APPENDIX

PRELIMINARY

1.1 UNIT AND MODULE LAYOUT

(1) Configuration

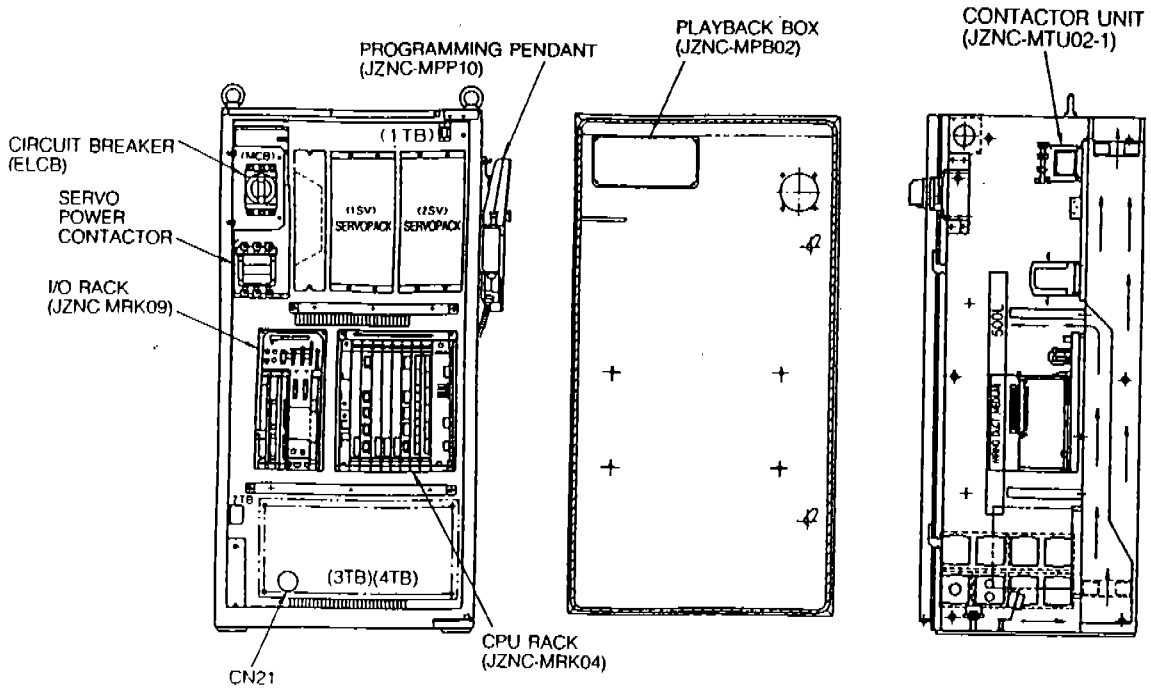
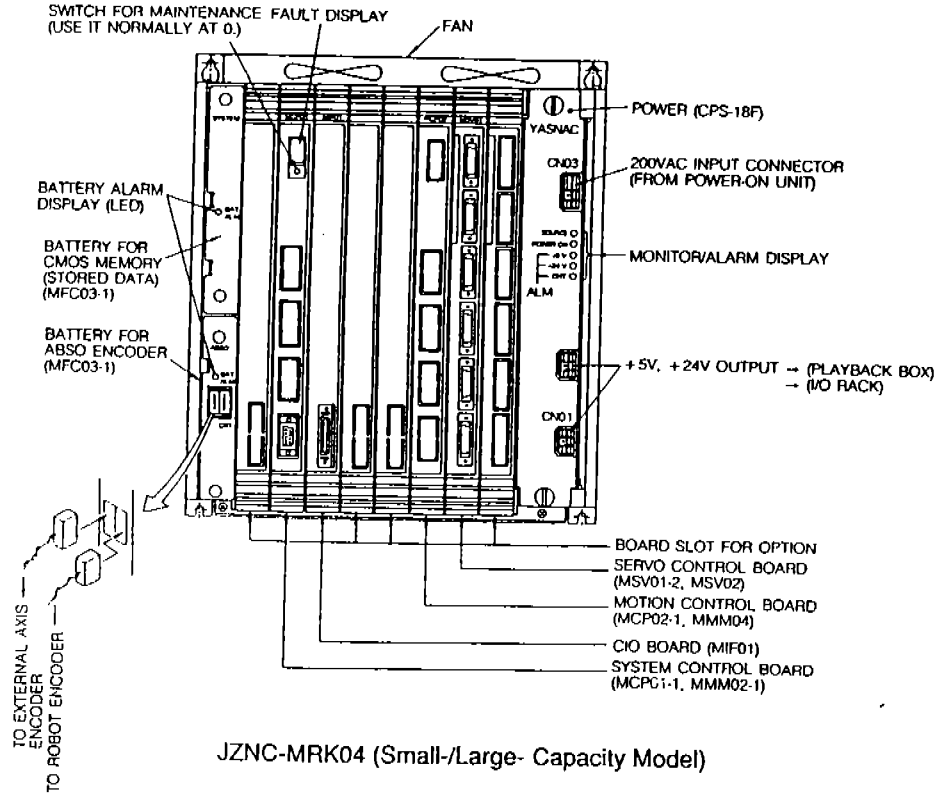


Fig. 1.1 (a) Configuration of YASNAC MRC (Small-Capacity Model)

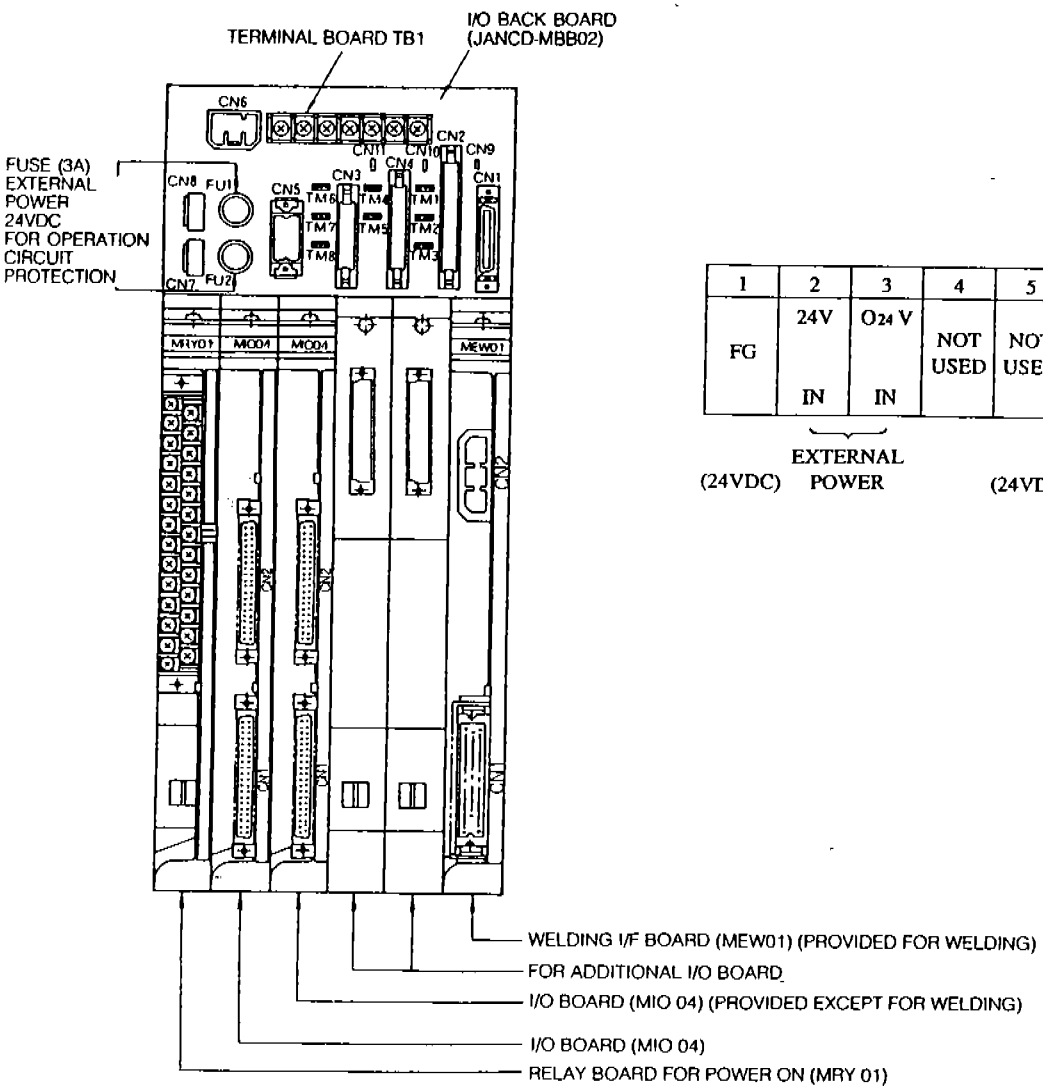
1.2.5 Configuration of CPU Rack (JZNC-MRK04, JZNC-MRK11)

The CPU rack is composed of the control power unit and various board racks.



JZNC-MRK04 (Small-/Large- Capacity Model)

1.2.3 I/O Rack Configuration (JZNC-MRK09)



1	2	3	4	5	6	7
FG	24V	O24 V	NOT USED	NOT USED	24V	O24 V
	IN	IN			OUT	OUT
	EXTERNAL POWER (24VDC)				I/O POWER SUPPLY (24VDC)	

Fig. 1.12 Configuration of I/O Rack

Description of Connector

CN1 : For signal with MIF01 (CN01)

CN2 : For signal with playback box (CN2)

CN3 : For signal with MTU02

CN4 : To SAFETY OPTION (For future use)

CN5 : To EXTERNAL AXES TU-CONTROL (For future use)

CN6 : Power supplied from 1PS (CN2)

CN7 : When internal power used
CN8 : When external power used
} Refer to (1) "Connecting external power supply".

CN9 : FG

CN10 : FG

CN11 : FG

1.1.1 Cooling System of the MRC Robots Panel Interior

Air is drawn in at the bottom. A fan in the top of the panel provides air to cool the servo. Another fan, in the lower part of the panel, circulates air in the panel to regulate internal temperature.

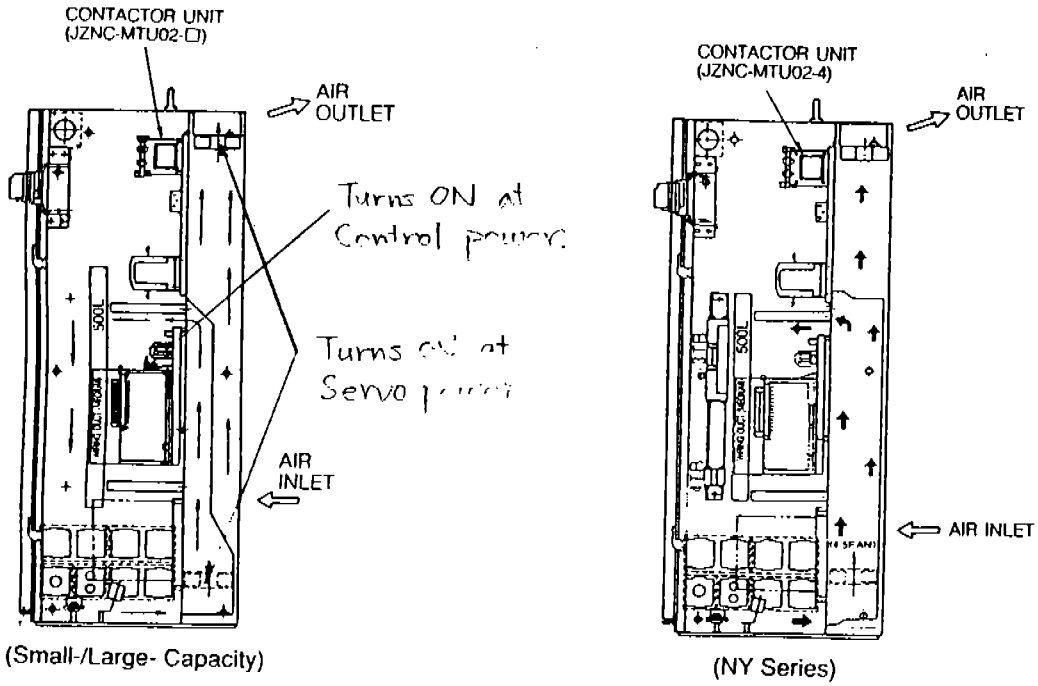
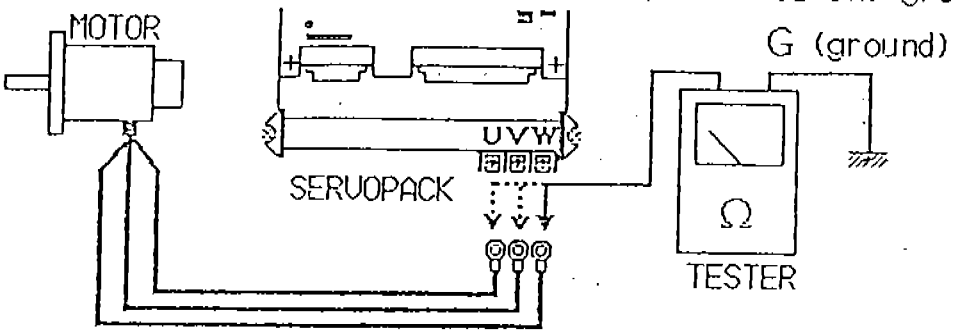


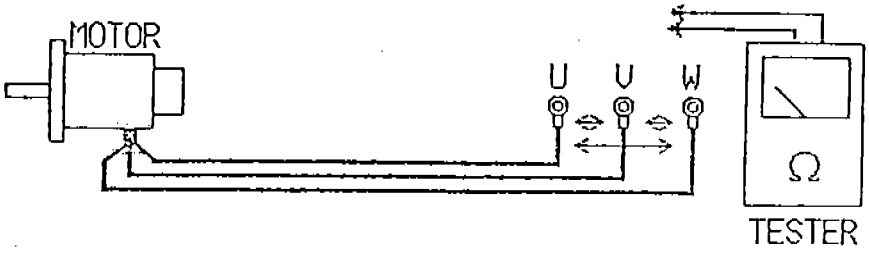
Fig. 1.2 YASNAC MRC Cooling System

CHECKING METHOD OF FIRST GROUND TERMINAL

Measure the resistance between motor lead wires and ground.



Measure the resistance of phases.

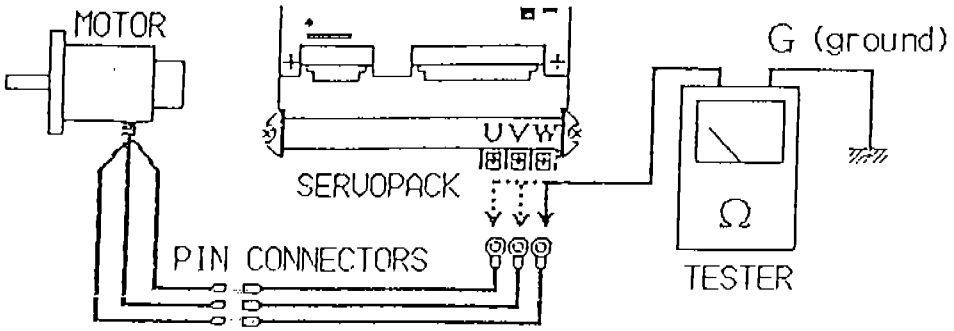


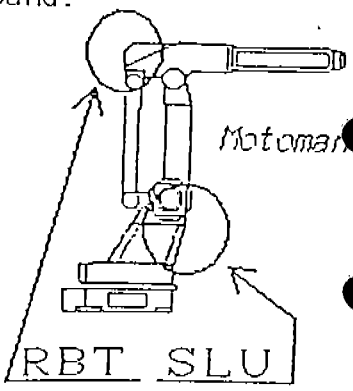
Measure the resistance between U and V, V and U, W and U.

note: It is sub-standard article when voltage is under 2.8 V.

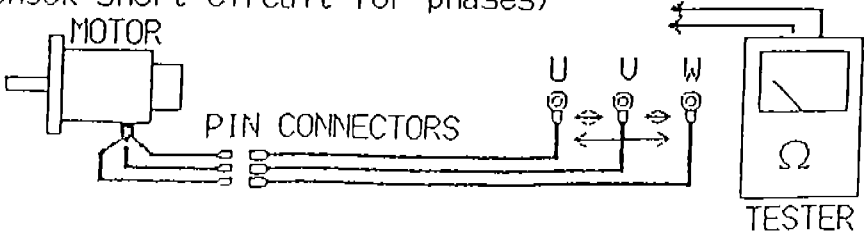
CHECKING METHOD OF SECOND GROUND TERMINAL

Measure the resistance between motor lead wires and ground.



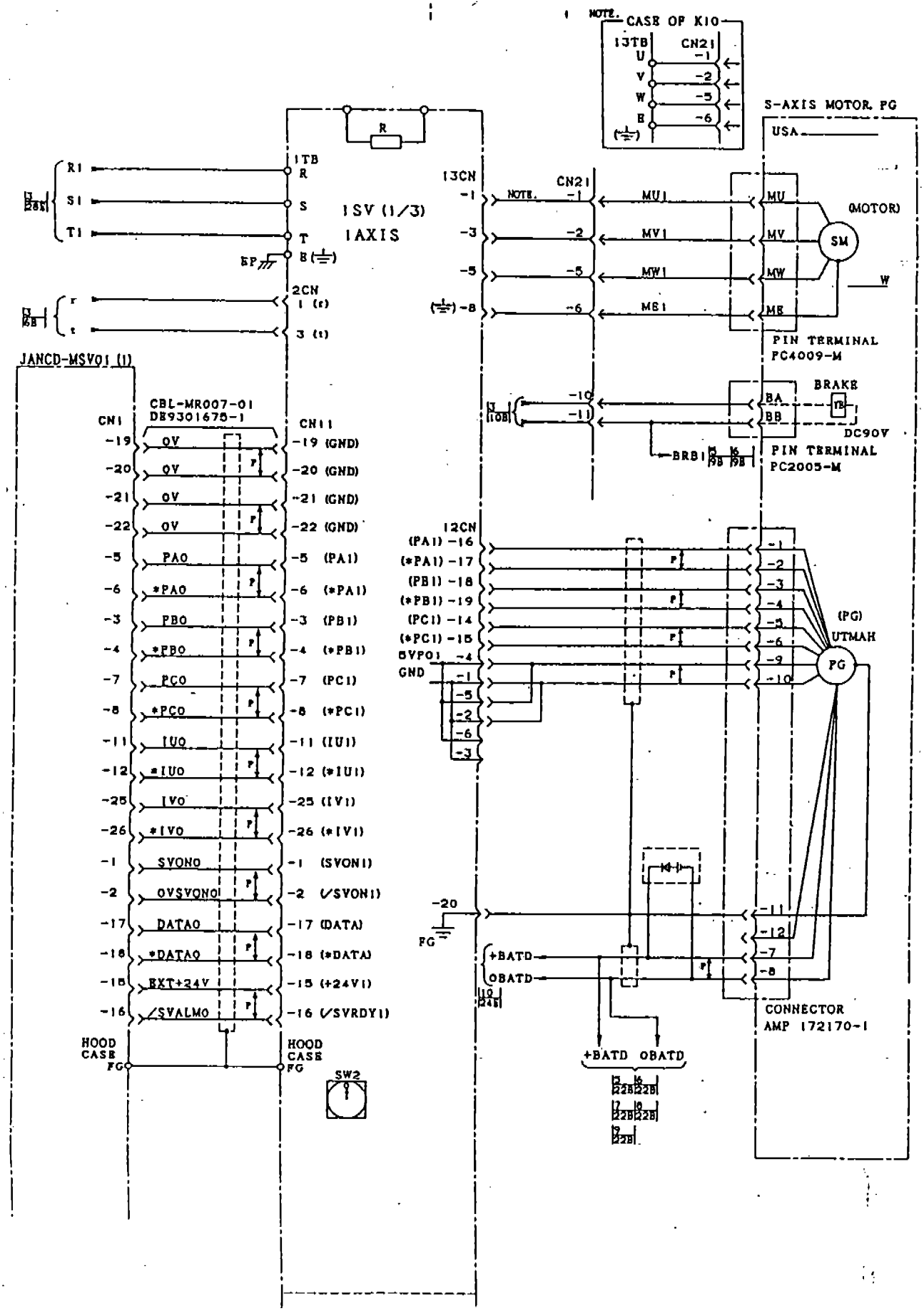


Measure the resistance for phases.
(Check short circuit for phases)



Check short circuit between U and V, V and W, W and U.

note: Check ground terminal of read wire of servomotor and short circule between with u and v, v and w, w and u in motor.


NOTE.
CASE OF K10
13TB
CN21
U -1
V -2
W -5
B -6
S-AXIS MOTOR PG
USA
R
1TB
R
S
T
B
1SV (1/3)
1AXIS
13CN
CN21
MU1
MV1
MW1
MB1
MU
MV
MW
MB
SM
(MOTOR)
W
PIN TERMINAL
FC4009-M
2CN
1 (r)
3 (t)
JANCD-MSV01 (1)
CBL-MR007-01
DB9301675-1
CN1
CN11
-19 0V -19 (GND)
-20 0V -20 (GND)
-21 0V -21 (GND)
-22 0V -22 (GND)
-5 PA0 -5 (PA1)
-6 *PA0 -6 (*PA1)
-3 PB0 -3 (PB1)
-4 *PB0 -4 (*PB1)
-7 PC0 -7 (PC1)
-8 *PC0 -8 (*PC1)
-11 IU0 -11 (IU1)
-12 *IU0 -12 (*IU1)
-25 IV0 -25 (IV1)
-26 *IV0 -26 (*IV1)
-1 SVON0 -1 (SVON1)
-2 0VSVON0 -2 /SVON1)
-17 DATA0 -17 (DATA)
-18 *DATA0 -18 (*DATA)
-15 EXT+24V -15 (+24V1)
-16 /SVALM0 -16 /SVRDY1)
HOOD CASE FG
HOOD CASE FG
SW2
BRAKE
BA
BB
DC90V
BRB1
PIN TERMINAL
PC2005-M
12CN
(PA1) -16
(*PA1) -17
(PB1) -18
(*PB1) -19
(PC1) -14
(*PC1) -15
5VPO1 -4
GND -1
-5
-2
-6
-3
(PG)
UTMAH
PG
-20
FG
+BATD
OBATD
+BATD OBATD
CONNECTOR
AMP 172170-1

7.2 INTERNAL CONNECTIONS

High reliability connectors which can be easily removed are used with each connector part. In Figs. 7.3 and 7.4, " —<← " shows pin connector which can also be removed. For the numbers and locations of connectors, see Fig. 7.2.

