FANUC

GE Fanuc Automation

Computer Numerical Control Products

α Series Servo Amplifier Module (SVM)
With FSSB

Servo Setup Manual

Warnings, Cautions, and Notes
as Used in this Publication

Warning

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

Caution

Caution notices are used where equipment might be damaged if care is not taken.

Note

Notes merely call attention to information that is especially significant to understanding and operating the equipment.

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Chapter 1 contains B-65162E/02-25, *Alpha Series Servo Amplifier Module (SVM) with FSSB Supplemental Descriptions Manual*.

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FANUC SERVO AMPLIFIER α series
SERVO AMPLIFIER MODULE(SVM) with FSSB
DESCRIPTIONS

EDIT.	DATE	DESIG.	DESCRIPTION					
						TITLE	SERVO AMPLIFIER MODULE WITH FSSB DESCRIPTIONS	
01	97.07.11	堀越	FIRST EDITION	S. Matubara	DRAW. No.	B－65162E／02－25		
EDIT.	DATE	DESIG.	DESCRIPTION			FANUC LTD	SHEET	001 /10

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				FANUC LTD		SHEET	002/10

1. GENERAL

The α series SERVO AMPLIFIER MODULE with FSSB is used with the new optical interface FSSB. The specifications of this SVM is same that of the current SVM except for the interface. The interchangeable current SVM and SVM for FSSB have identical model names in the drawing numbers. The middle nibbles of the drawing number, however, are differnt:6079 for the current SVM and 6096 for SVM with FSSB.

Current SVM   SVM with FSSB
A06B－6079－H□□□   →   A06B－6096－H□□□

2. SPECIFICATIONS

2.1 DESIGNATIONS

Tab. 1 DESIGNATIONS

MODEL NAME	SVM with FSSB	CURRENT SVM
SVM1-12	A06B-6096-H101	A06B-6079-H101
SVM1-20	A06B-6096-H102	A06B-6079-H102
SVM1-40S	A06B-6096-H103	A06B-6079-H103
SVM1-40L	A06B-6096-H104	A06B-6079-H104
SVM1-80	A06B-6096-H105	A06B-6079-H105
SVM1-130	A06B-6096-H106	A06B-6079-H106
SVM1-240	A06B-6096-H107	A06B-6079-H107
SVM1-360	A06B-6096-H108	A06B-6079-H108
SVM2-12/12	A06B-6096-H201	A06B-6079-H201
SVM2-12/20	A06B-6096-H202	A06B-6079-H202
SVM2-20/20	A06B-6096-H203	A06B-6079-H203
SVM2-12/40	A06B-6096-H204	A06B-6079-H204
SVM2-20/40	A06B-6096-H205	A06B-6079-H205
SVM2-40/40	A06B-6096-H206	A06B-6079-H206
SVM2-40/80	A06B-6096-H207	A06B-6079-H207
SVM2-80/80	A06B-6096-H208	A06B-6079-H208
SVM2-40L/40L	A06B-6096-H209	A06B-6079-H209
SVM3-12/12/12	A06B-6096-H301	A06B-6079-H301
SVM3-12/12/20	A06B-6096-H302	A06B-6079-H302
SVM3-12/20/20	A06B-6096-H303	A06B-6079-H303
SVM3-20/20/20	A06B-6096-H304	A06B-6079-H304
SVM3-12/12/40	A06B-6096-H305	A06B-6079-H305
SVM3-12/20/40	A06B-6096-H306	A06B-6079-H306
SVM3-20/20/40	A06B-6096-H307	A06B-6079-H307

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2.2 SPECIFICATIONS

The differences between SVM with FSSB and the current SVM are shown below.
As for the other specifications,
refer to FANUC CONTROL MOTOR AMPLIFIER α series DESCRIPTIONS (B-65162E/02).

2.2.1 CONNECTION OF OPTICAL CABLE

● Connect the optical cable from COP10A on CNC to COP10B on the first AMP.

● The optical cables from COP10A of the previous AMP is connected to COP10B of the next AMP.

● Please put the attached cap on COP10A of the last AMP to protect the optical connector form dust.

