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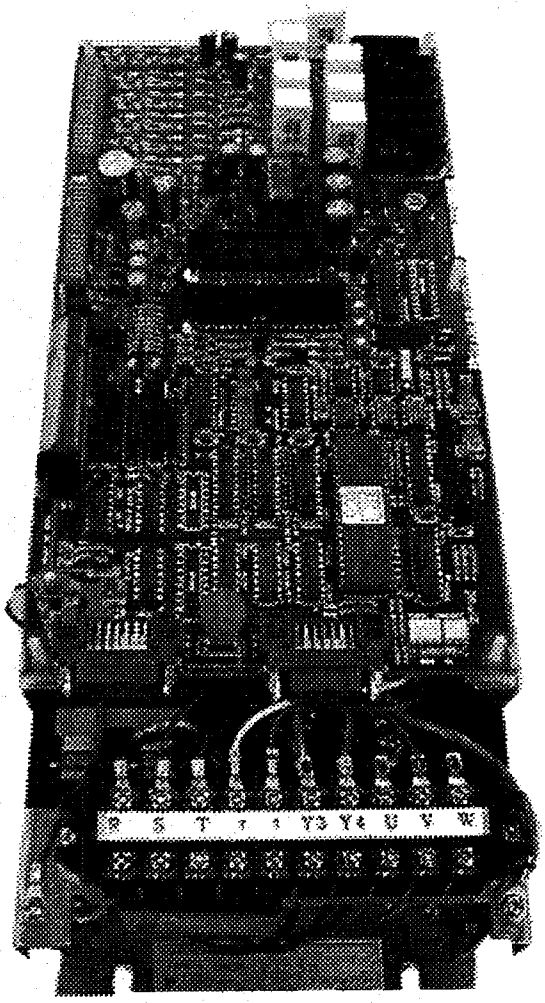
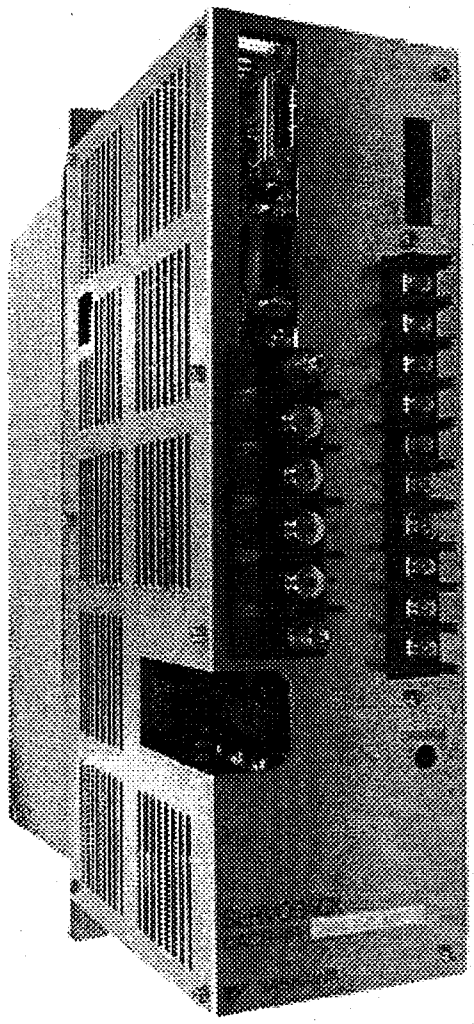




IR Servo Manual

(IR__SC & IR__SE types)

Date: 4/15/98

$50.00

IR__C

YASKAWA
Technical Service Division

IR Servo Control System for NC
CACR-IR□□C (for 1 ~ 3 axes)

Contents

YASKAWA ELECTRIC AMERICA, INC.

Original issued on:	8/30/93	**Note:**
Original issued by:		
Translated on:	1/11/96	
Translated by:		
Inspected by:		

1. Outline

This manual prescribes the function of the AC Servo control system (CACR-IR□□ SC, CRCR-IR□□□□ C and CRCR-IR□□□□□□□C) for the NC series. The IR type servo control application for NC is a control system of digital current controlling type which performs the positioning and speed control with it's host controller. The current command input is 46.875kHz PWM. Sequence and parameter data is input at 9600BPS serial transmission.

Figure 1. Block Diagram of AC Servo Control System

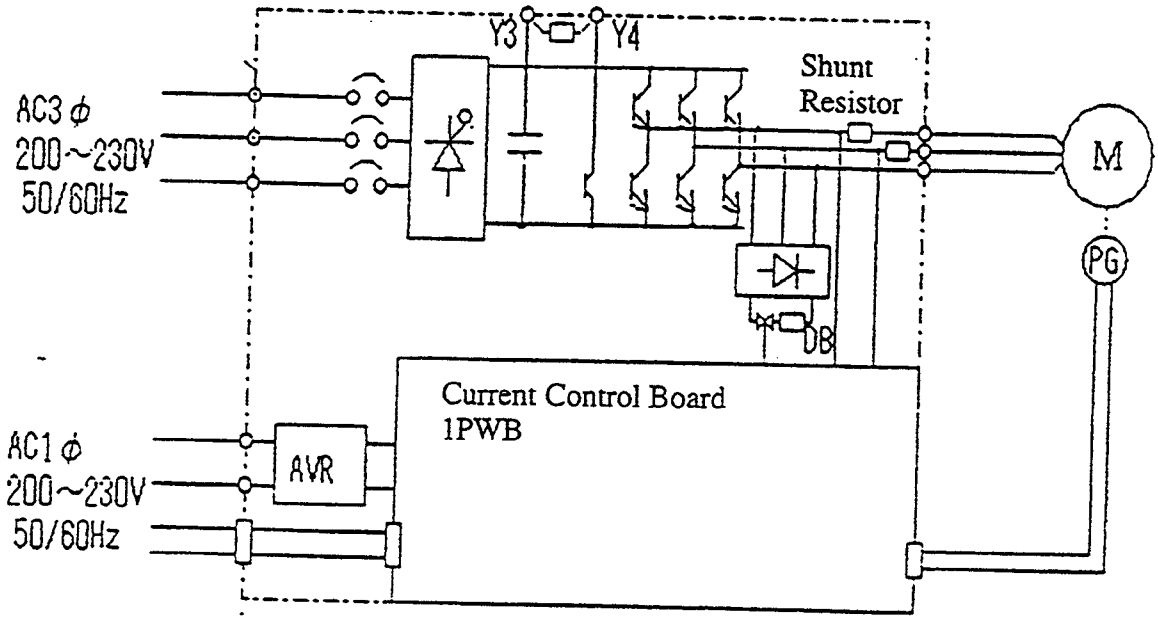


Figure 1. Block Diagram

2. System Composition

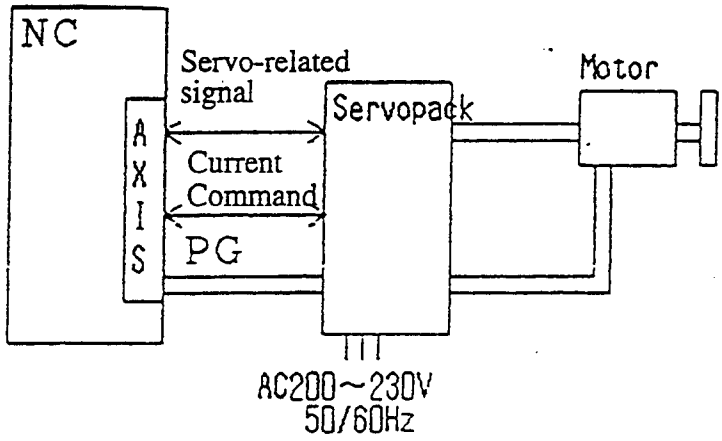
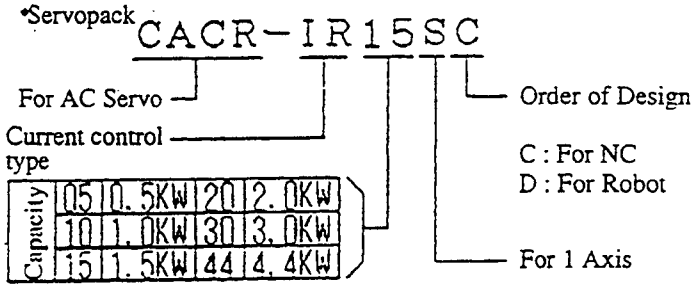
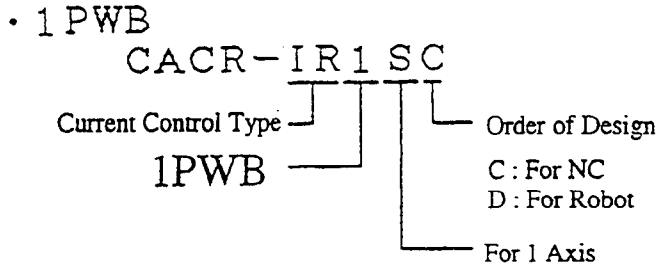


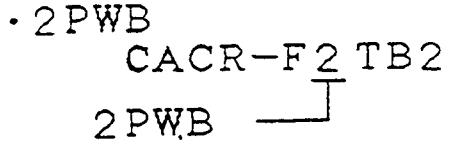
Figure 2. System Composition

3. How to Read Serial Numbers

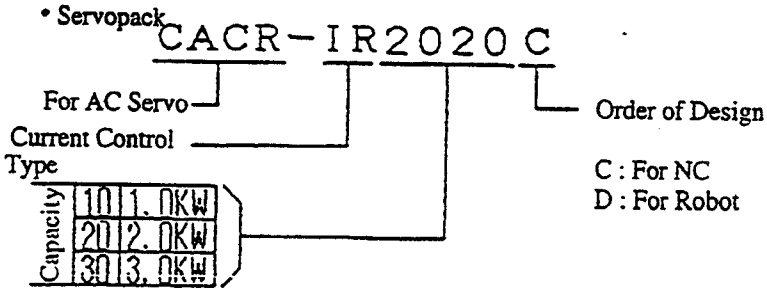
3.1. For 1st Axis

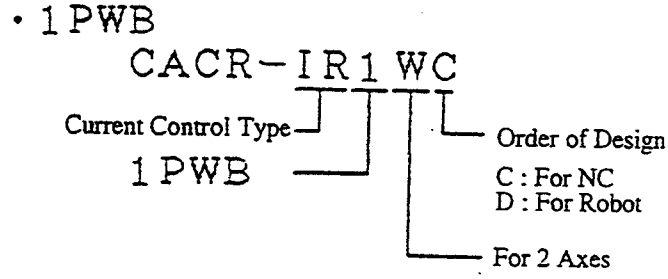


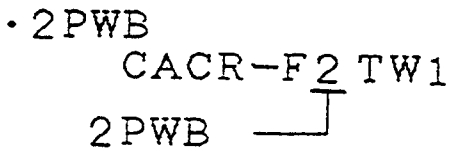




3.2. For 2 Axes







IR3030C

↳ CONTROL PCB HAS SEPARATE CONNECTORS FOR NC CONTROL AND SERVO MOTOR (12CN).

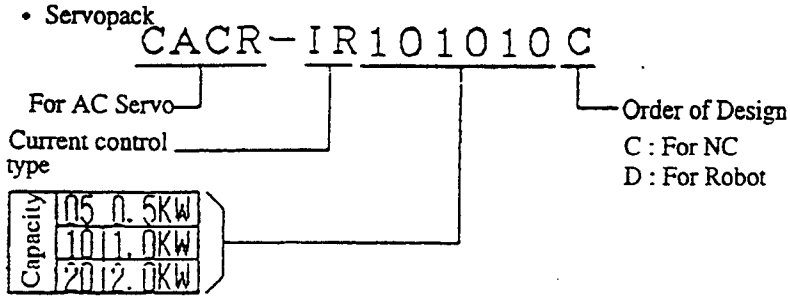
IR3030C-B

↳ 11CN & 12CN OF "3030C" ARE COMBINED IN ONE CONNECTOR (1CN). EVERYTHING ELSE IS THE SAME.

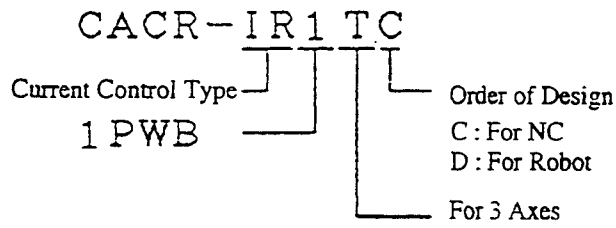
IR****C	IR****CB
CN11	CN1A (BOTTOM)
CN12	CN1B (TOP)
CN21	CN2A (BOTTOM)
CN22	CN2B (TOP)

3.3 For 3 Axes

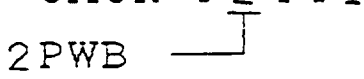
• Servopack



• 1PWB



• 2PWB



4. Rating and Specification

4.1. For 1 Axis

Corresponding Capacity KW			0.5	1.0	1.5	2.0	3.0	4.4
Control System Type CACR-			IR05SC	IR10SC	IR15SC	IR20SC	IR30SC	IR44SC
Input Power		Main circuit	3-phase AC 200 ~ 230V +10 ~ -15% 50 / 60Hz					
		Control circuit	Single phase AC 200 ~ 230V +10 ~ -15% 50 / 60Hz					
Environmental condition			Operational Temperature : 0 ~ 55 ° C Storage Temperature : - 20 ~ + 85° C Operational/preserving humidity : Less than 90% (no dew)					
Structure			Base mount					
Weight			Approximately 6.0Kg					Approx. 7Kg
Servo Output Characteristic	Rated current (Arms)		4.2	7.6	11.7	18.8	26.0	33.0
	Instantaneous current (Arms)		11.0	17.0	28.0	42.0	57.5	77.0
Control Method			3-phase full-wave rectification Transistor PWM method					
Control Command			U phase, V phase PWM current command (46.875KHz) Conform to RS422					
Feedback			Feedback by optical encoder maximum supply current 400mA					
I / O Signal	Current Command	Input Condition	PWM input of 46.875 kHz					
		Electrical Spec.	Input 200Ω Conform to RS422					
	Serial Cmu	Cmu Method	Half duplex asynchronous (9600 Bps) Refer to the serial protocol spec (DEE9403276) for the details.					
		Electrical Spec.	Input impedance approximately 200Ω Conform to RS422					
	Sequence Output Signal		SVALM					
Built - in Function	Protection Function		· Overvoltage · Overcurrent · MCCB trip · Voltage drop · Open phase · Abnormal regeneration · Current command disconnection · Abnormal current command · Abnormal current feedback · Abnormal CPU					
	DB Function		Auto. DB which functions when the power is off, servo alarm is generated and servo is off and is built in this system.					
	Regenerative Process		Built-in					
	Main power source interruption contactor		Within GD^2m x 5					

4-2. For 2-axes

Corresponding Capacity KW			0.5	1.0		2.0	3.0
Control System Type CACR-			IR0505SC	IR1010SC	IR1020SC	IR2020SC	IR3030SC
Input Power		Main circuit	3-phase AC 200 ~ 230V +10 ~ -15% 50 / 60Hz				
		Control circuit	Single phase AC 200 ~ 230V +10 ~ -15% 50 / 60Hz				
Environmental condition			Operational Temperature : 0 ~ 55 ° C Storage Temperature : - 20 ~ + 85° C Operational/preserving humidity : Less than 90% (no dew)				
Structure			Base mount (Forced air-cooling system over 2.5m/s)				
Weight			Approximately 9.0Kg				approx. 12kg
Servo Output Characteristic	Rated current (Arms)		4.2	7.6		11.7	18.8
	Instantaneous current (Arms)		11.0	17.0		28.0	42.0
Control Method			3-phase full-wave rectification Transistor PWM method				
Control Command			U phase, V phase PWM current command (46.875KHz) Conform to RS422				
Feedback			Feedback by optical encoder maximum supply current 400mA				
I / O Signal	Current Command	Input Condition	PWM input of 46.875 kHz				
		Electrical Spec.	Input 200Ω Conform to RS422				
	Serial Cmu	Cmu Method	Half duplex asynchronous (9600 Bps) Refer to the serial protocol spec (DEE9403276) for the details.				
		Electrical Spec.	Input impedance approximately 200Ω Conform to RS422				
	Sequence Output Signal		SVALM				
Built - in Function	Protection Function		· Overvoltage · Overcurrent · MCCB trip ·Voltage drop · Open phase · Abnormal regeneration · Current command disconnection · Abnormal current command · Abnormal current feedback · Abnormal CPU				
	DB Function		Auto. DB which functions when the power is off, servo alarm is generated and servo is off and is built in this system.				
	Regenerative Process		Built-in				
	Main power source interruption contactor		Within GD^2m x 5				

4-3. For 3-axes

Corresponding Capacity KW			0.5	1.0	2.0
Control System Type CACR-			IR050505SC	IR101010SC / IR101020SC	IR202020SC
Input Power		Main circuit	3-phase AC 200 ~ 230V +10 ~ -15% 50 / 60Hz		
		Control circuit	Single phase AC 200 ~ 230V +10 ~ -15% 50 / 60Hz		
Environmental condition			Operational Temperature : 0 ~ 55 ° C Storage Temperature : - 20 ~ + 85° C Operational/preserving humidity : Less than 90% (no dew)		
Structure			Base mount (Forced air-cooling system over 2.5m/s)		
Weight			Approximately 12.7Kg		
Servo Output Characteristic	Rated current (Arms)		4.2	7.6	11.7
	Instantaneous current (Arms)		11.0	17.0	28.0
Control Method			3-phase full-wave rectification Transistor PWM method		
Control Command			U phase, V phase PWM current command (46.875KHz) Conform to RS422		
Feedback			Feedback by optical encoder maximum supply current 400mA		
I / O Signal	Current Command	Input Condition	PWM input of 46.875 kHz		
		Electrical Spec.	Input 200Ω Conform to RS422		
	Serial Cmu	Cmu Method	Half duplex asynchronous (9600 Bps) Refer to the serial protocol spec (DEE9403276) for the details.		
		Electrical Spec.	Input impedance approximately 200Ω Conform to RS422		
	Sequence Output Signal		SVALM		
Built - in Function	Protection Function		· Overvoltage · Overcurrent · MCCB trip · Voltage drop · Open phase · Abnormal regeneration · Current command disconnection · Abnormal current command · Abnormal current feedback · Abnormal CPU		
	DB Function		Auto. DB which functions when the power is off, servo alarm is generated and servo is off and is built in this system.		
	Regenerative Process		Built-in		
	Main power source interruption contactor		Within GD^2m x 5		

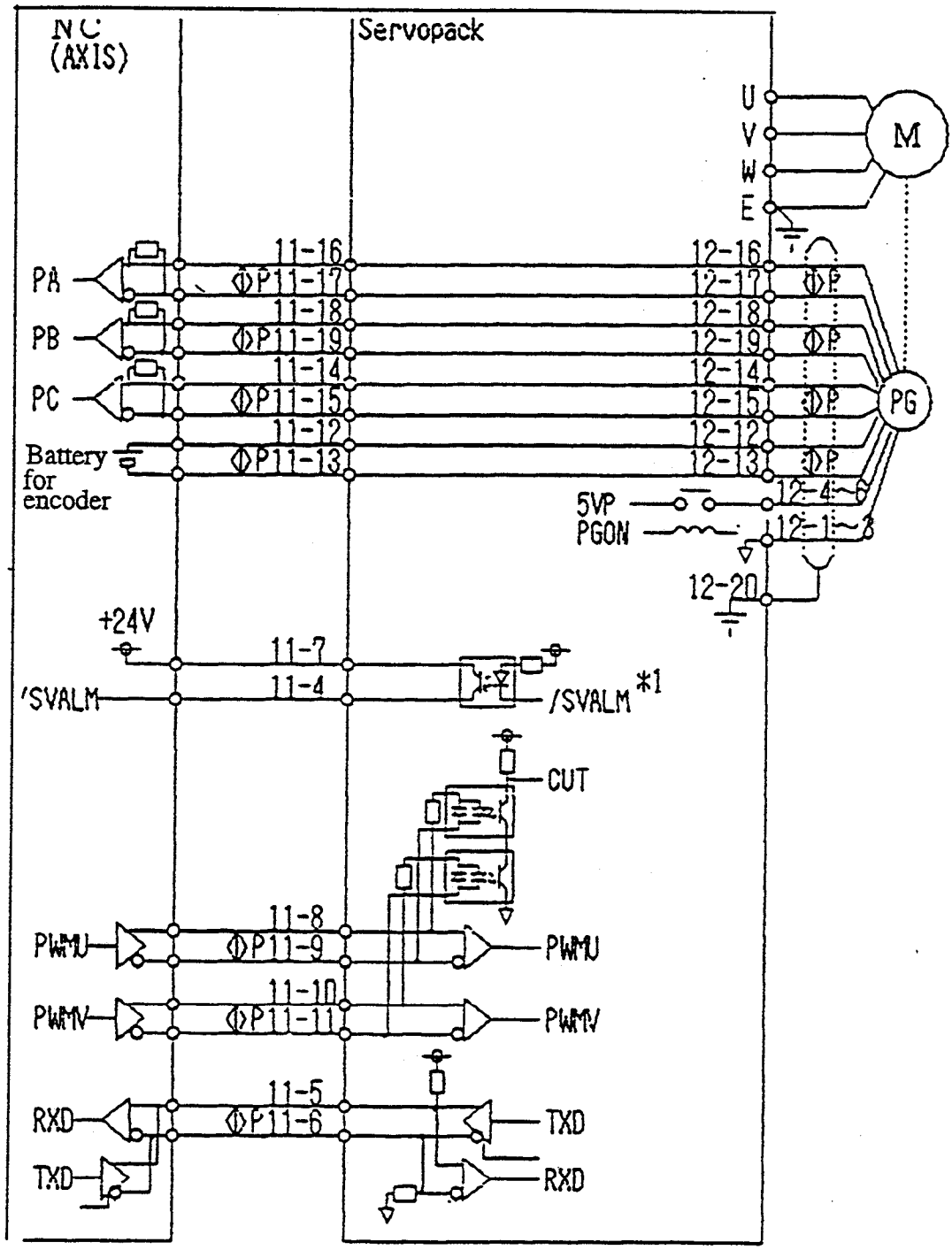
5. Standard Combination

Table 4. Combination of Servopack and Servomotor, Peripheral Devices

Servopack Type	Applied Servomotor	Power Supply Capacity / Motor KVA	Power Supply Capacity / MCCB
CACR-IR05SC	Corresponding to F series 500W	1.1	5
CACR-IR10SC	Corresponding to F series 1.0KW	2.1	8
CACR-IR15SC	Corresponding to F series 1.5KW	3.1	10
CACR-IR20SC	Corresponding to F series 2.0KW	4.1	12
CACR-IR30SC	Corresponding to F series 3.0KW	6.0	18
CACR-IR44SC	Corresponding to F series 4.4KW	8.0	24
CACR-IR0505C	Corresponding to F series 500W	2.1	8
CACR-IR1010C	Corresponding to F series 1.0KW	4.1	12
CACR-IR1020C	Corresponding to F series 1.0KW Corresponding to F series 2.0KW	6.0	18
CACR-IR2020C	Corresponding to F series 2.0	8.0	24
CACR-IR3030C	Corresponding to F series 3.0KW	11.0	32
CACR-IR050505C	Corresponding to F series 500W	3.1	10
CACR-IR101010C	Corresponding to F series 1.0KW	6.0	18
CACR-IR101020C	Corresponding to F series 1.0KW Corresponding to F series 2.0KW	8.0	24
CACR-IR202020C	Corresponding to F series 2.0KW	11.0	32

* Depends on the type of motor.