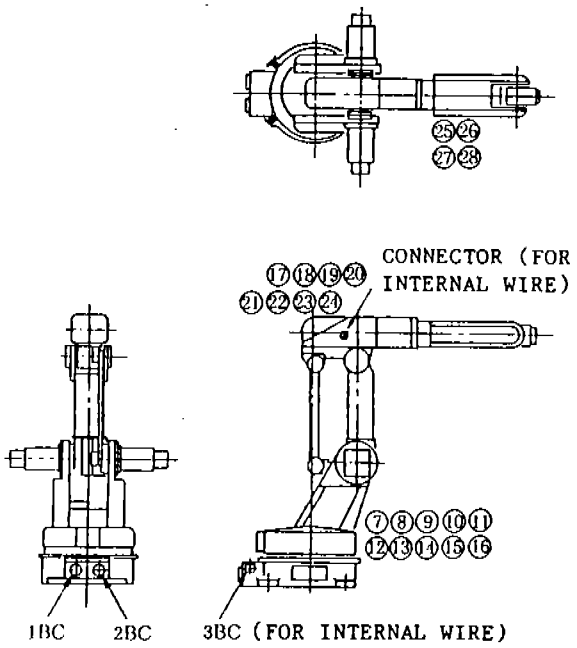
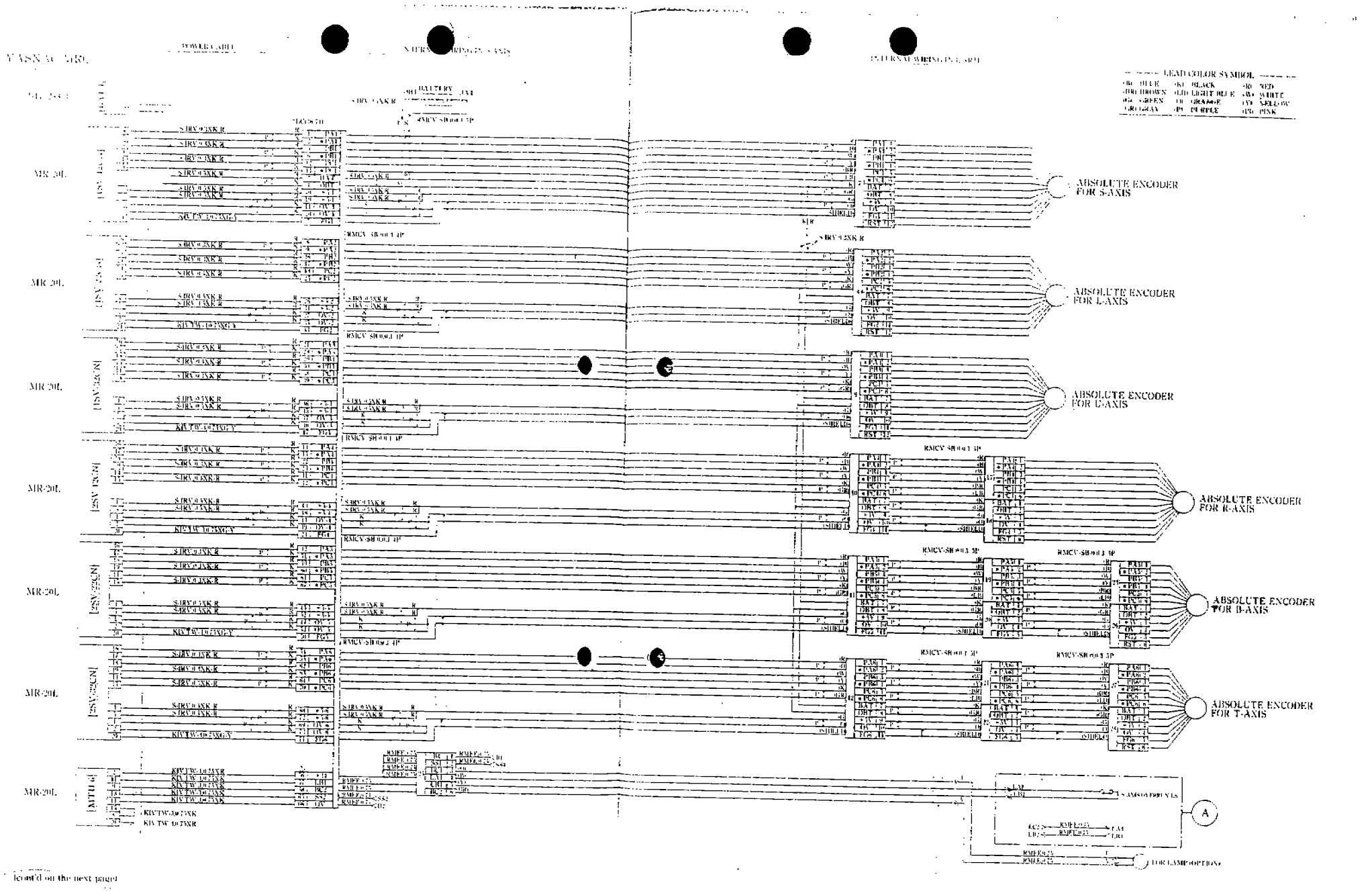


Fig. 7.2 Locations and Numbers of Connectors

Table 7.2 List of Connector Type

Name	No.	Receptacle Type	Plug Type
Base Connector	1BC	JL05-2A36-74PC	JL05-6A36-74SC
	2BC	JL05-2A28-21PC	JL05-6A28-21SC
For Internal Wire	3BC	JL05-2A20-29PC	JL05-6A20-29S (Optional)
Intermediate Connector	⑦⑧⑨⑩⑪⑫	172170-1	172162-1
	⑬⑭⑮⑯㉓㉔	1-480276-0	1-171196-0
	⑲⑳㉑㉒	172168-1	172160-1
Feedback Unit Connector	⑰⑱㉕㉖㉗㉘	172168-1	172160-1
Connector for Internal Wire	—	JL05-2A20-29SC	JL05-6A20-29P (Optional)


ABSOLUTE ENCODER FOR S-AXIS
ABSOLUTE ENCODER FOR L-AXIS
ABSOLUTE ENCODER FOR U-AXIS
ABSOLUTE ENCODER FOR R-AXIS
ABSOLUTE ENCODER FOR B-AXIS
ABSOLUTE ENCODER FOR T-AXIS
MR-20L
MR-20L
MR-20L
MR-20L
MR-20L
MR-20L
A
Fig. 7.3 Internal Connection Diagram

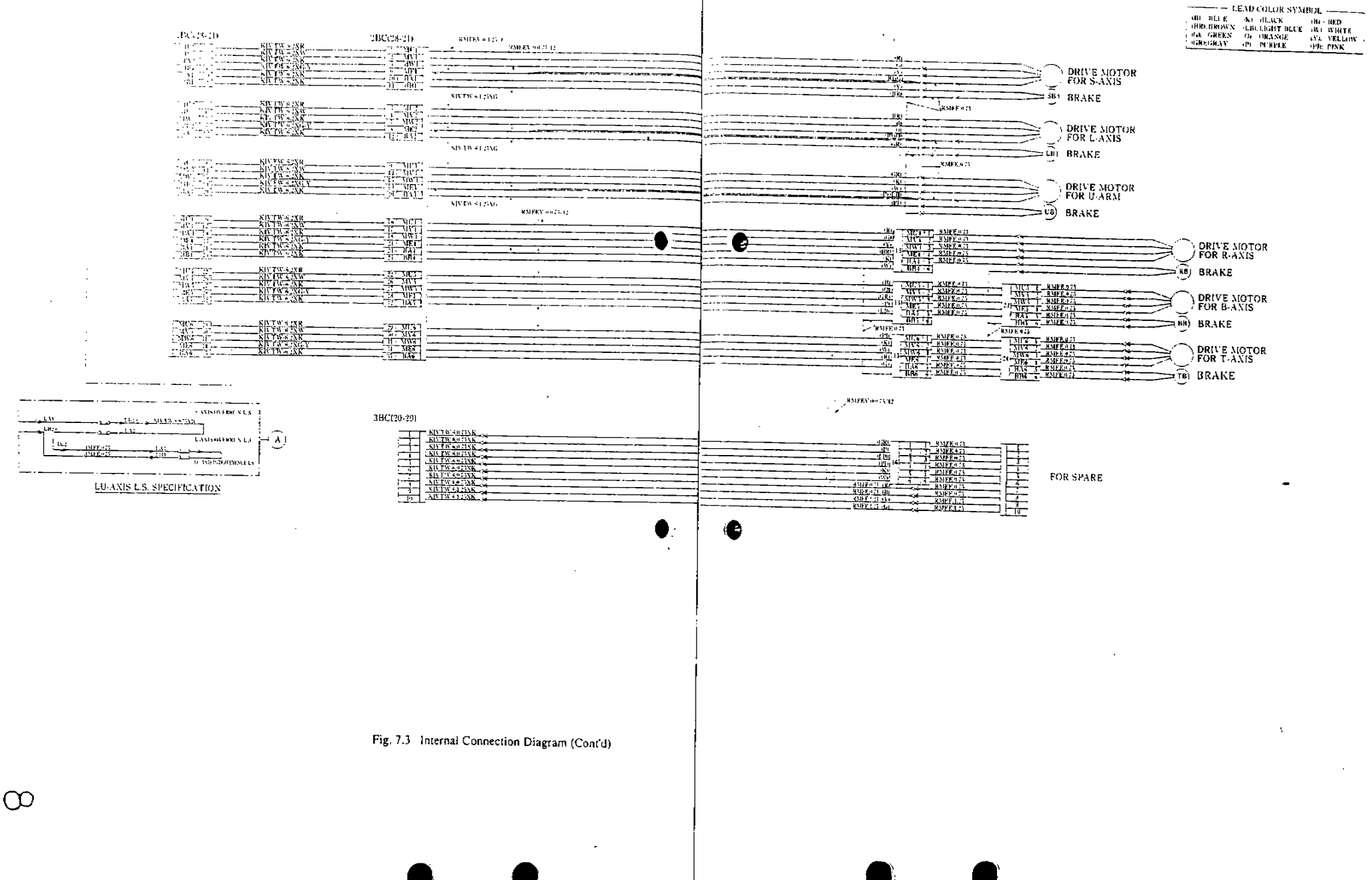
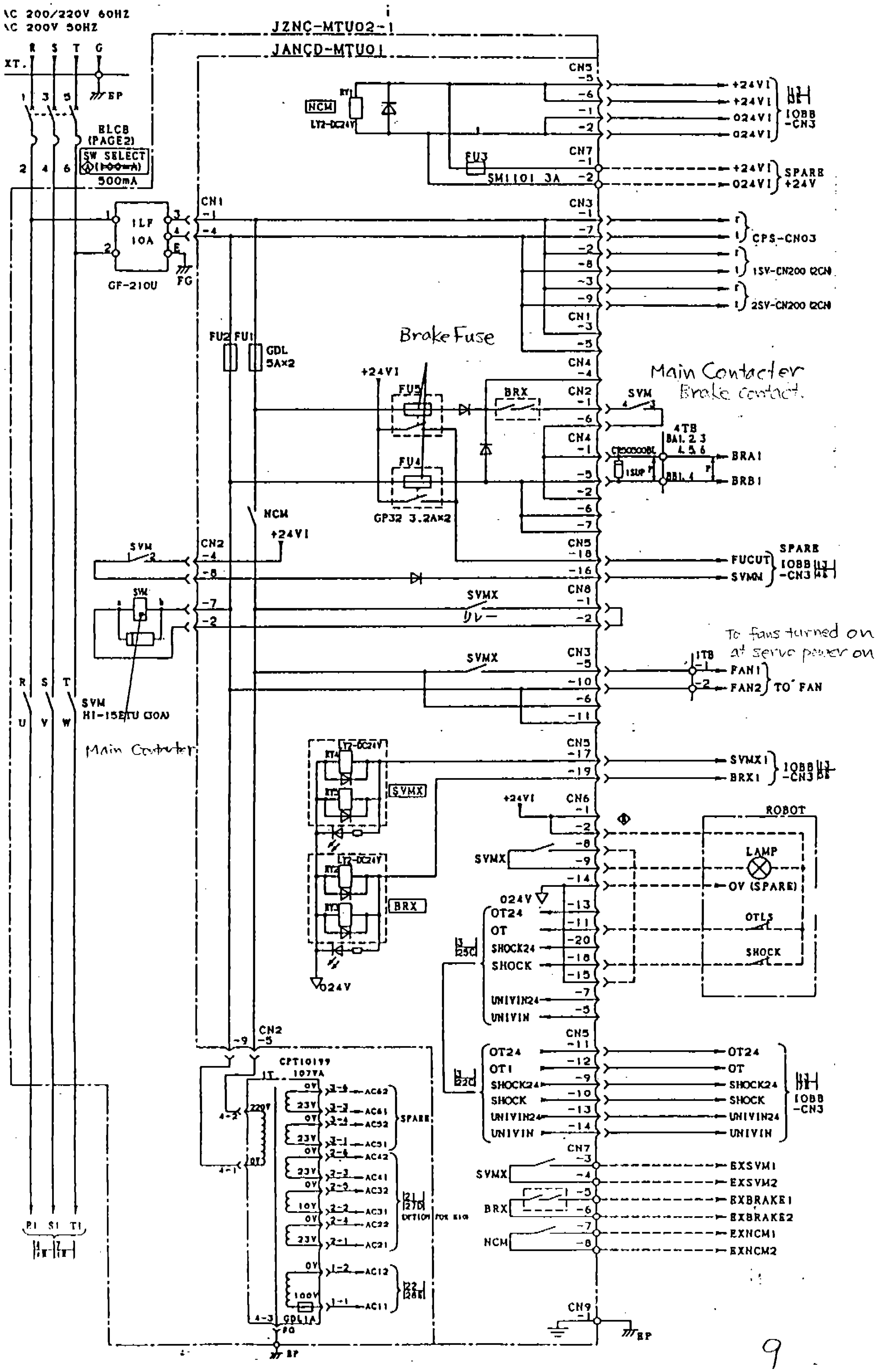


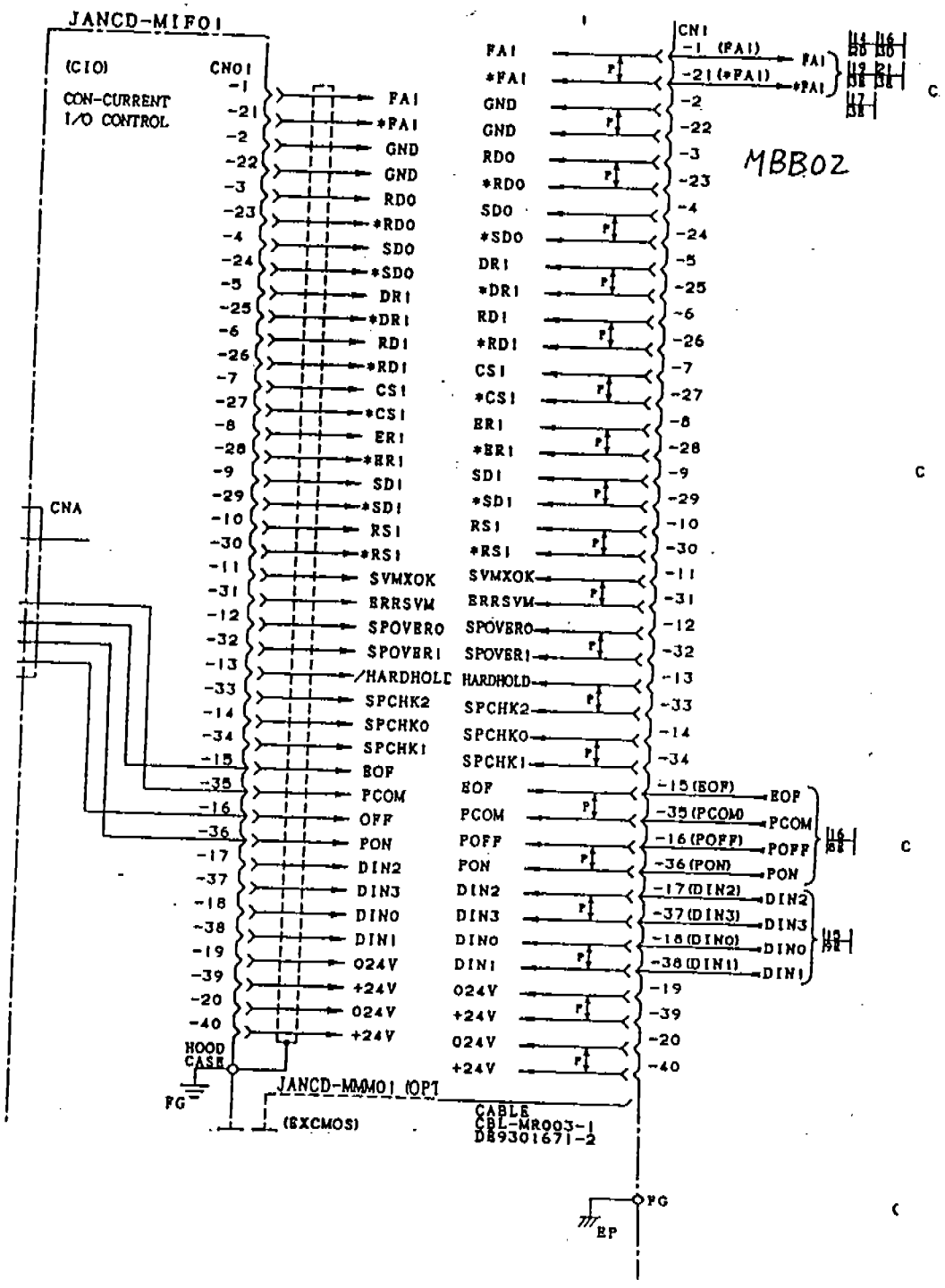
Fig. 7.3 Internal Connection Diagram (Cont'd)



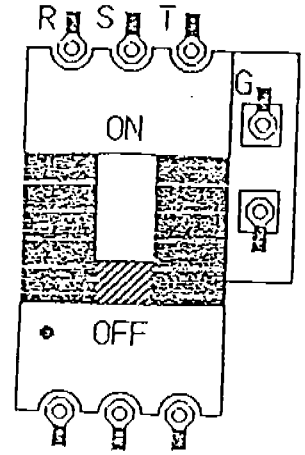
AC 200/220V 60HZ
AC 200V 50HZ
JZNC-MTU02-1
JANCD-MTU01
BLCB (PAGE2)
SW SELECT
500mA
1LF 10A
GF-210U
FG
FU2 FU1 GDL 5A×2
Brake Fuse
Main Contacter
Brake contact
+24V1
FU5
FU4
BRX
SVM
4TB
BRA1
BRB1
GP32 3.2A×2
NCM
FUCUT
SVMN
SPARE
IOBB -CN3
SVMX
To fans turned on at servo power on
FAN1
FAN2
TO FAN
SVM HI-15ETU (30A)
Main Contacter
SVMX1
BRX1
ROBOT
LAMP
OV (SPARE)
OTLS
SHOCK
024V
OT24
OT
SHOCK24
UNIVIN24
UNIVIN
EXSVM1
EXSVM2
EXBRAKE1
EXBRAKE2
EXNCM1
EXNCM2
CPT10199 107VA
SPARE
OPTION FOR EIO
+24V1
024V1
SM1101 3A
SPARE +24V
CPS-CN03
1SV-CN200 (2CN)
2SV-CN200 (2CN)
P1 S1 T1

MIF01–MBB02

Wiring Diagram. between MIF01 and MBB02



CHECKING METHOD OF EXTERNAL POWER VOLTAGE



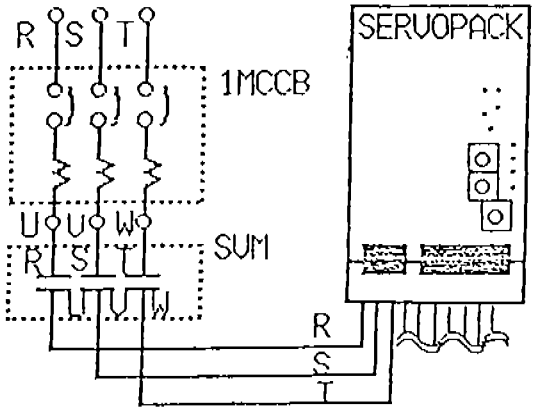
CIRCUIT BREAKER
(1MCCB)

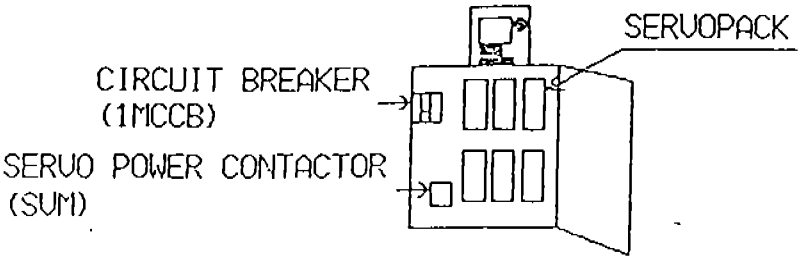
1. Get the tester ready.
2. Measure R,S and T terminals section of circuit breaker (1MCCB).
   1) Phase-to-phase voltage
      Measure phase-to-phase voltage (R-S), (S-T), (T-R).
      NORMAL···200 to 230 V ($^{+10}_{-15}$%)
   2) Ground-to-phase voltage (S phase ground)
      (R-G), (T-G)···200 to 230 V ($^{+10}_{-15}$%)
      (S-G) ···0 to a few V

note: There are R,B and T axis under servopack.

POWER READ WIRES CHECK

1. Check disconnection and lead wiring between servopack and servo power contactor (SUM), SUM and circuit breaker (1MCCB).
2. Check Primary voltage.
   (200 ~ 230 V $^{+10}_{-15}$ %)





2. PRECAUTIONS FOR ALLOWABLE WRIST LOAD

2.1 ALLOWABLE WRIST LOAD

(1) The allowable wrist load for the MOTOMAN-K10 is 10 kg, including the weight of the mount/gripper. The following conditions should be observed.

Table 2.1 Moment and Total Inertia

Motoman-	Axis	Moment N·m	Total Inertia ($GD^2/4$) kg·m²
K10	R	25.5	0.7
	B	19.6	0.43
	T	9.8	0.13

(2) If force is applied to the wrist instead of the load, force on R-, B- and T-axes should be within the values shown in Table 2.1. Contact your Yaskawa representative for further information or assistance.

(3) Where the volume of load is small, refer to moment arm rating shown in Fig. 2.1.

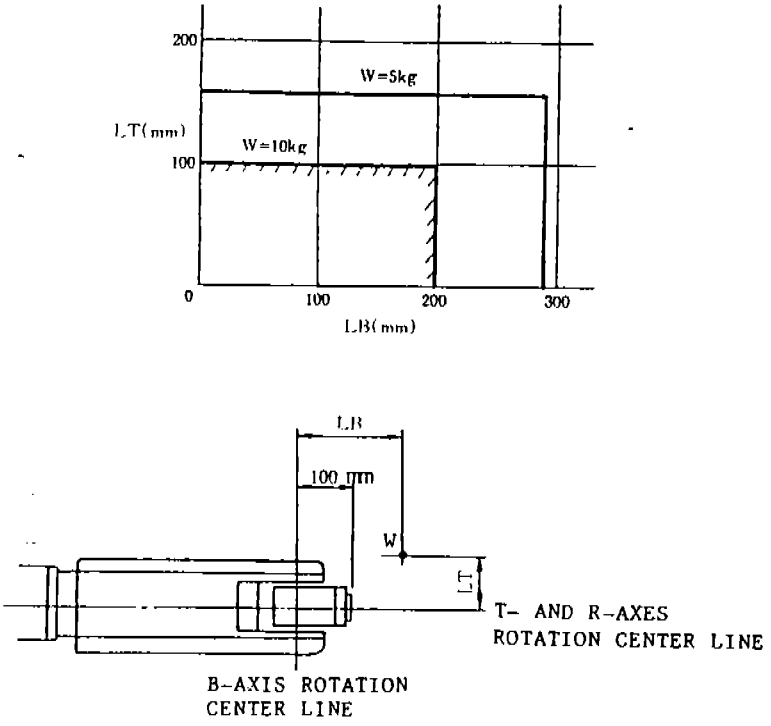
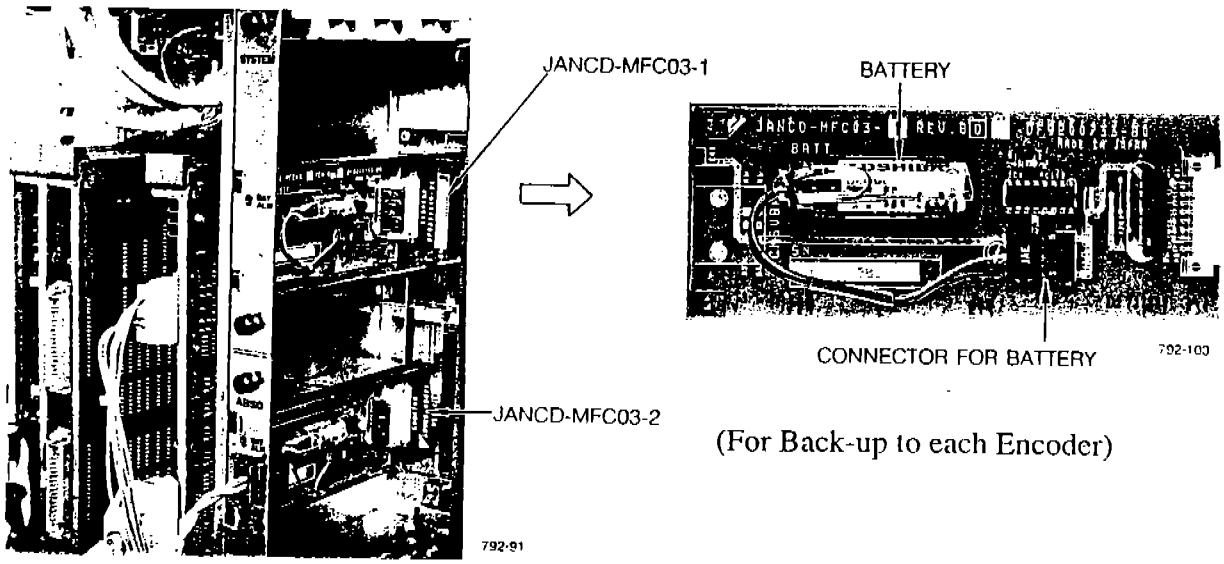


Fig. 2.1 Moment Arm Rating

(1) Replacing battery



(For Back-up to each Encoder)

Fig. 1.20 Battery Board (JANCD-MFC 03-1, -MFC 03-2)) (Excepting NY Series)

Replace the battery within 48 hours after the battery alarm occurs. (Battery alarm is indicated by the message on the programming pendant display and by the LED shown in Fig.1.19.)

