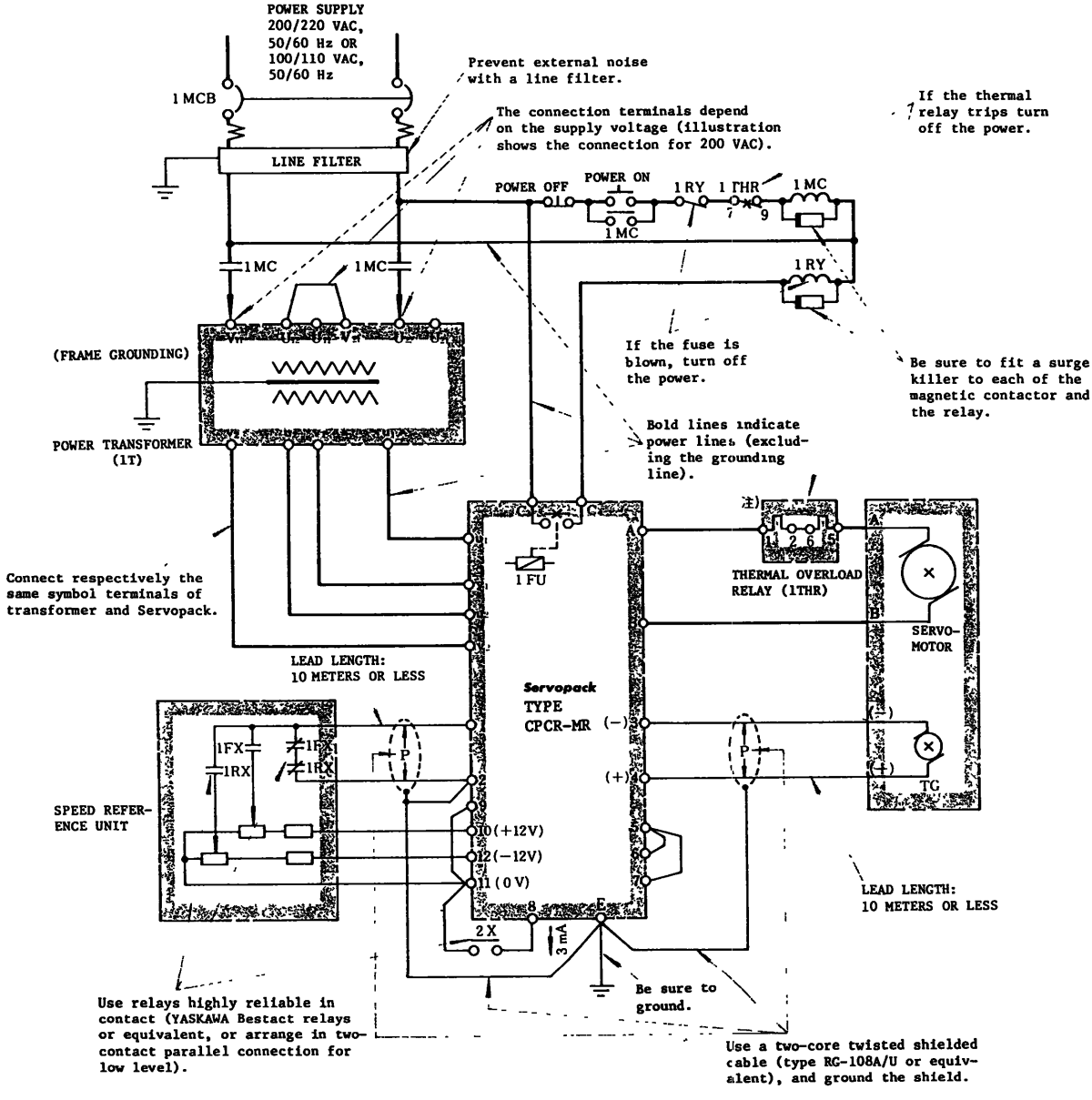
	Circuit Terminal	Servopack Type / Terminal Symbol	Rated Current (A)				AC/DC
			CPCR-MR01C -MR01CJ	CPCR-MR02C -MR02CJ	CPCR-MR05C	CPCR-MR07C	
Main Circuit	AC power supply	u1, v1	9	10.5	12	19	AC
	Motor main circuit and thermal overload relay	A, B	6	7	8	13	DC
	Optional	P, N	6	8	8	8	DC
	Control circuit power supply	u2, v2	0.2				AC
	Blown fuse detecting circuit	C3, C4	220 VAC, 1 A				-
Control Circuit	Speed reference input	1, 2	0 to ±6 V, 0 to 0.3 mA; 0 to ±7 V (±30 V), 0 to 1 mA (4 mA)				DC
	Tachometer-generator circuit	3, 4					
	Over-travel circuit	5, 6, 7	+8 V, 3 mA				DC
	Proportional drive	8, 11					
	Aux. speed reference input	9, 2	±2 to ±10 V, 0 to ±0.5 A				DC
	Output of ±12 V	10, 11, 12	±12 V, 30 mA Max.				DC
	External current-limit circuit	13, 14	0 to ±6 V, 2 mA				DC
	External base current-interrupting circuit	19, 11	+8 V, 3 mA				DC
Power transformer primary side		At 200 V	1.5	2.5	5	7.5	AC
		At 100 V	3	5	10	15	

Table 3 Recommended Cable Size

	Circuit Terminal	Servopack Type / Terminal Symbol	Cable Size (mm2)			
			CPCR-MR01C MR01CJ	CPCR-MR02C -MR02CJ	CPCR-MR05C	CPCR-MR07C
Main Circuit	AC power supply	u1, v1	2.0 or over (Heat-resistant cable)			3.5 or over (Heat-resistant cable)
	Motor main circuit and thermal overload relay	A, B				
	Optional	P, N	1.25 or over			
	Control circuit power supply	u2, v2				
	Blown fuse detecting circuit	C3, C4				
Control Circuit	Speed reference input	1, 2	Two-core twisted shielded cable Type RG-108A/U made by Fujikura Cable Works, Ltd., Japan or equivalent.			
	Tachometer-generator circuit	3, 4				
	Over-travel circuit	5, 6, 7	1.25 or over			
	Proportional drive	8, 11				
	Aux. speed reference input	9, 2	Two-core twisted shielded cable Type RG-108A/U			
	Output of ±12 V	10, 11, 12	1.25 or over			
	External current-limit circuit	13, 14				
	External base current-interrupting circuit	19, 11				
Power transformer primary side		-	2.0 or over (Heat-resistant cable)			

Notes:
1. For the main circuit, use cables of 600 V or more.
2. Where cables are bundled or put in a duct (unplasticized polyvinyl chloride conduit or metallic conduit), determine the cable size considering the current drop rate of the cables.
3. Where the ambient temperature (in the panel) is high (40 to 60°C), use heat-resistant cables.