6. Total Connection



*1: Capacity of Open Collector output is less than DC30V 30mA.
*2: Signal I/O line ↑↓ P indicates twisted pair line.

7. Details of Connection

7-1. Connector terminal CN11, 21, 31 for I/O signal

CN11, 21, 31 of the servopack are connected with the connector of the NC AXIS.

(1) Specifications of the Connector

Honda Tsushin Kogyo MR connector (20-pin)

Servopack	PWB mounted side	MR-20RMA (right angle type)
	Cable side	MR-20F (connector)
		MR-20L (connector case)

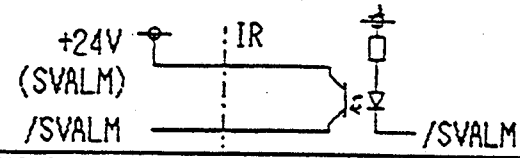
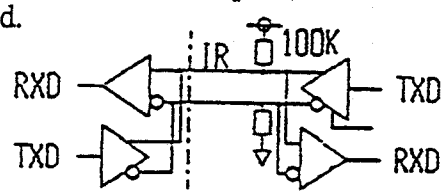
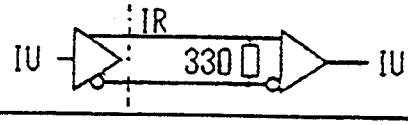
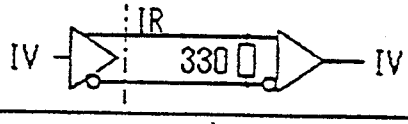
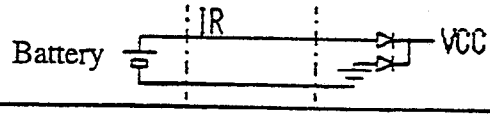
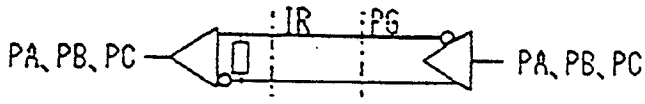
(2) Connector Pin Arrangement

Table 5.

1	2	3	4	5	6	7
S G			/SVALM	DATA	*DATA	SVALM
Signal 0V			Servo alarm output	Serial communication I/O		+24V Input

8	9	10	11	12	13
IU	*IU	IV	*IV	BAT	0BAT
Current command U phase		Current command V phase		Encoder battery input	

14	15	16	17	18	19	20
PC	*PC	PA	*PA	*PB	*PB	F G
PG signal C phase		PG signal A phase		PG signal B phase		Frame ground

Pin No.	Signals	Specification
1 ~ 3	SG	Signal 0V (SG: System Ground)
7	SVALM	Turn on while normal operation (not under alarmed condition).
4	/SVALM	
5	DATA	I/O for serial transmission. Conform to RS422. Refer to serial protocol spec (DE9400628) for transmission method.
6	*DATA	
8	IU	46.875KHz PWM current command U phase input. Refer to MB651142 (DE8409818) for PWM output method.
9	*IU	
10	IV	46.875KHz PWM current command U phase input. Refer to MB651142 (DE8409818) for PWM output method.
11	*IV	
12	BAT	Battery input for encoder.
13	OBAT	
14	PC	Output signals from PG to AXIS side.
15	*PC	
16	PA	
17	*PA	
18	PB	
19	*PB	

7-2. Connector terminal CN12, 22, 32 for PG signal
CN12, 22, 32 of the servopack are connected to an encoder, etc.

(1) Specifications of the Connector

Honda Tsushin Kogyo MR connector (20-pin)

Servopack	PWB mounted side	MR-20RMA (right angle type)
	Cable side	MR-20F (connector)
		MR-20L (connector case)

(2) Connector Pin Arrangement

1	2	3	4	5	6	7
0V	0V	0V	+5V	+5V	+5V	
0V of PG power supply			5V of PG power supply			

8	9	10	11	12	13
				BAT	0BAT
				Battery input	

14	15	16	17	18	19	20
PC	*PC	PA	*PA	PB	*PB	FG
PG signal C phase		PG signal A phase		PG signal B phase		Frame ground

7-3. External terminal and connector

Symbol	Terminal	Summary
(R) (S) (T)	Main circuit power supply input terminal	3-phase AC200 ~ 230V -15 ~ +10% 50 / 60Hz
(U) (V) (W)	Motor connecting terminal	(U) and motor (A) terminal (V) connect to motor (R) terminal (W) and motor (C) terminal
(r) (t)	Control power supply input terminal	Single phase AC200 ~ 230V -15 ~ +10% 50 / 60Hz
⏚	Ground terminal	Connect to motor (D) terminal and drop to ground.
(Y3) (Y4)	Regenerative resistance connecting terminal	(Y3) (Y4) Regenerative resistance connecting terminal at Y3, Y4. (Normally, external connection is not necessary).

8. Functions and Movements

Function Block Diagram

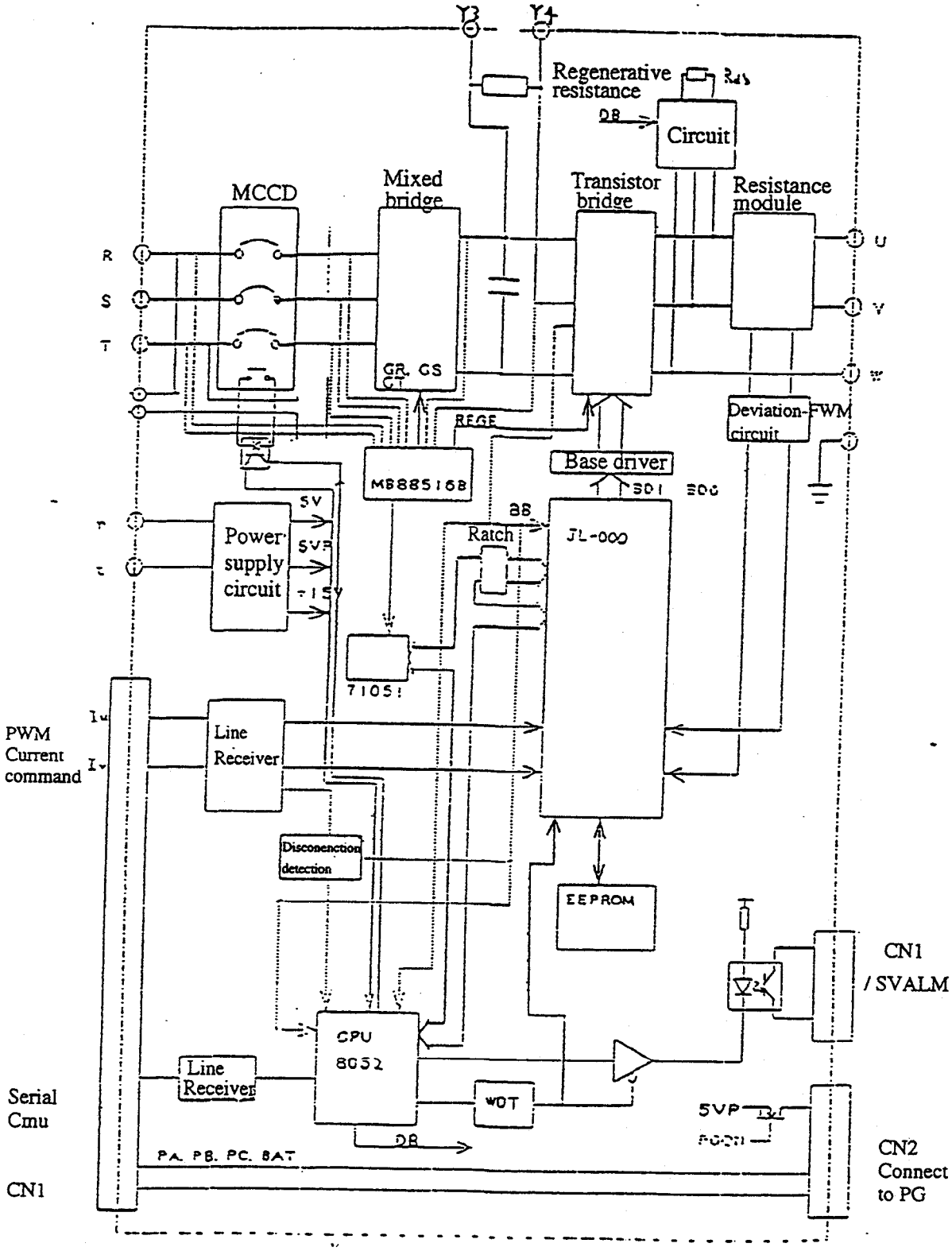


Figure 3. Block Diagram

8-1. Details of function

(1) I/O Signals

- Input for servopack current command U/V phase is done by 46.875KHz PWM.

  With the current amp., the data is converted at 11.719KHz and averaged twice to create the current command. This current command changes it's weight according to the current amp. gain by the serial transmission, so it is necessary to determine the command as follows:

  Current command becomes
  ± 4096 x 256
  at resolution x 4 · PWM saturation.

  Also, the current feedback at resolution · PWM saturation becomes
  ± 4096 x IMUL (IMUL: current amp. gain coefficient).

  Refer to the serial protocol specification (DE9400628), IR setup manual (DE9400629) to determine the current command and the current amp. gain.

- Servo alarm (SVALM)

  Generated if the alarm is not generated after approximately 400ms from the control power supply. The output is turned off by the servo alarm. The current detection resisting value is as follows:

Chart 9. List of Current Detection Resisting Value for 1 Axis

Type CACR-	IR05SC	IR10SC	IR15SC	IR20SC	IR30SC	IR44SC
Current detection resistance (mΩ)	20	10	10	5	5	3

Chart 10. List of Current Detection Resisting Value for 2 Axes

Type CACR-	IR0505C	IR1010C	IR1020C	IR2020C	IR30SC	IR3030C
Current detection resistance (mΩ)	20	10	1st axis: 10 2nd axis: 5	5	5	3

Chart 11. List of Current Detection Resisting Value for 3 Axes

Type CACR-	IR050505C	IR101010C	IR101020C	IR202020C
Current detection resistance (mΩ)	20	10	1st axis: 10 2nd axis: 10 3rd axis: 5	5

(2) Protecting Function

The servopack has a built-in function which protects the servopack and the motor from problems.

- Dynamic brake

  The servopack has a built-in dynamic brake for an emergency stop which works in the following cases.

  (i) Servo alarm (Problem detected)
  (ii) Current command disconnection
  (iii) Servo off
  (iv) Main power supply off

  To stop the motor, work the dynamic brake. When the main circuit function is available, the dynamic brake off can be manipulated by the serial transmission.

- Problem detection

  When the problem is detected, / SVRDY turns off and the contents of the detection are displayed by the LED which can be read in the serial transmission (contents of the servo alarm).

(i) Abnormality detection

Chart 12. Abnormality Detecting Function

Abnormality Detecting Function	Contents of Detection	RDY Lights Out
Overcurrent	Overcurrent occurred in the main circuit	O
MCCB trip	MCCB trip	O
Abnormal regeneration	Regeneration process circuit in iAP malfunction	O
Overvoltage	DC voltage in the main circuit became abnormally high	O
Insufficient voltage	DC voltage in the main circuit became abnormally low	O
Ground fault	Main circuit has ground fault	O
Abnormal offset	Abnormal current offset or no offset	O
Current command disconnection	Current command cable disconnection	O
Open phase	One phase out of three is open	O
Abnormal CPU	Abnormal CPU	O

* O: LED goes off when the problem is detected and / SVRDY goes off.
  X : LED does not go off even if the problem is detected.

(ii) Hardware problems

Chart 13. Hardware Problem Detecting Function

Detecting Function	Contents	RDY Lights Off
CPU ROM error	ROM error among CPU hardware	O
CPU RAM error	RAM error among CPU hardware	O
Serial transmission problem 1	Problem with serial transmission (test mode only)	O
Serial transmission problem 2		O
Gate alley problem	Problem with gate alley	O
EEROM error	Problem with EEROM	O
4-bit micro computer problem	Problem with 4-bit micro computer	O
Current feedback problem in U phase	Current feedback problem in U phase	O
Current feedback problem in V phase	Current feedback problem in V phase	O

(3) Servo alarm reset

The servo alarm reset can be done by serial transmission. However, the alarm is a result of some abnormality in the servo, so first check to see what the problem is and do troubleshooting before resuming the operation.

(4) Display

The conditions are displayed by the following LED's.

Chart 14. Displayed LED

Symbols	Model	Function
LD3	+5V	Lights up when the power supply is the control power supply of +5V.
LD2	RDY1	Lights up when the servo alarm is not for the 1st axis.
LD1	RDY2	Lights up when the servo alarm is not for the 2nd axis.
LD4	RDY3	Lights up when the servo alarm is not for the 3rd axis.
LED10	POWER	Lights up when the main power supply is turned on.

(5) SW setup

SW1 - 0 ~ 2 :Axis setup
0 : 1 axis
1 : 2 axes
2 : 3 axes

Setup the axes you are going to use. Without the setup (totally open) or if wrong axes are set, the total system does not work.

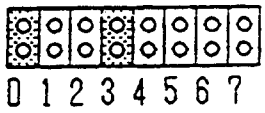
For 1 axis, one out of 1 ~ 3 axes can be set.
For 2 axes, one or two out of 1 ~ 3 axes can be set.
For 3 axes, all of the axes (1 ~ 3 axes) can be set.
Set all of the three axes for normal operation.

SW1 - 3 ~ 5 : Unused
Short or open

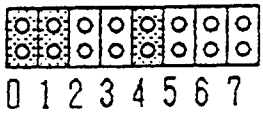
SW1 - 6, 7 : For test only
Open except for the test
If SW1-7 is open, normal operation cannot be done.

The axes are as follows when shipped out:

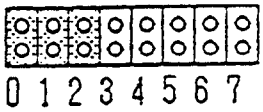
For 1 Axis



For 2 Axes



For 3 Axes



* SW1 - 0 ~ 2, 6, 7 of which the PROM version is over, IR3003 is as follows (setup for 2 axes is different from the above setup):

2 axes setup

- SW1 - 0 ~ 2 : Axis setup should be done as follows:

SW1-0	SW1-1	SW1-2	1st Axis	2nd Axis	3rd Axis
X	X	X	cannot be set		
O	X	X	1	none	none
X	O	X	none	2	none
O	O	X	1	2	none
X	X	O	none	none	3
O	X	O	1	none	3
X	O	O	none	2	3
O	O	O	2	1	none

X : Open
O : Short

SW 1 - 6 : Test only (Test mode 1)

If "short" happens, the serial transmission will be checked and regeneration will not work.

SW1 - 7 : Test only (Test mode 2)

The main circuit DC input (No. 3-phase power supply) mode will start if "short" occurs. Keep "power ready" and ignore MCCB, OV, TB alarms.

(6) Serial transmission

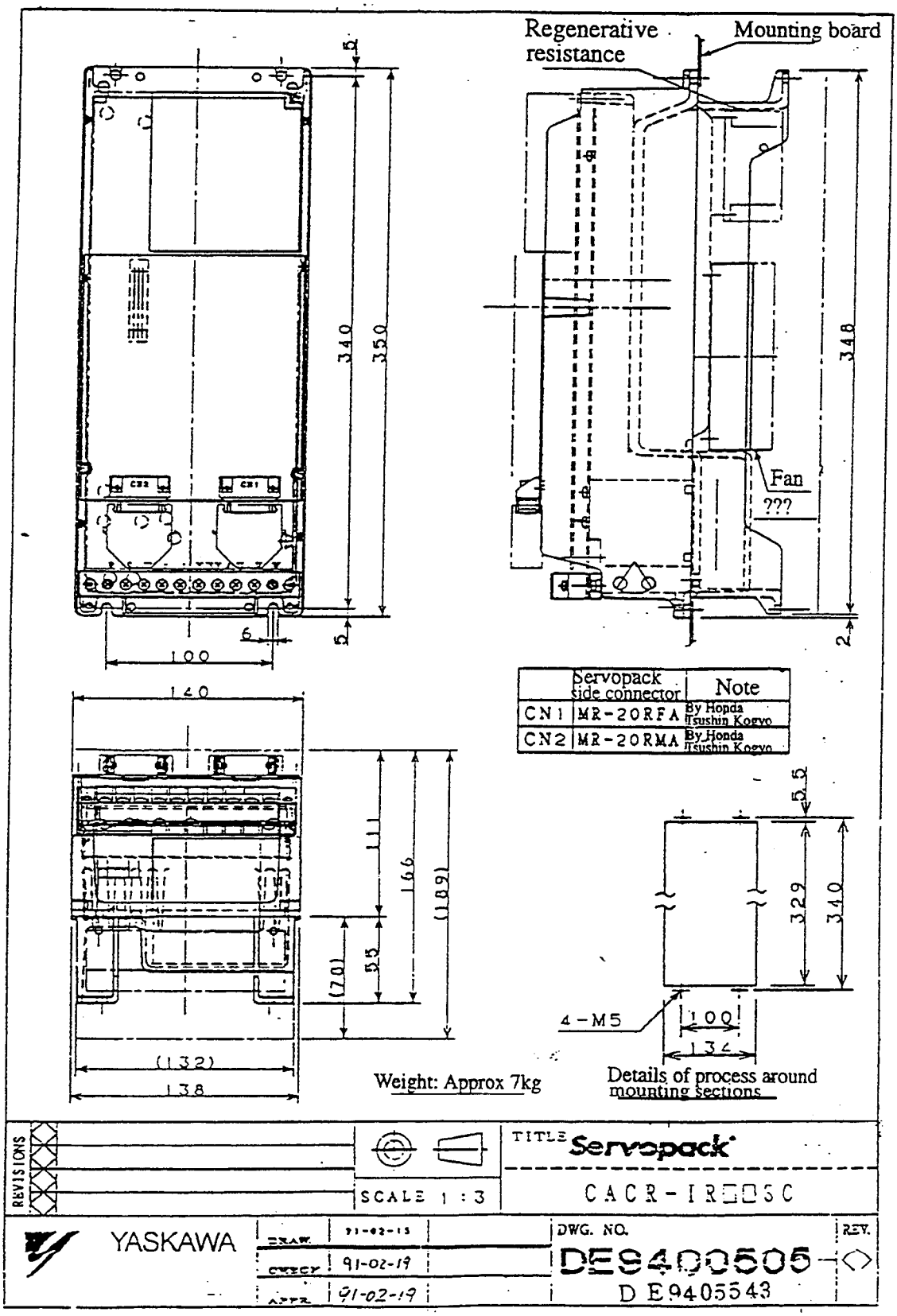
The sequence control, status reading, parameter setup / change / reading are done by serial transmission. Refer to the serial protocol specification DE9400628 for the details of the serial transmission.