《Replacement procedure》

<Small-/Large- Capacity Model>

(1) Pull the upper and lower pins toward you.
(2) Pull out the battery board.
(3) Remove the battery connector and take out the battery.
(4) Mount a new battery and connect the connector.
(5) Insert the board and push in the pins to fasten it.

NOTE : Although ICRAM and the absolute encoder are backed up by the super capacitor, install a new battery as soon as possible if the battery alarm occurs. Leaving the board without a battery over 48 hours will result in the loss of the job data.

<NY Series>

(1) The battery can be replaced either when the power supply is turned ON or OFF. To replace the battery when the power supply is turned OFF, charge the super capacitor for approx. 30 minutes in advance. For the details, refer to "Precautions at Power OFF" described below.
(2) Remove the covers on the JANCD-MFC05 and 06 boards.
(For the JANCD-MFC06, remove the CNSVBAT connector.)
(3) Remove the connectors (CNBAT) on the JANCD-MFC05 and 06 boards.
(4) Remove the battery (ER6V-3C) from the holder and replace it with a new battery (RE6V-3C).
(5) Connect the connectors (CNBAT) on the JANCD-MFC05 and 06.

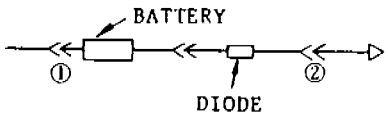
8.2.1 Replacement Procedures for Battery Unit

If the battery charge becomes too low or is depleted, replace it according to the following procedures.

(1) Remove the side cover (U-axis motor side) of rotary head.

(2) Remove the battery unit mounting screw (M5).

(3) Remove the pins ①, ② (PC-2005-M, W) on both sides of battery.



(4) Remove the old battery and mount the new battery.

NOTE

1. When the battery unit is being replaced, keep the power ON between YASNAC MRC and robot.
2. Be sure to insert the pins in correct direction.

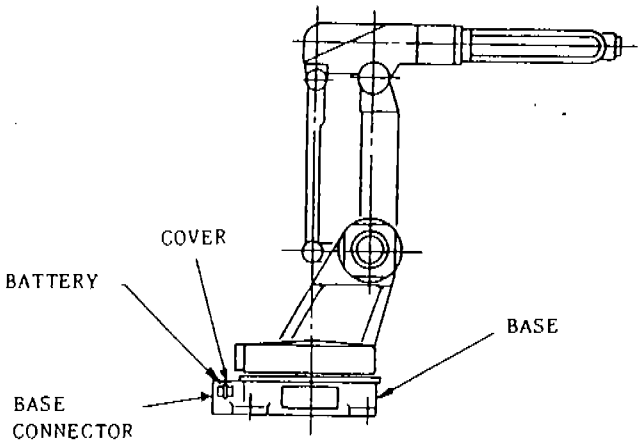
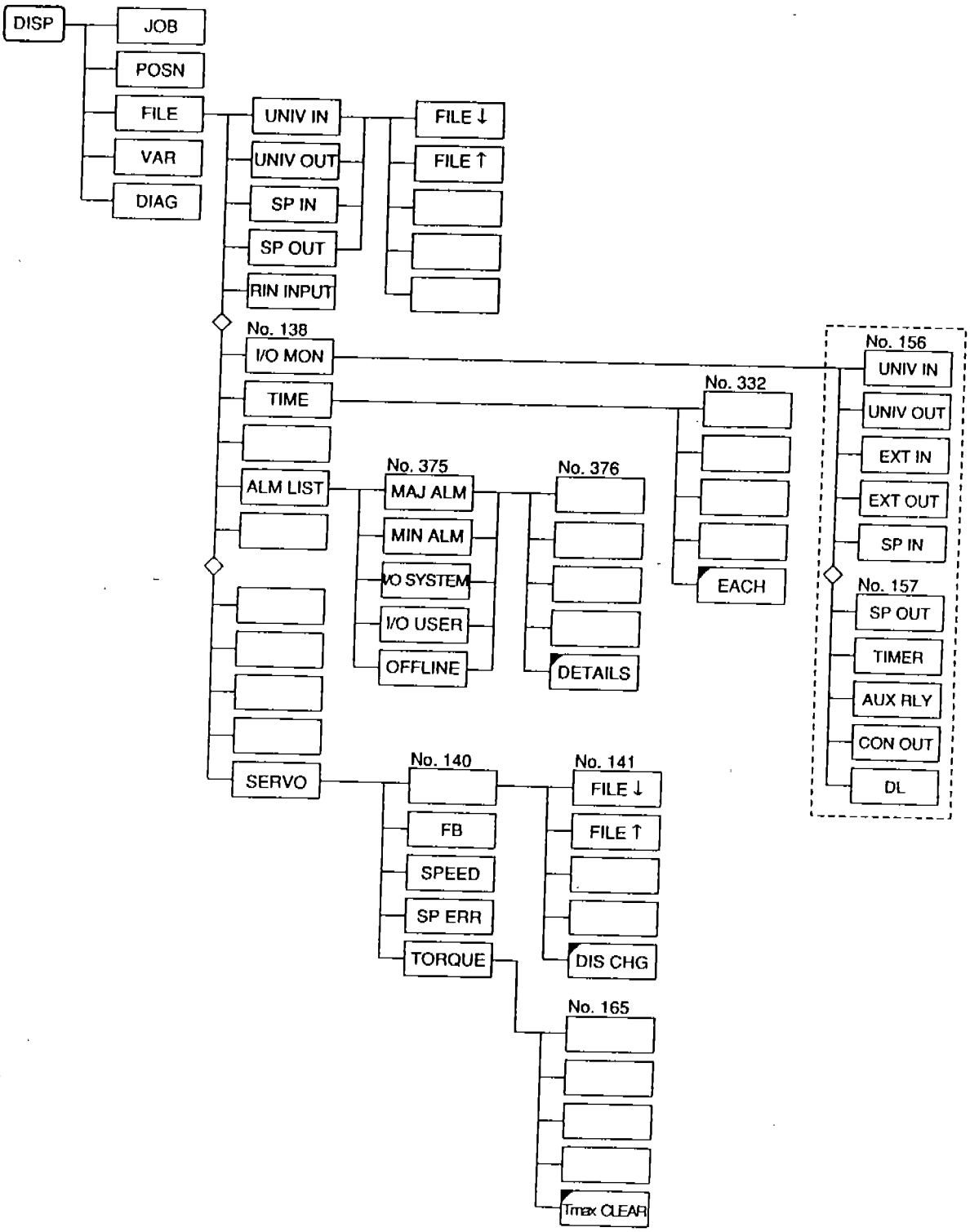


Fig. 8.2 Battery Location

2. DIAGNOSTIC DISPLAYS

The following diagnostics are available to check output and input signals, operations of the command system and the servo systems, and various kinds of periodic information.



2.1 INPUT STATUS DISPLAY

This diagnostics display shows each of the closed (ON) or opened (OFF) external input signals.

ON Status : ●
OFF Status : ○

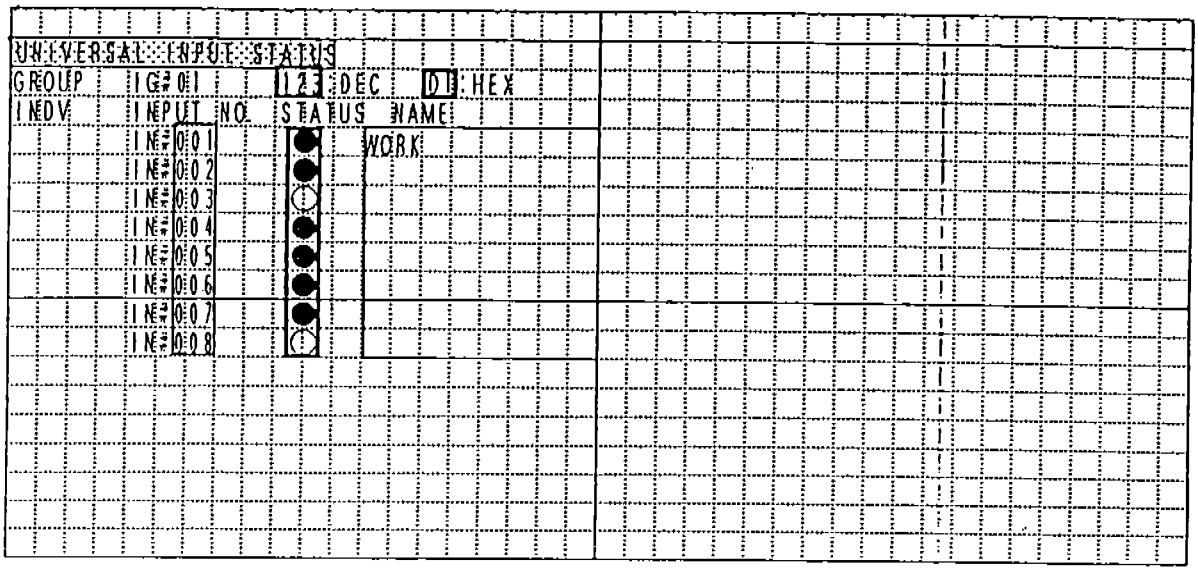


Fig. 2.1 Universal Input Status Display

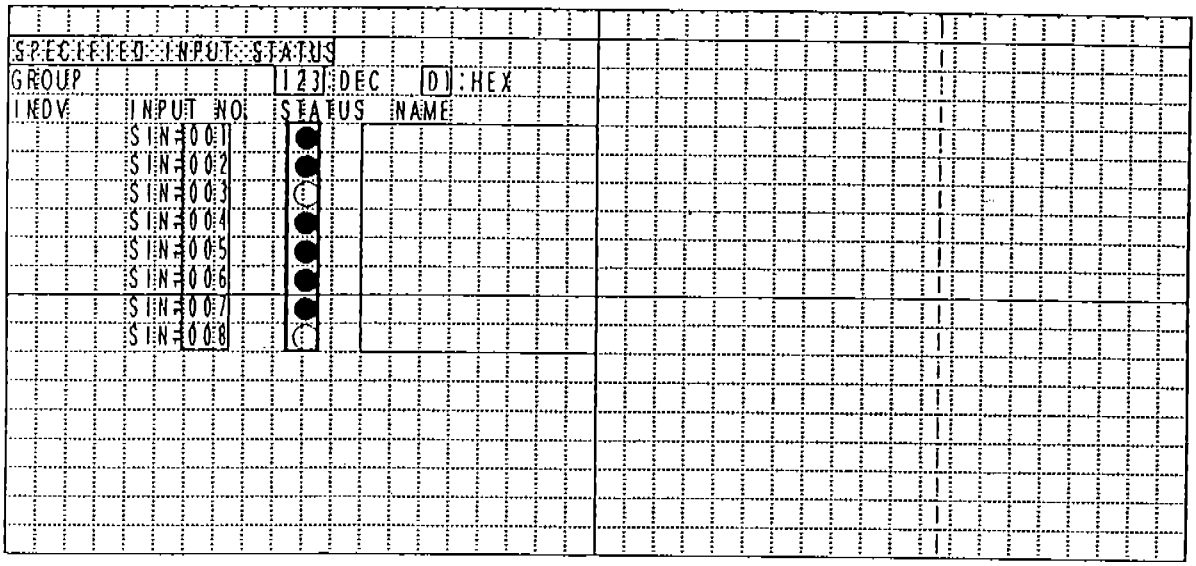
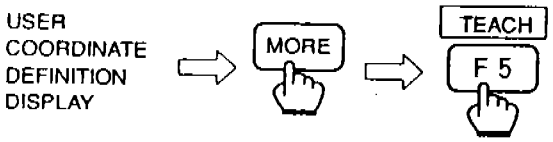


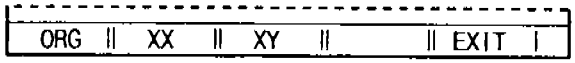
Fig. 2.2 Specified Input Status Display

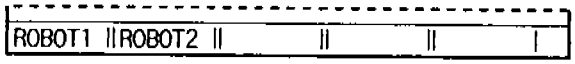
REGISTERING USER COORDINATES

Register user coordinates by teaching three control points (ORG, XX and XY).

1



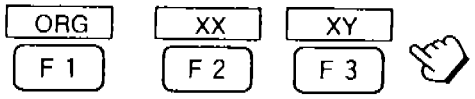


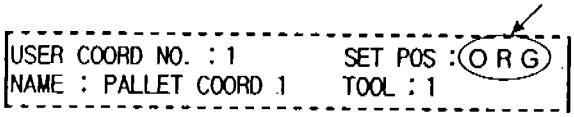


Display user coordinate definition of the desired user coordinate file. Then depress [MORE] and [F5] [TEACH].

〈If there are two or more manipulators〉
Soft key labels shown on the left appear.
Depress any key, [F1] to [F5], to select the manipulator to be taught.

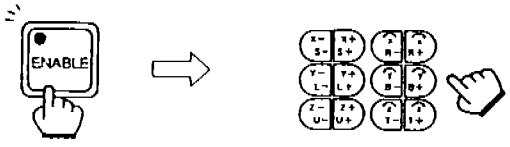
2





Depress [F1] [ORG], [F2] [XX] or [F3] [XY] to select the point to be taught. The name of the point is indicated in the setting position area.

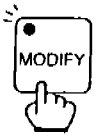
3



Depress [ENABLE] to light the lamp, if it is not already lit. Then depress axis keys to move the manipulator to the desired position.

5

4



Depress [MODIFY] to light the lamp.

5

Depress [ENTER] to input the position data.

Teach each point (ORG, XX and XY) by repeating steps **2** to **5**.

- ● is displayed in the setting condition area when a point is registered.
- Re-teaching is possible using this operation.

6

After registering each point, depress [F5] [QUIT]. The user coordinate is created and registered in the user coordinate file.

```
J:WORK-A   S:016  LOCK  CYCLE  STOP  CUST
USER COORDINATE DEFINITION        R1
USER COORD NO. : 1        SET POS : O R G
NAME : USER COORD 1       TOOL : 1
  R1:S
     L                              SET
     U                    O R G :   ●
     R                    X X   :   ●
     B                    X Y   :   ○
     T
!
FILE ↑ || FILE ↓ ||        || ORG PT||  SET  |
```

To use registered user coordinates, select it from the user coordinate select display.

〈Position change of control point already registered〉

Call up user coordinate definition display and teach one of the points again following steps **1** to **6**. When [F5] [QUIT] is depressed, new coordinates are registered.

■REGISTERING/OPERATING GROUP AXES (FOR SYSTEMS WITH STATION AXES)

The YASNAC MRC employs the station system for handling external axes. The station system concepts and benefits are discussed in Sect. 5; "EXPLANATION OF OPERATIONS OF THE MANIPULATOR".

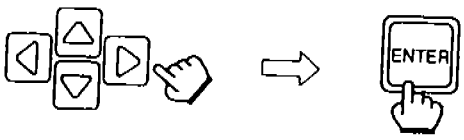
REGISTERING GROUP COMBINATIONS

In a system with station axes, the group combination display shown below appears after a new job name is stored. Select and register which group combination is to be used for the registered job.

```
J:WORK-A   S:000 LOCK  1CYCLE STOP SEL
GROUP COMBINATION
  GROUP AXIS  MASTER
  R1                      NO GROUP AXIS
  R2
  R1+S1
  R1+R2        R1
```

Group Combination Set Display

1



Move the cursor to the combination to be selected, then depress [ENTER]. The combination is registered and the job contents appears. The registered combination is displayed to the left of the screen title on the second line.

```
J:WORK-A   S:000 LOCK  1CYCLE STOP EDIT
JOB CONTENT          (R1+S1)
L:   S:  INST                  TOOL: *
0000 000 NOP
0001     END

=> MOVJ VJ=50.00
!
 MOVE ‖ ARITH ‖      ‖      ‖      |
IN/OUT ‖CONTROL‖DEVICE ‖SHIFT ‖ SAME |
```

Job Content Display

Note : The registered combination is peculiar to that job. Therefore, it is impossible to teach more than one station in a single job.

PROHIBITING EDITING OPERATIONS ON A SPECIFIC JOB

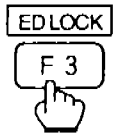
Editing operations on a specific job can be prohibited so that the job or data in the job is not inadvertently lost. When a job is protected from editing, neither the contents can be edited nor can the entire job be deleted. Prohibition of editing is set up and canceled on the job header display for each job.

1

Call up the job header display in teach mode and depress [EDIT].

```
J:WORK-A   S:000 LOCK  1CYCLE STOP EDIT
JOB HEADER
JOB NAME:WORK-A
COM
DATE:1992.12/11 10:00
CAP:12345BYTES
LINES:1234LINES    STEPS:123STEPS
EDIT LOCK[OFF]

 COPY ||DELETE ||ED LOCK|| NAME  || COM   |
```

2



Each time [F3] [EDLOCK] is depressed, setting of "EDIT LOCK" changes "ON (prohibited)" or "OFF (not prohibited)".

```
EDIT LOCK[ON]
```

9

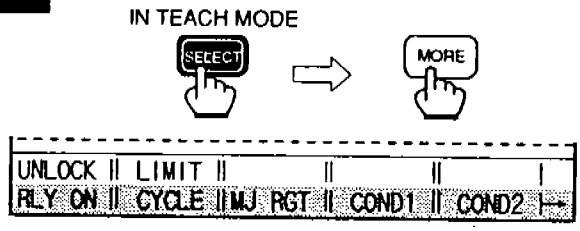
PROHIBITING EDITING OPERATIONS ON A SPECIFIC JOB (Cont'd)

●EXEMPTION OF POSITION DATA FROM THE PROHIBITION

If editing is prohibited, modification of position data in the job can be excluded.

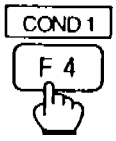
In play or remote mode, depress [TEACH] to display the soft key label on the right.

1

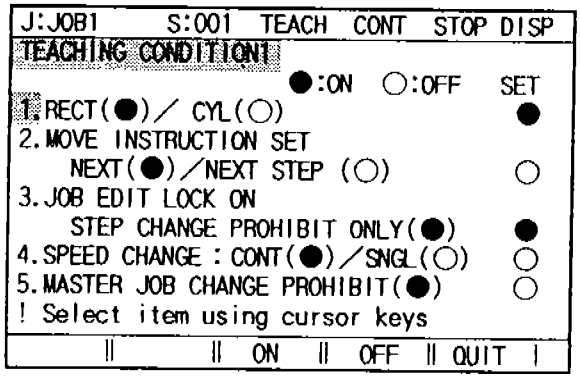


Depress [SELECT] in teach mode and [MORE].

2

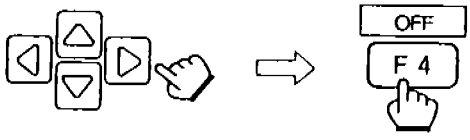


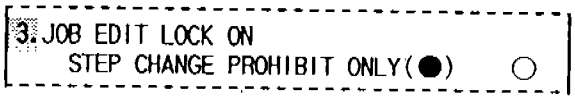
Depress [F4] [COND 1]. The teach condition 1 setting appears.



Depress [F3] [ON] to return to the status which cannot change position data.

3





Move the cursor to "3. JOB EDIT LOCK ON STEP CHANGE PROHIBIT ONLY" and depress [F4] [OFF]. "SET" mark changes to ●, indicating that modification of position data is possible.

4

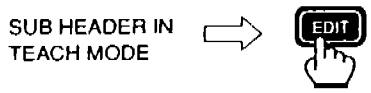
After setting, depress [F5] [QUIT].

Note : Once main power is turned OFF, this setting becomes ineffective. For a specific job on which editing operations are prohibited, always "● (prohibition of modification of steps : ON)" is selected after the main power is turned ON.

SETTING THE NUMBER OF LOCAL VARIABLES

Set up the number of local variables to be used in a job on the subheader display to allocate domain in memory.

1



Call up the subheader display in teach mode and depress [EDIT].

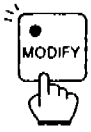
```
J:WORK-A   S:003 LOCK  1CYCLE STOP EDIT
SUB HEADER
 [NO. OF LOCAL VARIABLES]
BYTE(LB)      10   INT(LI)      10
DOUBLE(LD)    10   REAL(LR)     10
POSITION(LP)  10
```

2

Move the cursor to the local variable to use.

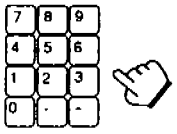
```
BYTE(LB)      10   INT(LI)      10
```

3



Depress [MODIFY].

4



Enter the number to use by using the number keys.

```
>20
```

9

SETTING THE NUMBER OF LOCAL VARIABLES (Cont'd)

5

Depress [ENTER] to set up the number of local variables at the cursor position.

```
J:WORK-A   S:003 LOCK  1CYCLE STOP EDIT
SUB HEADER
 [NO. OF LOCAL VARIABLES]
BYTE(LB)        10   INT(LI)        20
DOUBLE(LD)      10   REAL(LR)       10
POSITION(LP)    10
```

To set local variables of other types, repeat steps **2** to **5**.