WIRING (Cont'd)



Note: The thermal overload relay (1THR) for PM or JM provides neither terminal 5 nor 6.

Fig. 4 Example of Connection Diagram of Servopack

TEST RUN

Check Items before Test Run

Before starting operation, confirm the following:

(1) Servopack has been adjusted in accordance with the servomotor to be applied (Check each nameplate of the Servopack and servomotor).

Servopack is designed to be able to drive different types of servomotors (Print Motor, Cup Motor, Hi-Cup Motor, Minertia Motor Standard Series and Minertia Motor J Series). Servopack has been adjusted for its ratings at the factory for standard combination with servomotor. For standard combination, the type name of the servomotor is not given in the Servopack nameplate (Table 5).

(2) Supply voltage should be 100/110 V ±10% or 200/220 V ±10%.

(3) The primary side of the power transformer should be connected in accordance with the specified voltage as shown in Fig. 5.

(4) A thermal overload relay and the motor should be connected in series across terminals A and B of Servopack, connecting the motor terminals A and B to the corresponding terminals on the Servopack (for forward rotation: counterclockwise).

(5) The positive TG terminal (+) and the negative terminal (-) should be connected to terminals 4 and 3 of Servopack, respectively (for forward rotation).

TG terminals and applicable servomotors are shown in Table 7.

Note:

With the connections in items (4) and (5) above, if a positive reference voltage is applied, the motor rotates counterclockwise, and a negative voltage, clockwise (Table 4).

(6) Actuation of the thermal overload relay or the alarm relay must turn off the main power supply.

(7) The shields used for the TG circuit and the speed reference circuit and 0 V terminal 2 should be grounded.

(8) The speed reference voltage should be 0 V. (Speed reference circuit is shortcircuited.)

Table 4 Direction of Rotation of Motor

Servomotor Name and Type \ Direction of Rotation	Viewing from Drive End: Forward Running	Viewing from Drive End: Reverse Running
Print Motor Standard Series, Type (UG)PMES	Counterclockwise	Clockwise
Minertia Motor Standard Series, Type UGMMEM		
Minertia Motor J Series, Type UGJMED		
Cup Motor, Type UGCMED		
Hi-Cup Motor, Type UGHMED		

Table 5 Servopack Adjustment in Standard Combination of Servopack and Servomotor

Servopack Type	Servomotor Ratings: Type	Servomotor Ratings: Feedback (TG)Voltage*	Servomotor Ratings: Rated Current	Servopack Setting: Speed†	Servopack Setting: Starting Current
CPCR-MR01C-□	UGPMEN-08	28 VDC	4.9 A	4000 rpm	15 A ±10%
	(UG)PMES-09		5.5 A		
	UGPMEN-09		5.7 A		
CPCR-MR01CJ-□	UGJMED-10M	7 VDC	2.3 A	1000 rpm	11 A ±10%
CPCR-MR02C-□	(UG)PMES-12	21 VDC	6.4 A	3000 rpm	20 A ±10%
	UGPMEN-12		6.6 A		
CPCR-MR02CJ-□	UGJMED-40M	7 VDC	5.0 A	1000 rpm	15 A ±10%
	UGJMED-40L		5.6 A		
CPCR-MR05C-□	(UG)PMES-16	17.5 VDC	7.3 A	2500 rpm	20 A ±10%
	UGPMEN-16		7.5 A		
CPCR-MR07C-□	UGMMEM-25	21 VDC	13.1 A	3000 rpm	30 A ±10%

* At rated speed.
† At rated input voltage ±6.0 V across Servopack terminals 1 and 2.

Note: If any servomotor other than those listed above is combined with Servopack Type CPCR-MR□C, Servopack is adjusted for the servomotor as shown in Table 6.

Table 6 Servopack Adjustment in Optional Combination of Servopack and Servomotor

Servopack Type	Servomotor Ratings: Type	Servomotor Ratings: Feedback (TG)Voltage*	Servomotor Ratings: Rated Current	Servopack setting: Speed†	Servopack setting: Loop Gain
CPCR-MR02C-M	UGMMEM-06AA	21 VDC	6.2 A	3000 rpm	2-3/11 scales
CPCR-MR05C-M	UGMMEM-13AA		7.4 A		
CPCR-MR05C-C	UGCMED-04AA	12.25 VDC	8.2 A	1750 rpm	-
	UGCMEM-04GC		8.0 A		
CPCR-ME05C-H	UGHMED-03GG	7 VDC	7.8 A	1000 rpm	-

* At rated speed.
† At rated input voltage ±6.0 V across Servopack terminals 1 and 2.

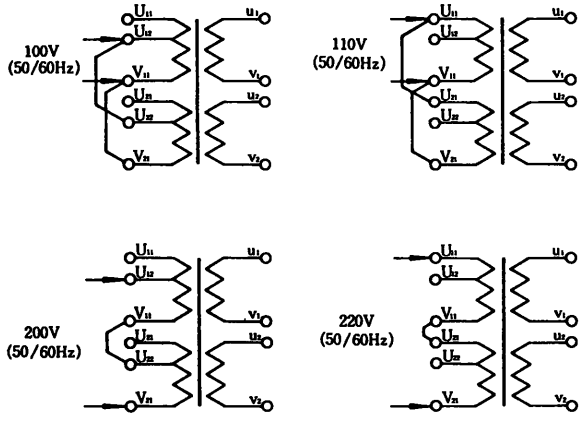


Fig. 5 Connection of Power Transformer

Table 7 Tachometer-Generator Terminals and Servomotors

TG Type	TG Terminals			Servomotor Type
	Connection Type	Symbol		
		Plus (+)	Minus (-)	
UGTGIM-7LV	Cannon connector	A	B	UGCMEM-[ ]GC
	Terminal board or outgoing-lead opening	1	2	UGJMED-[ ]
UGTGIM-7LVH	Cannon connector	A	B	UGCMED-[ ]AA
	Terminal board or outgoing-lead opening	1	2	UGHMED-[ ]GG
11TG-D027	Screw terminal	1	2	UGMMEM-[ ]
	Cannon connector	C	D	UGPMEN-[ ]
	Cannon connector	C	D	(UG)PMES-[ ]
TG-7SV built-in feedback unit, type TFUE-[ ]C7	Cannon connector	G	H	UGMMEM-[ ] UGPMEN-[ ] (UG)PMES-[ ]

Test Run Procedures

After following the instructions given in "Check Items before Test Run," turn on the power, and red light LED "POWER" of Servopack turns on. Increase the speed reference voltage gradually from 0, to start operation of the servomotor.