O	O	O	2	1	none

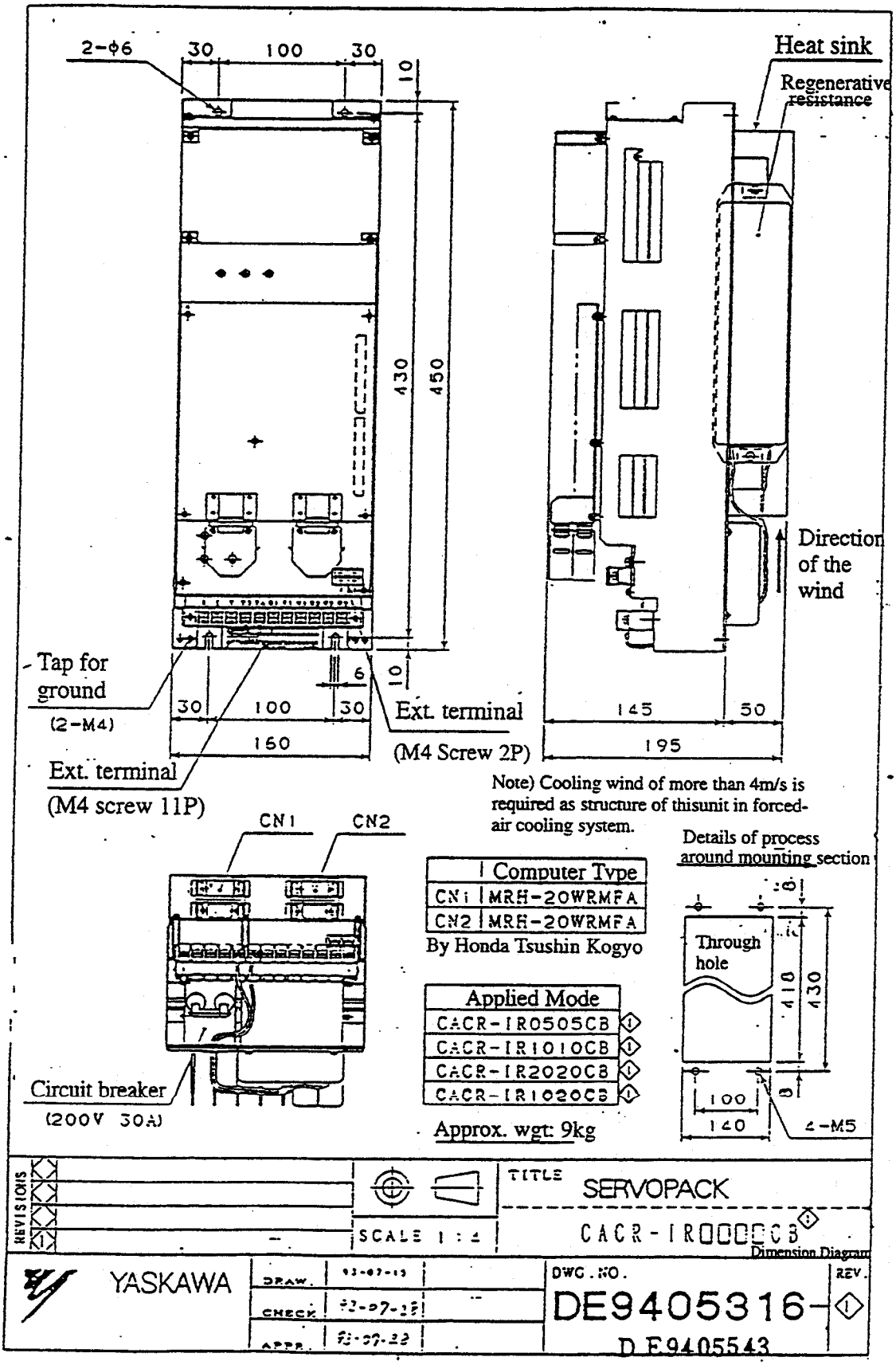
X : Open
O : Short

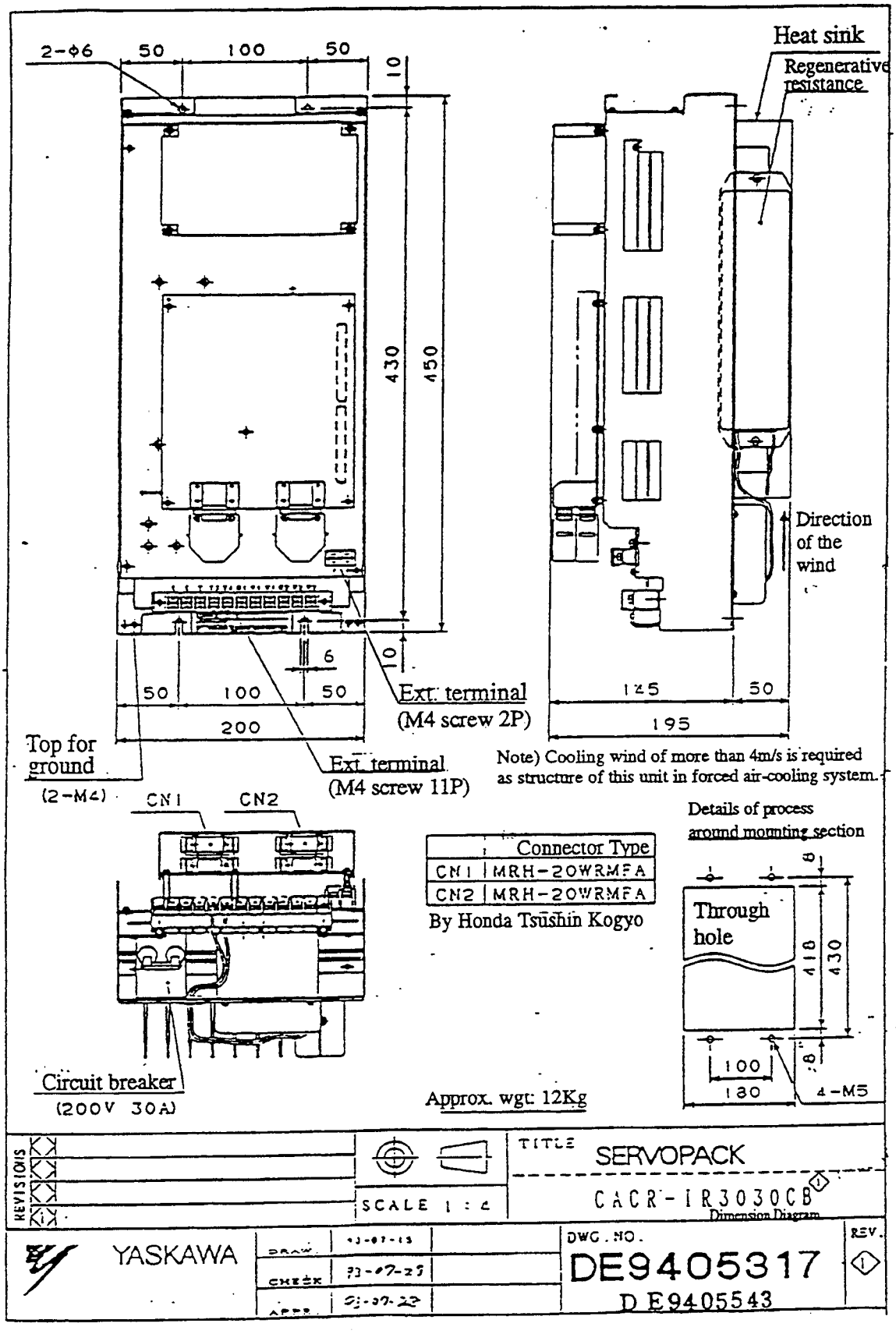
9. Dimension Diagram

9.1 For 1 Axis

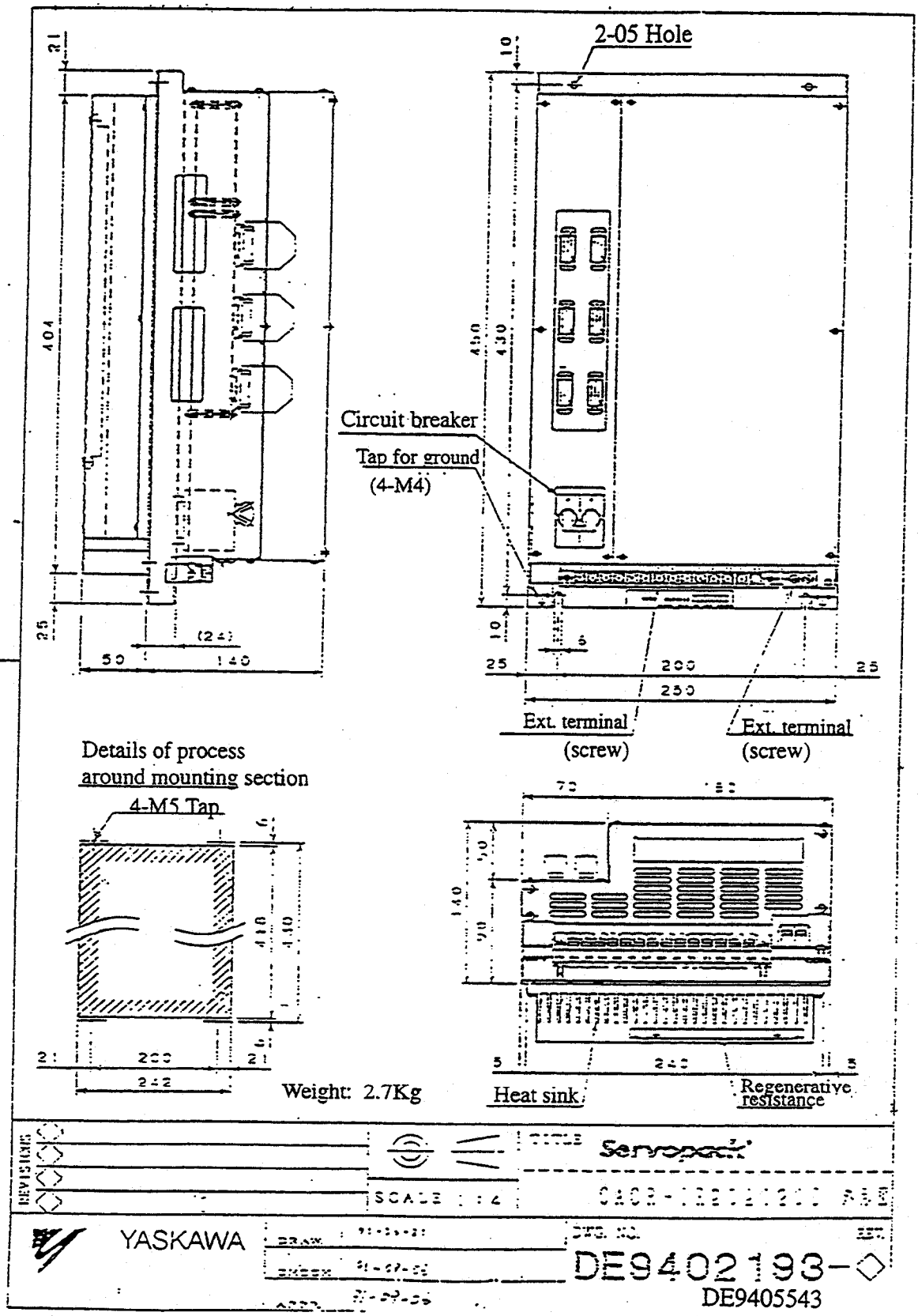


9.2. For 2 Axes


2-φ6
30
100
30
10
430
450
10
6
Heat sink
Regenerative resistance
Direction of the wind
Tap for ground
(2-M4)
30
100
30
160
Ext. terminal
(M4 Screw 2P)
145
50
195
Ext. terminal
(M4 screw 11P)
Note) Cooling wind of more than 4m/s is required as structure of thisunit in forced-air cooling system.
CN1
CN2
Computer Type
CN1 MRH-20WRMFA
CN2 MRH-20WRMFA
By Honda Tsushin Kogyo
Details of process around mounting section
Through hole
410
430
100
140
4-M5
Applied Mode
CACR-IR0505CB
CACR-IR1010CB
CACR-IR2020CB
CACR-IR1020CB
Approx. wgt: 9kg
Circuit breaker
(200V 30A)
REVISIONS
SCALE 1 : 4
TITLE SERVOPACK
CACR-IR□□□□CB
Dimension Diagram
YASKAWA
DRAW.
CHECK
APPR.
DWG. NO.
DE9405316
D E9405543
REV.


2-φ6
50
100
50
10
430
450
6
10
50
100
50
200
Top for ground
(2-M4)
Ext. terminal
(M4 screw 11P)
Ext. terminal
(M4 screw 2P)
Heat sink
Regenerative resistance
Direction of the wind
125
50
195
Note) Cooling wind of more than 4m/s is required as structure of this unit in forced air-cooling system.
CN1
CN2
Circuit breaker
(200V 30A)
Connector Type
CN1 MRH-20WRMFA
CN2 MRH-20WRMFA
By Honda Tsūshin Kogyo
Approx. wgt: 12Kg
Details of process around mounting section
Through hole
410
430
8
100
180
4-M5
REVISIONS
SCALE 1 : 4
TITLE
SERVOPACK
CACR-IR3030CB
Dimension Diagram
YASKAWA
DRAWN
CHECK
APPD
DWG. NO.
DE9405317
D E9405543
REV.

9.3 For 3 Axes


2-05 Hole
Circuit breaker
Tap for ground
(4-M4)
Ext. terminal
(screw)
Ext. terminal
(screw)
Details of process
around mounting section
4-M5 Tap
Weight: 2.7Kg
Heat sink
Regenerative
resistance
YASKAWA
DE9402193-◇
DE9405543

10. Warning

10-1. Minus load

When a motor is rotated from the minus side, you cannot practice ?

(Example) Supply motor drive
Motor drive for taking down objects

According to the specification, the regular control abbreviation of the servopack is short-time rating, such as the motor stopping time. So, if you need to apply the capacity to the minus load, refer to DEN-S.

10-2. Load inertia JL

The allowable load moment of inertia JL converted to the motor shaft, must be within five times the inertia of the applicable AC SERVOMOTOR. If the allowable inertia is exceeded, an overvoltage alarm may be given during deceleration. If this occurs, take the following actions:

- Reduce the current limit.
- Slow down the deceleration curve.
- Decrease the maximum speed.

10-3. High voltage line

If the supply voltage is 400 / 440V, the voltage must be dropped three-phase, 400 / 440V to 200V using a power transformer. Table 18 shows the transformer selection. Connection should be made so that the power is supplied and cut through the primary side-of the transformer. Single-phase 100V class power supply should not be used.

11. Warning

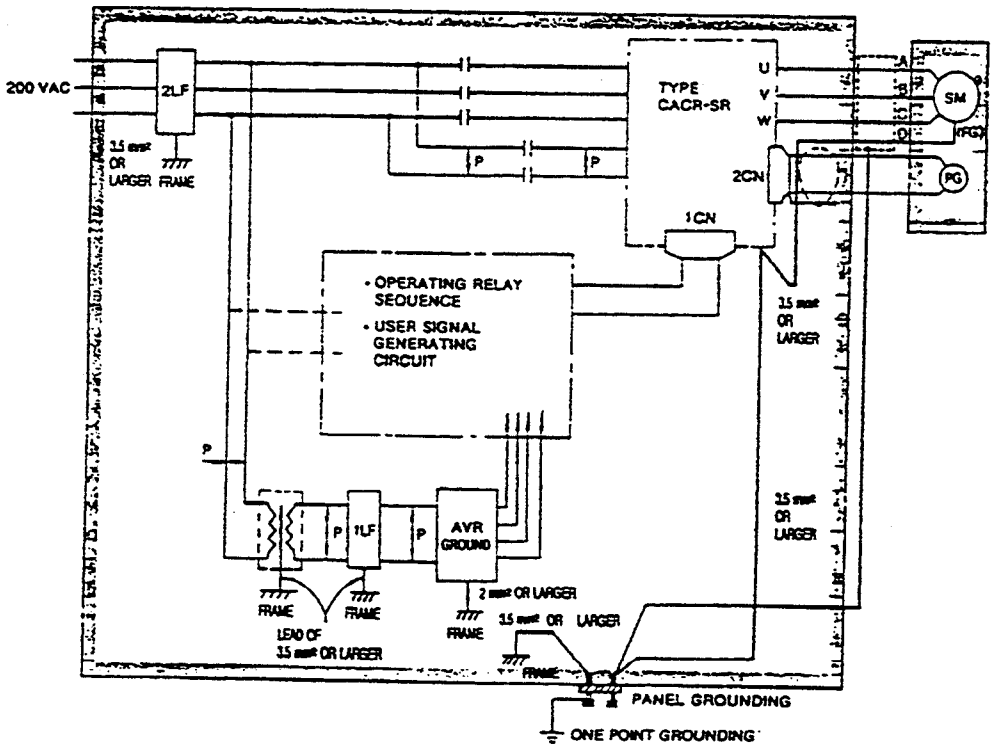
11-1. Noise prevention

The servopack has a power transistor in it's main circuit. Sometimes, an effect of the di / dt or dv / dt (switching noise) appears as a result of the wiring process or the way the ground is set.

The servopack also has a built-in CPU, which strictly requires a proper wiring or ground processing to prevent noise as much as possible.

To prevent trouble caused by the noise, the wiring and ground process must be done as Figure 8 shows.

(1) Ground process



(Note) 1. Use thick cables such as a flat mesh copper line over 3.5mm^2 as a cable which connects the outer cases.

2. Read the next paragraph carefully which describes the matters that require special attention when you use the noise filter.

3. The wiring between $\overbrace{\uparrow \atop \downarrow}$ P should be done by the twisted pair.

- Motor frame grounding

  If the motor is conencted to the ground through the frame on the machine side, the Cf dv / dt current flows through the motor floating capacity (C+) from the PWM power section.

  The E terminal of the motor (motor fram) must be connected to the ⏚ terminal of the servopack when you operate in order to avoid an effect of this current. ⏚ terminal of the servopack must be touched to the ground directly).

- Servopack SG OV

  If there is any noise in the input signal line, ground SG OV and if the motor wiring is encased in a metal duct, the duct and the box must be connected to the ground.

  All of the grounding must have one-point contacts to the ground.

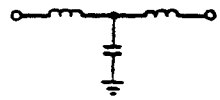
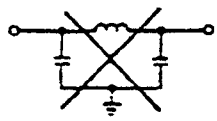
(2) Noise filter installation

In case you need to install a noise filter to prevent a noise from the power line, you need to use the prevention type.

Table 22 shows the list of noise filter applications. Insert the noise filter to the power supply and to the peripheral apparatus as well.

WARNING
If you mishandle the noise filter setup, the effect will be drastically reduced. So when you do the wiring to install the filter, follow the instructions (Figure 9 ~ 12) carefully.

Table 16. Application of Noise Filter

SERVOPACK Type CACR-	Applicable Noise Filter	Recommended Noise Filter	
		Type	Specifications
SR03BB SR05BB		LF-305	Three-phase 200 VAC class, 5 A
SR07BB		LF-310	Three-phase 200 VAC class, 10 A
SR10BB SR15BB	CORRECT	LF-315	Three-phase 200 VAC class, 15 A
SR20BB		LF-320	Three-phase 200 VAC class, 20 A
SR30BB		LF-330	Three-phase 200 VAC class, 30 A
SR44BB		LF-340	Three-phase 200 VAC class, 40 A
SR60BB	WRONG	LF-350	Three-phase 200 VAC class, 50 A

Note: Noise filter made by Tokin Corp.

(a) I/O wires should be separated. Do not fumble or put them in the same duct.

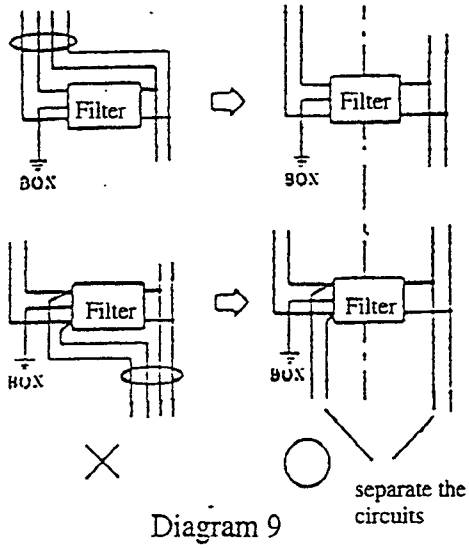


Diagram 9

(b) Ground line should not be placed in the same duct with the other lines such as the filter output line, signal output line, etc.

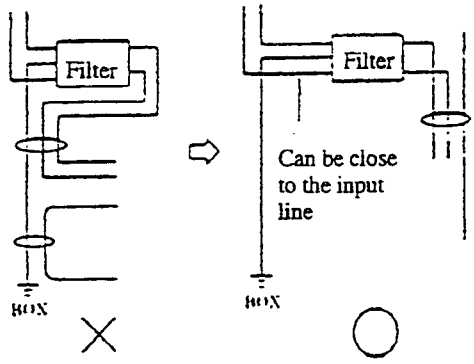


Diagram 10

(c) Ground line should be wired to the box or ground plate separately.

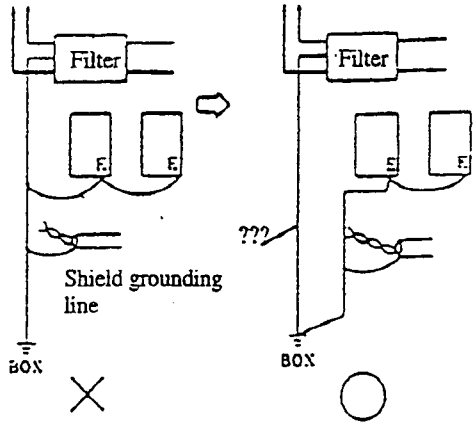


Diagram 11

(d) If the control panel ccontains the filter, connect the filter ground and the equipment ground to the base of the control unit.

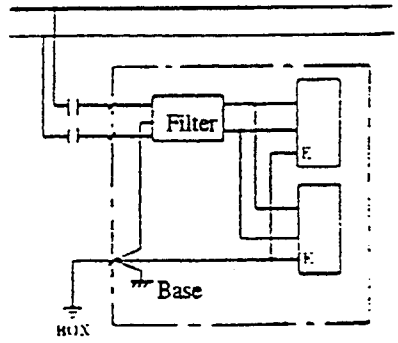


Diagram 12

11-2. Protecting the power line

The servopack line is operated by the commercial power supply (200V system). Therefore, we need to prepare a shut-off device for wiring (MCCB) or a fuse. (See Table 18).

In cases when using the fuse, a hasty fuse cannot be used. The fuse will be burnt out as "condensor-input-type" power supply is applied to the servopack.

Table 18. Power Supply Capacity and MCCB or Fuse Capacity

Servopack Model	Power Capacity / Set KVA	Power Capacity / MCCB A
CACR-IR05SC	1.1	5
CACR-IR10SC	2.1	8
CACR-IR15SC	3.1	10
CACR-IR20SC	4.1	12
CACR-IR30SC	6.0	18
CACR-IR44SC	8.0	24
CACR-IR0505C	2.1	8
CACR-IR1010C	4.1	12
CACR-IR1020C	6.0	18
CACR-IR2020C	8.0	24
CACR-IR3030C	11.0	32
CACR-IR050505C	3.1	10
CACR-IR101010C	6.0	18
CACR-IR101020C	8.0	24
CACR-IR202020C	11.0	32

* : Value applied to the rated load.