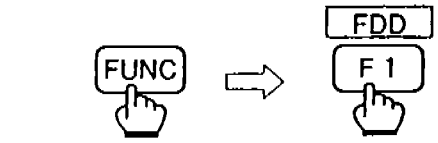
DATA TO BE SAVED AND FILE NAMES AFTER SAVED (Cont'd)

Data to be Saved and File'Names after Saved

Data to be Saved				File Name after Saved	Function Mode		Customer Mode	
					Save	Load	Save	Load
⑦ All Data in CMOS				CMOS .HEX	○		○	○
③ All User's Programs				JOB .HEX	○		○	○
	①	Job	Single job	Job name .JBI	○	○	○	○
			Related job (job + conditions)	Job name .JBR		○	○	○
	②	Condition Data	Weaving condition data	WEAV .CND	○	○	○	○
			Tool data	TOOL .CND	○	○	○	○
			User coordinate data	UFRAME .CND	○	○	○	○
			Welding start condition data	ARCSRT .CND	○	○	○	○
			Welding end condition data	ARCEND .CND	○	○	○	○
			COM-ARC2 condition data	COMSRT .CND	○	○	○	○
			COM-ARC2 data	COMARC2 .CND	○	○	○	○
			Path correction condition data	SENSCOR .CND	○	○	○	○
		Universal Data	Variable data	VAR .DAT	○	○	○	○
			Welding condition auxiliary data	ARCSUP .DAT	○	○	○	○
			Phase offset value data	PC1PC2 .DAT	○	○	○	○
④ Batched All Parameter				ALL .PRM	○		○	○
	④	Parameter	Robot matching parameter	RC .PRM	○		○	○
			System Definition Parameter	SD .PRM	○		○	○
			Coordinate origin (A) parameter	RO .PRM	○		○	○
			System matching parameter	SC .PRM	○		○	○
			Parameter for CIO	CIO .PRM	○		○	○
			Function definition parameter	FD .PRM	○		○	○
			Parameter for each application	AP .PRM	○		○	○
			Communication (universal) parameter	RS .PRM	○		○	○
			Communication (data link) parameter	CM .PRM	○		○	○
			Parameter for printer	SP .PRM	○		○	○
			Parameter for sensor	SE .PRM	○		○	○
			Parameter for vision	VC .PRM	○		○	○
			Servo parameter	SV .PRM	○		○	○
			Servomotor parameter	SVM .PRM	○		○	○
⑤ I/O Data			Concurrent I/O program	CIOPRG .LST	○		○	○
			I/O name data	IONAME .DAT	○		○	○
⑥ Customer Data			Reserved job name	RJNAME .DAT	○		○	○
			SV monitor signal	SVMON .DAT	○	○	○	○
			Names of variables	VARNAME .DAT	○		○	○
			Data of calibration between manipulators	RBCALIB .DAT	○		○	○
			Welding machine characteristic data	WELDER .DAT	○		○	○
			Welding machine characteristic user definition data	WELDUDEF .DAT	○		○	○
			Second home point position	HOME2 .DAT	○	○	○	○
			Alarm list data	ALMHIST .DAT	○		○	
			Absolute data	ABSO .DAT	○		○	○
			Welding condition guide data	ARCGUIDE .DAT	○		○	○
			System Information	SYSTEM .SYS	○		○	

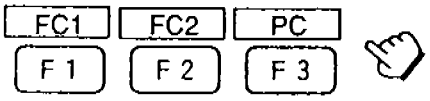
SELECTING DEVICE

1

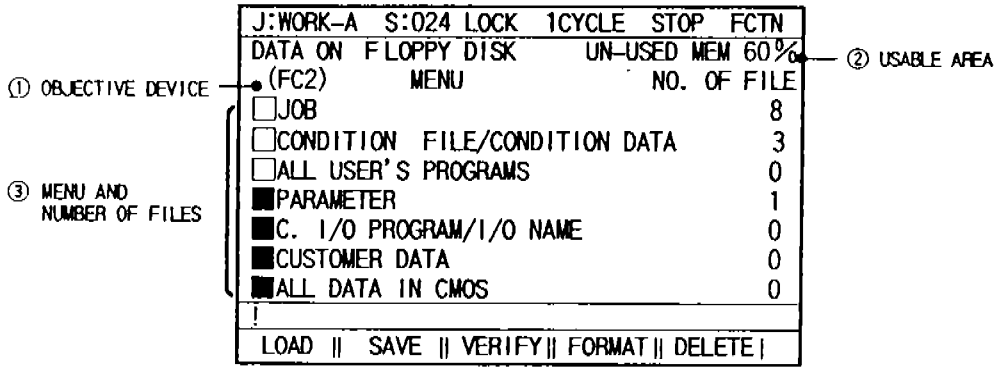


Depress [FUNC] in the teach mode to display the soft key labels. Then depress [F1] [FDD].

2



Depress the soft key corresponding to the desired device.
The external memory unit display appears.



External Memory Unit Display (MENU)

① Objective device
Objective external memory unit is displayed.

② Usable area
The amount of the usable area is displayed in the ratio for the objective device memory medium (floppy disk, etc.)

③ Menu and number of files
Data to be saved in the external memory unit are classified into these seven groups. The number of files which are currently saved in the objective memory device is displayed.

FORMATTING FLOPPY DISK

New floppy disks or those formatted in a different recording format from that of YASNAC MRC must be formatted. Format these floppy disks in the following procedure. All data on the floppy disk are destroyed by formatting.

YASNAC FC1 (used exclusively for 2DD floppy disk) formats them to 720 kB.

On the other hand, YASNAC FC2 formats them in the format set in the parameter.

Note : The recording format of the floppy disk for the YASNAC MRC conforms to MS-DOS. No different recording format is accepted.

To call up the external memory unit display

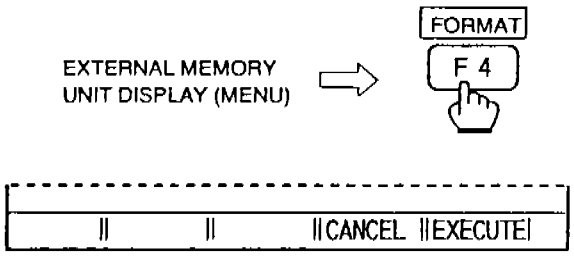
At teach mode,

FCTN → F1 [FDD]

→ F1 [FC1].

F2 [FC2]. F3 [PC]

1



Call the external memory unit display and depress F4 [FORMAT].

2

Depress F5 [EXECUTE] to start formatting.
To cancel formatting, depress F4 [CANCEL].

Note : All data on the floppy disk are deleted by formatting.

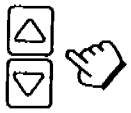
FILE MANAGEMENT OPERATION

The following operation performes load, save, varify or delete.

Load : Transfers data from external memory unit to YASNAC MRC.
Save : Transfer data from YASNAC MRC to the external memory unit.
Verify : Verifies the data of YASNAC MRC and the external memory unit ; informs if some parts are not matched.
Delete : Deletes an external memory unit file.

1

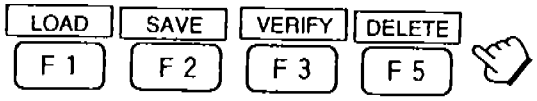
EXTERNAL MEMORY UNIT DISPLAY (MENU) ⇨



Call the external memory unit display and move the cursor to desired file.

☐JOB	8
☐CONDITION FILE/CONDITION DATA	3
☐ALL USER'S PROGRAMS	0

2



⇨ FILE SELECTION

Depress the desired soft key. For job or condition file/condition data, select the desired file for each procedure.

DATA ON FLOPPY DISK FC 2 ⟶ MEMORY		
[JOB LIST]	SNGL/RELATED	NO. 7
TEST-1	TEST-2	☆WORK-A
WORK-B	☆WORK-C	WORK-D
WORK-E		

EACH || BATCH || MODE ||CANCEL ||EXECUTE|

<Job>
For selecting method, refer to "FILE MANAGEMENT/HOW TO SELECT JOB".

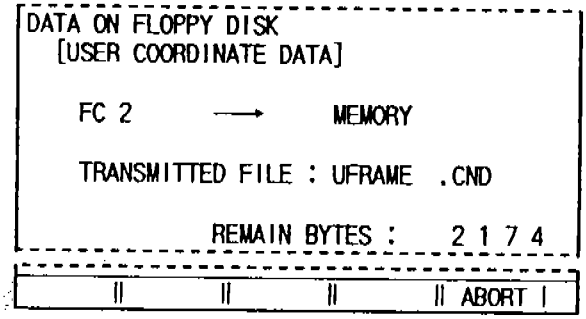
DATA ON FLOPPY DISK FC 2 ⟶ MEMORY		
CONDITION FILE/CONDITION DATA		
○ TOOL DATA	TOOL	.CND
○☆WEAVING DATA	WEAV	.CND
○☆USER COORDINATE DATA	UFRAME	.CND
○ ARC START CONDITION DATA	ARCSRT	.CND

EACH || BATCH || ||CANCEL ||EXECUTE|

<Condition File /data>
File name is specified for each type of data. Move the cursor to the desired data.

12

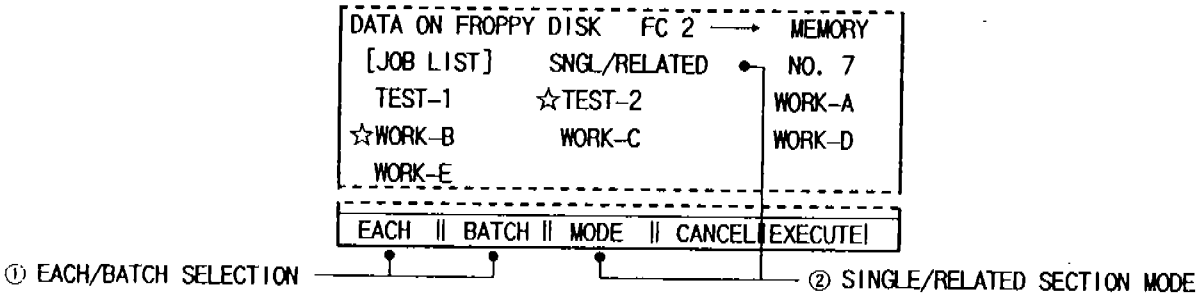
3



Depress F5 [EXECUTE] to start processing.
To stop processing, depress F4 [CANCEL].
To stop processing after depressing F5 [EXECUTE], depress F5 [ABORT].

HOW TO SELECT JOB

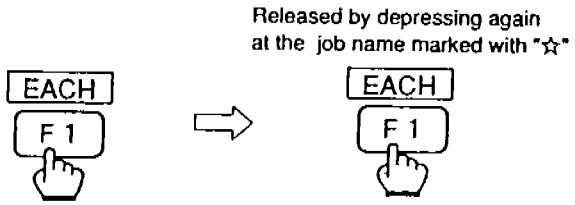
To select a job to save, load, verify or delete, the following selecting methods are available.



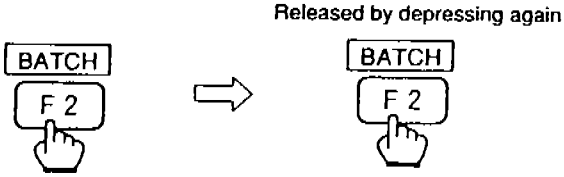
☆: Job at single selection mode
★: Job at related selection mode

① EACH/BATCH SELECTION

EACH : Depressing F1 [EACH] displays "☆" or "★" for each job where the cursor is placed and the job is objective.
Depressing F1 [EACH] again erases the mark and the objective job is released.



BATCH : Depressing F2 [BATCH] displays "☆" or "★" with all jobs and the jobs become objective.
Depressing F2 [BATCH] again erases the marks and the objective jobs are released.

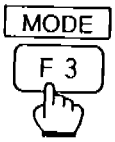


② SINGLE/RELATED SELECTION MODE

SINGLE : Single selection mode. Only a job at the cursor position becomes objective.

ALL : Related selection mode. A job at the cursor position and the related jobs or condition data become objective.

Each time F3 [MODE] is depressed, the cursor moves between "SINGLE/RELATED" on the display and SINGLE/RELATED SELECTION MODE" is switched.

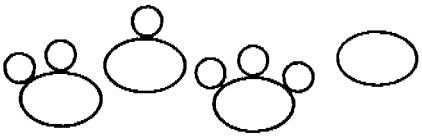


12

HOW TO SELECT JOB (Cont'd)

By switching EACH/BATCH, SINGLE/RELATED, job selection is as shown in the table below.

Job to be Selected and Related Job/Data

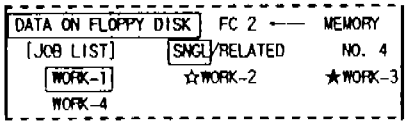
	SINGLE Selection Mode	RELATED Selection Mode
EACH Selection	Jobs marked with ☆ 	Jobs marked with ★ and its related jobs and data 
BATCH Selection	All jobs 	All jobs and their related jobs and data 

 : Job ○ : Related job/data

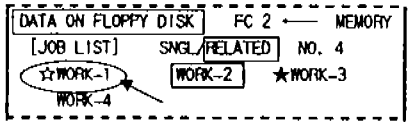
Difference between job name displays at save and at load/verify/delete :

Save :

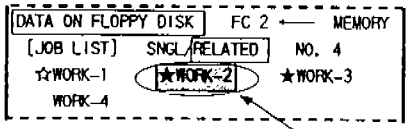
When a job is selected by depressing F1 [EACH], switching SINGLE/RELATED SELECTION mode, ☆/★ is displayed alternately for each job as shown below.



Call the SNGL select mode and move the cursor to WORK-1. Depress F1 [EACH].



☆is displayed on WORK-1. Then call the RELATED MODE and move the cursor to WORK-2. Depress F1 [EACH].

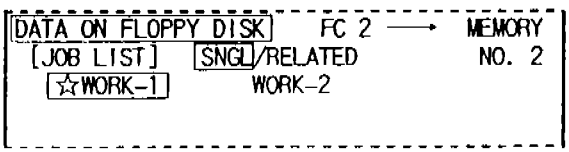


☆is displayed on WORK-2.

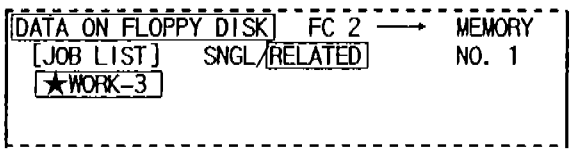
Load/Verify/Delete :

Job name to be displayed by switching SINGLE/RELATED SELECTION mode differs.

When "SINGLE" is selected by F3 [MODE], only jobs saved in the SINGLE SELECTION mode are displayed, while only jobs saved in the RELATED SELECTION mode are displayed when RELATED SELECTION is selected.



At Load/Verify/Delete (SINGLE SELECTION MODE)



(RELATED SELECTION MODE)

3.3 NO MOTION OPERATION POSSIBLE

No motion operation is possible in TEACH mode under the following two conditions, with no problem in the YASNAC MRC.

- MACHINE LOCK state.
- Any axes has overrun the software limit.

The following shows how to clear the machine lock mode and how to release the software limit overrun state.

(1) How to release machine lock mode

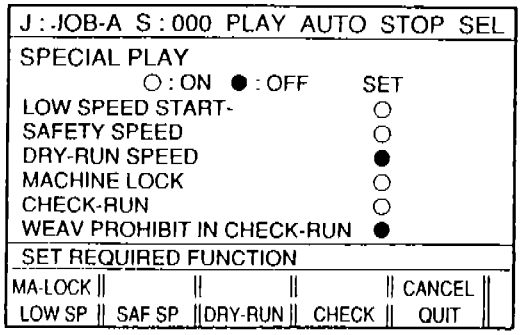
MACHINE LOCK mode is designated when checking the I/O status at playback of the job without moving the manipulator.
Release machine lock mode as follows.

< How to release MACHINE LOCK mode >

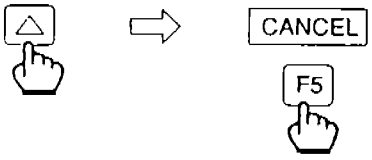
1 [SPECIAL]

Call up the soft key labels when [SELECT] is depressed in play mode and depress [F5] [SPECIAL].

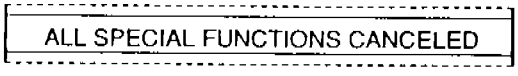
2



Setting display for special operation appears.



Depress [↑] to move the soft key cursor and depress [F5] [CANCEL].
All settings for special operation are cleared.



NOTE : MACHINE LOCK mode is released automatically if the main power is turned OFF.

3.2 CLEARING OVERRUN STATE (ALARM-4670 or -4671)

If any of the axes overrun, recover it as follows.

① When any of the overrun limit switches* activate, code Alarm 4670 or 4671 is displayed, and the servo power is turned OFF.

② Visually check which overrun limit switch has activated.

③ Find the cause for the overrun. If you suspect that the control circuit is defective, contact your Yaskawa representative.

④ Open the cover of the playback box, carry out the following operations, keeping the recovery switch depressed.

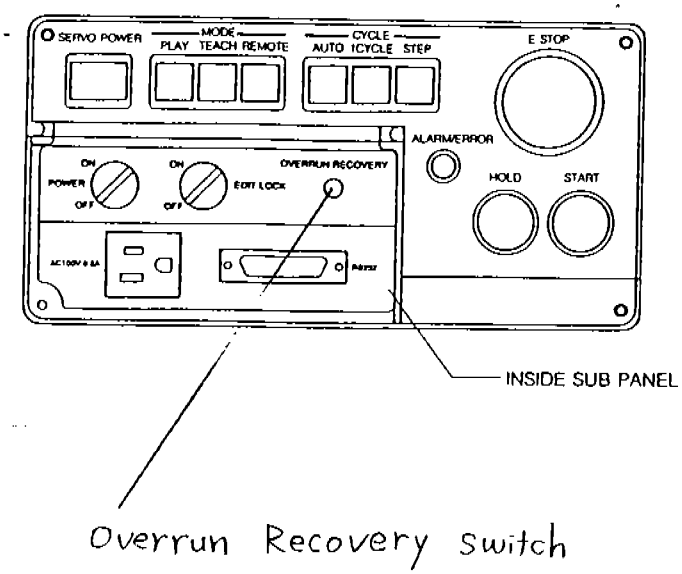
(1) Depress [RESET] key of the programming pendant.

(2) Depress the POWER ON button to turn ON the servo power supply.

(3) Set TEACH mode and move the overrun axis away from the limit switch with the axis keys on the programming pendant.

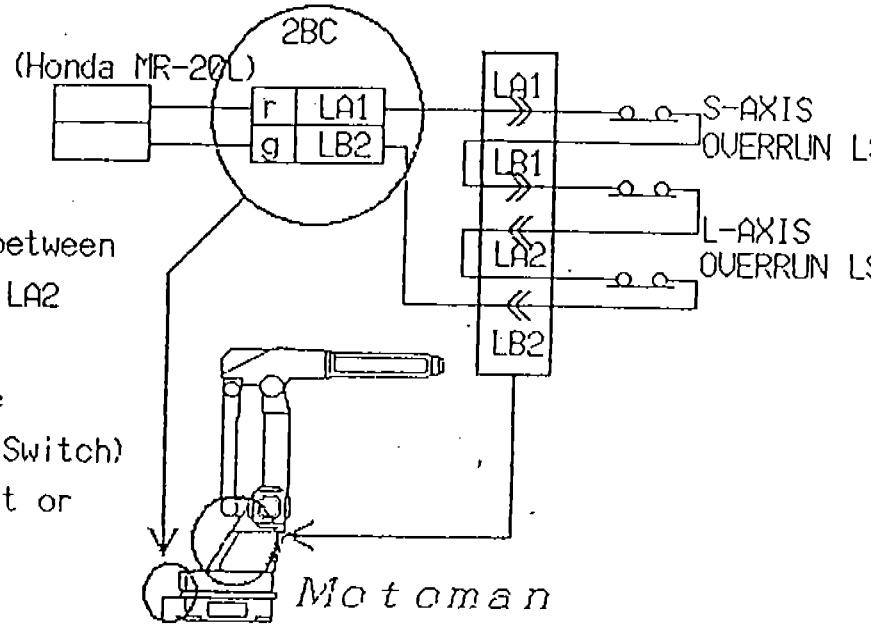
NOTE : If no operation for motion is available, clear overrun following the operations described in Par.3.3.

* Overrun limit switch is provided for each axis of the robot.



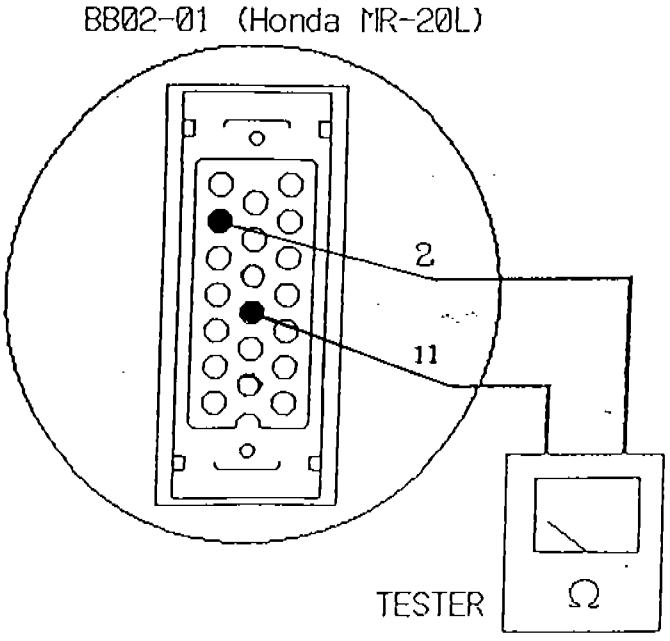
OVERRUN LS CHECK

1. Get the tester ready.
2. Remove LA1, LB2, LA2, LB2 pin connectors in rotary (S) head.
3. Perform conductive check between LA1 and LB1, LB1 and LA2, LA2 and LB2 with the tester.
   Normal ··· Conductive
4. Turn on and off LS (Limit Switch) manually and check if short or open state will change.



note: It is different for robot type. Please compare with manual for your robot.

OVERRUN LS CONTINUITY CHECK



TEMPORARY RELEASE OF SOFT LIMITS

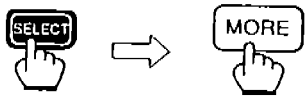
A switch which is mechanically set in order to detect the manipulator working range, etc. is called the limit switch. Soft limits are the working range where the manipulator is monitored by the software so that it can stop before the hard limit switch. The manipulator working range is restricted with the following three soft limits :

- Individual maximum working range for individual axes
- Mechanical interference area between axes
- Allowable cubic working range set parallel to robot coordinate axis

These soft limits are always monitored by the system and the manipulator stops automatically when it reaches any soft limit.

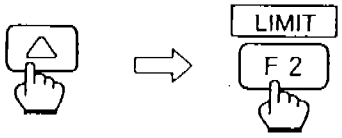
If necessary, use the following procedures to temporarily release the soft limits.

1

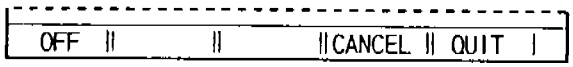


In teach mode, depress SELECT, then depress MORE.

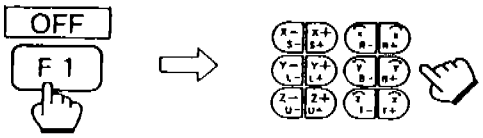
2



Depress ↑ to move the soft key cursor up then depress F2 [LIMIT].



3



Depress [F1] [OFF] and move the manipulator by the axis keys.

- Steps cannot be taught while soft limits are released.

4

There are three methods to : cancel the soft limit release.

- Depress [F4] [CANCEL], or
- Depress [PLAY] or [REMOTE] on the playback box, or
- Turn the controller main power switch to OFF to turn off the power supply.

RESET OF ABSOLUTE ENCODER

When you need to make revolution data of absolute encoder to zero (0) at external axis setting up, or after battery is disconnected from absolute encoder for more than three (3) days, you need to reset absolute encoder. Before you calibrate external axis home position, make sure to reset absolute encoder refer to following step. If you replace a motor, you need to reset encoder, too.

There are two type of absolute encoder. Each type has different resetting methods. Make sure which type encoder you have reffer to the motor type.

12 bit absolute encoder : Motor type USA*** - ** YRW**

15 bit absolute encoder : Motor type USA*** - ** YRS**

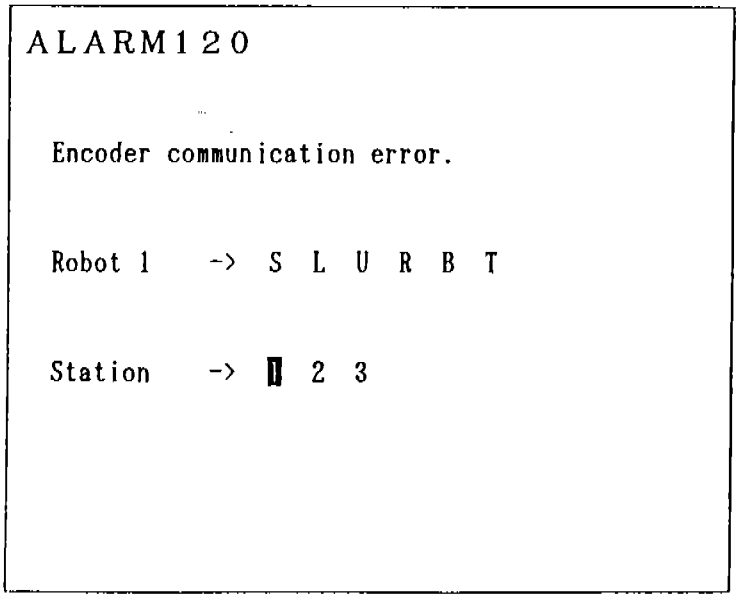
1. RESET OF 15 BIT ABSOLUTE ENCODER

1-1. Short 0V and RESET pin for more than three(3) minutes to discharge capaciter in encoder.
If the connecter is attached FIG.A, short between R and S.
If the connecter is attached FIG.B, short between White/Gray and White/Orange.
If the connecter is attached FIG.C, short between White/Gray and White/Orange.

1-2. Make wiring back to original condition.

1-3. Turn power on.
If Alarm 120 : Encoder communication error is displayed, try from STEP 1-1. again.
If screen come up normally, keep power on for more than three(3) minutes.

1-4. Calibrate home position.



First axis of Station 1 is abnormal.
Try step1-1. for this axis.