During test run, loads should not be applied to the servomotor. If it is obliged to start with the driven machine connected to the motor, confirm beforehand that the drive system has been ready for emergency stop at any time.

ADJUSTMENT

SETTINGS AT THE TIME OF DELIVERY

The Servopack has been factory-adjusted as follows:

(1) Speed reference input VS.servomotor speed ratio (no load) (Fig. 6).

The Servopack has been adjusted with the SPEED potentiometer (2VR), to accomodate any motor listed in Tables 5 and 6 in the speed reference input VS.servomotor speed ratio.

Since the output voltage fluctuation of TG ranges from ±5% (Type 11TG-D027) to ±10% (Types UGTGIM-7LV, -7LVH and TG-7SV), a fine adjustment with the SPEED potentiometer must be made for accurate rated speed.

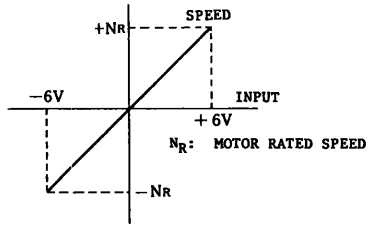
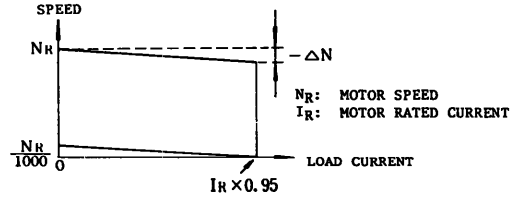


Fig. 6 Speed Reference Input - Servomotor Speed Ratio

(2) Speed variation (Fig. 7)



$$\text{SPEED VARIATION} = \frac{\Delta N}{N_R} \times 100\%$$

Fig. 7 Speed Variation

(3) Servomotor start-stop characteristics (Fig. 8)

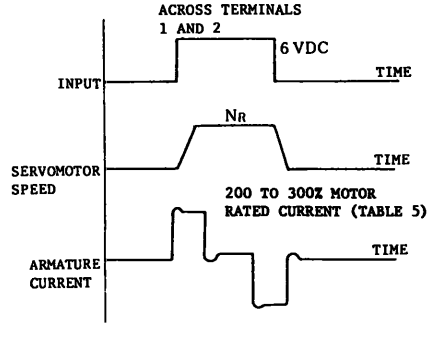


Fig. 8 Servomotor Start-Stop Characteristics

READJUSTMENT

If a readjustment of Servopack is required, readjust the Servopack referring to Table 8.

Adjustment Directions
Mark ○ : Potentiometer should be adjuted in accordance with specifications and application.
Mark △ : Potentiometer should not be adjusted except special cases.
Mark X : Do not adjust.

Table 8 Potentiometer Adjustment

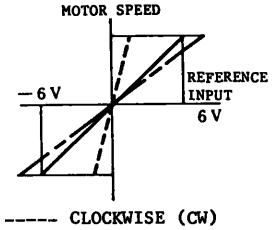
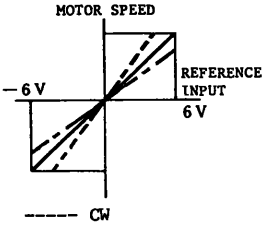
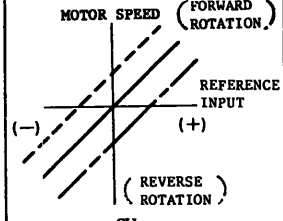
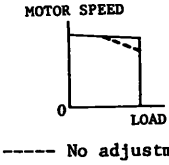
Potentiometer	1VR [IN-B]	2VR [SPEED]	3VR [ZERO]	[4VR]
Functions	Auxiliary input adjustment	Motor speed adjustment	Zero drift adjustment	Proportional gain adjustment
How to Adjust	To be adjusted only when the rated reference voltage (±2 to ±10 V) is other than ±6 V. Turn 1VR only to get the rated speed and do not operate other VRs.	To be adjusted to get the rated speed when ±6 V is applied across terminals 1 and 2. Turning 2VR CW increases the speed, and CCW decreases the speed.	To be adjusted so that the motor does not turn at the speed reference voltage 0 V. Turning 3VR CW allows the motor to be finely adjusted in normal rotation, and CCW in reverse rotation.	Adjust 4VR to shown obtain the TG waveform shown below at motor starting. 
Check Terminals	[IN-B], [TG]	[IN], [TG]	Observe the operation of motor	[TG]
Characteristics	 ----- CLOCKWISE (CW) ——— COUNTERCLOCKWISE (CCW)	 ----- CW ——— CCW	 ----- CW ——— CCW	 ----- CW ——— CCW
Adjustment	○	○	○	△
Potentiometer	5VR	6VR	7VR	8VR
Functions	Starting current adjustment	Speed loop gain adjustment	Current loop gain adjustment	Mode switch level adjustment
How to Adjust	Turning 5VR CW increases the starting current.	To increase gain, turn 6VR CW.	Turning 7VR CW increases current loop gain. Increase the gain until starting current just before starts hunting, observing the waveform at check terminal [CUR].	To be so adjusted that the load variation meets the specifications at the rated speed and the rated load (Load variation: -0.1% or less).
Check Terminals	[CUR]	[CUR], [TG]	[CUR]	[MS-M], [TG]
Characteristics	 ----- CW ——— CCW	If hunting, turn 6VR CCW to prevent it.	 ----- CW ——— CCW	 ----- No adjustment
Adjustment	X	△	X	△

Table 8 Potentiometer Adjustment (Cont'd)

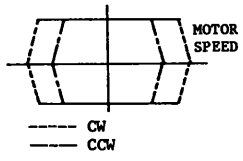
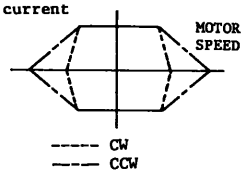
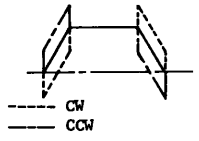
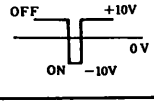
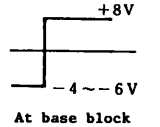
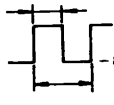
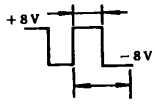
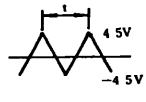
Potentiometer	9VR	10VR	11VR	1VR (Protection device)
Functions	Drive characteristic adjustment		Carrier frequency adjustment	EMF adjustment
How to Adjust	Adjustment required for CPCR-MR□CJ (for JM) only, within current limiting curve at over-speed. As a guide for correct adjustment, a full CW turning for 9VR and at 3 of 10 graduations for 10VR.		Where motor is in resonance with driven machine, adjust the frequency a little so that the resonance is eliminated.	To be adjusted by CH [EMF] so that the waveform at starting and stopping motor becomes as shown below. 
Check Terminals	[9VR], [CUR]	[C.REF], [CUR]	[OSC]	[EMF] (At lower section of protection device)
Character-istics	Starting and stopping current  	Starting and stopping current  	Set values · Type CPCR-MR01C to 05C: 6.7 kHz · Type CPCR-MR07C: 2.5 kHz Turning 11VR CW increases the frequency, and CCW decreases the frequency.	 Example of poor adjustment In case of poor adjustment, TG failure lamp LED [TG] is on.
Adjustment	×	×	△	△