12. Wiring

12-1. Rated current and size of the wires

Tables 19 ~ 24 show the size of the wires to the rated current of the servopack and the rated current.

The wires and their sizes are selected on the basis of the current capacity and the operational environment.

Table 26 shows an environment such as the ambient temperature 40°C and the rated current flows through the bundled 3 lead wires.

Table 24 shows the type of wires.

Table 19. Rated Current at Servopack External Terminal for 1 Axis

		Model CACR-	Rated Current A (Executed Value)					
		Terminal Mark	IR 05SC	IR 10SC	IR 15SC	IR 20SC	IR 30SC	IR 44SC
On-Line Terminal	Main circuit power supply input terminal	R, S, T	5	8	10	12	18	24
	Motor connection terminal	U, V W	4.2	7.6	11.7	18.8	26.0	33.0
	Control power supply input terminal	r, t	0.5					
Off-Line Terminal	I/O signal connector for control	CN11	max. DC100mA					
	PG signal connector	CN12	max. DC100mA. However, the power supply line is 500mA					
	Ground terminal	⏚						

Table 20. Rated Current Value of Servopack External Terminal for 2 Axes (A: rms)

		Model CACR-	Rated Current A (Executed Value)				
		Terminal Mark	IR 0505C	IR 1010C	IR 1020C	IR 2020C	IR 3030C
On-Line Terminal	Main circuit power supply input terminal	R, S, T	8	12	18	24	32
	Motor connection terminal	U, V W	4.2	7.6	7.6 18.8	18.8	26.0
	Control power supply input terminal	r, t	0.5				
Off-Line Terminal	I/O signal connector for control	CN11, 21	max. DC100mA				
	PG signal connector	CN12, 22	max. DC100mA. However, the power supply line is 500mA				
	Ground terminal	⏚					

Table 21. Rated Current Value of Servopack External Terminal for 3 Axes (A: rms)

		Model CACR-	Rated Current A (Executed Value)			
		Terminal Mark	IR 050505C	IR 101010C	IR 101020C	IR 202020C
On-Line Terminal	Main circuit power supply input terminal	R, S, T	10	18	24	32
	Motor connection terminal	U, V W	4.2	7.6	1, 2 axis : 7.6 3rd axis : 18.8	18.8
	Control power supply input terminal	r, t	0.5			
Off-Line Terminal	I/O signal connector for control	CN11, 21, 31	max. DC100mA			
	PG signal connector	CN12, 22, 32	max. DC100mA. However, the power supply line is 500mA			
	Ground terminal	⏚				

Table 22. Example of the Size of Cables Applied to the 1-Axis Servopack

		Model CACR-	Example of the Size of the Wires (mm^2)					
		Terminal Mark	IR 05SC	IR 10SC	IR 15SC	IR 20SC	IR 30SC	IR 44SC
On-Line Terminal	Main circuit power supply input terminal	R, S, T	More than HIV 1.25	More than HIV 2	More than HIV3.5		More than HIV5.5	
	Motor connection terminal	U, V W		More than HIV1.25				
	Control power supply input terminal	r, t	More than HIV1.25					
Off-Line Terminal	I/O signal connector for control	CN11	Twisted pair cable or twisted pair all sealed core wire over $0.2mm^2$, tin plated annealed copper twisted cable. Finished cable outside diameter : CN11 → less than ϕ16 CN12 → less than ϕ11					
	PG signal connector	CN12						
	Ground terminal	⏚	More than HIV2.0					

Table 23. Example of the Size of the Cable Applied to the 2-Axis Servopack (mm^2)

		Model CACR-	Example of the Size of the Wires (mm^2)				
		Terminal Mark	IR 0505C	IR 1010C	IR 1020C	IR 2020C	IR 3030C
On-Line Terminal	Main circuit power supply input terminal	R, S, T	More than HIV2	More than HIV 3.5	More than HIV5.5		More than HIV8
	Motor connection terminal	U, V W	More than HIV 1.25	More than HIV3.5			More than HIV 5.5
	Control power supply input terminal	r, t	More than HIV1.25				
Off-Line Terminal	I/O signal connector for control	CN11, 21	Twisted pair cable or twisted pair all sealed core wire over $0.2mm^2$, tin plated annealed copper twisted cable. Finished cable outside diameter : CN11 → less than ϕ16 CN12 → less than ϕ11				
	PG signal connector	CN12, 22					
	Ground terminal	⏚	More than HIV2.0				

Table 24. Example of the Size of the Cables Applied to the 3-Axis Servopack (mm^2)

		Model CACR-	Example of the Size of the Wires (mm^2)			
		Terminal Mark	IR 050505C	IR 101010C	IR 101020C	IR 202020C
On-Line Terminal	Main circuit power supply input terminal	R, S, T	More than HIV3.5	More than HIV5.5		More than HIV8
	Motor connection terminal	U, V W	More than HIV 1.25	More than HIV3.5		
	Control power supply input terminal	r, t	More than HIV1.25			
Off-Line Terminal	I/O signal connector for control	CN11, 21, 31	Twisted pair cable or twisted pair all sealed core wire over $0.2mm^2$, tin plated annealed copper twisted cable. Finished cable outside diameter : CN11 → less than ϕ16 CN12 → less than ϕ11			
	PG signal connector	CN12, 22, 32				
	Ground terminal	⏚	More than HIV2.0			

Table 25. Applied Cables

Type of Cable		Conductor Allowable Temperature °C
Notation	Item	
PVC	General vinyl cable	
IV	600V vinyl cable	60
HIV	Special heat resisting cable	75

Note) 1. Apply a cable of over 600V that withstands pressure.
2. When you bundle the cables and place the bundle in a duct (hard vinyl metal tube), consider the cables' reduction ratio of the allowable current.
3. If the ambient temperature (temperature inside the board) is high, apply the heat resisting cable instead of the general type vinyl cable, which quickly deteriorates if placed under high temperatures.

12-2. Safety instructions on wiring

- Read all of the instructions below before you wire.

(1) Signal line, PG feedback line

Use the twisted cables or multi-core twisted pair. (Refer to the draw. no. B9400664 or DE8400093).

Length of the wires:
Command input line: maximum 3m
PG feedback line: maximum 20m

The wire should be arranged in the shortest distance and an excessive length should be cut off.

(2) Ground line

Use a thick cable (as thick as possible). The 3rd type ground (ground resistance value is less than 100Ω) is recommended.

The connection to the ground must be a one-point connection.

If an insulated condition occurs between the motor and the machine, ground the motor with some other means.

(3) Noise prevention

Follow these instructions to prevent noise which causes malfunction.

- Noise filter and servopack should be installed as close as possible.
- Surge absorbent circuit must be attached to the coils such as the relay, contactor, solenoid, etc.
- The power line (power circuit such as the AC line, motor line, etc) and the signal line must be installed over 30cm apart. Do not place them in the same duct or bundle them together.
- Do not share the same outlet with the electric welding machine or the electric discharge machine. If there is any apparatus which generates a high frequency noise nearby, install the noise filter in the power-supply or the input circuit.
- As the servopack has a switching amp, it's signal line may show a noise.

(4) Jamming (R. F. I. : Radius Frequency Interference)

As our servopack is for industrial use, it has no prevention system for RFI. Therefore, if the servopack is operated close to a private house or RFI becomes a problem, attach the line filter to the input of the power supply.

(5) How to wire the cable core wire for the signal line

As the core wire is very thin (0.2 ~ 0.3mm^2), be careful not to bend or give tension to the wire.

12-3. 3 power loss

Table 26 shows the power loss of the servopack.

Table 26

Servopack Mode CACR-	Output Current (Executed Value) A	Main Circuit W	Regenerative Resistance Power Loss W	Control Circuit Power Loss W	Total Power Loss W
IR05SC	4.2	40	10	60	110
IR10SC	7.6	70	20		150
IR15SC	11.7	80			160
IR20SC	18.8	100	40		200
IR30SC	26.0	160	80		300
IR44SC	33.0	210	100		370
IR0505C	4.2	80	20	120	220
IR1010C	7.6	140	40		280
IR1020C	18.8 (2nd axis)	170	60		350
IR2020C	18.8	200	80		400
IR3030C	26.0	320	160		600
IR050505C	4.2	120	30	180	330
IR101010C	7.6	210	60		450
IR101020C	18.8 (3rd axis)	240	80		500
IR202020C	18.8	300	120		600

* : The power loss of the regenerative resistance occurs when reducing the speed of the motor. The power loss can be ignored except in some cases with frequent "start / stops".

13. Diagnosis and Measures

13-1. Example of diagnosing a problem

Table 27

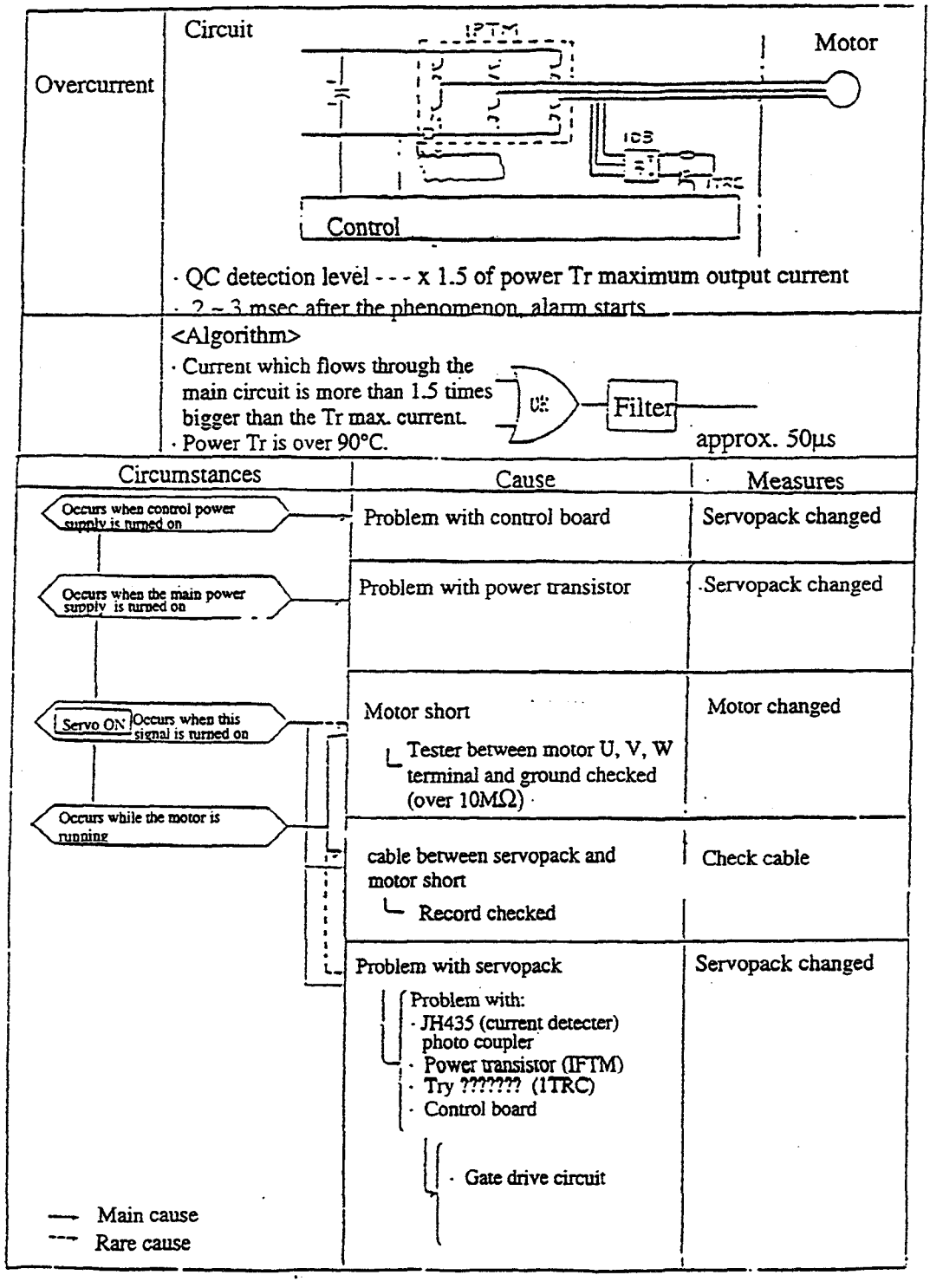
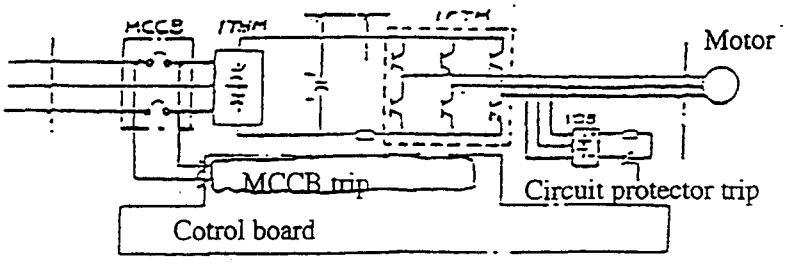


Table 28

Circuit protector trip



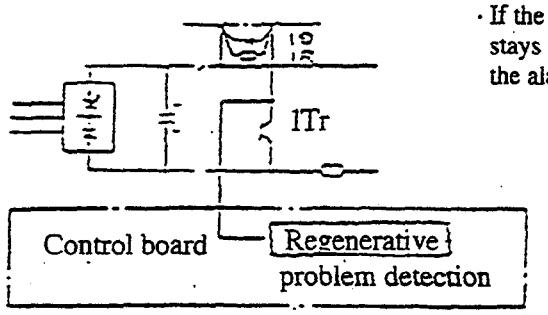
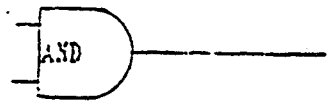
· After 47ms the phenomenon, the alarm starts.

<Algorithm>
· Both edge of MCCB I/O open — Filter — Approx. 47ms

Circumstances	Cause	Measure
Occurs when the control power supply is turned on	Trouble with control board	Servopack changed
	Circuit protector remains OFF	Circuit protector turned ON
Occurs when the main power supply is turned on	Trouble with servopack · Combined module trouble (1THM) · Power transistor trouble (1PTM)	Servopack changed
Servo ON — Occurs when this signal is turned on	Motor short circuited └ Motor U, V, W terminals and ground tester checked	Motor changed
Occurs while motor is running	Wire between servopack and motor short circuited └ Wiring checked	Check cable
	Trouble with servopack · Combined module (1TMM) trouble · Power transistor trouble (1PTM)	Servopack changed

Note) · Circuit protector trip stops when excessive current flows through the line. If the same problem occurs after restarting the circuit, it is possible that the servopack has a problem. In such a case, change the servopack. Also, the magnetic contactor on the input side of the servopack may have a contact point problem. Need to check.

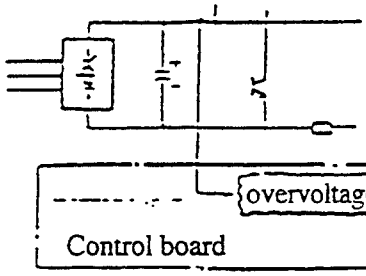
Table 29

Regenerative problem: RG	 · If the regenerative resistor (1Tr) stays on for approximately 0.4sec, the alarm will start.
	<Algorithm> · Regenerative transistor stays on for approximately 440ms. · Power supply ON. 

Circumstances	Cause	Measure
Occurs when the control power supply is turned on	Problem with control board	Servopack changed
Occurs when the main power supply is turned on	Problem with servopack · Regenerative transistor [1Tr] trouble · Regenerative resistor (IR) disconnection	Servopack changed
Occurs when the Servo ON signal is turned on	In case of parts with spec. for external mounting for regenerative resistor · External resistance connection missing · External connection disconnection	Wiring for ext. regenerative resistance disconnection Ext. regenerative resistor changed
Motor slows down	Load GD^2 is large. Motor rotation is too high	Operational condition reevaluated
Normal operation	In case of the use of the -- load (vertical load ratio): exceeds regenerative procesing capacity	Operational condition reevaluated Regenerative resistor reselected

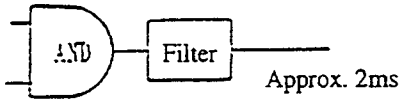
Table 30

Overvoltage: OV



When the main circuit voltage exceeds 410Voc, it detects the overvoltage in approx. 2msec.

<Algorithm>
- Main circuit DC voltage exceeds approximately 410V.
- Power supply ON



Circumstances	Cause	Measure
Occurs when the control power supply is turned on	Trouble with control board	Servopack changed
Occurs when the main power supply is turned on	Voltage of 3-phase input power supply is too high (approx. 300Vac)	Input power supply regulated
Occurs when the Servo ON signal is turned on Motor slows down	Load GD^2 and motor rotation number is too large	Operational condition reevaluated
	In case of the spec. for the external mounting parts of the regenerative resistance └ Selected wrong ext. resistance (external resistance value is too large)	External regenerative resistance is reselected
Normal operation (vertical load minus (-) load, etc)	Load value exceeds the limit of the regenerative processing capacity of the control apparatus	Operational condition reevaluated
	Motor rotation number is too large	Motor rotation number reduced
	Trouble with servopack └ Condition to the regenerative circuit	Servopack changed

Table 31

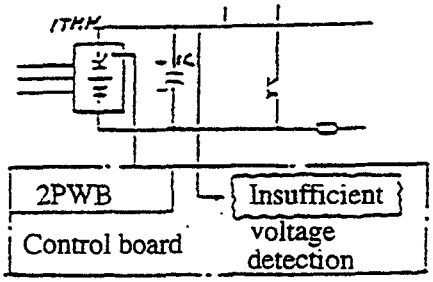
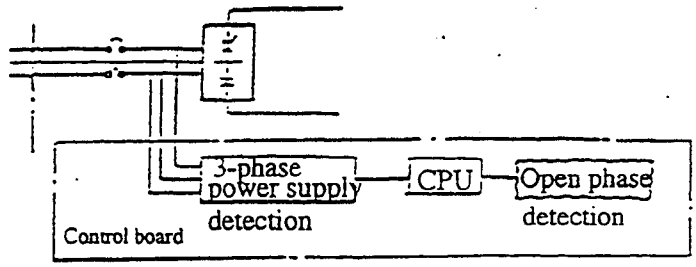
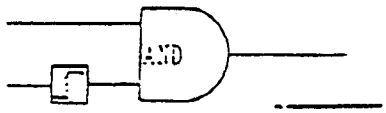
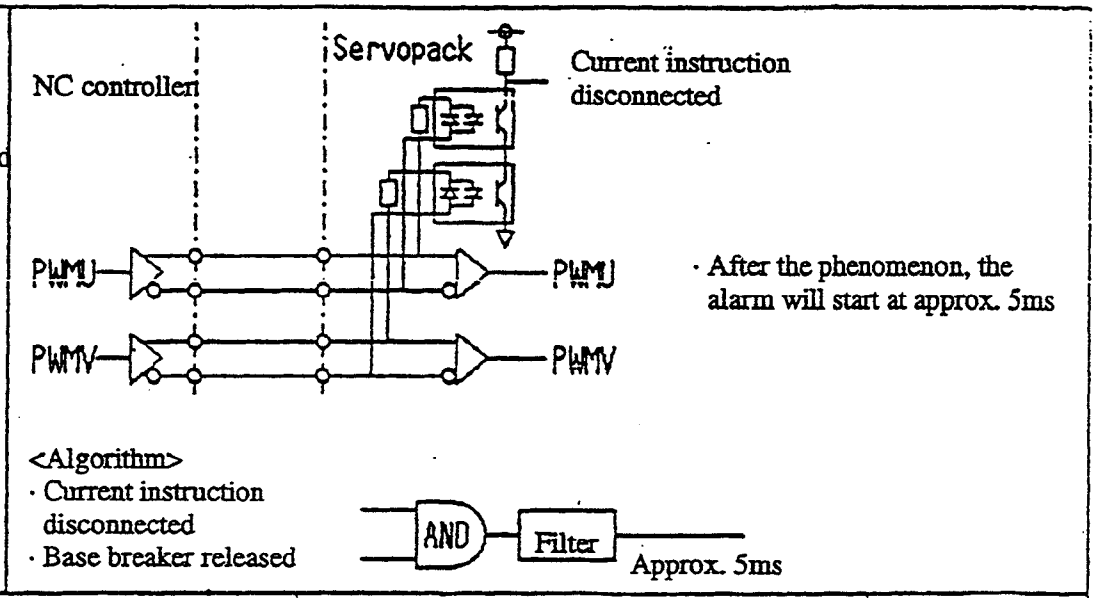
Insufficient voltage: UV	 After the 3-phase power supply is turned on and when the main circuit voltage becomes lower than 143Voc, the alarm is detected and starts after approximately 110msec. <Algorithm> · Main circuit DC voltage is less than approximately 143V · Power supply ON 	
Circumstances	**Cause**	**Measure**
Occurs when the control power supply is turned on	Trouble with control board	Servopack changed
Occurs when the main power supply is turned on	Trouble with servopack · Combined module (1THM) trouble · Control board (2PWB) trouble · Thyristor trigger circuit, etc.	Servopack changed
Occurs while the motor is running	3-phase input power supply opened · Tester for the 3-phase input power supply checked	3-phase input corrected
	Trouble with servopack · Combined module (1THM) trouble · Condensor (1C) trouble	Servopack changed

Table 32

Open phase detection	3φ 200/220  · Observed during 100msec only when the main power supply is turned on · Open phase detection in not practiced during normal operations
	<Algorithm> · One of the 3-phase power supply is open · Power supply ON 

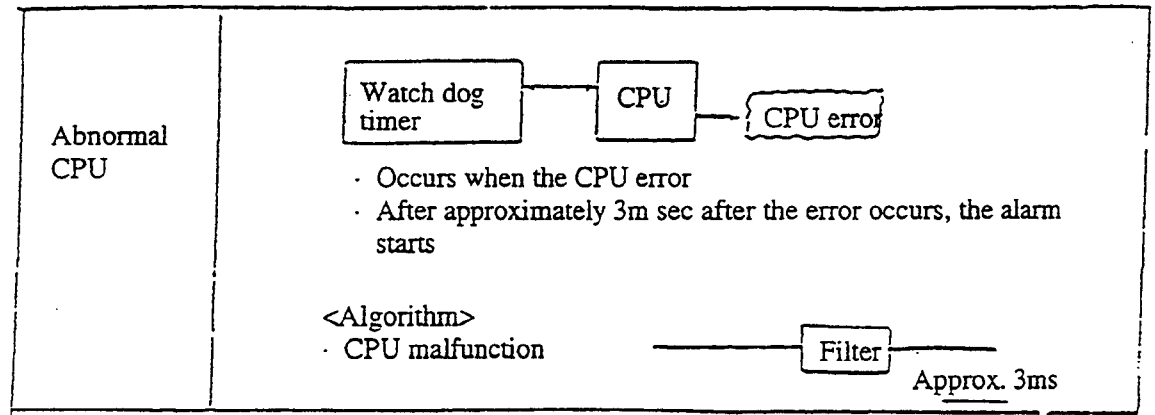
Circumstances	Cause	Measure
Occurs when the control power supply is turned on	Trouble with control board	Servopack changed
Occurs when the main power supply is turned on	Wiring of 3-phase power supply missing · Wiring checked	Power supply wiring checked
	Unbalanced 3-phase power supply · Voltage between R-S, S-T, T-R checked · Wiring to R, S, T external terminal changed	Power supply unbalance adjusted (or wiring of R, S, T changed)
Occurs while the motor is running	Trouble with servopack	Servopack changed

Table 33

Current instruction disconnected	

Circumstances	Cause	Measure
Occurs when the control power supply is turned on Occurs when the main power supply is turned on Occurs when the Servo ON signal is turned on Occurs while the motor is running	No current instruction issued	Instruction adjusted
	Current instruction cable disconnected	Wiring corrected
	Setup is for robots	Parameter changed
	Trouble with control board (current instruction detection circuit)	Servopack changed
	Current instruction cable short circuited with other cable miswiring	Wiring corrected

Table 34



Circumstances	Cause	Measure
Occurs when the control power supply it turned on	Trouble with control board (1PWB)	Servopack changed
Occurs when the main power supply is turned on Occurs while the motor is running	Internal chip malfunction	Power supply (control, main) turned on again to start operation

13-2. Other problems

Protective functions.