2. RESET OF 12 BIT ABSOLUTE ENCODER

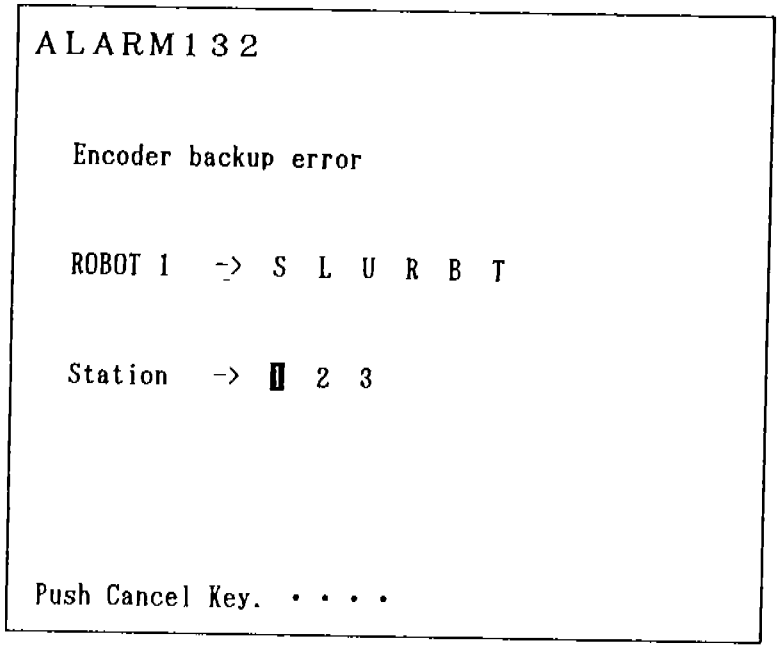
2-1. Short 0V and capaciter reset pin more than two minutes.
If the connecter is attached FIG.A, short between P and S.
If the connecter is attached FIG.B, short between Gray and White/Orange.
If the connecter is attached FIG.C, short between Gray and White/Orange.

2-2. Make wiring back to original condition.

2-3. Turn power on.
If Alarm 132 : "Encoder backup error" is displayed, the reset is successfully done, so push "Cancel" key. After count down is finished, keep power on for more than three(3) minutes.

If Alarm 132 is not displayed, try step 2-1. again.

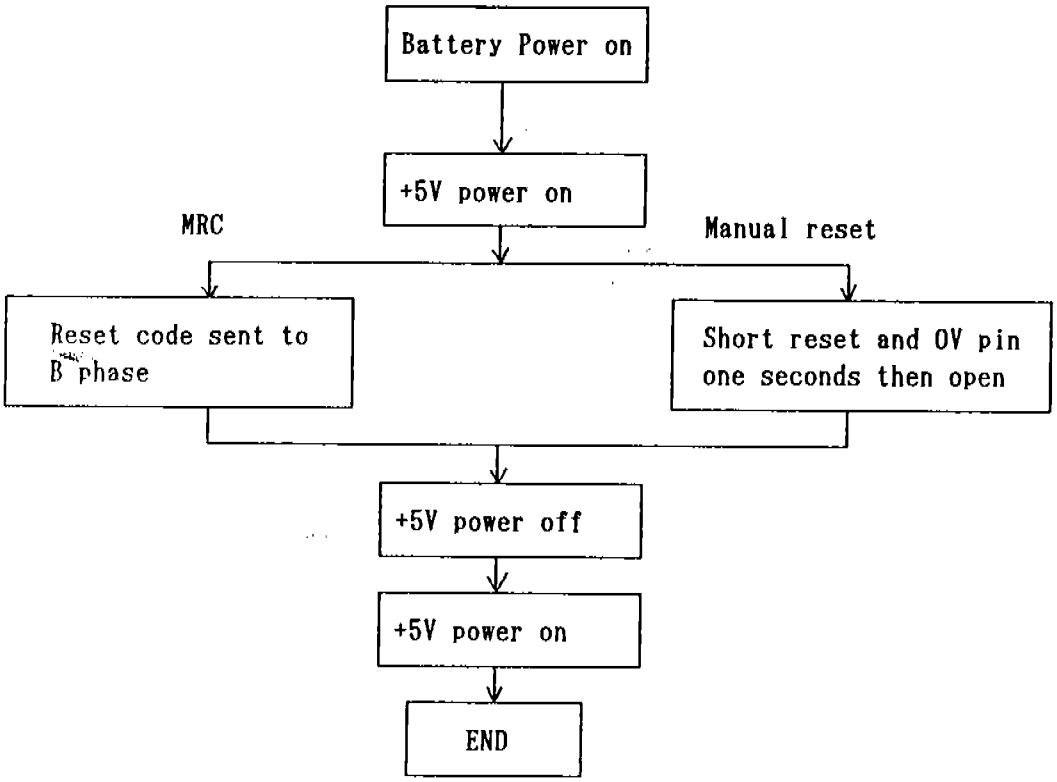
2-4. Calibrate Home position.



Capaciter discharge has completed for first axis in Station 1.
Push "Cancel" key.

RESET OF ABSOLUTE ENCODER

1. 12 bit encoder



2. 15 bit encoder

   1) Short condenser reset and OV for more than three(3) minutes.

   2) Battery power on.

   3) +5V power on.

   4) END

ENCODER CONNECTER LAYOUTS

1. MS connecter 12 bit encoder

Pin #	Color	Signal
A	Blue	A ch
B	White/Blue	A ch
C	Yellow	B ch
D	White/Yell	B ch
E	Green	Z ch

Pin #	Color	Signal
F	White/Gree	Z ch
G	Black	0V power
H	Red	5V power
J	Green/Yell	FG
K	Purple	S ch

Pin #	Color	Signal
L	White/Purple	S ch
P	Gray	Cap Reset
R	White/Gray	RST (Reset)
S	White/Orange	BAT(0)
T	Orange	BAT(+)

*15 bit encoder --- There are no wire connected to K,L,P.
Capaciter Reset is connected to R.

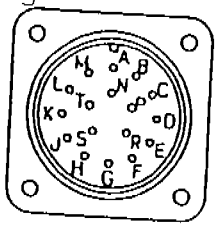


Fig A

2. Meitenlock connecter(AMP 12 contacts)
12 bit encoder

Pin #	Color	Signal
1	Blue	A ch
2	White/Blue	A ch
3	Yellow	B ch
4	White/Yell	B ch
5	Green	Z ch
6	White/Gree	Z ch

Pin #	Color	Signal
7	Orange	BAT(+)
8	White/Oran	BAT(0V)
9	Red	5V power
10	Black	0V power
11	Green/Yell	FG
12	White/Gray	Reset

Plug Terminals

(S)	Purple	S ch
(S)	White/purple	S ch
(CR)	Gray	Cap Reset

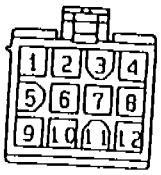


Fig B 172170-1

* 15 bit encoder --- There are no plug terminals.
Capaciter reset is connected to pin # 12(White/Gray).

3. Meitenlock connecter(AMP 6 contacts *2)
12 bit encoder

Pin #	Color	Signal
1	Blue	A ch
2	White/Blue	A ch
3	Yellow	B ch
4	White/Yell	B ch
5	Green	Z ch
6	White/Gree	Z ch

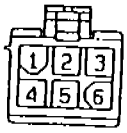
(White connecter)

Pin #	Color	Signal
1	Orange	BAT(+)
2	White/Oran	BAT(0V)
3	Red	5V power
4	Black	0V power
5	Green/Yell	FG
6	White/Gray	Reset

(Red connecter)

Plug Terminals

(S)	Purple	S ch
(S)	White/purple	S ch
(CR)	Gray	Cap.Reset



172168-1(8)
Fig C 1-172168-2(*)

* 15 bit encoder --- There are no plug terminals.
Capaciter reset is connected to pin # 6 (White/Gray).

Section 2
SECURITY SYSTEM

■PROTECTING USER FUNCTIONS BY USER ID NUMBER

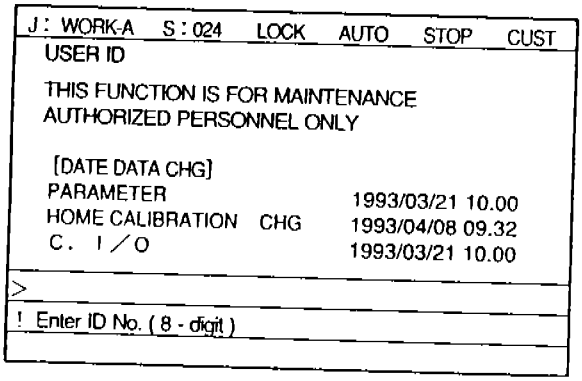
User functions are protected by a security system with a user ID number. This permits only authorized personnel who know the user ID number to modify settings. Select a system construction supervisor for proper operation and management.

SOFT KEY LABELS FOR USER FUNCTIONS

Use the following steps to call up soft key labels for user functions.

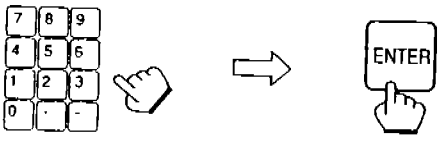
1

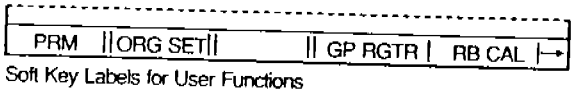
Depress CUSTOMER , MORE and F5 [ORG]. The user ID display appears.



If parameters, home calibration position, or concurrent I/O ladder program are changed after dilivery, "CHG" is displayed on the lines where the changes have been made. The date of the change is also displayed.

2





Soft Key Labels for User Functions

Enter the user ID number by number keys and depress ENTER. The soft key labels for user functions appear to call up corresponding displays.

- The user ID number consists of 8-digit numbers. User functions are protected by the user ID number.
- The user ID number being entered is not displayed.
- At the factory,"00000000" is preset for the user ID number.

Section 4
HOME POSITION CALIBRATING

■HOME POSITION CALIBRATING

Home position calibrating is an operation in which the home position and encoder zero position coincide. Although this operation is performed prior to shipment at the factory, the following cases require this operation to be performed again.

- Change in the combination of manipulator and YASNAC MRC controller
- Replacement of motor or encoder
- Clearing stored memory (by replacement of MIF01 board, weak battery, etc)
- Home position deviation caused by crushing the manipulator against a workpiece, etc.

HOME POSITION

Home position is pulse position "0" for each axis.

The deviation values between home position and control reference position are set to parameters. The deviation values are specified by an angle in units of 1/1000°, and vary for different manipulator types. See Par. 4.6.

HOME POSITION CALIBRATING

Position the manipulator at the home position by axis operation to calibrate the home position. There are two ways of home position calibrating:

- All the axes can be moved at the same time
- Individual axes can be selectively moved

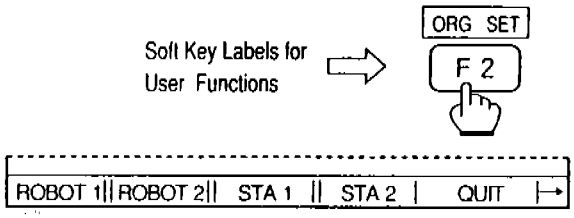
If the absolute data of home position are already known, set the absolute data again after completing home position registration.

Note: Teaching and playback are not possible before home position calibrating is completed. In a system with two or more manipulators, home position of all the manipulators must be calibrated before starting teaching or playback.

■HOME POSITION CALIBRATING OPERATION

BATCH REGISTERING ALL AXIS

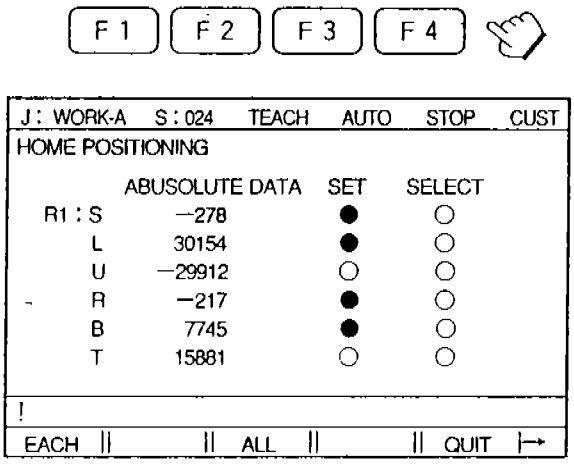
1



Call up the soft key labels for user functions and depress F2 [ORG SET].

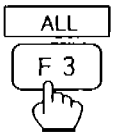
· Robot axis registered in the system is displayed on the soft key labels.

2



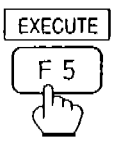
Depress the soft key of a desired robot axis.
The home positioning display appears.

3



Depress F3 [ALL].

4

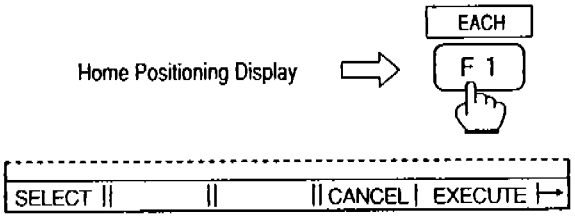


Depress F5 [EXECUTE] to register the displayed current value of all axes as a home position.

· Depressing F4 [CANCEL] stops operation.

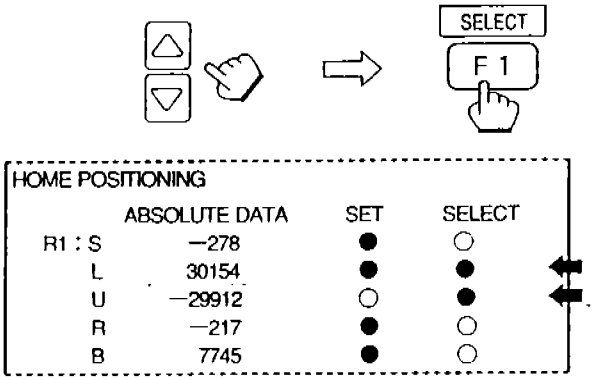
REGISTERING INDIVIDUAL AXIS

1



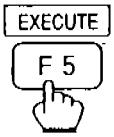
Call up the home positioning display by steps 1 and 2 of "BATCH REGISTERING ALL AXES" and depress F1 [EACH].

2



Move the cursor to the axis for which the home position is to be registered.
Each time F1 [SELECT] is depressed, the setting of "SELECT" changes "●(selected)" to "○(not selected)".

3

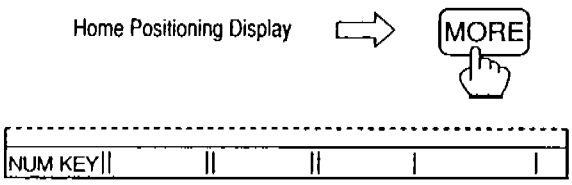


Depress F5 [EXECUTE] to register the current value of axis displayed "●(not selected)" as a home position.
Depressing F4 [CANCEL] stops the operation.

CHANGING ABSOLUTE DATA

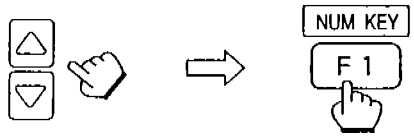
Use the following steps to change the absolute data of axis for which the home position calibrating has been completed.

1



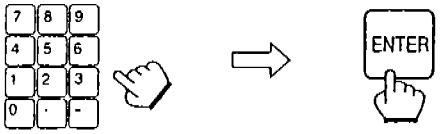
Call up the home positioning display by steps 1 and 2 of "BATCH REGISTERING ALL AXES" and depress [MORE].

2



Move the cursor to the absolute data to be changed and depress [F1] [NUM KEY].

3



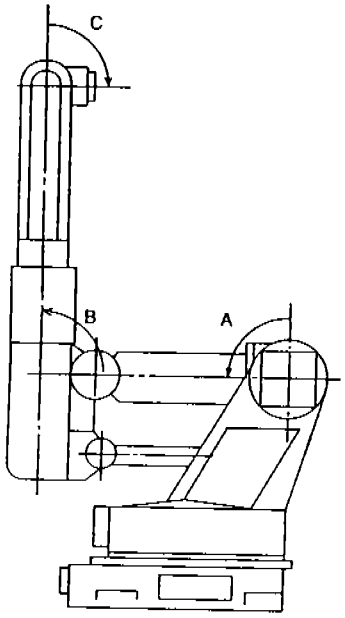
Enter the desired numbers using the number keys and depress [ENTER].

If there are some absolute data to be changed, repeat steps 2 and 3.

■HOME POSITION ACCORDING TO MANIPULATOR TYPE

MOTOMAN-K TYPE

・MOTOMAN-K6SH,-K10SH,-K10SB,-K30SH (6-Axis)

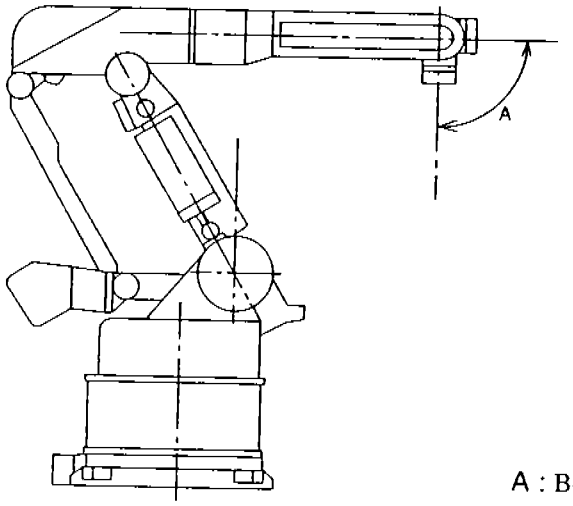


A : L-axis home position angle (90°)

B : U-axis home position angle (90°)

C : B-axis home position angle (-90°)

・MOTOMAN-K50SX (6-Axis)



A : B-axis home position angle(-90°)

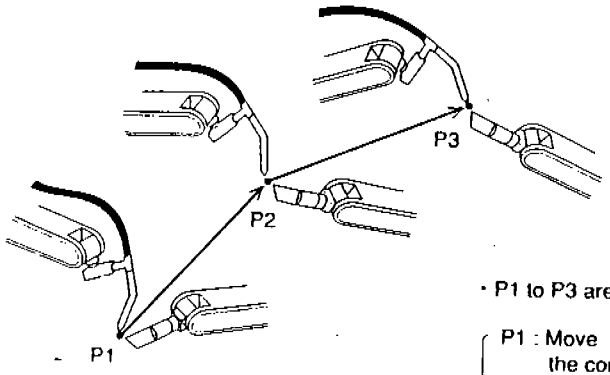
Section 5
CALIBRATION FOR ROBOT AXES AND STATION AXES

■HOW TO MOVE ROBOT AXES AND STATION AXES

To execute indepedent and/or cooperative operations with two or more manipulators or with a manipulator and a station, positions of both axes must be registered in advance. This preparatory setting of positions is robot calibration or robot-station calibration.

ROBOT CALIBRATION

Align the control points of both manipulators at three points in space and register the positions.



- P1 to P3 are points in space selected arbitrarily.

P1 : Move either manipulator to any position. Then align the control point of the other manipulator to the position of the control point of the former manipulator.

P2,P3 : Do the same as for P1.

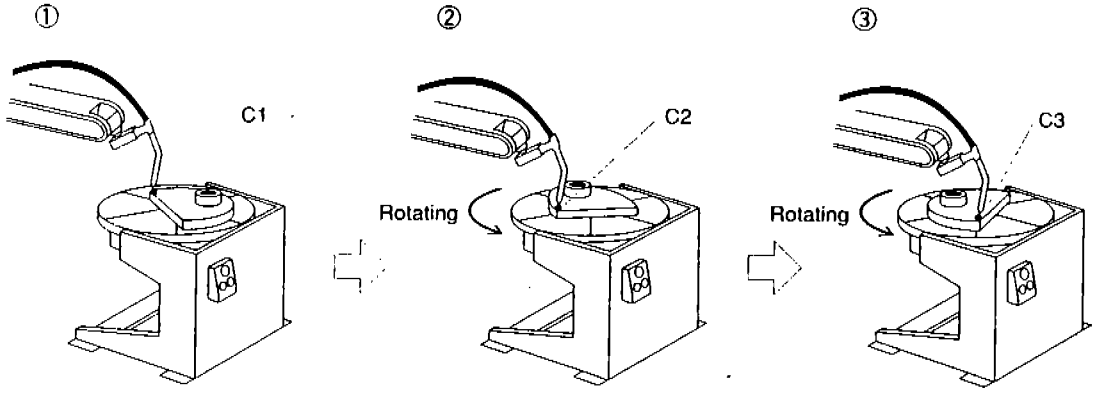
ROBOT-STATION CALIBRATION

Station with one rotary axis

① Select an arbitrary point on the turntable of the station axis with the control point of the manipulator and register the position as C1.

② Turn the station axis about 45°.(The direction of rotation does not matter.) Align the control point of the manipulator with C1 after rotating and register the position as C2.

③ Turn the station axis further in the same direction.
Align the control point of the manipulator with C2 after rotating and register the position as C3.

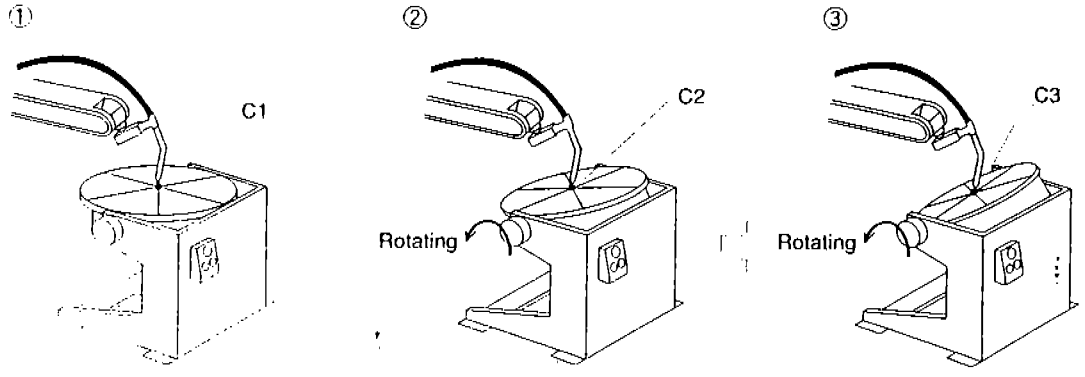


Station with two rotary axes

① Align the center of the turntable of station axes with the control point of the manipulator and register the position as C1.

② Turn the station axes somewhat in the possible range.
Align the control point of the manipulator with the center of the turntable and register the position as C2.

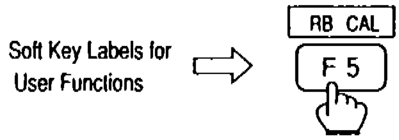
③Turn the station axis further in the same direction.
Align the control point of the manipulator with the center of the turntable and register the position as C3.



■CALIBRATING OPERATION

ROBOT CALIBRATION DISPLAY

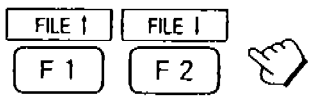
1




```
J : WORK-A   S : 024   TEACH   CYCLE   STOP   CUST
ROBOT CALIBRATION COORDINATE VALUE
FILE NO. : 01    ROBOT   : R1+R2
   X     :    mm      R x    :    d e g.
   Y     :    mm      R y    :    d e g.
   Z     :    mm      R z    :    d e g.



!
 FILE ↓ || FILE ↑ ||        || ORG PT ||  SET  |→
```

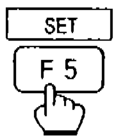
Call up the soft key labels for user functions and depress [F5] [RB CAL].
The robot calibration coordinate value display appears.

2



If the desired file number display does not appear, depress [F1] [FILE ↓] or [F2] [FILE ↑] to call it up.