Table 9 List of Check Terminals

Check Terminal Symbol	[SGOV]	[IN]	[IN-B]	[TG]	[C-REF]	[9VR]	C-OUT
Check Terminal Name	Signal 0 V	INPUT Monitor	INPUT-B Monitor	TG Monitor	CURRENT REFERENCE Monitor	9VR Monitor	CURRENT AMPLIFIER OUTPUT Monitor
Description	0 V common terminal for waveform observation.	For observing the waveform of speed reference input when the speed reference is fed across terminals 1 and 2. +6 VDC/± rated speed	For observing the speed reference input when the speed reference is fed through terminals 9 and 2.	For observing the TG output waveform. Transient speed can be observed. 7 VDC ±5%/ 1000 rpm	For observing the current reference (amplified waveform of speed deviation). Used when 4VR or 6VR is adjusted.	For adjusting the current limit of JM.	For observing the output voltage of current amplifier.

Check Terminal Symbol	[CUR]	[MS-M]	[SOURCE]	[1BD] [4BD]	[2BD] [3BD]	[OSC]
Check Terminal Name	CURRENT Monitor	MODE SWITCH Monitor	BASE BLOCK Monitor	BASE DRIVE Monitor	BASE DRIVE Monitor	TRIANGLE PULSE OSC Monitor
Description	Check terminal to detect motor armature current and starting/ stopping current. Approx. 50 mV/A	For observing the operation of mode switch. The mode switch is off at +10 V, and on at -10 V.  	For observing the power transistor drive mode. At normal operation  At base block	For observing the conduction angle to the chopper period in forward rotation. CONDUCTION ANGLE  CHOPPER PERIOD	For observing the conduction angle to the chopper period in reverse rotation. CONDUCTION ANGLE  CHOPPER PERIOD	For observing the operation of triangle waveform pulse oscillator which determines chopper's frequency. MR01C-05C: t = 150 µs ±10% MR07C: t = 400 µs ±10% 

ADJUSTING PROCEDURES

A block diagram of the internal circuit of Servopack, Type CPCR-MR is shown in Fig. 9. And the positions of potentiometers and check terminals for waveform observation are shown in Fig. 10.

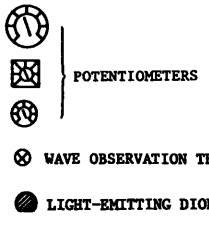
See Table 8 and 9 for general adjustment of potentiometers, and check terminals for waveform observation, respectively.

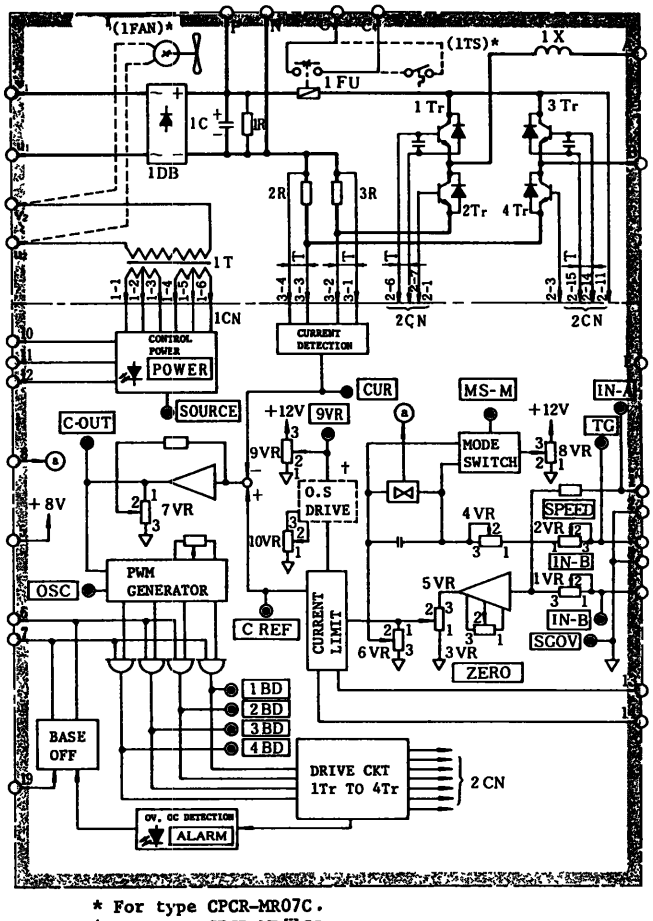
The potentiometer should be adjusted, observing the waveform at specified check terminals (do not manipulate unnecessarilly).

For reference, Fig. 11 shows the waveforms at the respective check terminals for step responses.

Servopack and Control Circuit Board Types

Servopack Type CPCR-	Control Circuit Board Type CPCR-MR-
MR-01C	CA01C
MR-02C	CA02C
MR-05C	CA05C
MR-07C	CA07C
MR-01CJ	CA01C-J
MR-02CJ	CA02C-J





* For type CPCR-MR07C.
† For type CPCR-MR□CJ.