Table 35. CACR-IR Hardware Problems (for 1 ~ 3 Axes)

Detective Function	Contents	Main Cause	Measures
CPU ROM problem	The sum check is done to the CPU ROM and when an error occurs, the problem is detected (only when initializing).	• Part of the ROM is damaged • ROM pin has poor connection • I/O is damaged	• ROM is changed • ROM is inserted again • I/O is checked
CPU RAM problem	The CPU RAM data check is done and when an error occurs, the problme is detected (only when initializing).	• CPU is damaged	• CPU is changed
Serial communication problem 1	The I/O port of the serial communication is checked and when an error occurs, the problem is detected (test mode only).	• Line receiver driver for serial communication is damaged • CPU communication port is damaged • Other devices are connected to the serial communication	• Line receiver, driver for the serial communication are changed • CPU is changed • The device is removed
Serial communication problem 2	The data of the serial communication is checked and when the trouble occurs, the problem is detected (test mode only).	• Line receiver driver for serial communication are damaged • Baud rate generating the iC has a problem • Other devices are connected to the serial communication	• Line receiver, driver for the serial communication are changed. • iC is changed • The device is removed
Gate alley problem	The I/O of gate alley and the calculation function are checked and when an error occurs, the problem is detected (only when initializing).	• Gate alley problem • I/O is damaged	• Gate alley is changed • I/O is checked

Detective Function	Contents	Main Cause	Measures
EEROM	The writing/reading (confirmation) check of the EEROM was done and when an error occurs, the problem is detected (only when writing EEROM).	• Problem with EEROM • I/O of gate alley and EEROM are damaged	• EEROM is changed • I/O is checked
4-bit micro computer problem	The serial communication of a 4-bit microcomputer is checked and when an error occurs, the problem is detected (except when initializing and activating the power supply).	• Problem with a 4-bit microcomputer • Problem with iC for a 4-bit microcomputer communication • Noise to the serial	• 4-bit microcomputer is changed • iC for a 4-bit microcomputer communication is changed • Adjusted
Current feedback problem	The data check of the current feedback is done and when an error occurs, the problem is detected (only when initializing).	• Problem with iC for detecting current • Problem with photo coupler, gate alley	• iC for detecting current is changed • Photo coupler, gate alley are changed
Current instruction problem	The data check of the current instruction is done and when an error occurs, the problem is detected (only when releasing the base breaker for the first time).	• Disconnection, miswiring of the current instruction cable connector • Problem with gate alley • Instruction problem	• Current instruction cable connector is adjusted • Gate alley is changed • Instruction iC is changed

Note) If an abnormal instruction is detected, the servo alarm will generate (reset does not work), but the abnormal current instruction will cause the current instruction cable disconnnection alarm.

IR _ _ SE Spec.

YASKAWA
Technical Service Division

YASNAC CACR-iR SE Servo Unit
Production Specification

Contents

YASKAWA ELECTRIC AMERICA, INC.

Original issued on:	5/24/93	**Note:**
Original issued by:	NC Design Section	This is the 2nd and latest version issued on 6/14/93.
Translated on:	4/28/96	
Translated by:		
Inspected by:		

1. Summary

This specification prescribes the function of the AC Servo control system (CACR-iR□□ SE and CACR-IR□□□□□□□EB) for the NC series. This system is a control system of digital current control type, so the positioning and the speed control are done by the upper side controller. The current command is the PWM input 46.875KHz. The sequence and parameter can be communicated at 9600bps serial.

Figure 1. Block Diagram of AC Servo Control System

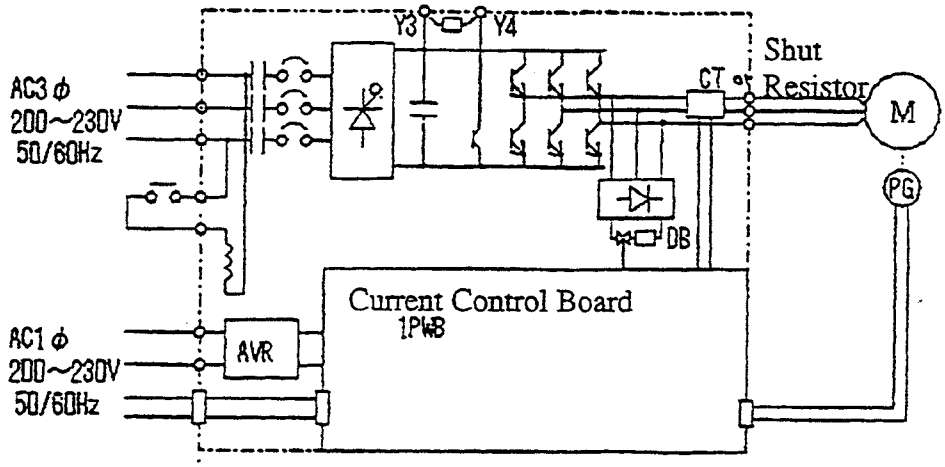
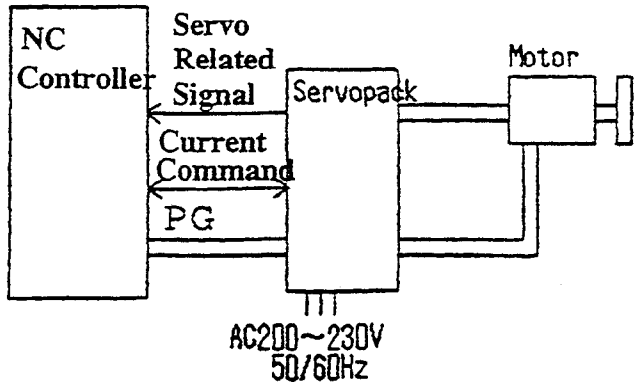


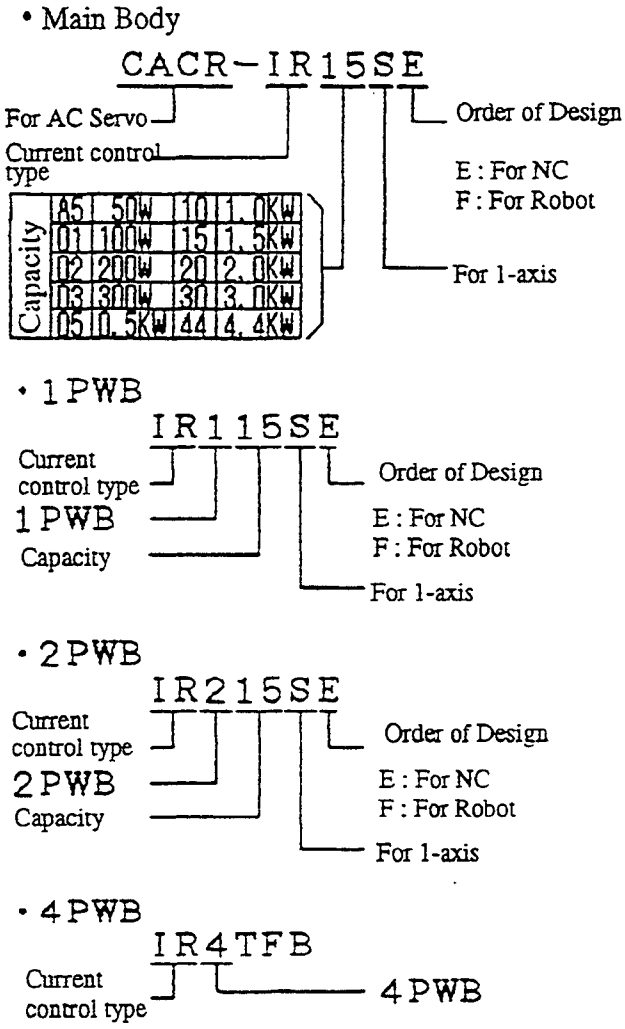
Figure 1. Block Diagram

2. System Composition



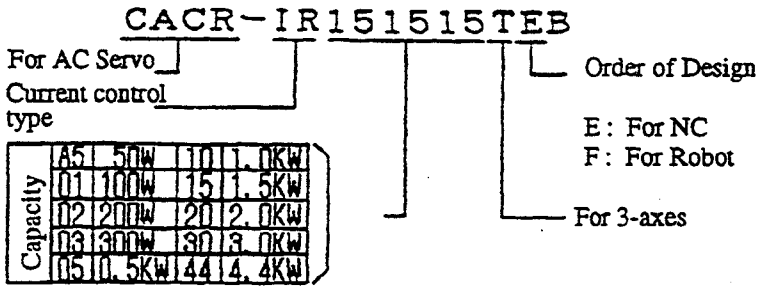
3. How to Read Serial Numbers

3.1. For 1-axis

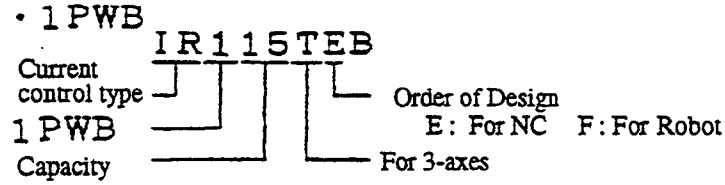


3.2. For 3-axes

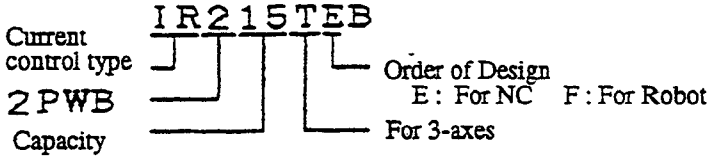
• Main Body



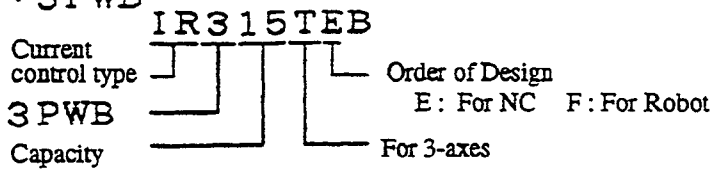
• 1PWB



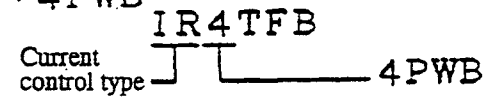
• 2PWB



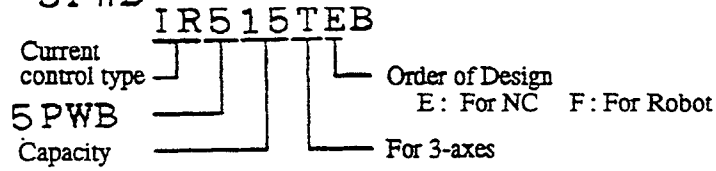
• 3PWB



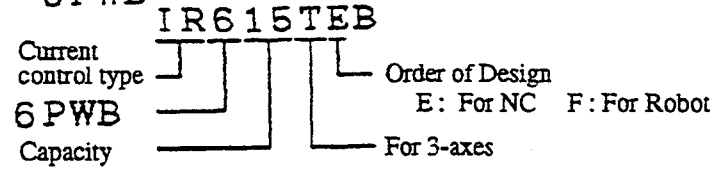
• 4PWB



• 5PWB



• 6PWB



4. Rating and Specification

4.1. For 1-axis

Corresponding Capacity KW			0.05	0.1	0.2	0.3	0.5	1.0	1.5	2.0	3.0	4.4
Control System Type CACR-			IRA5SE	IR01SE	IR02SE	IR03SE	IR05SE	IR10SE	IR15SE	IR20SE	IR30SE	IR44SE
Input Power Supply	Main circuit		3-phase AC 200 ~ 230V + 10 ~ - 15% 50 / 60Hz									
	Control circuit		Single phase AC 200 ~ 230V + 10 ~ - 15% 50 / 60Hz									
Environmental condition			Operational Temperature : 0 ~ 60 ° C Preserving Temperature : - 20 ~ + 85° C Operational/preserving humidity : Less than 90% (no dew)									
Structure			Rack mount Forced air-cooling system (Over 2.5m / s)									
Weight			Approximately 6.3Kg								Approx. 7.8Kg	
Servo Output Characteristic	Rated current (Arms)		0.7	1.0	3.0	3.0	4.2	7.6	11.7	18.8	26.0	33.0
	Instantaneous current (Arms)		2.1	2.8	8.5	8.5	11.0	17.0	28.0	42.0	57.5	77.0
Control Method			3-phase full-wave rectification iGBT PWM method									
Control Command			U phase, V phase PWM current command (46.875KHz) RS422 standard									
Feedback			Feedback by optical encoder maximum supply current 450mA									
I / O Signal	Current Command	Input Condition	PWM input of 46.875KHz									
		Electrical Spec.	Input impedance approximately 200Ω RS422 standard									
	Serial Cmu	Cmu Method	Half duplex asynchronous (9600 bps). Refer to the serial protocol spec. (DE9403276)									
		Electrical Spec.	Input impedance approximately 200Ω RS422 standard									
	Sequence Output Signal		/ SVRDY									

Built -in Function	Protection	* Overvoltage * Overcurrent * MCCB trip * Voltage drop * Open phase * Regeneration trouble * Ground fault * Current command disconnection * current feedback problem * CPU problem
	Display	Alarm display, condition display
	DB Function	Built-in automatic DB which works when the main power supply is off, servo alarm occurs and the servo is off.
	Regenerative Process	Built-in
	Main power source interruption contactor	Built-in
	Applied load inertia	Less than GDm^2 x 5

4-2. For 3-axes

Corresponding Capacity KW			0.05	0.1	0.2	0.3	0.5	1.0	1.5
Control System Type CACR-			IRA5A5A5TE	IR01010ITE	IR020202TE	IR030303TE	IR050505TE	IR101010ITE	IR151515TE
Input Power Supply		Main circuit	3-phase AC 200 ~ 230V + 10 ~ - 15% 50 / 60Hz						
		Control circuit	Single phase AC 200 ~ 230V + 10 ~ - 15% 50 / 60Hz						
Environmental condition			Operational Temperature : 0 ~ 60 ° C Preserving Temperature : - 20 ~ + 85° C Operational/preserving humidity : Less than 90% (no dew)						
Structure			Rack mount Forced air-cooling system (Over 2.5m / s)						
Weight			Approximately 8Kg						
Servo Output Characteristic	Rated current (Arms)		0.7	1.0	3.0	3.0	4.2	7.6	11.7
	Instantaneous current (Arms)		2.1	2.8	8.5	8.5	11.0	17.0	28.0
Control Method			3-phase full-wave rectification iGBT PWM method						
Control Command			U phase, V phase PWM current command (46.875KHz) RS422 standard						
Feedback			Feedback by optical encoder maximum supply current 450mA						
I / O Signal	Current Command	Input Condition	PWM input of 46.875KHz						
		Electrical Spec.	Input impedance approximately 200Ω RS422 standard						
	Serial Cmu	Cmu Method	Half duplex asynchronous (9600 bps). Refer to the serial protocol spec. (DE9403276)						
		Electrical Spec.	Input impedance approximately 200Ω RS422 standard						
	Sequence Output Signal		/ SVRDY						

Built - in Function	Protection	* Overvoltage * Overcurrent * MCCB trip * Voltage drop * Open phase * Regeneration trouble * Ground fault * Current command disconnection * current feedback problem * CPU problem
	Display	Alarm display, condition display
	DB Function	Built-in automatic DB which works when the main power supply is off, servo alarm occurs and the servo is off.
	Regenerative Process	Built-in
	Main power source interruption contactor	Built-in
	Applied load inertia	Less than GDm^2 x 5

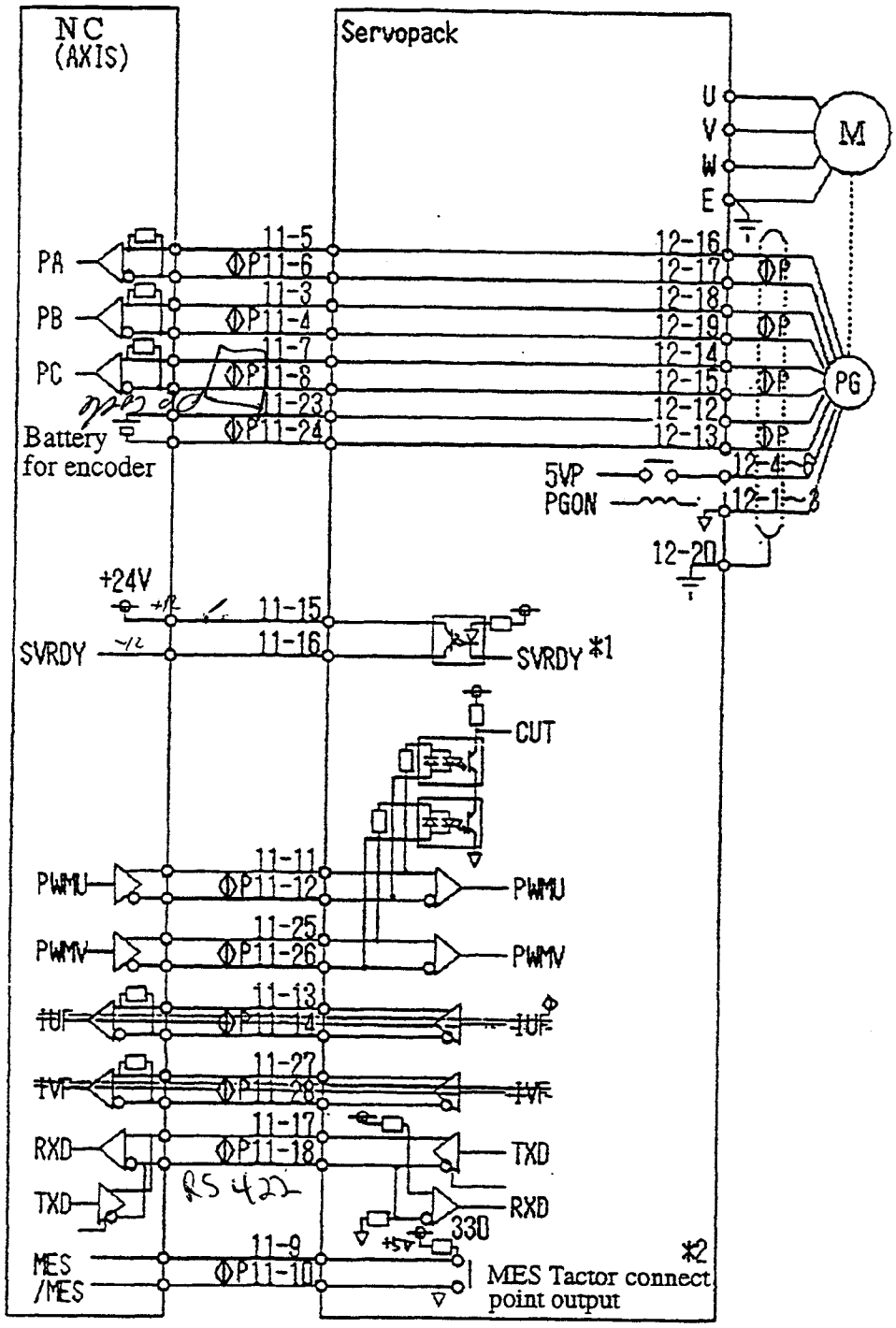
5. Standard Combination

Table 3. Combination of Servopack and Servomotor, Peripheral Devices

Servopack Type	Applied Servomotor	Power Supply Capacity / Set	Current Capacity / 1 set of NCCB
CACR-IRA5SE	Corresponding to R series 50W	0.1	5
CACR-IR01SE	Corresponding to R series 100W	0.2	5
CACR-IR02SE	Corresponding to R series 200W	0.45	5
CACR-IR03SE	Corresponding to R series 300W	0.65	5
CACR-IR05SE	Corresponding to R series 500W	1.1	5
CACR-IR10SE	Corresponding to F series 1.0KW	2.1	8
CACR-IR15SE	Corresponding to F series 1.5KW	3.1	10
CACR-IR20SE	Corresponding to F series 2.0KW	4.1	12
CACR-IR30SE	Corresponding to F series 3.0KW	6.0	18
CACR-IR44SE	Corresponding to F series 4.4KW	8.0	24
CACR-IRA5A5A5TE	Corresponding to R series 50W	0.3	5
CACR-IR010101TE	Corresponding to R series 100W	0.65	5
CACR-IR020202TE	Corresponding to R series 200W	1.3	8
CACR-IR030303TE	Corresponding to R series 300W	2.0	8
CACR-IR050505TE	Corresponding to R series500W	3.1	10
CACR-IR101010TE	Corresponding to F series 1.0KW	6.0	18
CACR-IR151515TE	Corresponding to F series 1.5KW	8.0	24

* Depends on the type of motor.