3



Depress [F5] [SET].
The robot calibration display appears.

```
J : WORK-A   S : 024   TEACH  CYCLE   STOP   CUST
ROBOT CALIBRATION
FILENO01 ROBOT  :R1+R2 POSITION  :C1
STATUS     C1 : ○      C2 : ○      C3 : ○
  TOOL : **            TOOL :
R1 : S        :        R2 : S        :
     L        :             L        :
     U        :             U        :
     R        :             R        :
     B        :             B        :
!
  C1   ||  C2   ||  C3   ||DATA CL|| TEACH |
```

Robot Calibration Display

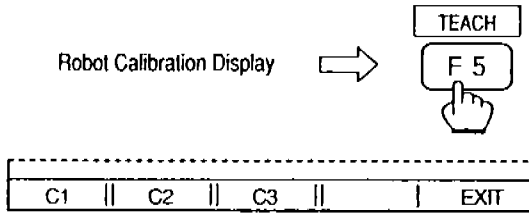
Note: Depress [F5] [SET] in step 3 to change to the robot calibration setting state. The state is cleard by any of the following:

- Depressing [F5] [EXIT] key.
  Robot calibration setting operation is completed by this operation.
- Depressing any of [DISP], [SELECT], [FUNC], or [CUSTOMER] key.
- Depressing any of [PLAY], [TEACH], or [REMOTE] key.

The above operations cancel data that have been set and restore the state prior to setting.

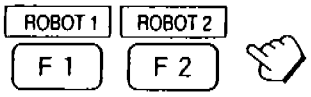
EXECUTING CALIBRATION

1



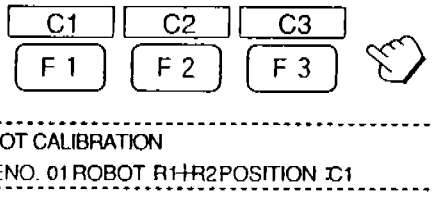
Call up the robot calibration display and depress F5 [TEACH].

《If the file being displayed has not been registered》



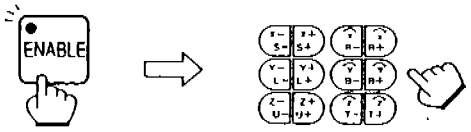
Robot and station axes registered in the system are displayed on the soft key labels.
Depress the desired soft key.

2



Depress one of F1 to F3 to be registered.

3

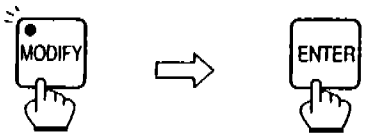


Depress ENABLE to align the control points of both manipulators using the axis keys.
· Interlocking two manipulators is not possible.

《Selecting robot and station axes to move》

· Depress * and GROUP AXES to select group combination of axes to move.
· Depress GROUP AXES to select either axis of the selected group axes.

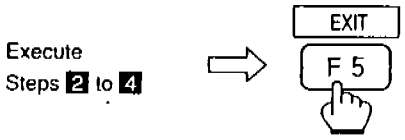
4




```
ROBOT CALIBRATION
FILENO. :01 ROBOT :R1+R2 POSITION :C1
STATUS   C1 : ●   C2 : ○   C3 : ○
    TOOL : 0              TOOL : 0
R1 : S     30     R2 : S      2
     L   1025          L      0
     U  −421           U      0
```

Depress [MODIFY] and [ENTER].
The current position data of the manipulator appears on the display.

5

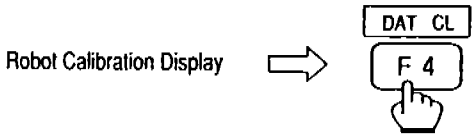


Register the remaining two points by steps 2 to 4 and depress [F5] [EXIT].
The calibration setting is completed and the data are registered.

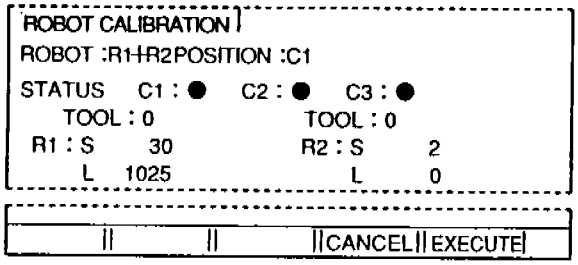
- Depressing [F5] [EXIT] deletes the previously set data.

DELETING CALIBRATION DATA

1



Call up the robot calibration display and depress F4 [DATACL].



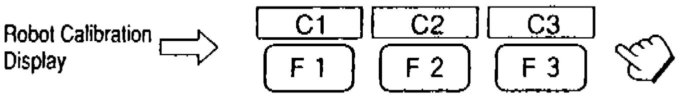
2

Depress F5 [EXECUTE] to delete the display C1 to C3 calibration data of the group combination.

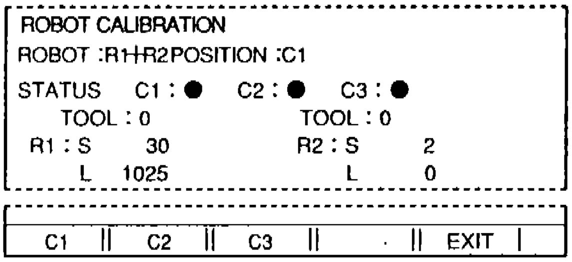
- Depressing F4 stops the deleting operation.

CHECKING CALIBRATION POSITION

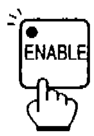
1



Call up the robot calibration display and depress [F1] [C1], [F2] [C2] or [F3] [C3] to confirm the point.



2



Depress [ENABLE].

3

Depress [FWD].

Two manipulators or a manipulator or station move to the calibrated position simultaneously.

- Manipulator moves only while [FWD] is depressed.
- Manipulator automatically stops after reaching the calibrated position.

Section 6
LOADING FROM EXTERNAL MEMORY UNITS

■FILE BATCH LOADING

Among the files stored in the external memory units, four groups of "PARAMETER" , "C. IO PROGRAM/IO NAME", "CUSTOMER DATA", and "ALL DATA IN CMOS" cannot be loaded in function mode so as to protect the data.

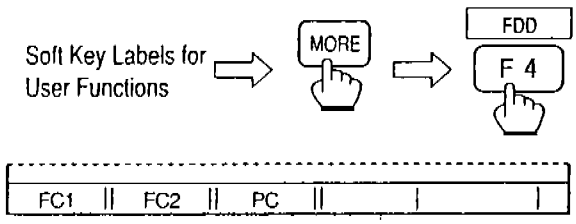
Can not load

DATA ON FLOPPY DISK	UN-USED MEM 20%
(FC2) MENU	NO. OF FILE
☐ JOB	8
☐ CONDITION FILE / CONDITION DATA	3
☐ ALL USER'S PROGRAMS	1
■ PARAMETER	1
■ C. I/O PROGRAM / I/O NAME	2
■ CUSTOMER DATA	11
■ ALL DATA IN CMOS	1

Data on Floppy Disk Display (Menu) in Function Mode

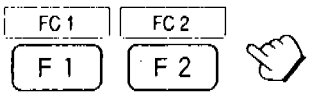
All files can be loaded using the user functions.
Use the follwing steps.

1



Call up the soft key labels for user functions and depress MORE and F4 [FDD].

2

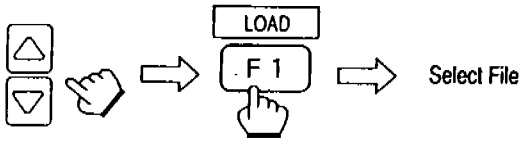


Depress the desired soft key.
The data on floppy disk display (menu) appears.

J : WORK-A S : 024 LOCK CYCLE STOP CUST	
DATA ON FLOPPY DISK	UN-USED MEM 30%
(FC2) MENU	NO. OF FILE
☐ JOB	0
☐ CONDITION FILE / CONDITION DATA	2
☐ ALL USER'S PROGRAMS	1
☐ PARAMETER	1
☐ C.I/O PROGRAM / I/O NAME	2
☐ CUSTOMER DATA	9
☐ ALL DATA IN CMOS	1
LOAD || SAVE || VERIFY || FORMAT || DELETE	

Data on Floppy Disk Display (Menu) in Customer Mode

3



Move the cursor to the desired file group and depress [F1] [LOAD].
Select the file to load, if necessary.

4

Depress [F5] [EXECUTE] to start loading.

- To stop loading, depress [F4] [CANCEL].
- To stop loading after depressing [F5] [EXECUTE], depress [F5] [ABORT].

Section 8
SECOND HOME POSITION AND ACTION TO BE TAKEN AFTER ALARM

8

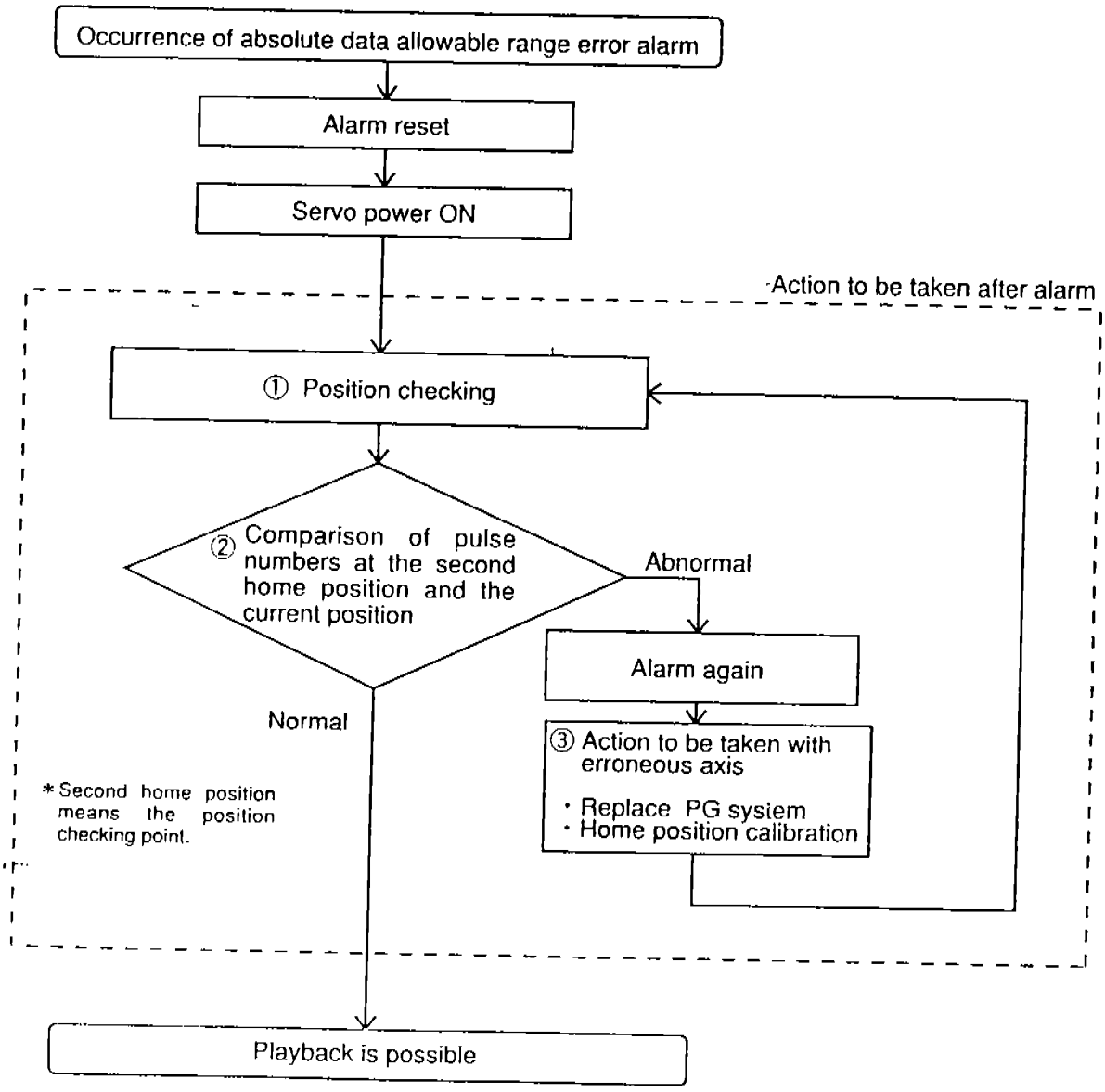
■OPERATION OBJECTIVE

If the absolute number of rotation detected at power ON does not match the data stored in the absolute encoder when the last time power was turned OFF, an alarm is issued after the control power is turned ON.

There are two possible causes of this alarm:

- Error in the PG system
- The manipulator has been moved after power was turned OFF.

If there is an error with the PG system , the manipulator may crush when playback is started by the start button. To prevent this, if the absolute data allowable range error alarm has occurred, playback and test run are not possible and position checking is performed.



Explanation on ① to ③ in the fig.8-2

① If the absolute data allowable range error alarm occurs, move to the second home position by axis operation and check the position. Playback, test run, and the forward operation are not possible before position checking.

② The pulse number at the second home position is compared with that at the current position. If the difference is within the allowable range, playback is enabled. If not, the error alarm occurs again.

The allowable range is the number of pulses per rotation of the motor (PPR data).

The initial value of the second home position is the home position (where all axes are at pulse 0). The second home position can be changed. For details, refer to "SETTING SECOND HOME POSITION".

③ If the error alarm occurs again, there may be an error in the PG system. Check the system. After taking action with the erroneous axis, calibrate the home position of the axis, then check the position again.

Notes:

- Home position calibration of all the axes at the same time enables playback operations without position checking.
- Sometimes with a system having a manipulator without a brake, it is possible to enable playback without position checking after the absolute data allowable range error alarm occurs. However, as a rule, perform position checking.

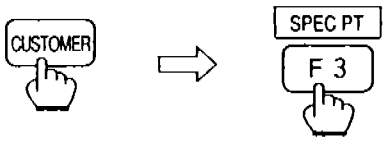
Under the above special conditions, the manipulator moves as follows.

After starting, the manipulator moves to the step indicated by the cursor at a low speed (1/10 of the maximum speed).
If it is halted and restarted during this motion, the low speed is retained until the step at cursor is reached.
Regardless of cycle setting, the manipulator stops after the cursor step is reached. Starting the manipulator again then moves it at the programmed speed and cycle of the job.

■SECOND HOME POSITION

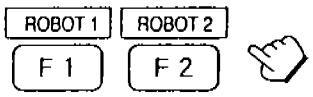
Apart from the normal home position of the manipulator, the second home position can be set up as a check point for absolute data. Use the following steps to set the second home position.
If two or more manipulators or stations are controlled by one control panel, the second home position must be set for each manipulator or station.

1



Depress CUSTOMER and F3 [SPEC PT].

2

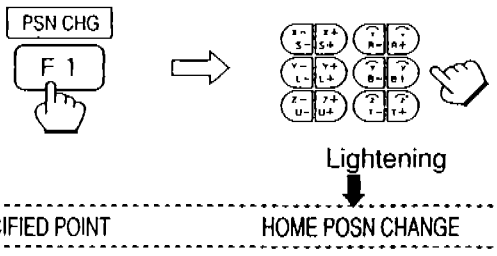


Depress the soft key of robot or station axis to set the second home position.

J : WORK-A S : 024 TEACH CYCLE STOP CUST			
SPECIFIED POINT			
	SPECIFIED	CURRENT	DIFFERENCE
R1 : S	0	5000	5000
L	0	0	0
U	0	0	0
R	0	0	0
B	0	0	0
T	0	0	0
BASE1	0	0	0
!			
PSN CHG ||	||	||	|| QUIT

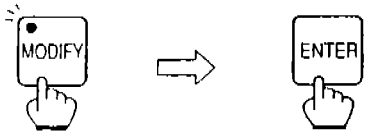
Specified Point Position Display

3



Depress F1 [PSN CHG] to move the manipulator to the new second home position by the axis keys.

4



Depress MODIFY and ENTER to change the second home position.

■ACTION TO BE TAKEN AFTER ALARM OCCURRENCE

CHECKING POSITION

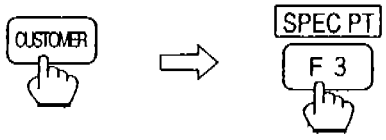
If the absolute data allowable range error alarm occurs,

- reset the alarm
- turn ON the servo power

After above operation, use the following steps to check the position. After checking the position, if it is found that the PG system is out of order, replace it or take necessary action.

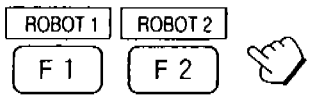
See the diagnostic power ON and OFF position displays to check the current position of the robot with the main power is ON and OFF, respectively.

1



Depress CUSTOMER and F3 [SPEC PT].

2

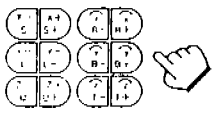


Depress the soft keys of robot or station axis to check the position.

J : WORK-A S : 032 TEACH CYCLE STOP CUST			
SPECIFIED POINT			
	SPECIFIED	CURRENT	DIFFERENCE
R1 : S	0	5000	5000
L	0	0	0
U	0	0	0
R	0	0	0
B	0	0	0
T	0	0	0
BASE1	0	0	0
PSN CHG || || || CHECK || QUIT			

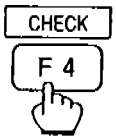
Specified Point Position Display

3



Move the control point of the manipulator or station axis to the second home position by the axis keys.

4



Depress [F4] [CHECK].
- Pulse number at the second home position and that at the current position are compared. If the difference is within the allowable range, playback is enabled.
- If not, the error alarm occurs again.

《Moving to the second home position by depressing [FWD] 》

The [FWD] key can be used for operation in step **3**.
Depress [F5] [MODIFY] and [FWD] keys to move to the second home position.

- The axis moves at the selected manual speed.
- The [HIGH SPD] key is not available.

PRECAUTION

Error in the PG system is a possible cause of an alarm. By the above operations, the axis may crush when the [FWD] key is depressed.
Observe safe procedures around the machine.

■S2C062 to S2C179 FUNCTION SETTING FOR CONTROL OF I/O SIGNALS

S2C062 UNIVERSAL OUTPUT RELAY WHEN CONTROL POWER IS ON

S2C062	0 : RESET TO POWER OFF 1 : INITIALIZATION (ALL UNIVERSAL RELAYS OFF)

This parameter specifies the state of the universal output relays when the control power is ON.
Since the power OFF state, including peripheral devices, cannot be completely reproduced, take attention when restarting.

S2C063 TERMINAL OUTPUT AT I/O ERROR

S2C063	FORCED RESET

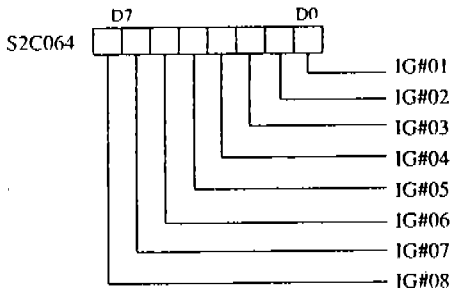
This parameter specifiies processing for output signals when an error occurs in the I/O section. If a number other than "0" is set, output signal reset (OFF) processing is not executed.

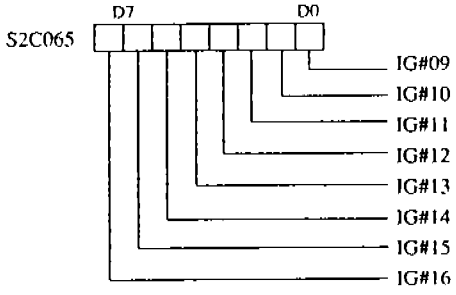
S2C064, S2C065 PARITY OF UNIVERSAL INPUT GROUPS

S2C064	IG#01 to IG#08 0 : NO PARITY CHECK 1 : WITH PARITY CHECK
S2C065	IG#09 to IG#16 0 : NO PARITY CHECK 1 : WITH PARITY CHECK

These parameters specify whether to execute parity checks with parameters when instructions covering the input group (IG#) are executed. The instructions covering the input group are as shown below.

- IF sentence (JUMP, CALL, RET, PAUSE, STOP)
- Pattern jump, pattern job call
- DIN
- WAIT



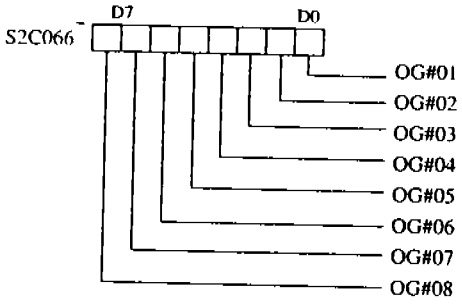


Parity bits are set as the highest level bits of each output group.
If an error is detected during parity check, an alarm occurs and the manipulator stops. Remains unchanged if no parity check is specified.

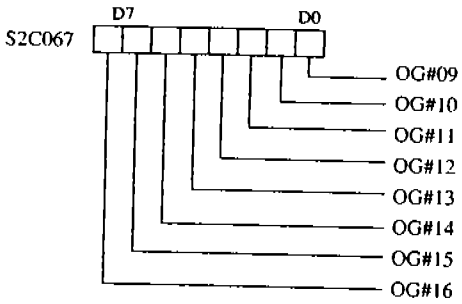
S2C066, S2C067 PARITY OF UNIVERSAL OUTPUT GROUPS

S2C066	OG#01 to OG#08 0 : NO PARITY CHECK 1 : WITH PARITY CHECK
S2C067	OG#09 to OG#16 0 : NO PARITY CHECK 1 : WITH PARITY CHECK

These parameters specify whether the output group instruction is executed with parity check (even parity) .



PARITY CHECK AT BIT-ON (1)



PARITY CHECK AT BIT-ON (1)

Parity bits are set as the highest level bits of each output group.

For example, if OG#01 is specified with parity and DOUT OG# (1) 2 is executed,the result will be 00000010 if 2 is binary converted. Since there will be only one bit (odd) ON at this time, the parity bit (highest level bit) will be set to ON and 10000010 (130) will be output OG# (1) .

As in the case of a variable such as DOUT OG# (1) B03, parity bits are added to the contents of the variable data.

However, if the contents of the variable exceed 127, as in the case of DOUT OG# (1) 128, an alarm will occur.

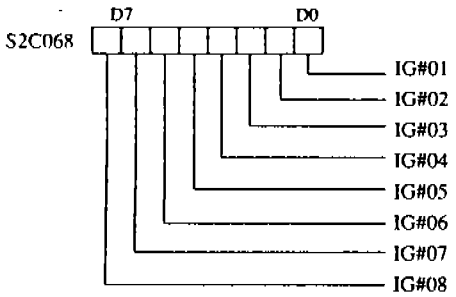
Remains unchanged if no parity check is specified.

S2C068, S2C069 DATA OF UNIVERSAL INPUT GROUPS

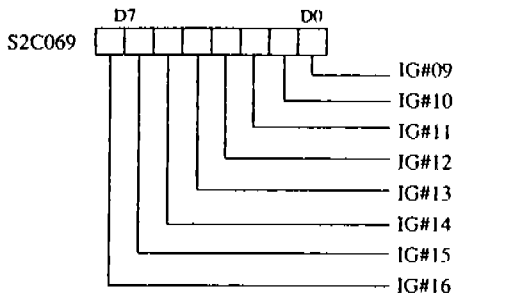
S2C068	IG#01 to IG#08 0 : BINARY 1 : BCD
S2C069	IG#09 to IG#16 0 : BINARY 1 : BCD

These parameters specify whether to handle the input group data as binary data or as BCD data when an instruction for the input group (IG#) is executed. Instructions for the input group are as follows:

- IF sentence (JUMP, CALL, RET, PAUSE, STOP)
- Pattern jump, pattern job call
- DIN
- WAIT



BCD DATA SPECIFICATION AT BIT-ON (1)

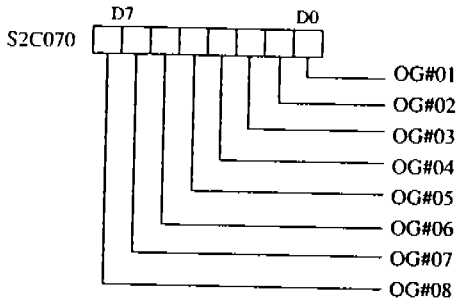


BCD DATA SPECIFICATION AT BIT-ON (1)

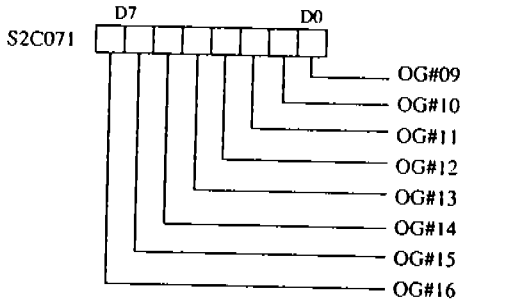
S2C070, S2C071 DATA OF UNIVERSAL OUTPUT GROUPS

S2C070	OG#01 to OG#08 0 : BINARY 1 : BCD
S2C071	OG#09 to OG#16 0 : BINARY 1 : BCD

These parameters specify whether the output group instruction is executed with binary data or BCD data.