Fig. 9 Internal Block Diagram

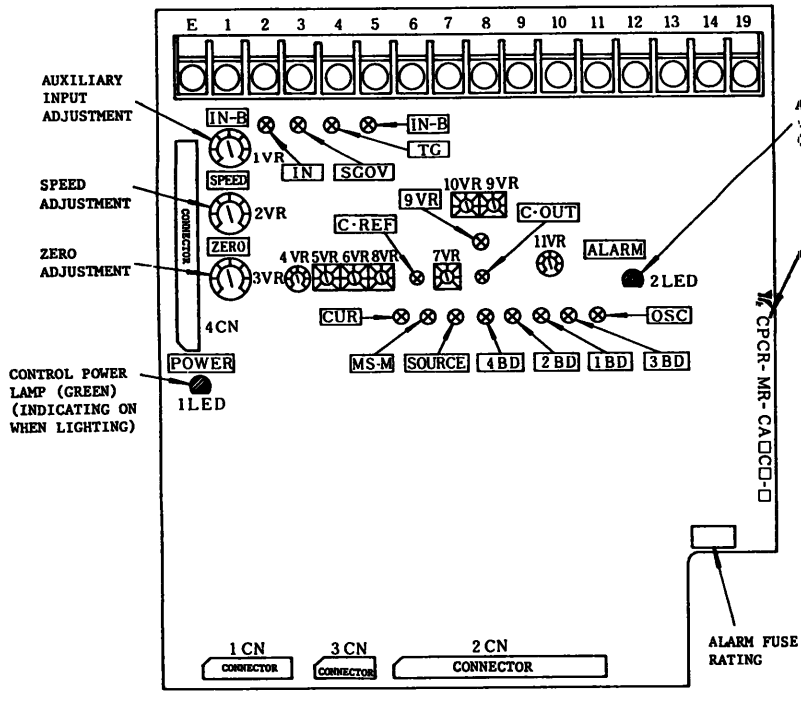


Fig. 10 Arrangement of Potentiometers and Check Terminals

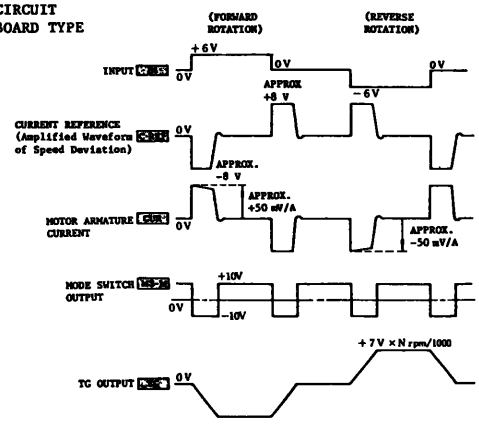


Fig. 11 Waveforms at the Respective Check Terminals for Step Responses

ADJUSTING PROCEDURES (Cont'd)

Examples of Adjustment

(a) Setting the motor speed (Fig. 12)

Some adjustment and operations described below are necessary when driving motors other than those adjusted for the Servopack (to convert the motor adjusted based on Table 5 to that of Table 6), or when correcting the output voltage deviation of TG in order to obtain an accurate speed.

* Short-circuit terminal 9 with 11, or 2 and, apply ±6.0 VDC (ripple 6 mV p-p or less) across terminals 1 and 2 of Servopack. With the connection shown in Fig. 12, +6 V input results in forward rotation, whereas -6 V input reverses the rotation.

† Measure the motor speed with a tachometer. If the speed can be set at roughly at an accuracy of ±10%, measure the TG voltage with a digital voltmeter (In forward operation, -7 V/1000 rpm, and in reversing, +7 V/1000 rpm).

** Adjust the SPEED potentiometer (2VR), so that the motor operates at the rated speed (In this case, do not operate other potentiometers).

(b) Setting the rated reference voltage (Fig. 13)

Using the auxiliary input terminal 9, set the rated reference voltage according to the following procedure.

* With terminal 1 shortcircuited with 0 volt terminal or to 11, apply desired reference voltage across terminals 9 and 2 of Servopack (ripple voltage 6 mV or less in a range from ±2 V to ±10 V). In the connection shown in Fig. 13, positive input results in forward rotation, and negative input, in reverse rotation.

† Measure the motor speed with a tachometer. If the speed can be set roughly in an accuracy of ±10%, measure the TG voltage with a digital voltmeter (in forward rotation, -7 V/1000 rpm, and in reverse rotation, +7 V/1000 rpm).

** Adjust the IN-B potentiometer (1VR) to obtain the motor rated speed (in this case, do not operate other potentiometers).

(c) Zero adjustment

If the motor rotates on a speed reference input of 0 V, adjust the ZERO potentiometer (3VR) to stop the motor.

With this adjustment, motor rotates less than 1 rpm, and a digital voltmeter or tachometer cannot be used to measure the motor speed. The zero adjustment should be made, observing the rotation of the motor and the operation of the machine.

Note:

Zero adjustment is not effective for the entire range of ambient temperature. If the ambient temperature changes considerably during use, apply a speed reference voltage of 0 V as a motor stop signal and use in the P action control mode (Short-circuiting of terminals 8 and 9).

1 Make the speed reference voltage 0 V.

2 After the motor stops, shortcircuit terminals 8 and 11.

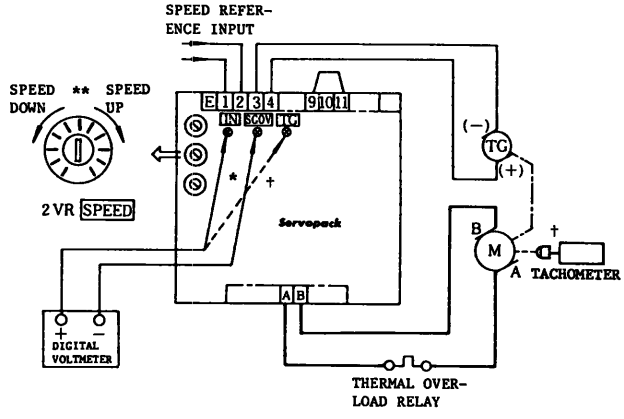


Fig. 12 Setting of Motor Speed

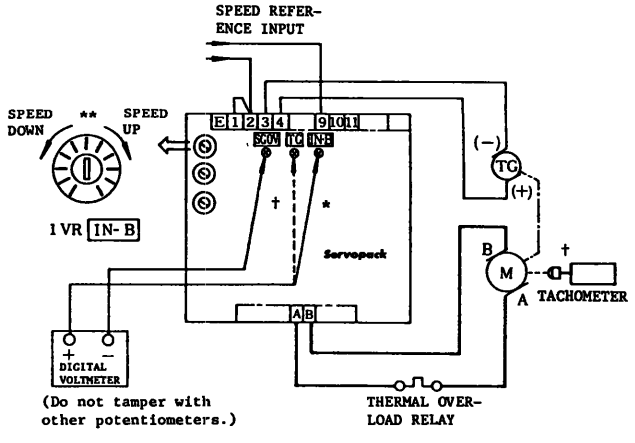


Fig. 13 Changing of Rated Reference Voltage

MAINTENANCE

MAINTENANCE PROCEDURES

(1) Servopack (Type CPCR-MR)

Servopack employs contactless circuit and uses highly reliable semiconductors. Only periodical cleaning to remove dust and occasional tightening of screws are required.

If the alarm fuse is blown, replace it with new one (one spare fuse is supplied).

The types and capacities of alarm fuses used in Servopack are as shown in Table 10.

Table 10 Types and Capacities of Alarm Fuses

Servopack Type CPCR-		MR01C	MR01CJ	MR02C	MR02CJ	MR05C	MR07C
Alarm Fuse	Type	PL-475	PL-450	PL-475	PL-475	PL-4100	PL-4150
	Capacity	7.5A	5A	7.5A	7.5A	10A	15A

(2) Servomotor

General inspection of servomotor is shown in Table 11.