6. General Connection Diagram



* 1: Each capacity of the output circuit is 30VDC, 30mA or less.
* 2: The tactor connect output is only the signal level output.
* 3: P Twisted pair wires

6. Details of Connection

6-1. Connector terminal CN11, 21, 31 for I/O signal
CN11, 21, 31 of the servopack is connected with the connector of the NC AXIS.

(1) Specifications of the Connector

PCR connector by HONDA TSUSHIN KOGYO (28 pin)

Servopack	PWB mounted side	PCR - E28LMD (right angle type)
	Cable side	PCR - E28F (connector)
		PCS - E28LA (connector case)

(2) Connector Pin Arrangement

Table 4.

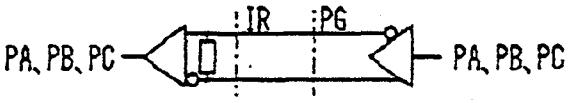
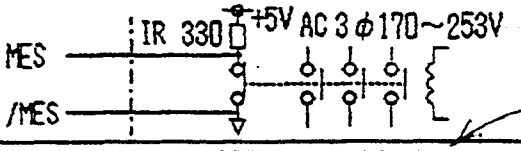
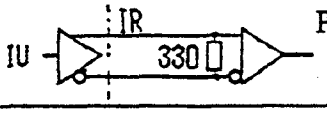
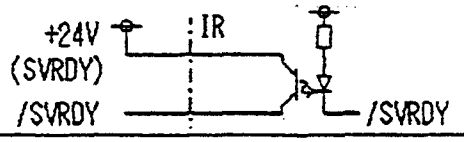
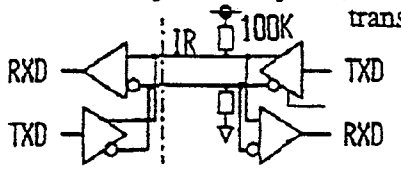
1	3	5	7	9	11	13
	PB	PA	PC	MES	IU	IUF
	PG signal B phase	PG signal A phase	PG signal C phase	Factor connect point Output	Current Command U phase	電流フィードバックU

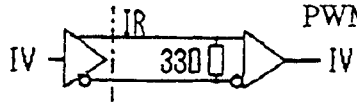
2	4	6	8	10	12	14
	*PB	*PA	*PC	/MES	*IU	*IUF
	PG signal B phase	PG signal A phase	PG signal C phase	OV of factor connect point	Current Command U phase	電流フィードバックU

15	17	19	21	23	25	27
SVRDY	DATA	S	G	BAT	IV	IVF
+24V	Serial Cmu I/O	Signal OV		Encoder Battery Input	Current Command V phase	電流フィードバックV

16	18	20	22	24	26	28
/SVRDY	*DATA	S	G	0BAT	*IV	*IVF
Servo ready output	Serial Cmu I/O	Signal OV		Battery OV	Current Command V phase	電流フィードバックV

(3) Specifications of the Signals

Pin No.	Signal	Specification
3	PB	Output signal from PG to AXIS side. 
4	*PB	
5	PA	
6	*PA	
7	PC	
8	*PC	
9	MES	Output aux. connect point of tactor in Servopack. Tactor ON, Aux. connect point OFF. 
10	/MES	
11	IU	PWM current command U phase of ~~875KHz~~ input. Refer to the manual MB651142 (DE8409818) for the PWM output method. 
12	*IU	
13	IUF	46.875KHzのPWM電流フィードバック相出力 PWM出力方法は、MB651142説明書(DE8409818) 参照。 
14	*IUF	
15	SVRDY	Turned on while the normal operation is on (no alarm). 
16	/SVRDY	
17	DATA	I / O of serial transmission. Refer to the serial protocol spec. (DE9403276) for the transmitting method. 
18	*DATA	

Pin No.	Signal	Specification
19 ~ 22	SG	Signal OV.
23	BAT	Battery input for encoder. 
24	OBAT	
25	IV	PWM current command V phase input of 46.875KHz. Refer to the manual MB651142 (DE8409818) for the PWM output method. 
26	*IV	
27	IVF	46.875KHzのPWM電流フィードバックV相出力 PWM出力方法は、MB651142説明書(DE8409818)参照。 
28	*IVF	

6.2. Connector terminal CN12, 22, 32 for PG signal
CN12, 22, 32 of servopack are connected to encoder, etc.

(1) Specifications of the Connector

MR connector by HONDA TSUSHIN KOGYO (20 pin)

Servopack	PWB mounted side	MR - 20RMA (right angle type)
	Cable side	MR - 20F (connector)
		MR - 20L (connector case)

(2) Connector Pin Arrangement

Table 7.

1	2	3	4	5	6	7
0V	0V	0V	+5V	+5V	+5V	
OV of PG Power Supply			5V of PG Power Supply			

8	9	10	11	12	13
				BAT	0BAT
				Battery Input	

14	15	16	17	18	19	20
PC	*PC	PA	*PA	PB	*PB	FG
PG Signal C Phase		PG Signal A Phase		PG Signal B Phase		Frame Ground

6-3. Connector for Control Power Supply CN2 (For 3-axes only)

(1) Specifications for the Connector

D3100 series connector by AMP (3-pin)
Servopack PWB mounted side 1 - 178293 - 5 (right angle)
Cable side 1 - 178288 - 7 (connector)

(2) Connector Pin Arrangement

Table 8.

1	2	3
r		t
Control Power Supply Input r Phase		Control Power Supply Input t Phase

(3) Specifications

Single phase AC200 ~ 230V - 15 ~ + 10% 50 / 60Hz

6-4. Connector CN13, CN23, CN33 (less than 10 for 3-axes)

(1) Specifications of the Connector

D3100 series connector by AMP (4-pin)
Servopack PWB mounted side 1 - 178297 - 5 (right angle)
Cable side 1 - 178288 - 3 (connector)

(2) Connector Pin Arrangement

Table 9.

1	2	3	4
U	V	W	FG
U phase	V phase	W phase	Frame Ground

(3) Specifications

Connect U and motor A terminal, V and motor B terminal, W and motor C terminal.

6-5. Connector CN3 for the main circuit power supply ON/OFF connect point (for 3-axes only)

(1) Specifications of the Connector

D3100 series connector by AMP (3-pin)
Servopack PWB mounted side 1 - 178138 - 2 (right angle)
Cable side 1 - 178128 - 3 (connector)

(2) Connector Pin Arrangement

Table 10.

1	2	3
MPON	/ MPON	
Main circuit power supply ON / OFF connect point		

(3) Specifications

The connect point is to cut the power supply to the main circuit by turning the built-in contactor ON/OFF.

The contact point capacity is AC200 ~ 230V 12mA.

6-6. External terminal and connector

(1) For 1-axis

Table 11.

Terminal Symbol	Name	Summary
R S T	Main circuit power supply input terminal	3-phase AC200 ~ 230V -15 ~ +10% 50 / 60Hz
U V W	Motor connection terminal	Connect U and motor A terminal, V and motor B terminal, W and motor C terminal
r t	Control power supply input terminal	Single phase AC200 ~ 230V -15 ~ +10% 50 / 60Hz
⏚	Ground terminal	Connect with motor D terminal and drop it to the earth
Y3 Y4 Y5	Regenerative resistor connecting terminal	Regenerative resistor connecting terminal at Y3, Y5 (Usually external connnection is not necessary). Short Y4 and Y5.
MPON / MPON	Main circuit power supply ON/OFf connect point terminal	Turn the built-in contactor ON/OFF to stop the main circuit power supply. Contact point capacity is AC200 ~ 230V 12mA.

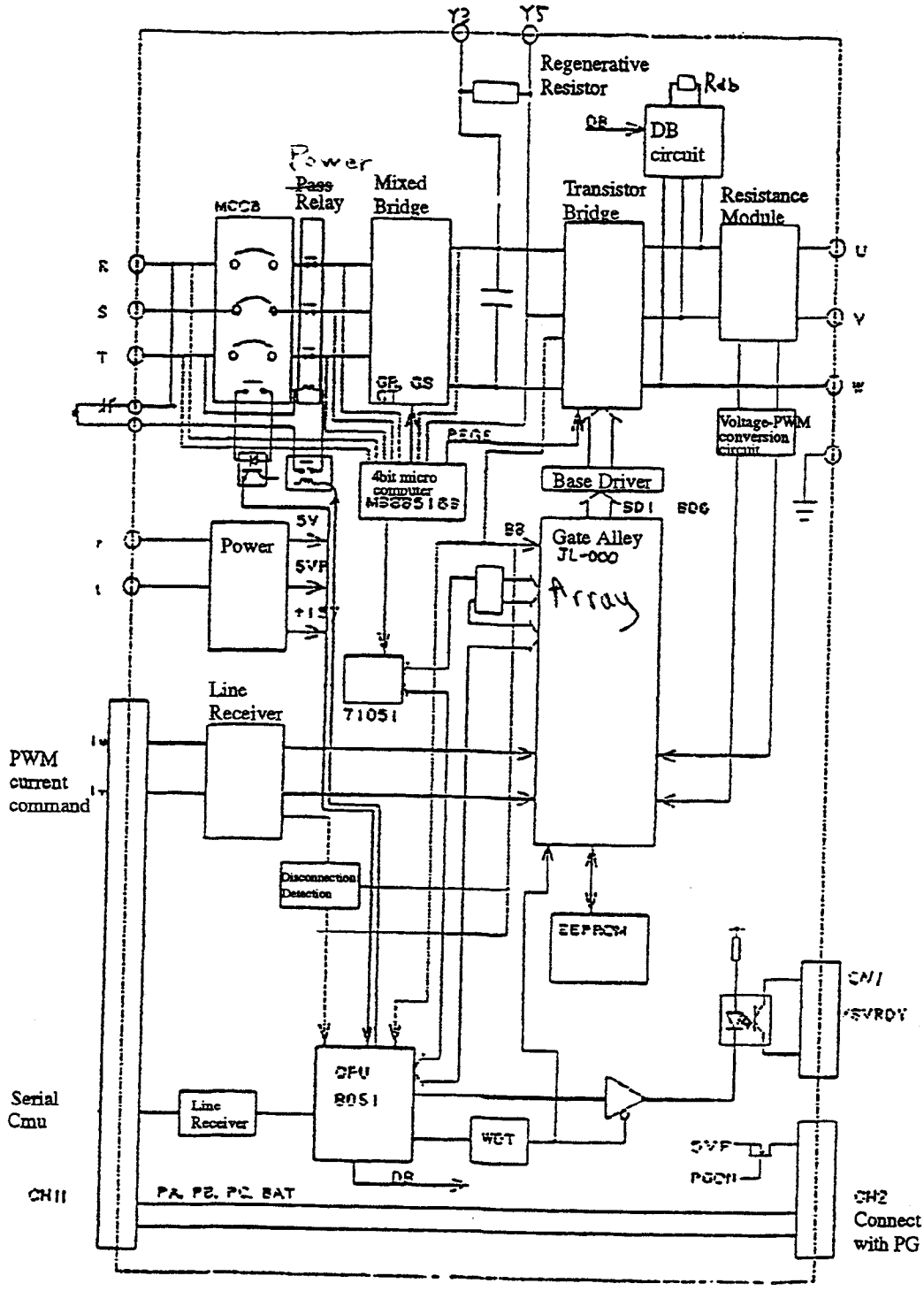
(2) For 3-axis

Table 12.

Terminal Symbol	Name	Summary
R S T	Main circuit power supply input terminal	3-phase AC200 ~ 230V -15 ~ +10% 50 / 60Hz
U V W	Motor connecting terminal	Connect U and motor A terminal V and motor B terminal, W and motor C terminal (1.5KW only).
⏚	Ground terminal	Connect with motor D terminal and drop to the earth (1.5KW only).

7. Function / Motion

Function block diagram.



7-1. Details of the Function

(1) I / O Signals

- Current command input (PWMU, PWMV)
  Input the current command U phase, V phase of the servopack by PWM of 46.875KHz. With the current amp, the data conversion is done at 11.719KHz of which an average from the two conversions becomes the current command. For the current command, the weight is added by the current amp. gain from the serial transmission, so when you determine the current command, consider this point.

  The current command becomes:

  ±4096 x 256 at x 4 resolution PWM saturation

  The current feedback becomes:

  ±4096 x IMUL at x 4 resolution PWM saturation
  (IMUL: Current amp. gain coefficient).

  Refer to the serial protocol specification (DE9403276), IR setup manual (DE9400629) for the method of determining the current amp. gain and the current command.

- Servo ready (/ SVRDY)
  Approximately 400ms after the control power supply is turned on, the servo ready becomes ON when no alarm is on. The output is turned off by the servo alarm.

Table 13. Current Detection Resistance Value

Model CACR-	IRA5SE	IR01SE	IR02SE	IR03SE	IR05SE	IR10SE	IR15SE	IR20SE	IR30SE	IR44SE
Current detection resistance (mΩ)	100	100	50	20	20	10	10	5	3	3

Table 14. Current Detection Resistance Value

Model CACR-IR	A5A5A5TE	010101TE	020202TE	030303TE	050505TE	101010TE	151515TE
Current detection resistance (mΩ)	100	100	50	20	20	10	10

(2) Protecting Function

The servopack has a built-in function which protects the servopack and the motor from problems.

- Dynamic brake
  The servopack has a built-in dynamic brake for an emergency stop which works in the following cases.

  (i) Servo alarm (Problem detected)
  (ii) Current command disconnection
  (iii) Servo off
  (iv) Main power supply off

  To stop the motor, work the dynamic brake. When the main circuit function is available, the dynamic brake off can be manipulated by the serial transmission.

- Problem detection
  When the problem is detected, / SVRDY turns off and the contents of the detection are displayed by the LED which can be read in the serial transmission (contents of the servo alarm).

  (i) Problem detection for 1-axis

Table 15. Problem Detection for 1-Axis

Display	Problem	Contents	SVRDY OFF
1	Overcurrent OC	Overcurrent flows in the main circuit	○
2	MCCB trip	MCCB tripped	○
3	Regeneration problem	Regenerative circuit in iAMP did not function	○
4	Overvoltage	Main circuit DC voltage became abnormally high	○
6	Insufficient voltage	Main circuit DC voltage became abnormally low	○
8	Ground fault	Main circuit ground fault	○
b	Current offset problem	Offset problem or no offset	○
E	Current command disconnection	Current command cable is disconnected	○
F	Open phase	1 phase out of 3 phases is open	○
□	CPU problem	CPU problem	○

* ○ : LED goes off when the problem is detected and / SVRDY goes off.
× : LED does not go off even if the problem is detected.

(ii) Hardware problem for 1-axis

Table 16. Hardware Problem Detection for 1-Axis

Display	Problem	Contents	SVRDY OFF
H.01	CPU ROM problem	ROM problem out of CPU hardware	○
H.02	CPU RAM problem	RAM problem out of CPU hardware	○
H.03	Serial communication problem 1	Serial communication problem (test mode only)	○
H.04	" 2		○
H.05	Gate alley problem	Abnormal gate alley	○
H.08	EEROM error	Abnormal EEROM	○
H.09	4-bit micro computer problem	Abnormal 4-bit micro computer	○
H.0A	Current feedback problem U phase	Current feedback problem U phase	○
H.0b	Current feedback problem V phase	Current feedback problem V phase	○

* H□□ : LED displays "H", "□" and "□" every second.

(iii) Problem detection for 3-axes

Table 17. Problem Detection for 3-Axes

Display	Problem	Contents	SVRDY OFF
Axis No. 1.	Overcurrent	Overcurrent flows in the main circuit	O
2.	MCCB trip	MCCB tripped	O
3.	Regenerative problem	Regenerative process circuit in iAMP did not work	O
4.	Overvoltage	Main circuit DC voltage became abnormally high	O
5.	Insufficient voltage	Main circuit DC voltage became abnormally low	O
Axis No. 8.	Ground fault	Ground fault in main circuit	O
Axis No. b.	Current offset prob.	Abnormal current offset or no offset	O
Axis No. E.	Current command disconnection	Current command cable is disconnected	O
F.	Open phase	1 phase out of 3 phases is open	O
□	CPU problem	Abnormal CPU	O

* Axis No. E. LED displays " Axis No " . " □ " and " E. " every second.
* O : LED goes off if the problem is detected and / SVRDY goes off.
  X : LED does not go off even if the problem is detected.

(iv) Hardware problem of 3-axes

Table 18. Hardware Problem Detection for 3-Axes

Display	Problem	Contents	SVRDY OFF
H. 1	Abnormal CPU ROM	ROM problem out of CPU hardware	O
H. 2	Abnormal CPU RAM	RAM problem out of CPU hardware	O
H. 3	Serial communication problem 1	Abnormal serial communication (test mode only)	O
H. 4	" 2		O
H. 5	Abnormal gate alley 1	1st axis gate alley has problem	O
H. 6	Abnormal gate alley 2	2nd axis gate alley has problem	O
H. 7	Abnormal gate alley 3	3rd axis gate alley has problem	O
H. 8	EEROM error	Abnormal EEROM	O
H. 9	Abnormal 4-bit micro computer	Problem with 4-bit micro computer	O
H. A	Current feedback problem 1 U phase	Current feedback problem 1st axis U phase	O
H. b	Current feedback problem 1 V phase	Current feedback problem 1st axis V phase	O
H. c	Current feedback problem 2 U phase	Current feedback problem 2nd axis U phase	O
H. d	Current feedback problem 2 V phase	Current feedback problem 2nd axis V phase	O
H. E	Current feedback problem 3 U phase	Current feedback problem 3rd axis U phase	O
H. F	Current feedback problem 3 V phase	Current feedback problem 3rd axis V phase	O

* 1. 9 : LED displays " H " . " . " and " 9 " every second.

(3) Servo Alarm Reset

Reset when the servo alarm is on can be done by the serial transmission. However, resuming the operation must be done after the proper troubleshooting and steps are performed because the "Alarm" mean that trouble occurred for some reason.

(4) Display

Condition is displayed by the following LED.

Table 19. LED

Tool Symbol	Model	Function
LD3	+5V	Lights up when +5V of the control power supply has a problem.
LD2	SVRDY1	Lights up when the 1st servo alarm does not work.
LD1	SVRDY2	Lights up when the 2nd servo alarm does not work.
LD4	SVRDY3	Lights up when the 3rd servo alarm does not work.
LD5	7 segment LED	Displays the servo condition and alarm. Refer to tables 15 ~ 18 for the alarms and table 20 for the conditions.

Table 20. LED Condition Display

Display	Problem	Contents
	Main power supply off	Before the main power supply turns on. Base interrupted.
	Main power supply on	Main power supply starting. Base interrupted.
	Power ready	Main power supply turn on completed. Base interrupted.
	Main circuit current conduction	Main circuit function.
	EEROM writing	EEROM writing. Base interrupted.

(5) SW Setup

- For 1 axis

- SW1 - 0, 1 : Axis setup, but both should be open for 1-axis. Otherwise, it cannot be used.

- SW1 - 2 : For test (Test mode 1).
  All others are open.
  When short happens, check the serial transmission.
  Regeneration also does not work.

- SW1 - 3 : For test (Test mode 2).
  All others are open.
  When short happens, the main circuit PC input (no 3-phase power source) starts.
  If SW1 - 3 is open, the normal operation cannot be done.

- SW2 : Axis setup is as follows.
  If a scale on the SW2 is over "3", the setup becomes invalid.

SW2	Axis Setup
0	1
1	2
2	3
3	Invalid

- Setup for shipping

  SW1 - 0 ~ 3 : Open, SW2 is "0".

- For 3-axes

SW1 - 0, 1 : Used together with SW2 when axis is set.
Setup is done as follows:

SW2 Setup	SW1-0: Short SW1-1: Short			SW1-0: Open SW1-1: Open			SW1-0: Short SW1-1: Open		
	1st axis	2nd axis	3rd axis	1st axis	2nd axis	3rd axis	1st axis	2nd axis	3rd axis
0	1	2	3	none	2	3	3	none	1
1	2	1	3	1	none	3	1	2	3
2	2	3	1	2	1	none	1	2	3
3	1	3	2	1	3	none			
4	3	1	2	2	3	none			
5	3	2	1	3	1	none			
6	1	none	none	3	2	none			
7	2	none	none	none	2	1			
8	3	none	none	none	1	2			
9	none	1	none	none	1	2			
A	none	2	none	none	1	3			
B	none	3	none	none	3	1			
C	none	none	1	1	none	2			
D	none	none	2	2	none	1			
E	none	none	3	2	none	3			
F	1	2	none	3	none	2			

* For example, when SW1-0, 1: Short, SW2 is 1, the 1st axis becomes the 2nd, the 2nd becomes the 1st and the 3rd axis remains as it is.

* When SW1-0, 1: Open, the setup becomes the IR setup for 1-axis IR.

- SW1 - 2 : For test (Test mode 1).
  All others are open.
  When the short happens, check the serial transmission and the regenerative function becomes invalid.

- SW1 - 3 : For test (Test mode 2).
  All others are open.
  When the short happens, the main circuit DC input (no 3-phase power supply) mode starts.
  If SW1 - 3 is open, the normal operation cannot be operated.