BCD DATA SPECIFICATION AT BIT-ON (1)



BCD DATA SPECIFICATION AT BIT-ON (1)

S2C076 UNIVERSAL OUTPUT NO. WHEN ROBOT DROP ALLOWABLE RANGE ERROR OCCURS

S2C076	0 : NO OUTPUT 1 to 128 : UNIVERSAL OUTPUT NO.

This parameter specifies the universal output No. to output the robot drop allowable range error alarm occurrence externally. When this function is not used, set "0".

10.4 APPLICATION PARAMETERS

ARC WELDING

AxP000 APPLICATION

AxP000	0:ARC WELDING

This parameter specifies the application.
Set "0" for arc welding.

AxP002 WELDING START CONDITION FILE REPRESENTATIVE FORM

AxP002	0:SAME CONDITION 1:DIFFERENT CONDITION

This parameter specifies the representative form of the welding start condition file .

0 : Start conditons and actual welding conditions are the same.

1 : Start conditions and actual welding conditions are different.

AxP003 WELDING ASSIGNMENT OF WELDING START CONDITION FILES

AxP003	1 to 33

This parameter specifies the beginning condition number in the welding start condition file to be assigned to welder 2. Condition files of a lower number are automatically assigned to welder 1. For a system with one welder, set "3" (maximum value).

Axp004 WELDING ASSIGNMENT OF WELDING END CONDITION FILES

AxP004	1 to 5

This parameter specifies the beginning condition number in the welding end condition file to be assigned to welder 2 .
Condition files of a lower number are automatically assigned to welder 1 .
For a system with one welder, set "5" (maximum value).

AxP005 WELDING SPEED PRIORITY

AxP005	0:MOV INSTRUCTION SPEED 1:WELDIND SPEED

This parameter specifies whether the welding speed is specified by the "ARCON" instruction or by the welding start condition file, or added to "MOV" instruction .

AxP009 WORK CONTINUING

AxP009	0:CONTINUE 1:STOP

This parameter specifies whether to output an "ARCON" instruction to restart after the manipulator stopped while the "ARCON" instruction is being output .

AxP010 WELDING INSTRUCTION OUTPUT

AxP010	0 to 8

This parameter specifies the beginning number (0 to 8) of the analog output channel to the welder. "0" indicates that no welder exists .

AxP011, Ax9012 MANUAL WIRE OPERATION SPEED

AxP011	LOW SPEED
AxP012	HIGH SPEED

These parameters specifiy the manual wire operation speed as a percentage of the maximum instruction value. Instruction polarity is determined by the current instruction in the welder characteristic file .
The setting range is from 0 to 100 .

AxP013, AxP014 WELDING CONTROL TIME

AxP013	TIP REPRLACEMENT
AxP014	NOZZLE CLEANING

These parameters specifiy the welding control time in units of minutes.
The setting range is from 0 to 999 .

AxP015 to AxP017 NUMBER OF WELDING CONTROLS

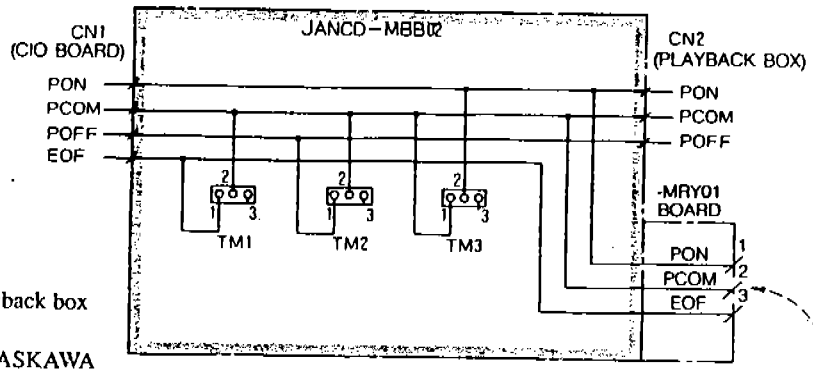
AxP015	RETRY
AxP016	ARC SHORTAGE RESTART
AxP017	AUTO STICKING RELEASE

These parameters specify the number of welding controls.
The setting range is from 0 to 99 .

(2) Power ON/OFF setting

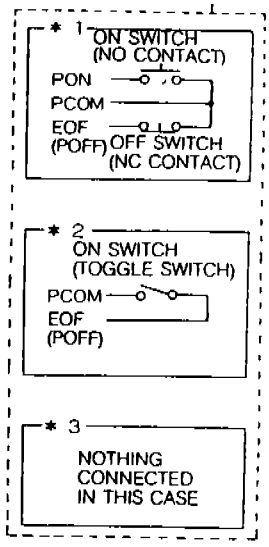
If an optional playback box is used and the workplace is remote from the controller (YASNAC MRC), this ON/OFF power switch can be used to turn control power (CPS power) ON and OFF.

The control signal to turn control power ON and OFF is input from the playback box board and the MRY board. Inputs from these two locations are set up on the MBB02 board. The setting follows :



NOTE : Input from playback box is optional. Contact your YASKAWA representative.

Fig. 1.14 Power ON/OFF Switch Setting



For connecting method, refer to "(5) Exclusive-use input".

• To use both ON and OFF switches to turn power ON and OFF (∗1)

TM1	TM2	TM3	Explanation
1-2	2-3	2-3	Only the input from the playback box board is effective.
2-3	1-2	2-3	Only the input from the MRY01 board is effective.
2-3	2-3	2-3	Both inputs from the boards are effective.

• To use only the ON switch to turn power ON and OFF (∗2)

TM1	TM2	TM3	Explanation
1-2	2-3	1-2	Only the input from the playback box board is effective.
2-3	1-2	1-2	Only the input from the MRY01 board is effective.
2-3	2-3	1-2	Both inputs from the boards are effective.

• To use the main switch (NFB) to turn power ON and OFF (∗3)

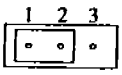
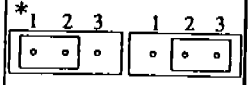
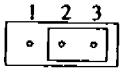
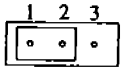
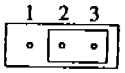
TM1	TM2	TM3	Explanation
1-2	1-2	1-2	

NOTES :

1. Connection of the ON and OFF switches depends on the setting. (See ∗1 to ∗3.)
2. In the tables, "1-2" stands for shortcircuiting pins 1 and 2 with a shorting plug ; "2-3" for pins 2 and 3.

(3) The connection method and shorting pin setting when the shock sensor is used.

Table 1.2 How to Put Pins

Shock Sensor	MBBO2 TM4	MRY01
Not Used		
Used		 HOLD status  SERVO OFF status

* Either setting is accepted.

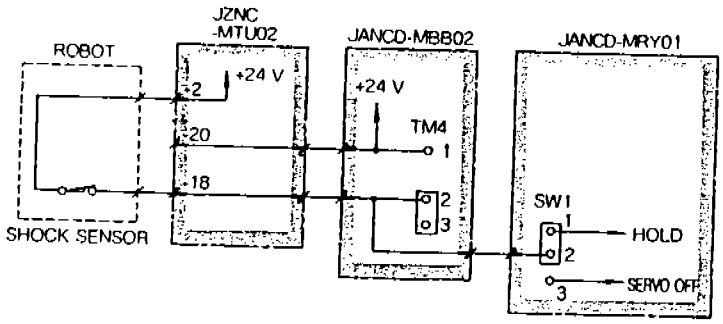


Fig. 1.15 Connection Diagram when Shock Sensor Used

NOTE : Shorting pins (TM5, 6, 7, 8) are short-circuited between pins 1 and 2.
(For future use: Not to be changed)

(4) Switches on the servo control boards (MSV01-2, MSV02)

There are a total of six pins to control six axes, three pins each for SW2 and SW3. When an axis is not used in a hardware structure, short-circuit 1-2 of each switch. (Short-circuit 2-3 when using the axis.)

NOTE : Setting of these switches must not be changed.

1. INTRODUCTION

MRC performs external axis control by software servo as well as by basic robot axes.

This instruction manual describes the rotary switch and shorting pin settings which specify the axes to be used for the SERVOPACK and MSV01 board. It also shows the combination of motor type and SERVOPACK type in the table and describes how to set motor constants and servo constants which are required for MRC external axis control.

2. HARDWARE AXIS SETTING

When external axes are used in the YASNAC-MRC, it is necessary to set rotary switch and short pins for the SERVOPACK and servo control board MSV01.

2.1 SERVOPACK Axis Setting (Rotary Switch Setting)

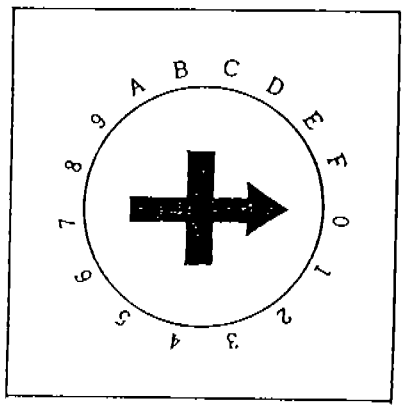
It is necessary for each YASNAC-MRC SERVOPACK to specify axes (number of axes it is using)disregarding to 1-axis collection or 3-axis collection. This paragraph first describes the 1-axis collecting SERVOPACK and then the 3-axis collecting SERVOPACK.

2.1.1 1-axis collecting SERVOPACK axis setting

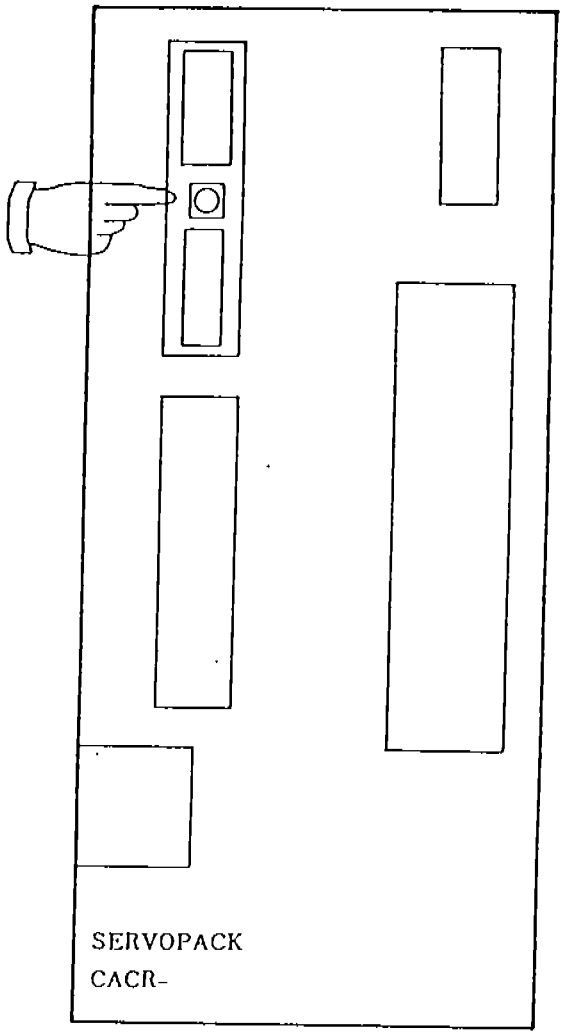
Set the rotary switch shown in Fig. 1 (a) according to the following table.

Axis Used	Setting of Rotary Switch	Connection with MSV Board
External 1st axis	0	Connected to CN01
External 2nd axis	1	Connected to CN02
External 3rd axis	2	Connected to CN03
External 4th axis	0	Connected to CN04
External 5th axis	1	Connected to CN05
External 6th axis	2	Connected to CN06

Example) When external 1st axis is used, set the rotary switch to "0".



ROTARY SWITCH



1-AXIS COLLECTING SERVOPACK

Fig. 1 (a) Rotary Switch Setting of 1—axis Collecting SERVOPACK

2.1.2 3—axis collecting SERVOPACK axis setting

Set the rotary switch shown in Fig. 1 (b) according to the following table. 3—axis collecting SERVOPACK can make other combinations of many types of axes in addition to the following table. However, basically, set the rotary switch according to the table.

Number of External Axes Used	Axis Used			Setting of Rotary Switch
	1st Axis	2nd Axis	3rd Axis	
1	1st external axis	Not used	Not used	6
2	1st external axis	2nd external axis	Not used	F
3	1st external axis	2nd external axis	3rd external axis	0

Then the 1st external axis is connected to MSV board CN1, 2nd external axis to MSV board CN2 and 3rd external axis to MSV board SN3.

Example)

When 3—axis collecting SERVOPACK is used for the 1st external axis and the first axis is used as 1st external axis, set rotary switch to "6".

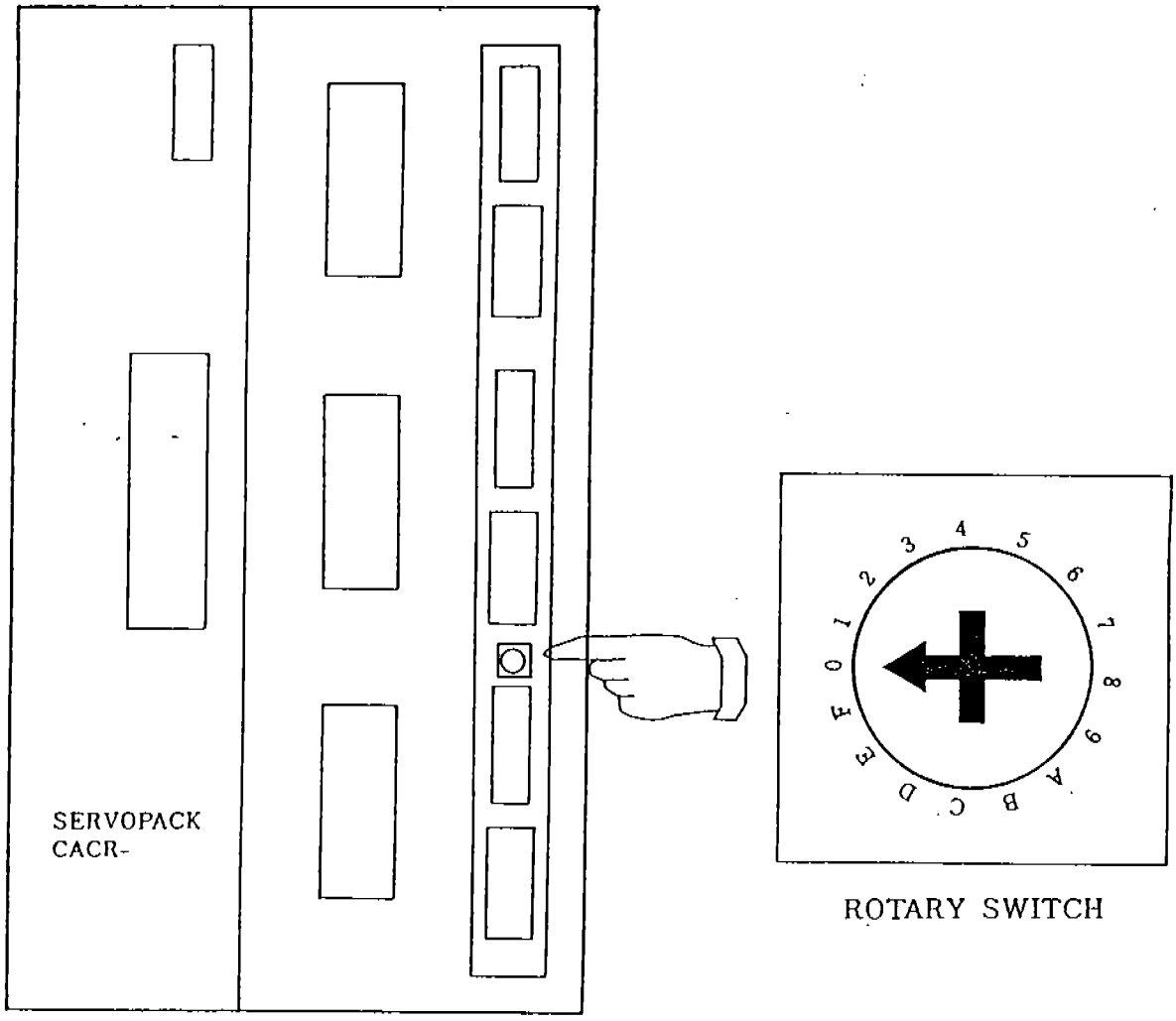


Fig. 1 (b) Rotary Switch Setting of 3—axis Collecting SERVOPACK

2.2 MSV01 and MSV02 Board Shorting Pin Setting

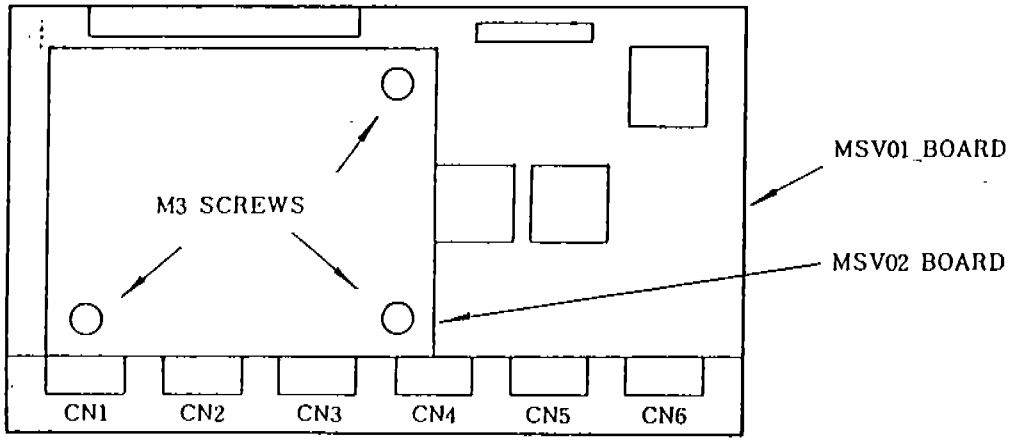
When external axes are used, the axis control CPU board is needed for external axes.

For one to three external axes, the MSV01−1 board is used. Each four to six external axes are used, MSV01−2 board and MSV02 board are used. Each board controls three axes. Therefore, when one external axis is used, the control circuits for the remaining two axes are not connected. The remaining two axes are unused axes.

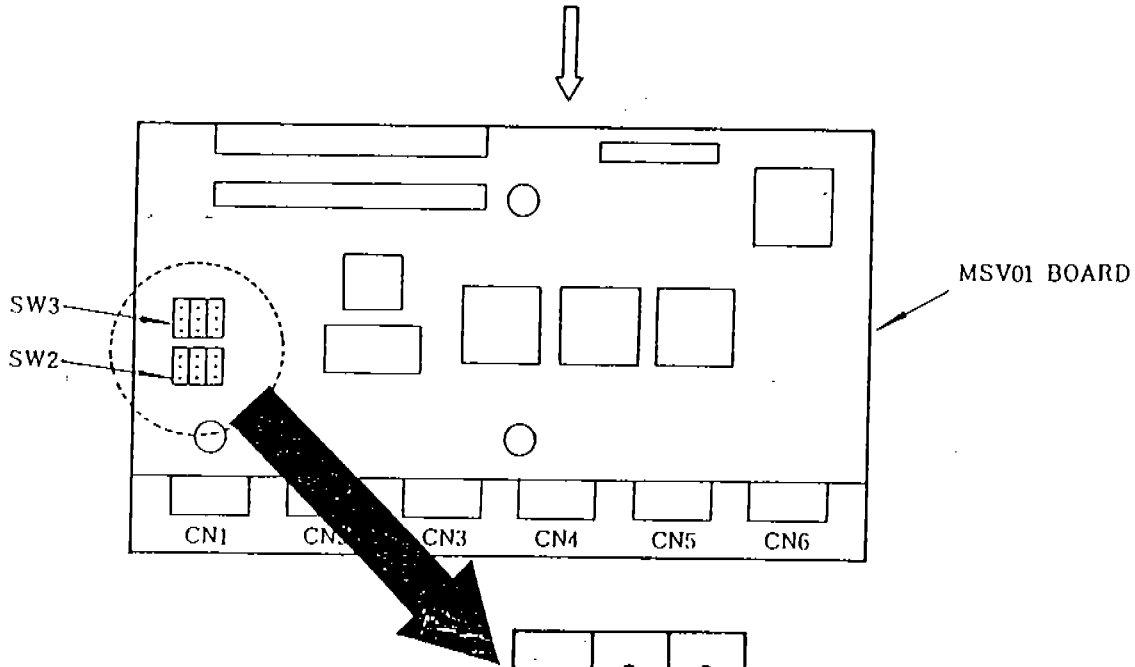
For unused axes, shorting pin setting is needed for the MSV01−1 board or MSV01−2 board.

Shorting pin setting method is described below.

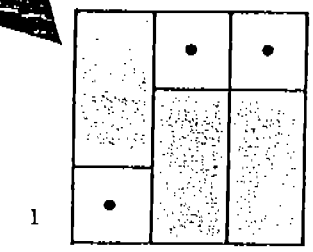
If shorting pin setting is not made for unused axes, alarm status is entered internally and the servo power supply cannot be turned ON. (When the servo ON button is depressed, "alarm 1040: SYSCON section system error (1)" occurs and the servo power supply cannot be turned ON.)



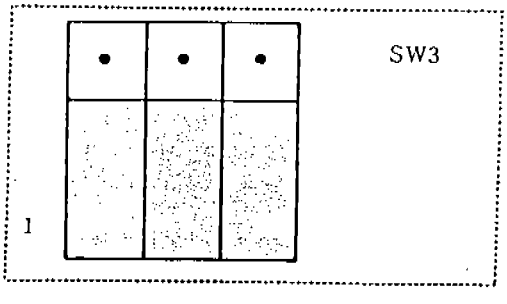
Remove M3 screws with which the MSV02 board is mounted on the MSV01 board, and remove the MSV02 board. (Only MSV01−2 board is needed.) Since the MSV01−1 board is used for up to three external axes, the above operation is not needed.



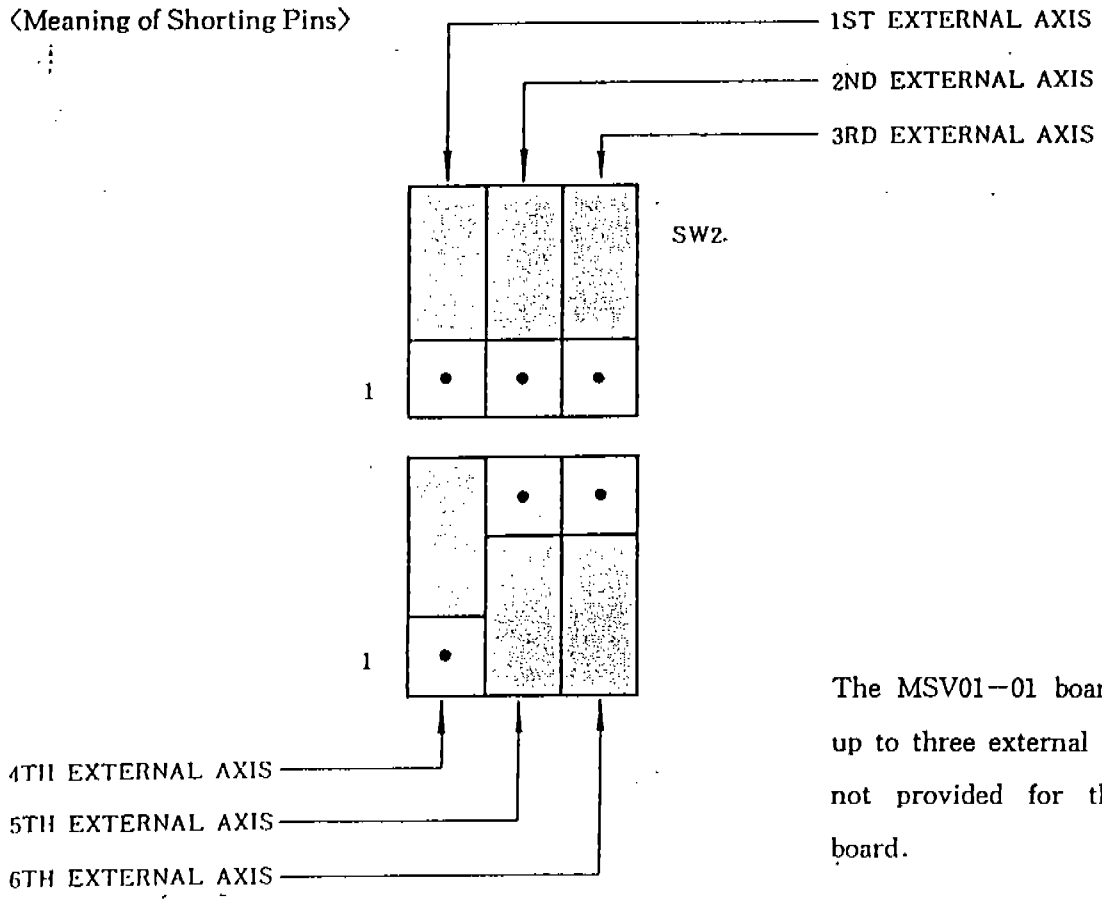
The MSV01−01 board is used for up to three external axes. SW3 is not provided for the MSV01−1 board.