As for specific inspection method of each servomotor, see the instruction manual provided for the motor.

Table 11 Inspection Schedule of Servomotors

		Inspection Items of Servomotors
With motor at rest	Installation	· Any loose bolts and nuts · Any damaged parts · Coupling out of balance · Contaminated parts with dust or oil
	Electrical	· Injury to leads and terminals · Vertical slide of brush in brush-holder not smooth · Excessive brush wear · Injury to brush section · Insulation resistance · Roughened, solid, discolored, or deformed commutator surface
With motor running	Commutator	· Excessive commutation sparks · Vibration of brush and brushholder
	Current	· Measurement of RMS value of armature current with AC ammeter · Current above rated
	Mechanical	· Abnormal noise due to vibration · Thrust load from driven machine · Poor ventilation due to clogging of air filter

TROUBLESHOOTING

Examples of Service Diagnosis for Defective Wiring or Parts

(1) The fuse is blown, when the power is turned on (Fig. 14). --- (A)

(2) The motor rotates at a high speed as soon as the power is turned on, despite the reference is 0 (Fig. 15). --- (B)

(3) The motor does not rotate when the reference voltage is applied (Fig. 16). --- (C)

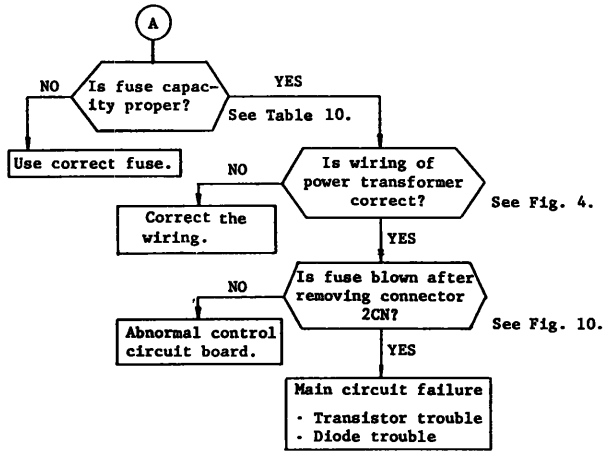


Fig. 14

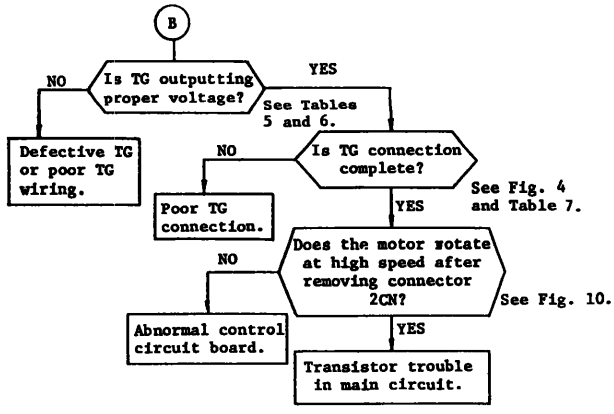
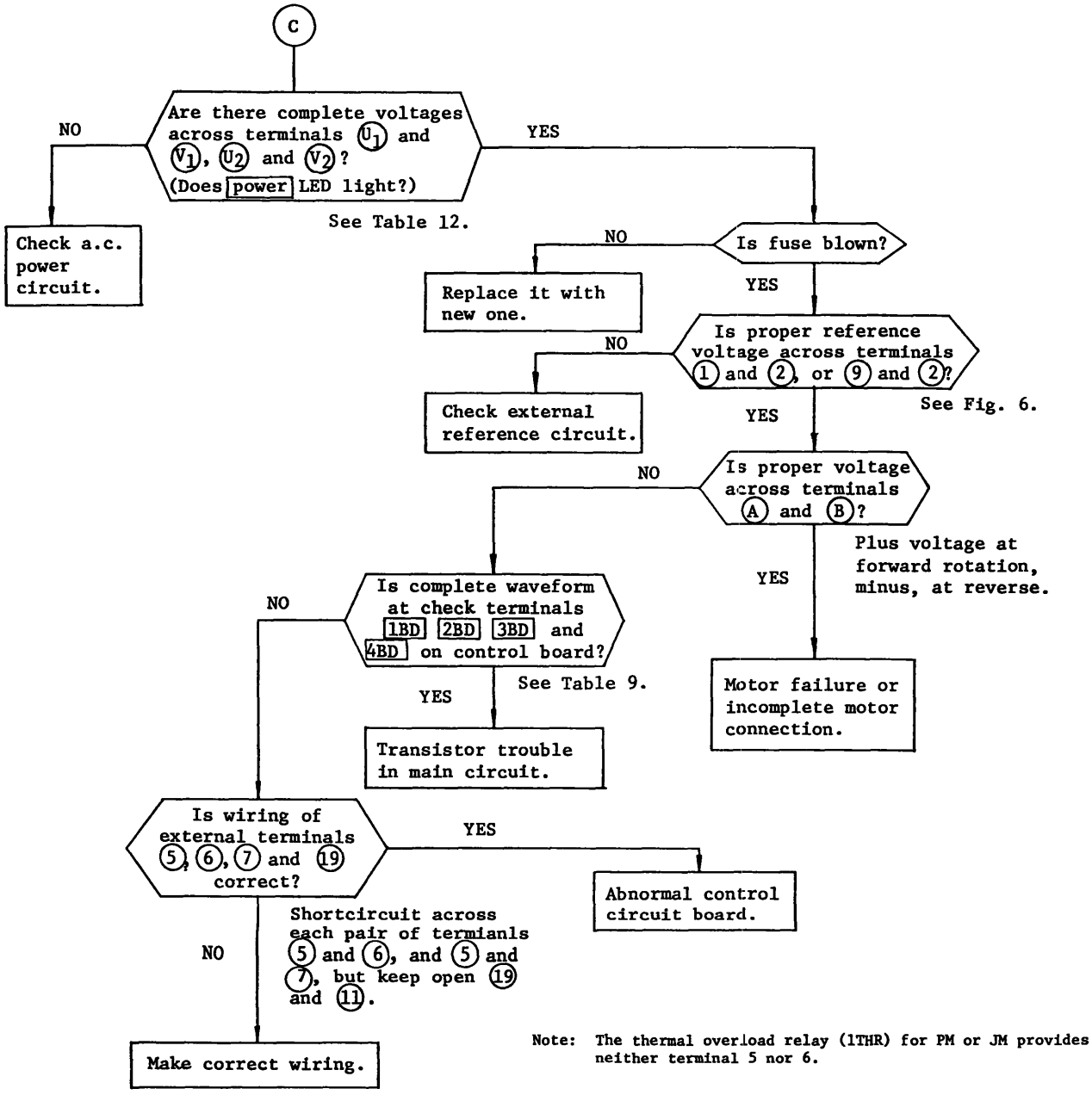


Fig. 15



Note: The thermal overload relay (1THR) for PM or JM provides neither terminal 5 nor 6.