- Setup for shipping

SW1 - 0,1 : Short, SW1 - 2, 3 : Open, SW2 is "0".

(6) Serial Transmission

Sequence control, status reading, parameter setup / change / read can be done by serial transmission.

Refer to the serial protocol specification DE9403276 for details of the serial transmission.

(7) Contactor Problem Detection

The problem detection for the contactor is not done by the servopack as it has an external contact point. However, the contact point information of the contactor can be observed by the status of the contactor by the output from an auxiliary contact point and the serial transmission.

If the main power supply is turned on by the NC but the contactor doesn't come ON, there must be some problem.

IR _ _ SE Connection

YASKAWA
Technical Service Division

Applied to YASNAC i80
CACR-iR** SE Servo
Connection Manual (Supplemental)

The contents of this manual are supplemental description of changes you have to know when you apply CACR-iR **SE Servo to i80. Therefore, you may as well use this manual together with the connection manual of YASNAC i80.

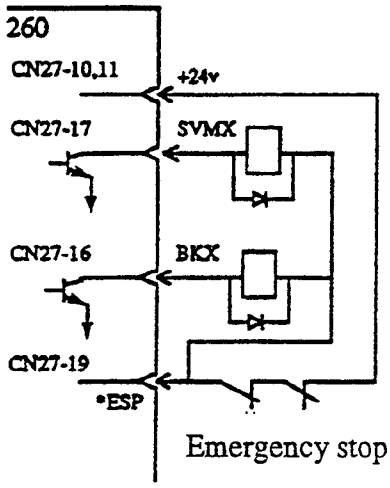
Contents

YASKAWA ELECTRIC AMERICA, INC.

Original issued on:	11/12/93	**Note:**
Original issued by:	NC Design Section	This is the 1st and latest version issued on 12/14/93.
Translated on:	4/28/96	
Translated by:		
Inspected by:		

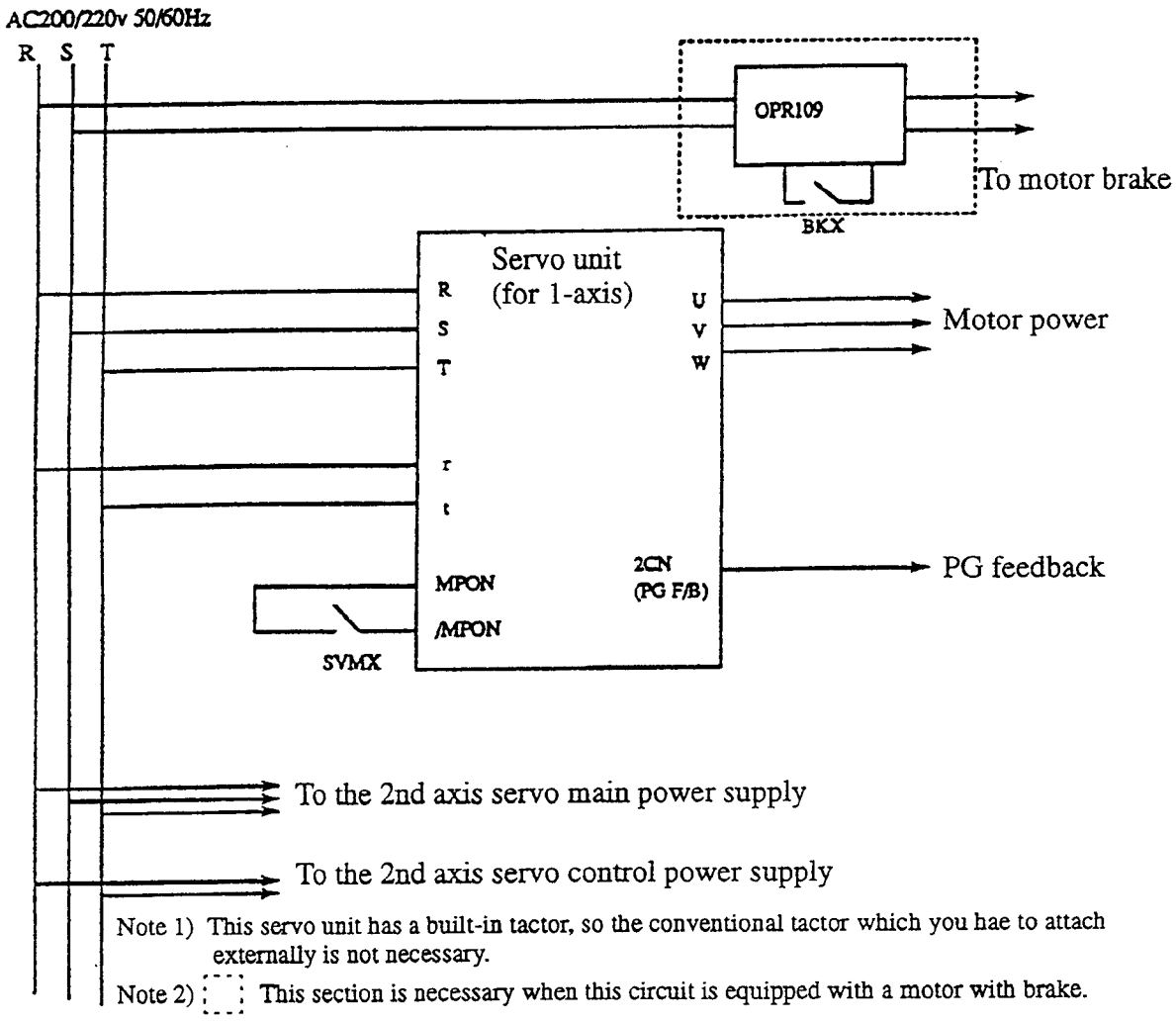
1. Applied Sequence

Details of the applied sequence connection.



Note) To relay SVMX, BKX, use the miniature relay DC24V. (Recommended product MY-42 by OMRON).

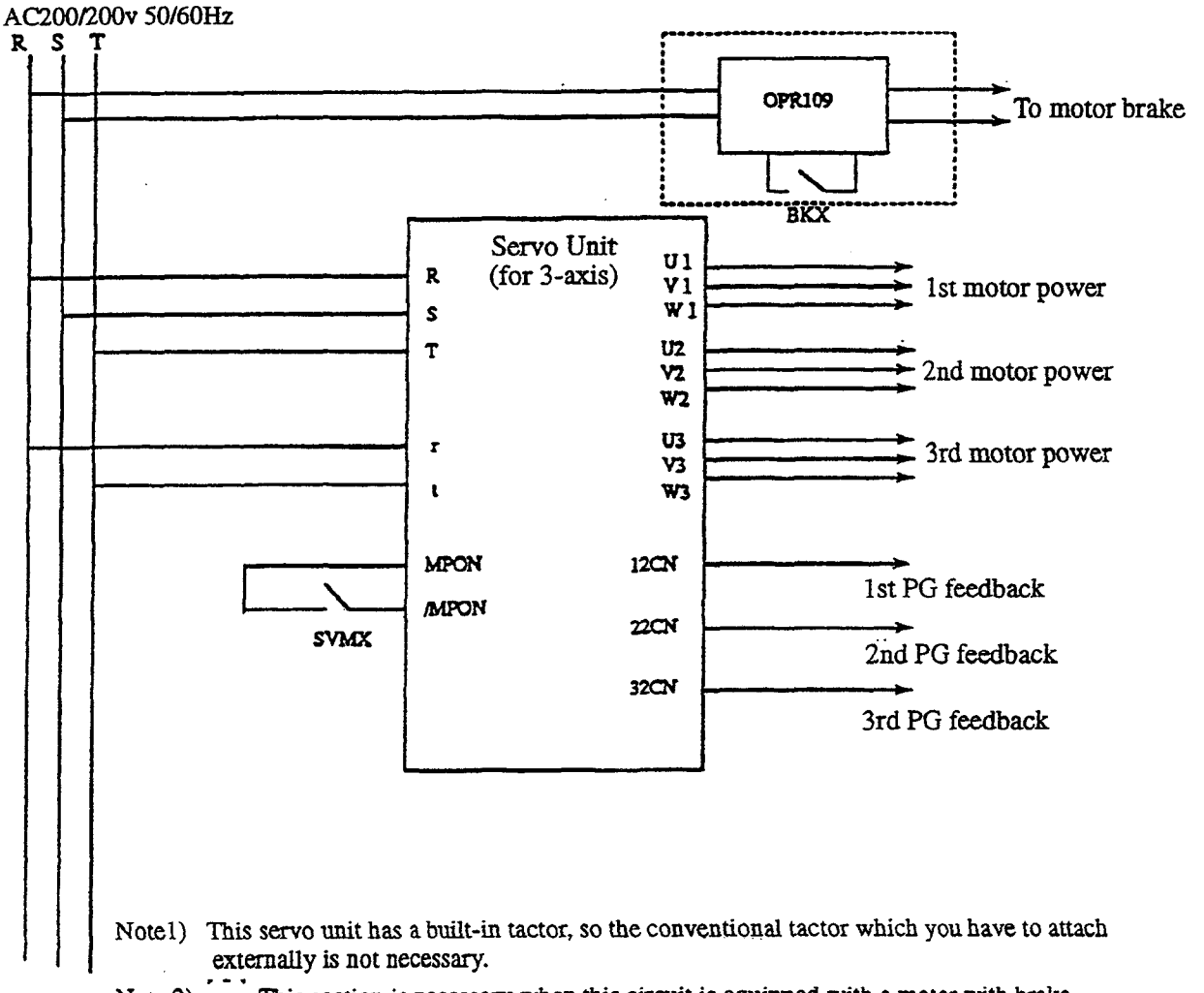
Main Circuit Connection (for 1-axis)



Note 1) This servo unit has a built-in tactor, so the conventional tactor which you hae to attach externally is not necessary.

Note 2) This section is necessary when this circuit is equipped with a motor with brake.

Connection in the Main Circuit (for 3 axis)

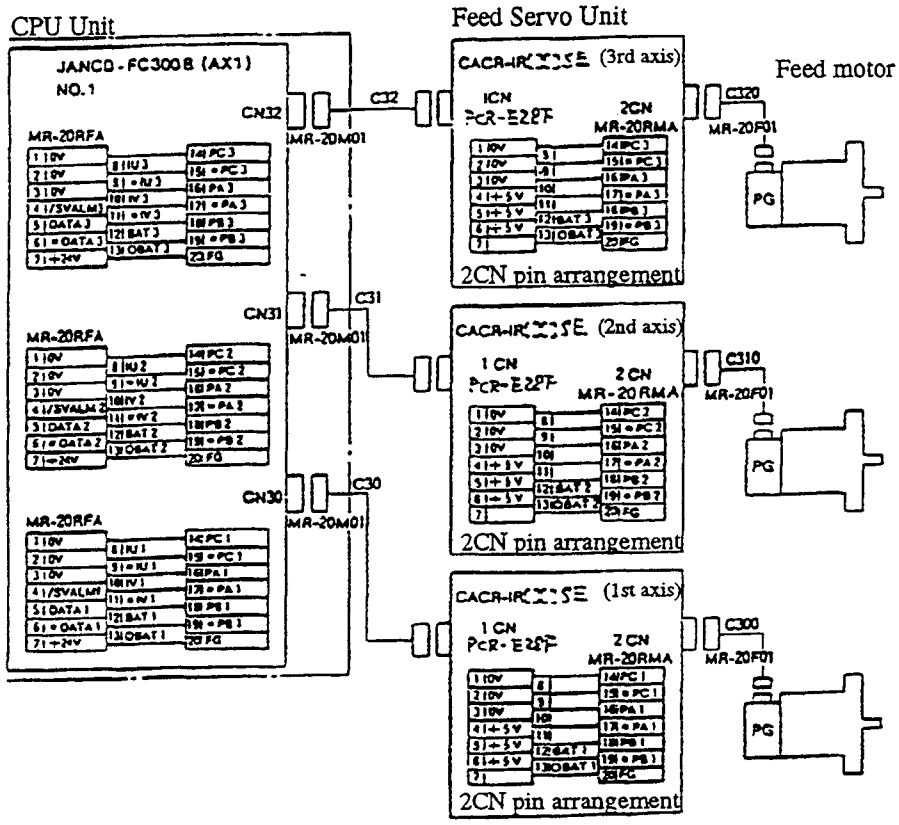


Note1) This servo unit has a built-in tactor, so the conventional tactor which you have to attach externally is not necessary.

Note 2) This section is necessary when this circuit is equipped with a motor with brake.

2. Connection Between the Units

(1) Cable



Cable Connection

Note) In case of 3-axis servo, read the connector as follows:

3-axis servo

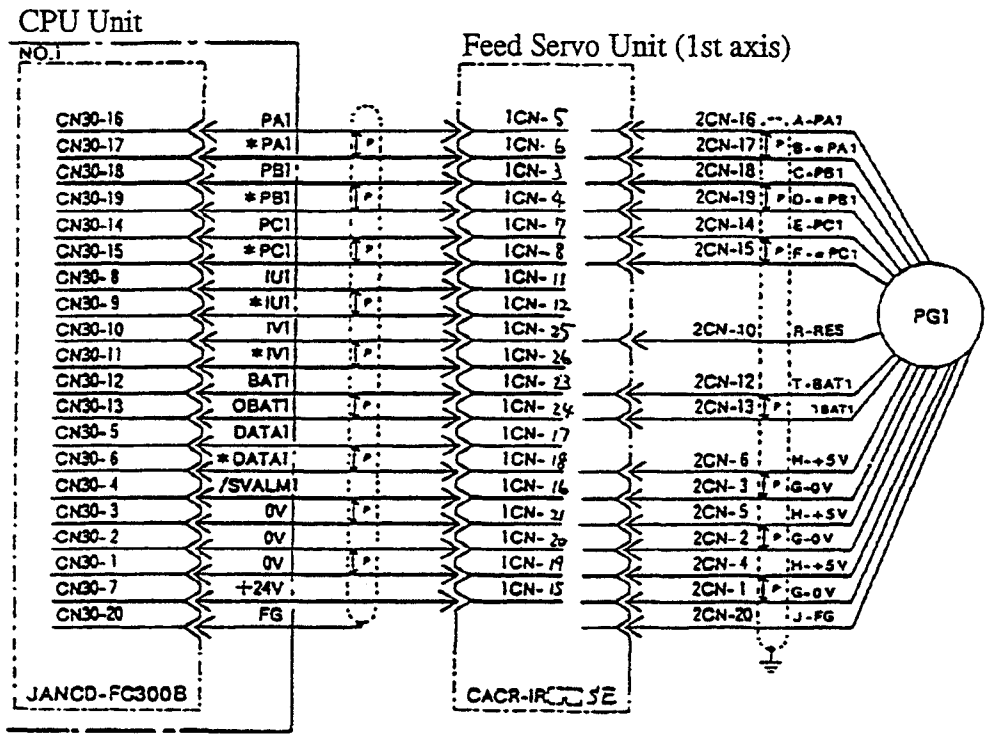
1st axis	1CN	CN11
1st axis	2CN	CN12
2nd axis	1CN	CN21
2nd axis	2CN	CN22
3rd axis	1CN	CN31
3rd axis	2CN	CN32

Req. C30 ~ C32 cables, use the cables we provide.

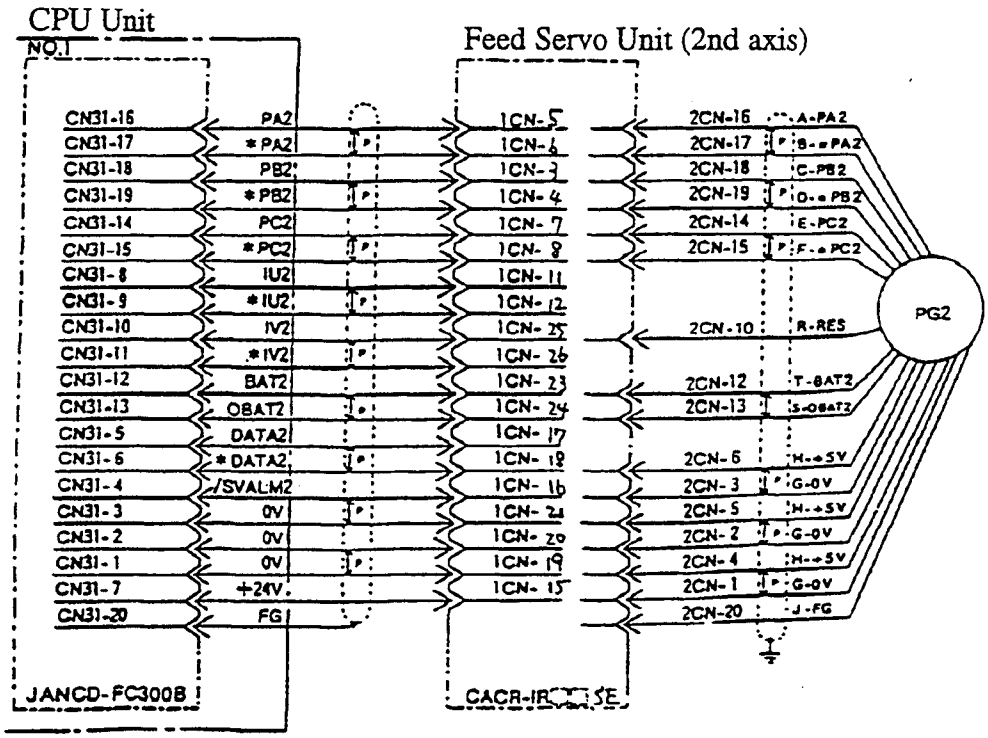
Model	Cable Length
CABLE - WA00.5 - 1	0.5m
CABLE - WA01.0 - 1	1.0m
CABLE - WA01.5 - 1	1.5m
CABLE - WA02.0 - 1	2.0m
CABLE - WA02.5 - 1	2.5m
CABLE - WA03.5 - 1	3.0m

(2) Details of Connection with Feed Servo Unit

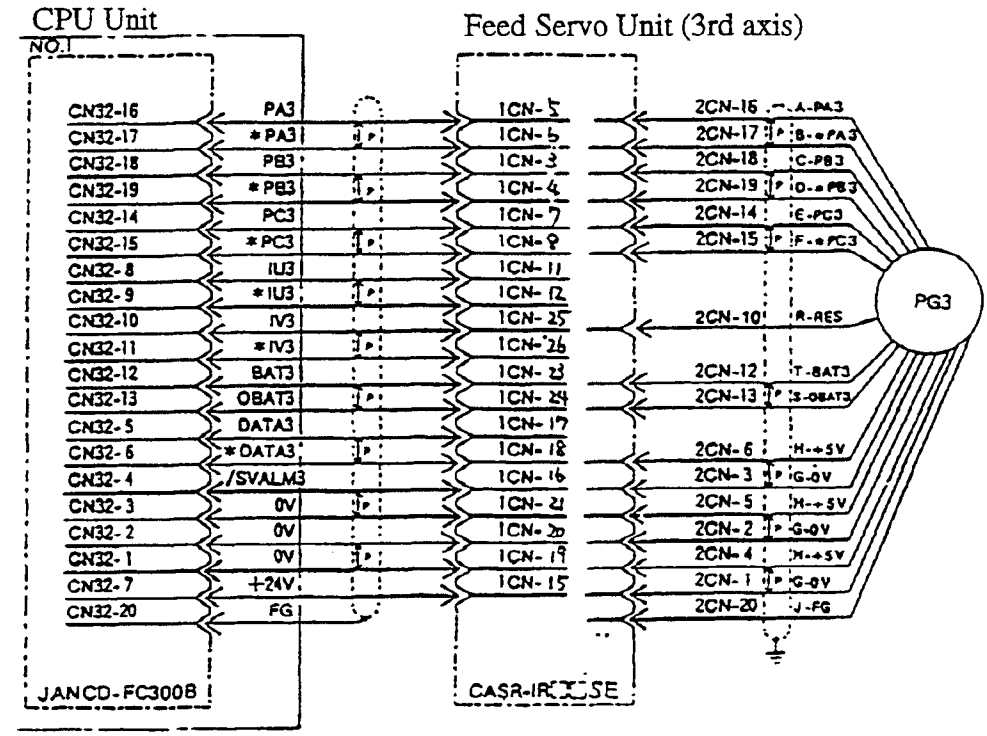
1) For the 1st axis



2) For the 2nd axis



3) For the 3rd axis



Note) In case of 3-axis servo unit, read the connector as follows:

3-axis servo

1st axis	1CN	CN11
1st axis	2CN	CN12
2nd axis	1CN	CN21
2nd axis	2CN	CN22
3rd axis	1CN	CN31
3rd axis	2CN	CN32

(3) Details of 3-Axis Combined Type Servo, Connector Section

1) Connector CN13, CN23, CN33 (less than 10, for 3 axes only) for connecting motors.
Specifications of the connector:
D3100 series connector by AMP (4-pin)
Servopack PWB mounted side 1 - 178297 - 5 (right angle)
Cable side 1 - 178288 - 3 (connector)

Connector Pin Arrangement

1	3	5	8
U	V	W	FG
Motor U phase	Motor V phase	Motor W phase	Frame Ground

Specifications:
U and motor A terminal , V and motor B terminal, W and motor C connects terminal.

2) Connector CN3 for the main circuit power supply ON/OFF connecting point

Specifications of the connector:

D3100 series connector by AMP (3-pin)

Servopack PWB mounted side 1 - 178138 - 2 (right angle)

Cable side 1 - 178128 - 3 (connector)

Connector Pin Arrangement

1	2	3
MPON	/ MPON	
Main power supply ON/OFF connecting point		

Specifications:

Connecting point to cut the power of the main circuit power supply by turning the built-in contactor ON/OFF. AC200 ~ 230V 12mA.