SW2 Example: One external axis used

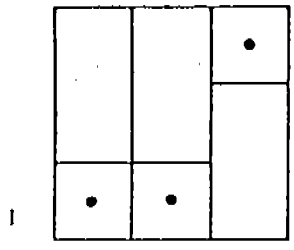


〈Meaning of Shorting Pins〉



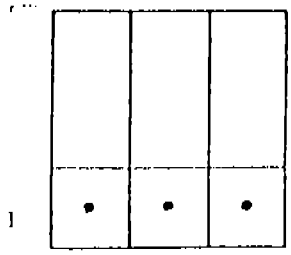
The MSV01−01 board is used for up to three external axes. SW3 is not provided for the MSV01−1 board.

〈Typical Setting〉



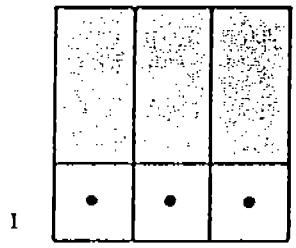
When two external axes are used

(Since the MSV01−1 board is used, SW3 is not needed.)

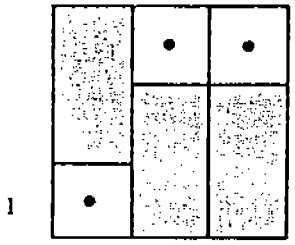


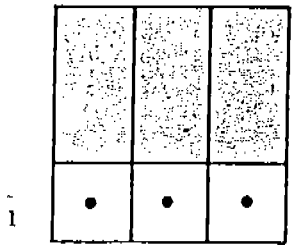
When three external axes are used

(Since the MSV01−1 board is used, SW3 is not needed.)

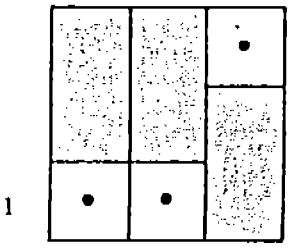


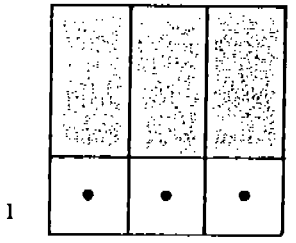
When four external axes are used



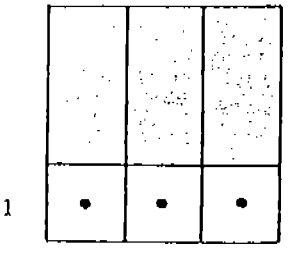


When five external axes are used





When six external axes are used



YASNAC MRC is provided with functions required for maintenance as the customer maintenance mode.

In the customer maintenance mode, the following functions are available :

- Automatic setting of system parameters required when I/O modules (I/O boards, welder I/F boards, etc.) are added
- Changing user options
- Initialization of various user files

By initializing a user file, the stored data will be deleted.

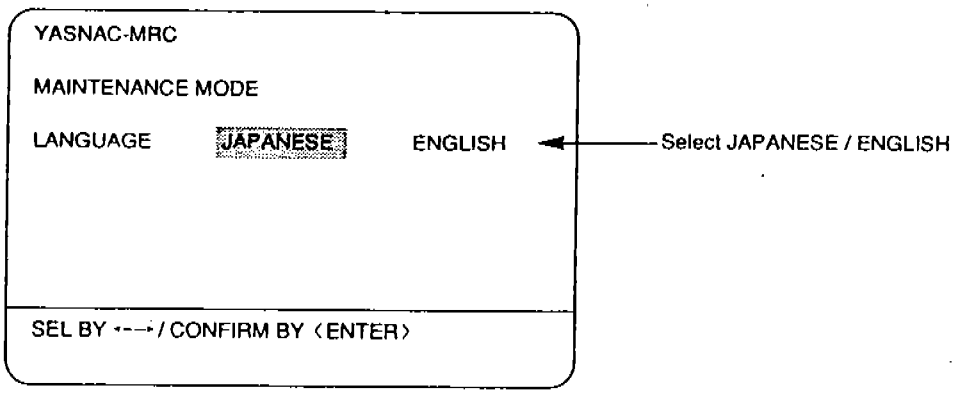
In the customer maintenance mode, the security system using user ID numbers is employed. Only authorized personnel who knows the user ID number can enter the customer maintenance mode. Select a supervisor in charge of maintenance for proper management and control. The same user ID number is used as the customer function number.

To use the customer maintenance mode functions, pay attention to the following points after understanding the main purpose thoroughly.

1. Operation must be performed under control of the person in charge of maintenance.
2. Store and control the necessary data before initialization.
3. YASKAWA will not be responsible for any accidents or failures caused by improper data setting.

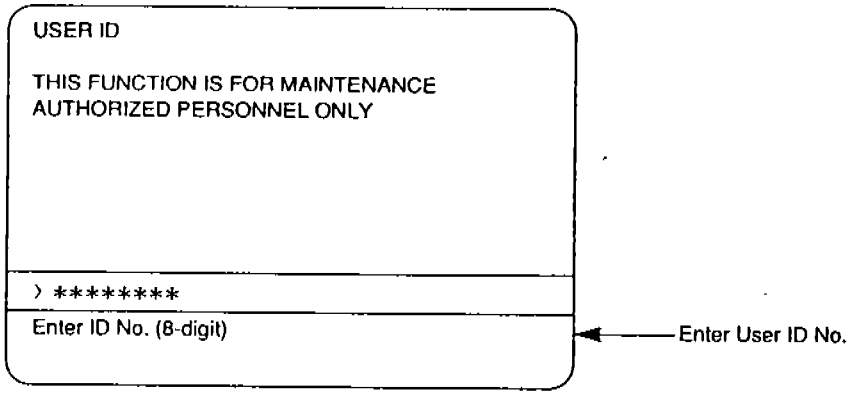
1. ACTIVATION OF CUSTOMER MAINTENANCE MODE

By turning ON the control power supply with the [CUSTOMER] key on the programming pendant depressed, the following display appears.

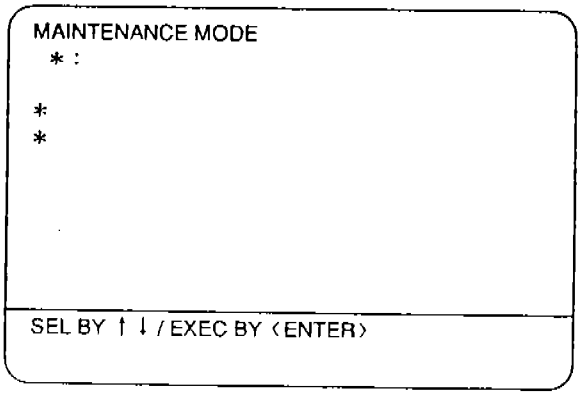


Depress the [ENTER] key after selecting either "JAPANESE" or "ENGLISH", the display is changed to the following one.

Notes :
1. Selecting "JAPANESE" or "ENGLISH" gives a display in the selected language.
2. The setting of this display is valid only in the maintenance mode, having nothing to do with 1st/2nd language in the online mode.



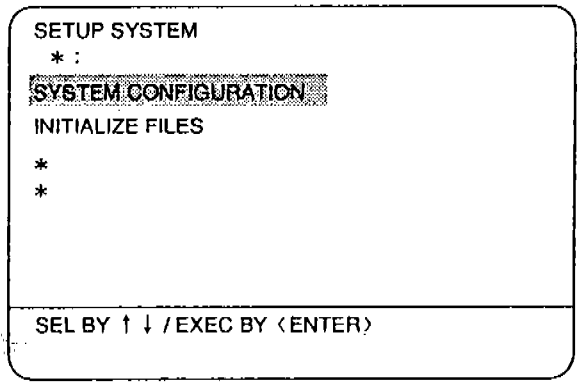
By depressing the [ENTER] key after entering the user ID number using the number keys, the following maintenance mode display appears.



Note : Since items marked with * are used exclusively for the manufacturer, the display is masked.

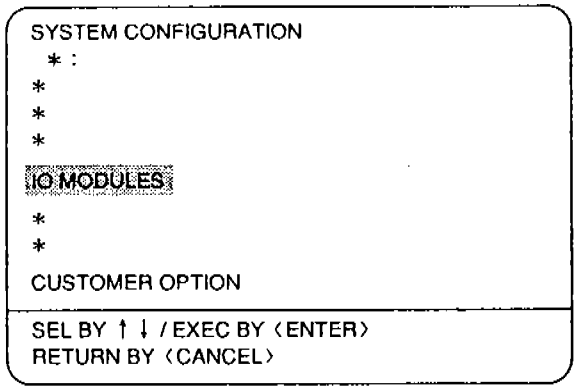
2. HOW TO ADD I/O MODULES

When an I/O module (I/O boards, welder I/F boards, etc.) is added, mount the I/O module on the I/O rack with the control power supply OFF.
Then start up the customer maintenance mode in the procedures described in Par. 1 "ACTIVATION OF CUSTOMER MAINTENANCE MODE".
Select the "SETUP SYSTEM" and depress the ENTER key in the maintenance mode display. The following display appears.



Note : Since items marked with * are used exclusively for the manufacturer, the display is masked.

Select the "SYSTEM CONFIGURATION" and depress the ENTER key in the setup system display. The following display appears.



Note : Since items marked with * are used exclusively for the manufacturer, the display is masked.

Select the I/O module in the system configuration display.
The following display appears.
(Display where MI004 is mounted on slot 1, MI001 on slot 2 and MEW01-1 on slot 5)

```
IO MODULES

SLOT-1          DI024
SLOT-2          DI032
SLOT-3          NONE
SLOT-4          NONE
SLOT-5          EW01-1

CONFIRM BY <ENTER> / ABORT BY <CANCEL>
```

I/O Board Display

Board	Display
MI001	DI032
MI002	DI032
MI003	DI016
MI004	DI024

Check that each slot display is the same as the I/O module mounted status.

Note : If the slot display is different, check the mounted status. If the mounted status is correct, the I/O module may be defective. Contact your YASKAWA representative.

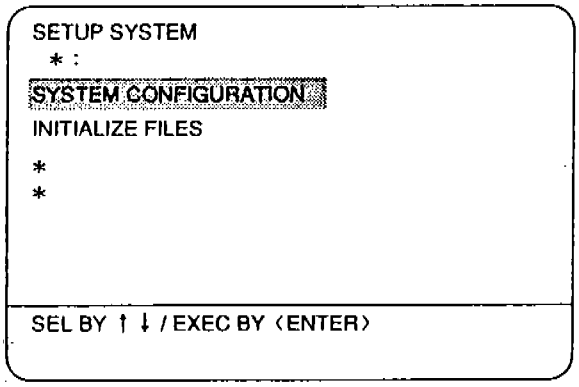
By depressing the [ENTER] key the following message is displayed for verification.

```
IO MODULES

SLOT-1          DI024
SLOT-2          DI032
SLOT-3          NONE
SLOT-4          NONE
SLOT-5          EW01-1

ARE YOU SURE?          YES   NO
SEL BY ←→ / CONFIRM BY <ENTER>
```

When the [ENTER] key is depressed after selecting "YES" in the above message, the system parameter is set automatically according to the current hardware mounted status and then the system configuration display is returned. Then addition of I/O module has been completed.

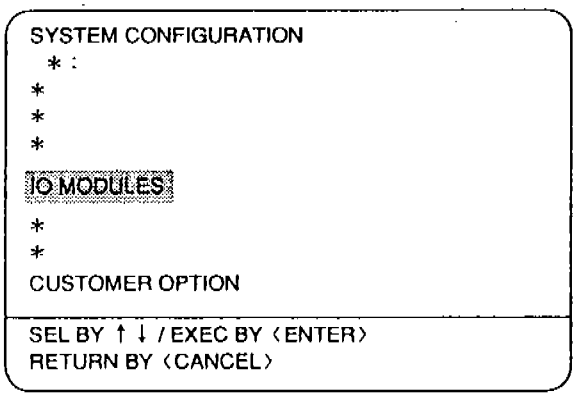
3. HOW TO CHANGE CUSTOMER OPTIONS

To change a customer option (remote function, etc.), start up the customer maintenance mode in the procedures described in Par. 1 "ACTIVATION OF CUSTOMER MAINTENANCE MODE".
Select the "SETUP SYSTEM" and depress the ENTER key in the maintenance mode display. The following display appears.



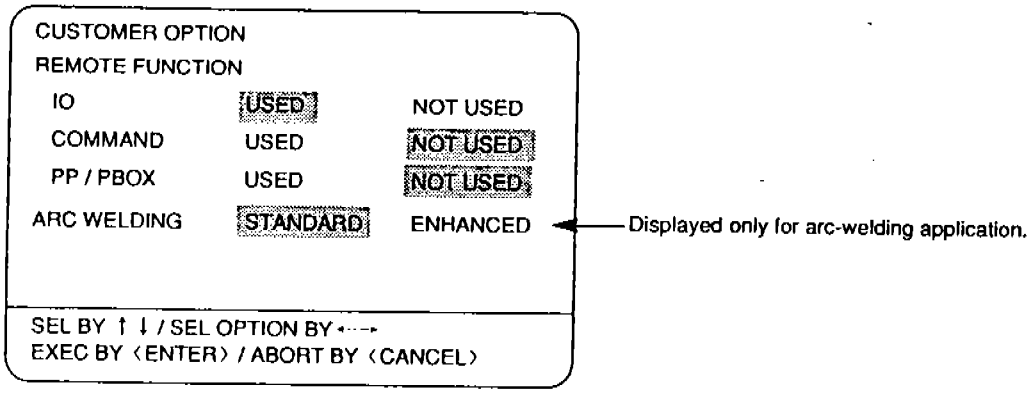
Note : Since items marked with * are used exclusively for the manufacturer, the display is masked.

Select the "SYSTEM CONFIGURATION" and depress the ENTER key in the system setup display. The following display appears.

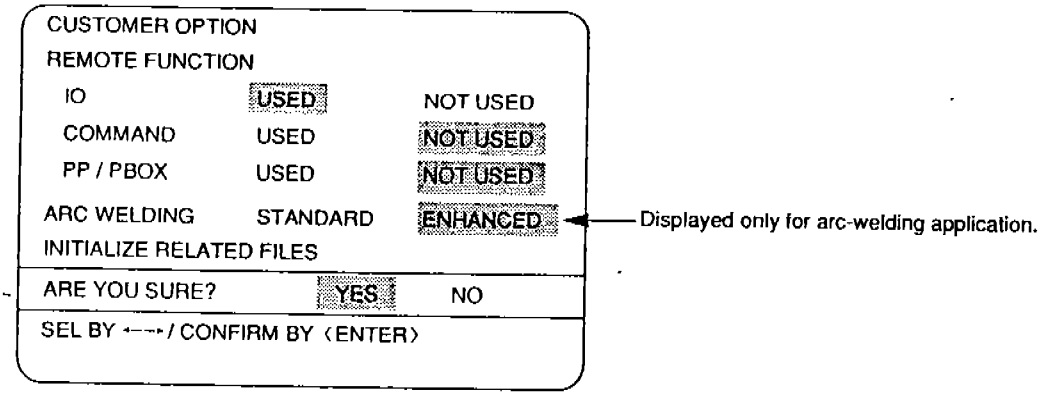


Note : Since items marked with * are used exclusively for the manufacturer, the display is masked.

Select the customer option in the system configuration display. The following display appears.



By depressing the ENTER key, the following message is displayed for verification only when the setting is changed. Unless the setting is changed, the system configuration display is returned.

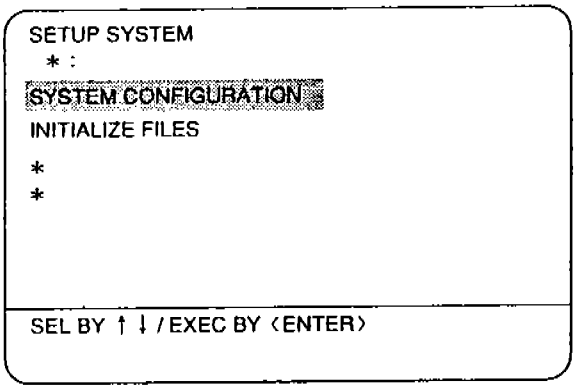


When the ENTER key is depressed after selecting "YES" in the above message, the system parameter is set automatically according to the current hardware mounted status and then the system configuration display is returned. Then customer option changing operation has been completed.

Note : Only when the arc-welding functions setting is changed, the welding start condition file and end condition file are initialized.
When the COM-ARC function is valid the arc-welding function cannot be enhanced.

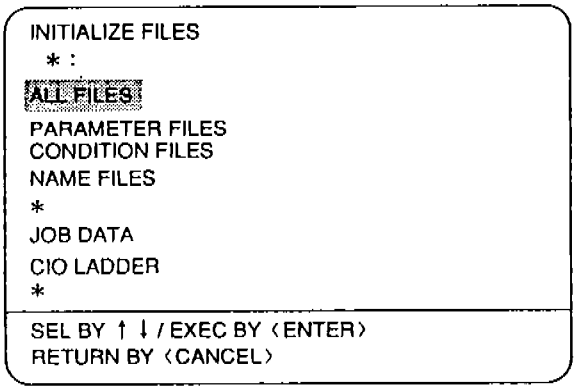
4. HOW TO INITIALIZE FILES

To initialize a user file, select the "SETUP SYSTEM" and depress the [ENTER] key in the maintenance mode display. The following display appears.



Note : Since items marked with * are used exclusively for the manufacturer, the display is masked.

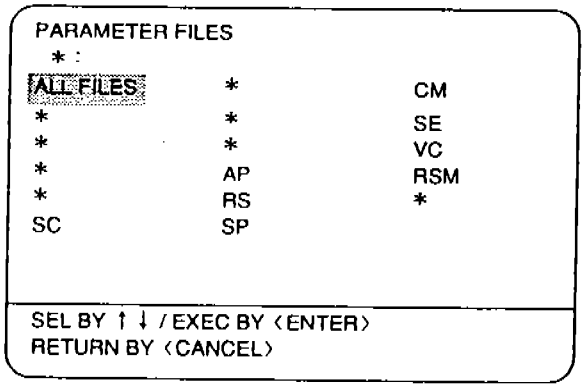
Then select "INITIALIZE FILES" and depress the [ENTER] key in the system setup display. The following display appears.



Select the file by using the [↑] or [↓] key and depress the [ENTER] key.
By selecting "ALL FILES", "JOB DATA" or "CIO LADDER", the message is displayed for verification.
By depressing the [ENTER] key after selecting "YES", initialization is executed.

Note : Since items marked with * are used exclusively for the manufacturer, the display is masked.
Even if "ALL FILES" is selected, items marked with * will not be initialized.

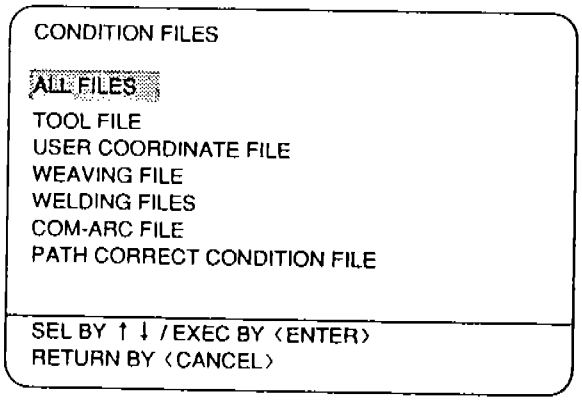
When "PARAMETER FILES" is selected in the file initialization display, the following display appears.



When the parameter is selected by using the [↑], [↓], [←] or [→] key and when the [ENTER] key is depressed, the message is displayed for verification. By depressing the [ENTER] key after selecting "YES", initialization is executed.

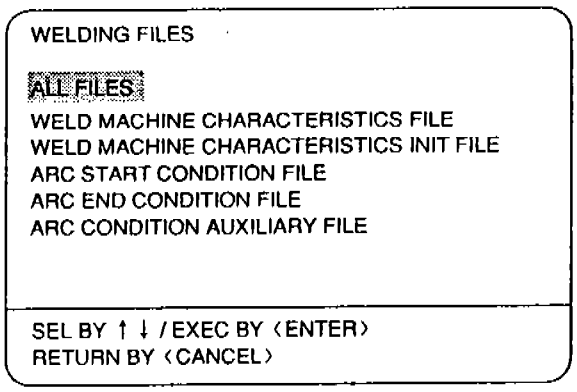
Note : Since items marked with * are used exclusively for the manufacturer, the display is masked.
Even if "ALL FILES" is selected, items marked with * will not be initialized.

By selecting "CONDITION FILES" in the file initialization display, the following display appears.

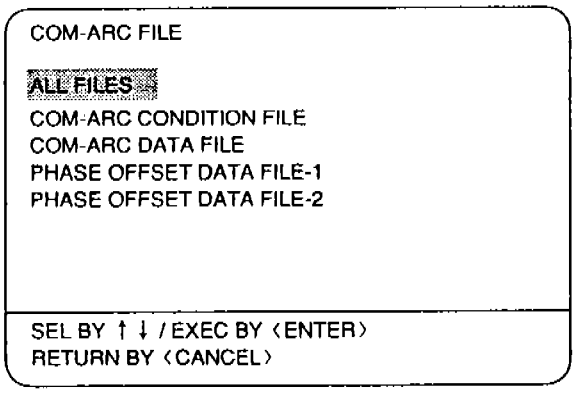


Select the file by using the [↑] or [↓] key and depress the [ENTER] key. When "ALL FILES", "TOOL FILE", "USER COORDINATE FILE", "WEAVING FILE" or "PATH CORRECT CONDITION FILE" is selected, the message is displayed for verification. By depressing the [ENTER] key after selecting "YES", initialization is executed.

By selecting "WELDING FILE" in the condition file display, the following display appears.

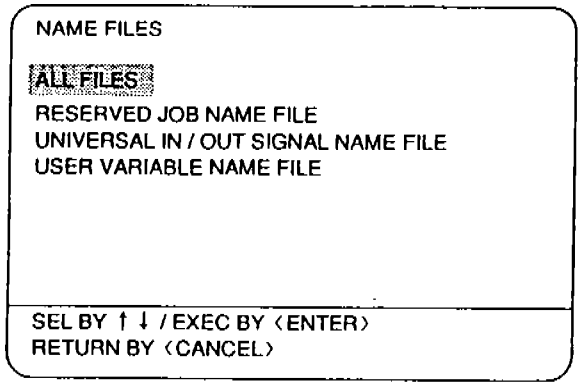


Select the file by using the [↑] or [↓] key and depress the [ENTER] key. The message is displayed for verification. By depressing the [ENTER] key after selecting "YES", initialization is executed.
When "COM-ARC FILE" is selected in the condition file display, the following display appears.



Select the file by using the [↑] or [↓] key and depress the [ENTER] key. The message is displayed for verification. By depressing the [ENTER] key after selecting "YES", initialization is executed.

By selecting "NAME FILE" in the file initialization display, the following display appears.



Select the file by using the [↑] or [↓] key and depress the [ENTER] key. The message is displayed for verification. By depressing the [ENTER] key after selecting "YES", initialization is executed.