Fig. 16

Table 12 Power Transformer Specifications

Servopack Type CPCR-	Power Transformer Type CPT	Servopack Connecting Terminals	
		U1 - V1	U2 - V2
MR01C	8585 (300 VA)	35 VAC ±10%	100 VAC ±10%
MR02C	8624 (500 VA)	47 VAC ±10%	
MR05C	8660 (1 kVA)	85 VAC ±10%	
MR07C	8665 (1.5 kVA)	80 VAC ±10%	
MR01CJ	8589 (300 VA)	100 VAC ±10%	
MR02CJ	8630 (500 VA)		

LED Indication for Service Diagnosis

(1) Servopack

- Power indication

  POWER LED (green) ON: To confirm that the power is supplied to the control circuit.

- Alarm indication

  ALARM LED (red) ON:

		Main cause	Simple check
Overcurrent.	When applying the power.	Power transistor trouble.	
		Motor grounding.	Disconnect motor, and check motor grounding with a tester.
	When applying the speed reference voltage.	Power transistor trouble.	
		Layer shortcircuit of DC reactor.	
		Defective printed circuit board. (Current detecting or drive circuit)	Remove 2CN connector.
Regenerative overvoltage.	When slowing down or stopping the motor.	Overspeed. (Rated)	Measure TG voltage and calculate the speed for check.
		Over load GD^2.	Check the GD^2.

Note: 1. Reset operation should be done with power turned off, after alarm circuit function.
2. When the power is turned on, ALARM LED may light instantaneously. But it does not indicate any trouble.

(2) Protection Device (Separately installed)

- Input signal indication

  INPUT LED (white) ON: Indicates that the speed reference input voltage is applied. (±0.1 V or above)

  INHIBIT LED (white) ON: Indicates the state of control inhibited.

  1 When inhibited externally.
  Input at terminals 5, 6 and 7, input at terminal 19.

  2 When inhibited due to abnormal state (red LED lights on).

- Servo trouble indication

  PROTECT LED (red) ON: Indicates the overcurrent mode when ALARM LED goes on.

  RE·GENE LED (red) ON: Indicates the regenerative overvoltage mode when ALARM goes on.

  TG LED (red) ON:

		Main cause	Simple check
TG circuit trouble	TG LED goes on after the motor has rotated momentarily.	· TG wiring open.	Disconnect TG wiring, and check it with a tester. (normal value: 1 to 200Ω)
		· Floating TG brush.	
		· Defective TG (disconnection).	
		TG circuit shortcircuited.	Check TG with a tester. (normal value: 1 to 200Ω)
		TG connection reverse in polarity.	Interchange TG connection.
		Motor connection reverse in polarity.	Interchange motor connection.
	TG goes on during operation.	Incomplete 1VR adjustment.	Readjust it according to Table 8.
		· Poor contact in contactor of motor circuit.	Replace it with new one.
		· Poor contact in relay of TG circuit.	Replace it with new one.
		Oil in motor or TG.	Remove the brush and check.
		Worn motor brush or TG brush.	Remove the brush and check.
		Loosened screws in motor circuit or TG circuit.	Tighten the screws.
	TG goes on without motor running.	· Disconnection of motor wiring.	Disconnect motor wiring, and check the conduction between the removed leads with a tester. (normal value: 5Ω or below)
		· Loosened connection of motor wiring.	
		· Floating motor brush.	
		Defective operation or poor contact in contactor of motor circuit.	Replace it with new one.

Note: For resetting when the servo trouble circuit functions, depress the reset button 1PB of protection device. At the same time, alarm circuit in Servopack is reset.

Examples of Service Diagnosis for Incomplete Adjustment (Table 13)

Table 13 Examples of Service Diagnosis for Incomplete Adjustment

Trouble	Cause	What to do
Motor rotates even if the speed reference voltage is 0 V.	Incomplete ZERO potentiometer (3VR) adjustment.	Adjust 3VR correctly.
Motor does not come up to rated speed, even though the rated reference voltage (±6 V) is applied.	Incomplete SPEED potentiometer (2VR) adjustment.	Turning 2VR clockwise (CW) increases the speed, and counterclockwise (CCW) decreases.
Motor vibrates after the power is turned on or the reference voltage is applied.	LOOP gain too high.	Turn LOOP potentiometer (6VR) CCW to decrease the loop gain.
Alarm fuse functions at starting or stopping.	Load inertia too large.	Make load inertia small by turning 5VR potentiometer CCW.
Motor speed overshoot is too large at starting or stopping.	· Level of mode switch too high. · LOOP gain too high.	· Turn 8VR potentiometer CCW to decrease the level. · Turn 6VR CCW to decrease the loop gain.
Regulation is poor. Though low speed regulation is good, the high is bad.	· Current limit excessive. · Level of mode switch too low.	· Turn 5VR CW to increase the current limit value. · Turn 8VR CW to increase the level.
Relay trips frequently.	Motor overloaded.	Check load current and accel/decel duty cycle.

PROTECTION DEVICE

The protection device Type JESP-PT [ ] is not standard equipment of Servopack.

PRECAUTIONS IN USE

Confirming the Type

The types of protection devices for Servopack are as shown in **Table 1.**

Installation

- Be sure to mount the protection device on the left side of Servopack.
- Mount it on Servopack as shown in **Fig. 17.**

Wiring

- Do not pull, tug or jerk the connector leads.
- When fitting the connector, insure proper direction of insertion and avoid bending pins. Do not insert forcibly.
- When wiring, do not obscure the reset push-button and the indicating LEDs.

PROCEDURES WHEN THE PROTECTION DEVICE HAS BEEN ACTUATED (Fig. 18)

The protection device contains two indicators; a white LED which turns red to indicate an input/output signal and a red LED which lights to indicate the protecting-circuit operation mode.

If the protecting circuit ("overcurrent protection," "overvoltage protection" and "TG failure protection") is actuated, a servo error signal is sent to Servopack, to stop the action of the motor drive circuit.

The protecting circuit continues to function unless the protection device is reset. For resetting the protecting circuit, locate the cause of trouble, and take a proper action, as outlined in "Service Diagnosis in Reference to LED Indication."