3) Connector CN2 for control power supply

Specifications of the connector:

D3100 series connector (3-pin)

Servopack PWB mounted side 1 - 178298 - 5 (right angle)

Cable side 1 - 178288 - 3 (connector)

Connector Pin Arrangement

1	2	3
r		t
Control power supply Input r phase		Control power supply Input t phase

Specifications:

Single phase AC200 ~ 230 -15 ~ +10% 50 / 60Hz

3. Appendix

1) Rating and Specifications

(1) For 1 axis

Corresponding Capacity Kw		0.5	1.0	1.5	2.0	3.0	4.4
Control System Type CACR-		iR05SE	iR10SE	iR15SE	iR20SE	iR30SE	iR44SE
Input Power Supply	Main circuit	3 phase 200 ~ 230v + 10 ~ - 15% 50 / 60Hz					
	Control circuit	Single phase 200 ~ 230v + 10 ~ - 15% 50 / 60Hz					
Environmental Condition		Temperature: 0 ~ +60°C Storage temperature: -20 ~ +85°C Usage, storage humidity: Less than 90% (no dew)					
Construction		Rack mount Forced air cooling system (over 2.5m/s)					
Servo Output Characteristic	Rated current (Arms)	4.2	7.6	11.7	18.8	26.0	33.0
	Instantaneous max. current (Arms)	11.0	17.0	28.0	42.0	57.5	77.0
Control Method		3-phase full-wave rectification iGBT PWM					
Feedback		Optical encoder					
I / O Signal	Current Command	PWM input					
	Current Feedback	PWM output					
	Serial Cmu Method	Half duplicate sychronized method					
	Sequence Output Signal	/ SVRDY					
Built-in Function	Protective Function	* Overvoltage * Overcurrent * MCCB trip * Voltage drop * Open phase * Abnormal regeneration * Ground fault * Current command disconnection * Current command trouble * Abnormal current feedback * Abnormal CPU					
	Display	Alarm display, condition display					
	DB Function	Built in automatic DB which works when the main power supply is off, servo alarm occurred, servo is off.					
	Regenerative Process	Built-in					
	Main Power Supply Interrupting Contactor	Built-in					
	Applied Load Inertia	Within GDm^2 x 5					

(2) For 3 axis

Corresponding Capacity Kw		0.5	1.0	1.5
Control System Type CACR-		iR050505EB	iR101010EB	iR151515EB
Input Power Supply	Main circuit	3 phase 200 ~ 230v + 10 ~ - 15% 50 / 60Hz		
	Control circuit	Single phase 200 ~ 230v + 10 ~ - 15% 50 / 60Hz		
Environmental Condition		Temperature: 0 ~ +55°C Storage temperature: -20 ~ +85°C Usage, storage humidity: Less than 90% (no dew)		
Construction		Rack mount Forced air cooling system (over 2.5m/s)		
Servo Output Characteristic	Rated current (Arms)	4.2	7.6	11.7
	Instantaneous max. current (Arms)	11.0	17.0	28.0
Control Method		3-phase full-wave rectification iGBT PWM		
Feedback		Optical encoder		
I / O Signal	Current Command	PWM input		
	Current Feedback	PWM output		
	Serial Cmu Method	Half duplicate synchronized method		
	Sequence Output Signal	/ SVRDY		
Built-in Function	Protective Function	* Overvoltage * Overcurrent * MCCB trip * Voltage drop * Open phase * Abnormal regeneration * Ground fault * Current command disconnection * Current command trouble * Abnormal current feedback * Abnormal CPU		
	Display	Alarm display, condition display		
	DB Function	Built in automatic DB which works when the main power supply is off, servo alarm occurred, servo is off.		
	Regenerative Process	Built-in		
	Main Power Supply Interrupting Contactor	Built-in		
	Applied Load Inertia	Within GDm^2 x 5		

Note) The load ratio of each axis should be less than 70% in case the three axis is operated simultaneously.

2) Power Supply Capacity

Model CACR-	Applied Motor USAGED-	Power Supply Capacity / Set KVA	Current Capacity A per one MCCB
iR05SE	05A*	1.1	5
iR10SE	09A*	2.1	8
iR15SE	13A*	3.1	10
iR20SE	20A*	4.1	12
iR30SE	30A*	6.0	18
iR44SE	44A*	8.0	24
iR050505EB	05A*	3.1	10
iR101010EB	09A*	6.0	18
iR151515EB	13A*	8.0	24

3) Servo Unit and Calorific Value

Servo Unit CACR-	Total Calorific Value	Internal Calorific Value (W)		
		100% Load Factor	75% Load Factor	50% Load Factor
iR05SE	100	58	52	49
iR10SE	110	61	55	50
iR15SE	130	70	63	58
iR20SE	150	73	65	60
iR30SE	200	97	82	71
iR44SE	250	112	92	79
iR050505EB	160	---	74	64
iR101010EB	180	---	80	68
iR151515EB	220	---	90	76

Note) 1. Internal calorific value: Residual calorific value in the box in case the fin of the servo unit is exposed to the atmosphere of over 2.5m/s.

2. The heat plan of the box in which the servo unit is installed is different from specification to specification, but usually a 70% load ration is applied.

4) SW Setup

(1) For 1-axis

SW1: For test only. Leave the initial setup as is.
Setup - - - SW1 - 0 ~ 3; Open

SW2: Axis setup (determines the connector type)

SW2	NC Side Connector
0	FC300B CN30
1	FC300B CN31
2	FC300B CN32
3 ~ F	Invalid

(2) For 3 axes

SW1: For test only. Leave the initial setup as is.
Setup - - - SW1 - 0, 1: Short SW1 - 2, 3: Open

SW2: Axis setup (Determines the connector type)

SW2	CN11 Connect to	CN21 Connect to	CN31 Connect to
0	FC300B CN30	FC300B CN31	FC300B CN32
1	FC300B CN31	FC300B CN30	FC300B CN32
2	FC300B CN31	FC300B CN32	FC300B CN30
3	FC300B CN30	FC300B CN32	FC300B CN31
4	FC300B CN32	FC300B CN30	FC300B CN31
5	FC300B CN32	FC300B CN31	FC300B CN30
6	FC300B CN30	Invalid	Invalid
7	FC300B CN31	Invalid	Invalid
8	FC300B CN32	Invalid	Invalid
9	Invalid	FC300B CN30	Invalid
A	Invalid	FC300B CN31	Invalid
B	Invalid	FC300B CN32	Invalid
C	Invalid	Invalid	FC300B CN30
D	Invalid	Invalid	FC300B CN31
E	Invalid	Invalid	FC300B CN32
F	FC300B CN30	FC300B CN31	Invalid

5) Dimension Diagram

Refer to the following diagram.

Model	Drawing
CACR-iR05SEB	DE9405341
CACR-iR10SEB ~ 30SEB	DE9405342
CACR-iR44SEB	DE9405343
CACR-iR050505EB	DE9301462
CACR-iR101010EB ~ 151515EB	DE9301461

IR _ _ SE Alarms

YASNAC i80
CACR - iRSE Servo

List of Alarms

This is a list of hardware alarms of CACR-iR SE type Servo applied to YASNAC i80. Other alarms are displayed on the NC CRT.

Refer to the operation manual (i80L: TO-C843-11.21, i80M: TO-C843-11.31) for details.

YASKAWA ELECTRIC AMERICA, INC.

Original issued on:	10/18/93	**Note:**
Original issued by:	NC Design Section	
Translated on:	4/28/96	
Translated by:		
Inspected by:		

(i) Problem Detection for the 1st Axis

Table 1. Problem Detection for the 1st Axis

Display	Problem	Contents	SVRDY lights off
1	Overcurrent detection	Overcurrent occurred in the main circuit.	○
2	MCCB trip detection	MCCB tripped.	○
3	Regenerative problem detection	Regenerative process circuit in iAMP does not work.	○
4	Overvoltage detection	Voltage in the main circuit became abnormally high.	○
6	Insufficient voltage detection	Voltage in the main circuit became abnormally low.	○
8	Ground fault detection	Ground fault in the main circuit.	○
b	Current offset problem detection	Current offset problem or no current offset.	○
E	Current command disconnection detection	Current command cable is disconnected.	○
F	Open phase detection	1 phase out of 3 is open.	○
□	CPU problem detection	Abnormal CPU.	○

* ○ : LED goes out when the problem is detected and /SVRDY becomes OFF.
  × : LED does not go out when the problem is detected.

(ii) Hardware Trouble of 1-Axis

Table 2. Abnormal Hardware Detecting Function for 1-Axis

Display	Problem	Contents	SVRDY lights off
H.01	CPU ROM problem	ROM problem in CPU hardware.	○
H.02	CPU RAM problem	RAM problem in CPU hardware.	○
H.03	Serial communication problem 1	Abnormal serial communication (test mode only).	○
H.04	Serial communication problem 2		○
H.05	Gate alley problem	Abnormal gate alley.	○
H.08	EEROM error	Abnormal EEROM.	○
H.09	4 bit micro computer problem	Abnormal 4 bit micro computer problem.	○
H.0A	Current feedback problem with U phase	Abnormal U phase in current feedback.	○
H.0b	Current feedback problem with V phase	Abnormal V phase in current feedback.	○

* For H.09 LED shows "H" "□" "0" every second.

(iii) Problem Detection for 3-Axis

Table 3. Problem Detection for 3-Axis

Display	Problem	Contents	SVRDY lights off
Axis No. 1	Overcurrent detection	Overcurrent occurred in the main circuit.	○
2	MCCB trip detection	MCCB tripped.	○
3	Regenerative problem detection	Regenerative process circuit in iAMP does not work.	○
4	Overvoltage detection	Voltage in the main circuit became abnormally high.	○
6	Insufficient voltage detection	Voltage in the main circuit became abnormally low.	○
Axis No. 8	Ground fault detection	Ground fault in the main circuit.	○
Axis No. b	Current offset problem detection	Current offset problem or no current offset.	○
Axis No. E	Current command disconnection detection	Current command cable is disconnected.	○
F	Open phase detection	1 phase out of 3 is open.	○
□	CPU problem detection	Abnormal CPU.	○

* For * Axis No. E LED displays "Axis No. - - □ - - E - every second.
* ○ : LED goes out when the problem is detected and /SVRDY becomes OFF.
× : LED does not go out when the problem is detected.

(iv) Hardware Problem of 3-Axis

Table 4. Hardware Problem of 3-Axis

Display	Problem	Contents	SVRDY lights off
H. 1	CPU ROM problem	ROM problem in CPU hardware.	O
H. 2	CPU RAM problem	RAM problem in CPU hardware.	O
H. 3	Serial communication problem 1	Abnormal serial communication (test mode only).	O
H. 4	Serial communication problem 2		O
H. 5	Gate alley problem 1	Abnormal 1st axis gate alley.	O
H. 6	Gate alley problem 2	Abnormal 2nd axis gate alley.	O
H. 7	Gate alley problem 3	Abnormal 3rd axis gate alley.	O
H. 8	EEROM Error	Abnormal EEROM.	O
H. 9	4-bit micro computer	Abnormal 4-bit micro computer.	O
H. A	Current feedback problem with 1 U phase	Abnormal current feedback problem on 1st axis U phase.	O
H. b	Current feedback problem with 1 V phase	Abnormal current feedback problem on 1st axis V phase.	O
H. c	Current feedback problem with 2 U phase	Abnormal current feedback problem on 2nd axis U phase.	O
H. d	Current feedback problem with 2 V phase	Abnormal current feedback problem on 2nd axis V phase.	O
H. E	Current feedback problem with 3 U phase	Abnormal current feedback problem on 3rd axis U phase.	O
H. F	Current feedback problem with 3 V phase	Abnormal current feedback problem on 3rd axis V phase.	O

* For : H. 9 LED shows ' H' ' □ ' ' 9 every second.

YPTE OF CONTROL :

YASNAC i80 M

TITLE :

ABSOLUTE POSITION DETECT FUNCTION

Contents :

YASKAWA ELECTRIC AMERICA, INC.

Original issued on	5/24/93	Note:
Original issued by	Yaskawa Engineering	
Translated on	7/15/93	
Translated by	K.P.	
Inspected by		

1. Summary

This manual explains about Alarms and Setup for Absolute Position Detecting Function.

2. Setting method

1) Input Option Parameter of Absolute Value detecting function and Parameter in numerical value according to the list of Parameters.
2) Turn of the power once and start again.
3) Set Pm109 as [1]. (Parameters can be rewritten)
4) Practice manual Zero Return.
5) After process 4), check Parameters to see if they are ;
   pm8000.0 = 1 (X axis)
   pm8000.1 = 1 (Y axis)
   pm8000.2 = 1 (Z axis)
   (These can be confirmed on Maintenance Process Setup display, too)
6) Set Pm109 as [0].
7) Turn off the power. Now setting is done.

3. Adjusting stopping position at Zero Return Position.

1) Set Pm109 as [1] (Parameter can be rewritten)
2) After Manual Zero Return, set parameters as ;
   pm8000.0 = 0 (X axis)
   pm8000.1 = 0 (Y axis)
   pm8000.2 = 0 (Z axis)
   to be Zero Setting Incomplete comdition and then press Reset Key.
   (This can be done on Maintenance Process Setup display)
3) Change the numerical calue of Parameter pm4551 - 4553 (Supposed C phase shifting distance) and adjust the position of Zero Return. After changing, Reset Key must be pressed.
4) Practice Manual Zero Return.
5) After 4) is done, confirm parameters to be pm8000.0 = 1 (X axis)
   pm8000.1 = 1 (Y axis)
   pm8000.2 = 1 (Z axis)
   (This can be confirmed on Maintenance Process Setup display)
6) If the stopping position is different, repeat the process from 2).
7) Set Pm109 as [0]. (Parameters cannot be rewritten)

4. NC · SV Alarm

4.1 Confirm the contents of Alarm

1) Bring up Alarm Job display in common process.
Jot down the illuminated Alarm.
If Servo Alarm [3100 ~ 3109] are displayed, you have to jot down Alarm on SV Alarm Function display.

2) If the following Alarms are lit, practice the process in 4 - 3.
Alarm No. 2131 ABSO POS CHECK ERROR (X axis)
Alarm No. 2132 ABSO POS CHECK ERROR (Y axis)
Alarm No. 2133 ABSO POS CHECK ERROR (Z axis)

3) Refer Operation Manual, Appendix for other Alarms and confirm the deteils with Maintenance Manual or give us a call.

4-1. Alarms

1) Alarm No. 2131 ABSO POS CHECK ERROR (X axis)
Alarm No. 2132 ABSO POS CHECK ERROR (Y axis)
Alarm No. 2133 ABSO POS EHCEKC ERROR (Z axis)
Contents : The difference between the positions at the time of activation and the previous power-off is bigger than the value of Parameter setting.

2) Alarm No. 3161 ABSO ERROR (X axis)
Alarm No. 3162 ABSO ERROR (Y axis)
Alarm No. 3163 ABSO ERROR (Z axis)
Contents : Detection of Erroneous operation of Absolute Encorder

3) Alarm No. 3181 ABSO ERROR (X axis)
Alarm No. 3182 ABSO ERROR (Y axis)
Alarm No. 3183 ABSO ERROR (Z axis)
Contents: Detection of PG Counter Erroneous operation of Absolute Encorder

4) Above Alarms are lit when changing Motors, so PG Connector, R-S Short of motors must be practiced thoroughly as shown in 6).

4-3. Revision process after Alarm

1) Check Parameters to see if they are ;
   Parameter Pm8001.0 = 1 (X axis position gap shown)
   Pm8001.1 = 1 (Y axis position gap shown)
   Pm8001.2 = 1 (Z axis position gap shown)
   (Only for the axis for which Alarm is lit)
   (This can be checked on Meintenance Process Setup display)

2) Check Machine Coordinate System of the current position display and Parameters
   Pm8801 (Machine Coord. system value when X axis power is off)
   Pm8802 (Machine Coord. system value when Y axis power is off)
   Pm8803 (Machine Coord. system value when Z axis power is off)
   and confirm the position gap. (Jot down the gap)
   (If the position gap occurs, Alarm will generate on account of setup condition of Pm8411, Pm8412, Pm8413)

3) Compare the actual Machine Coordinate system and that from the time of power-off if the value is the same, set Pm109 as [1]. (Parameter can be rewritten)
   If this penomenon appears frequently, give us a call.
   If there is any position gap, follow the process in 4-4.

4) Release the condition of Positoin gap. (Only for the axis for which Alarm is lit).
   Set Parameters as; Pm8001.0=0 (X axis position gap condition)
   Pm8001.1=0 (Y axis position gap condition)
   Pm8001.2=0 (Z axis position gap condition)
   for releasing Position gap condition and then press Reset Key.
   (This process can be done on Maintencance Process Setup Display)

5) Release Zero Position Setting condition. (Only for the axis for which Alarm is lit)
   Set Parameters as ; pm8000.0 = 0 (X axis Zero Position setting condition)
   pm8000.1 = 0 (Y axis Zero Position setting condition)
   pm8000.2 = 0 (Z axis Zero Position setting condition)
   for releasing Zero Position Setting condition and then press Reset Key.
   (This process can be done on Meintenance Process Setup Display)

6) Practice Zero Return manually and confirm the machine position.

7) Check to see if the parameters are'
   pm8000.0 = 1 (X axis Zero Position setting condition)
   pm8000.1 = 1 (Y axis Zero Position setting condition)
   pm8000.2 = 1 (Z axis Zero Position setting condition)
   (This can be confirmed on Meintenance Process setup display)

8) Set Pm109 as [0]. (Parameters can be rewritten)

9) Check to see there is no Alarm. Now all the process is completed.

4-4. When Alarm [2131], [2132], [2133] are lit for Position Gap.

1) When Alarms are lit, write down the contents of the following items.

1. Machine Coordinate system of Position display
2. Parameter Pm8801 Machine Coord. System value when X axis power is off
   Pm8802 Machine Coord. system value when Y axis power is off.
   Pm8803 Machine Coord. systm value when Z axis power is off.
3. Parmaeter Pm8811 Offset quantity for X Axis Zero setting
   Pm8812 Offset quantity for Y axis Zero setting
   Pm8813 Offset quantity for Z axis Zero setting
4. Parameter Pm8411 Limited value of X axis position gap
   Pm8412 Limited value of Y axis position gap
   Pm8413 Limited value of Z axis position gap
5. Parameter Pm8000.0 X axis Zero Position setting condition
   Pm8000.1 Y axis Zero Position setting condition
   Pm8000.2 Z axis Zero Position setting condition
6. Parameter Pm8001.0 X axis position gap condition
   Pm8001.1 Y axis position gap condition
   Pm8001.2 Z axis position gap condition

2) After the contents of the above items are jot down, practice the process following once 6. and then 4-3.

3) If this problem occurs frequently, please let us know with the contents of your memo.

5. Relative Parameters

Pm1044.4=1	X axis Absolute Position Detection
Pm1045.4=1	Y axis Absolute Position Detection
Pm1046.4=1	Z axis Absolute Position Detection
Pm8411	Limited value of X axis Position Gap (1=0.001mm)
Pm8412	Limited value of Y axis Position Gap (1=0.001mm)
Pm8413	Limited value of Z axis Position Gap (1=0.001mm) (in case of mm system)
Pm8801	Machine Coord. system when the power for X axis is turned off
Pm8802	Machine Coord.. system when the power for Y axis is turned off
Pm8803	Machine Coord. system when the power for Z axis is turned off

pm8811	Offset quantity for X axis Zero setting (Automatic setting)
pm8812	Offset quantity for Y axis Zero setting (Automatic setting)
pm8813	Offset quantity for Z axis Zero setting (Automatic setting)
pm8000.0	X axis Zero Position setting condition
pm8000.1	Y axis Zero Position setting condition
pm8000.2	Z axis Zero Position setting condition
Pm8001.0	X axis Position gap condition
Pm8001.1	Y axis Position gap condition
Pm8001.2	Z axis Position gap condition
Pm4551	X axis Supposed C Phase shifting distance
Pm4552	Y axis Supposed C Phase shifting distance
Pm4553	Z axis Supposed C Phase shifting distance

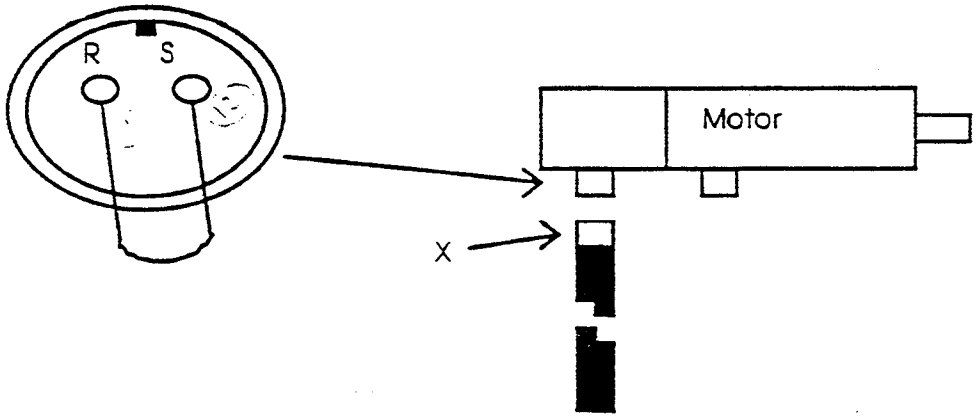
(This is an additional Parameter comes with additional new function)

Pm4451	Final running distance for X axis Reference Point Return
Pm4452	Final running distance for Y axis Reference Point Return
Pm4453	Final running distance for Z axis Reference Point Return

6. Others

1) This is a necessary process when changing Motor (PG).
2) Sometimes the contents of memory within PG to be changed to incorrect. So remove PG cable of Motor and practice R-pin S-pin short of PG connector on Motor side. (See the draw. below)
   Short must be practiced more than 5 minutes.
3)

Turn off the power before you operate this process.



IR Replacement

Changing Procedure for IR type Servo unit

1. Machine side main breaker off.

2. Remove all wires and connectors from IR servo unit.

3. Replace unit.

4. Connect all wires and connectors to unit.

5. SB Type : Set all jumper pin (SW1~SW4).
   SE and SEB Type : Set a rotary switch to same with original unit.