For resetting, depress the 1PB button on the surface of the protection device (the alarm circuit of Servopack is reset simultaneously). While the pushbutton is kept depressed, the LEDs "PROTECT," "TG" and "RE-GENE," and "ALARM" on the circuit board of Servopack light.

Notes:

1. Servo error signal contact rating (terminals (16, 17 and 18).
2. Transfer 1 contact (1C).
3. Contact capacity 200/100 VAC at 1 A, 24 VDC at 1 A.

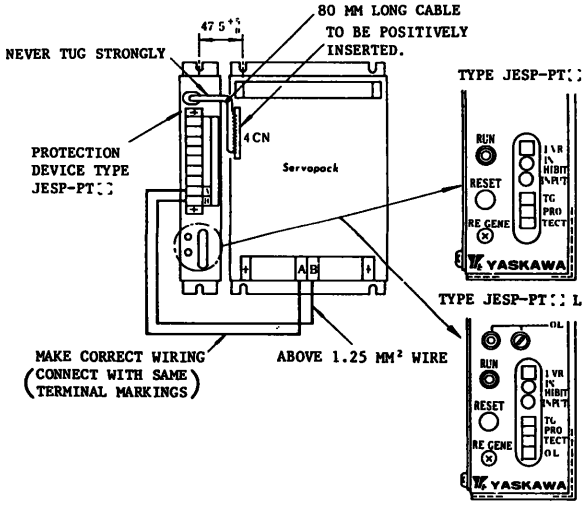
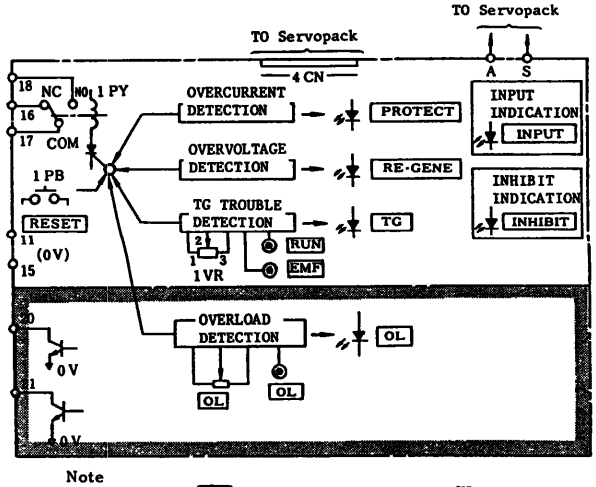


Fig. 17 Mounting and Connection of Servopack and Protection Device



Note
1. Diagram in [ ] is only for type JESP-PT[ ] L.
2. Terminals (20) and (21) are used when Yaskawa Programmable Motion Controller is connected.

Fig. 18 Elementary Diagram of Protection Device

CONNECTION OF SERVOPACK WITH A MOTOR AND PERIPHERALS (Fig. 19)

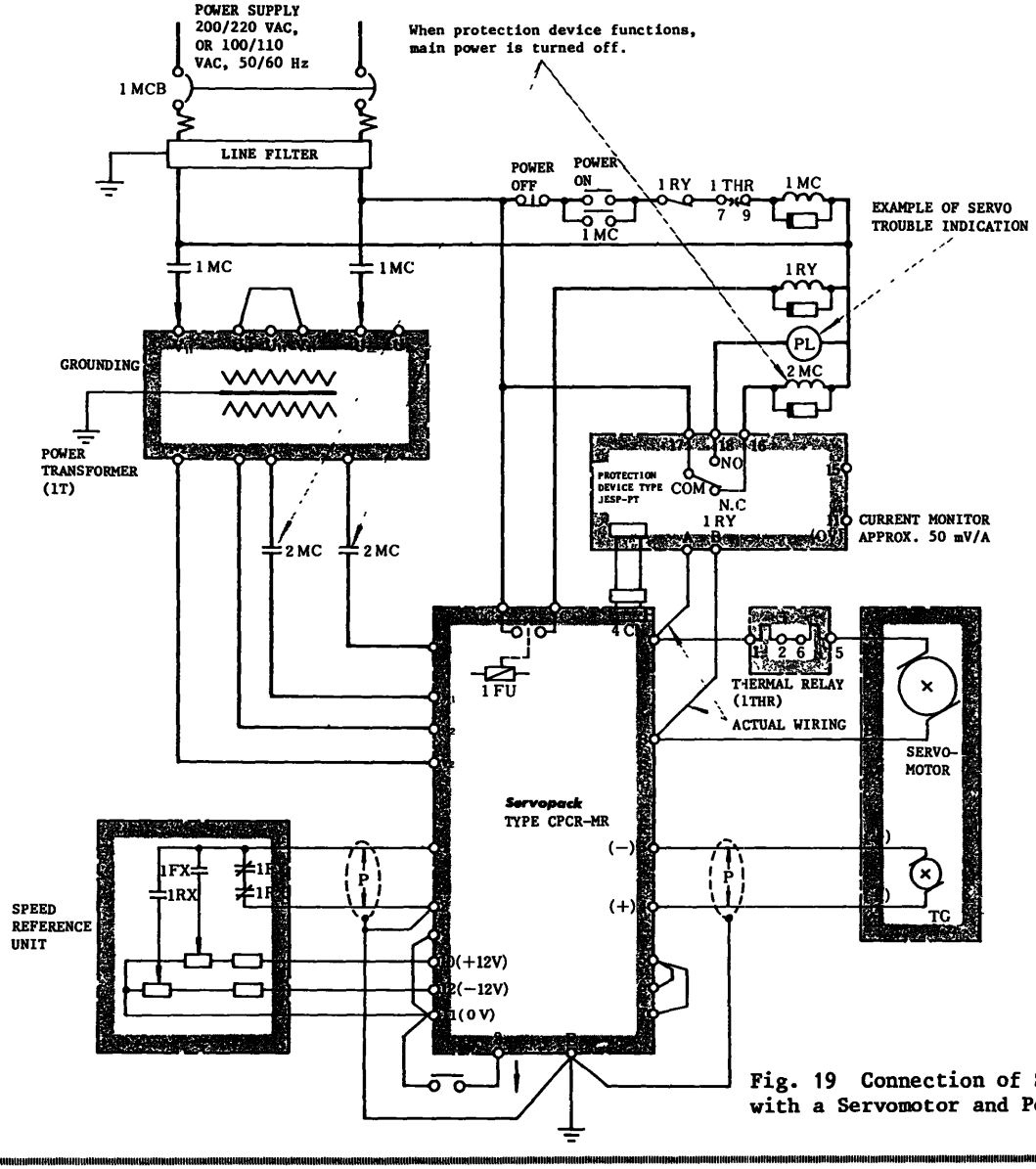


Fig. 19 Connection of Servopack with a Servomotor and Peripherals

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