● Up to 8 axes are available. (The number of the axes is not the number of the AMPs.)
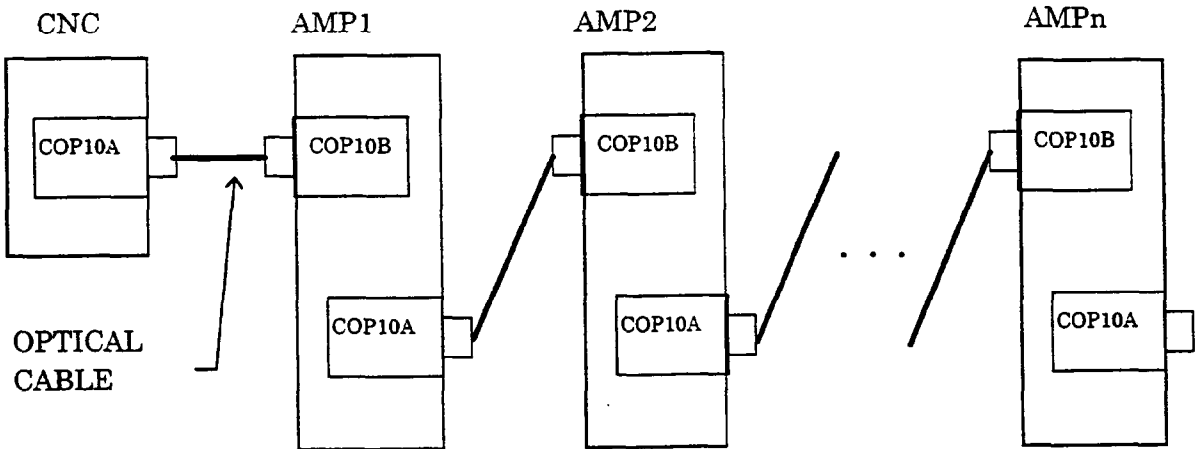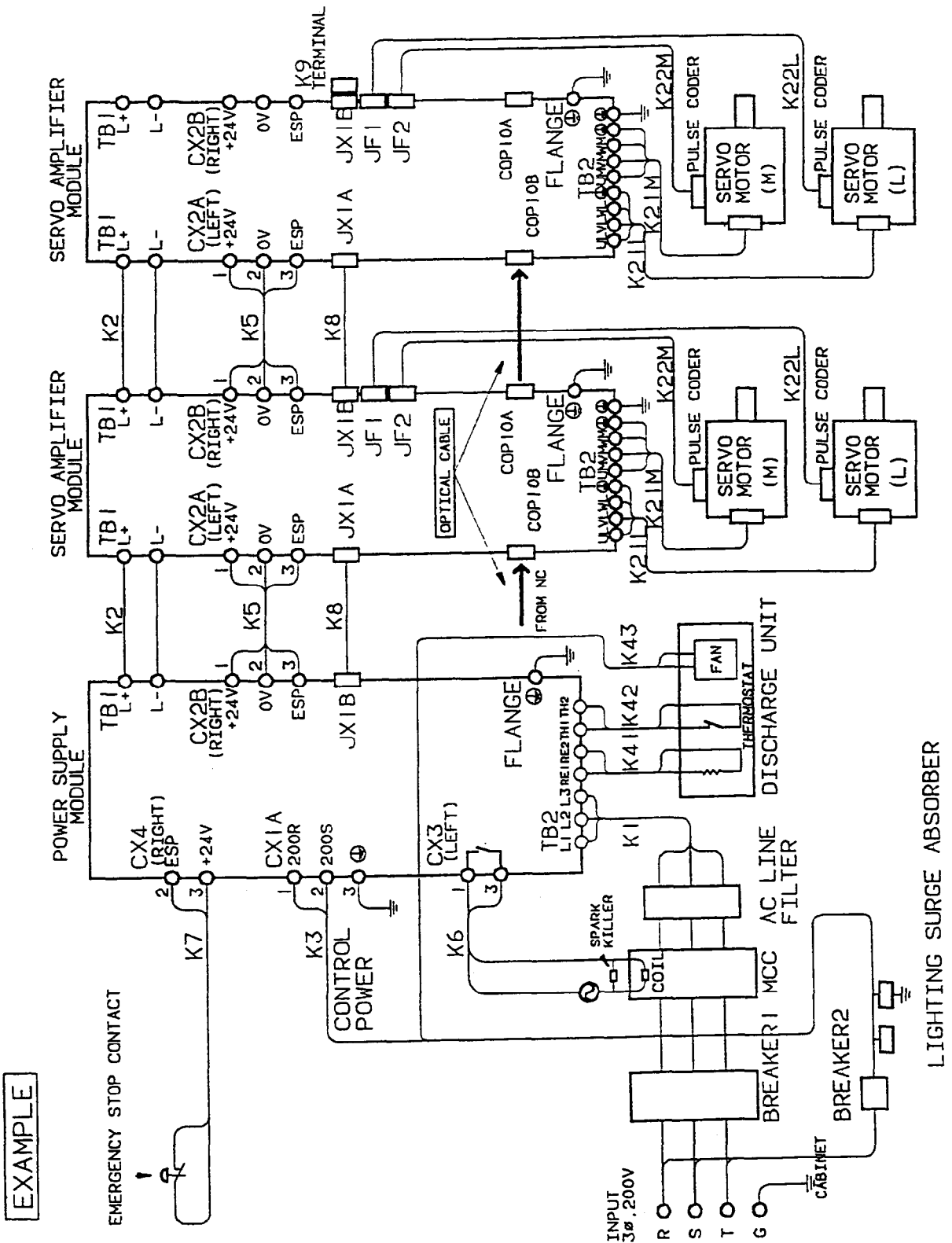
Fig.1 CONNECTION OF OPTICAL CABLE

2.2.2 OVERALL CONNECTION DIAGRAM

(a) Except for SVM1-240,360

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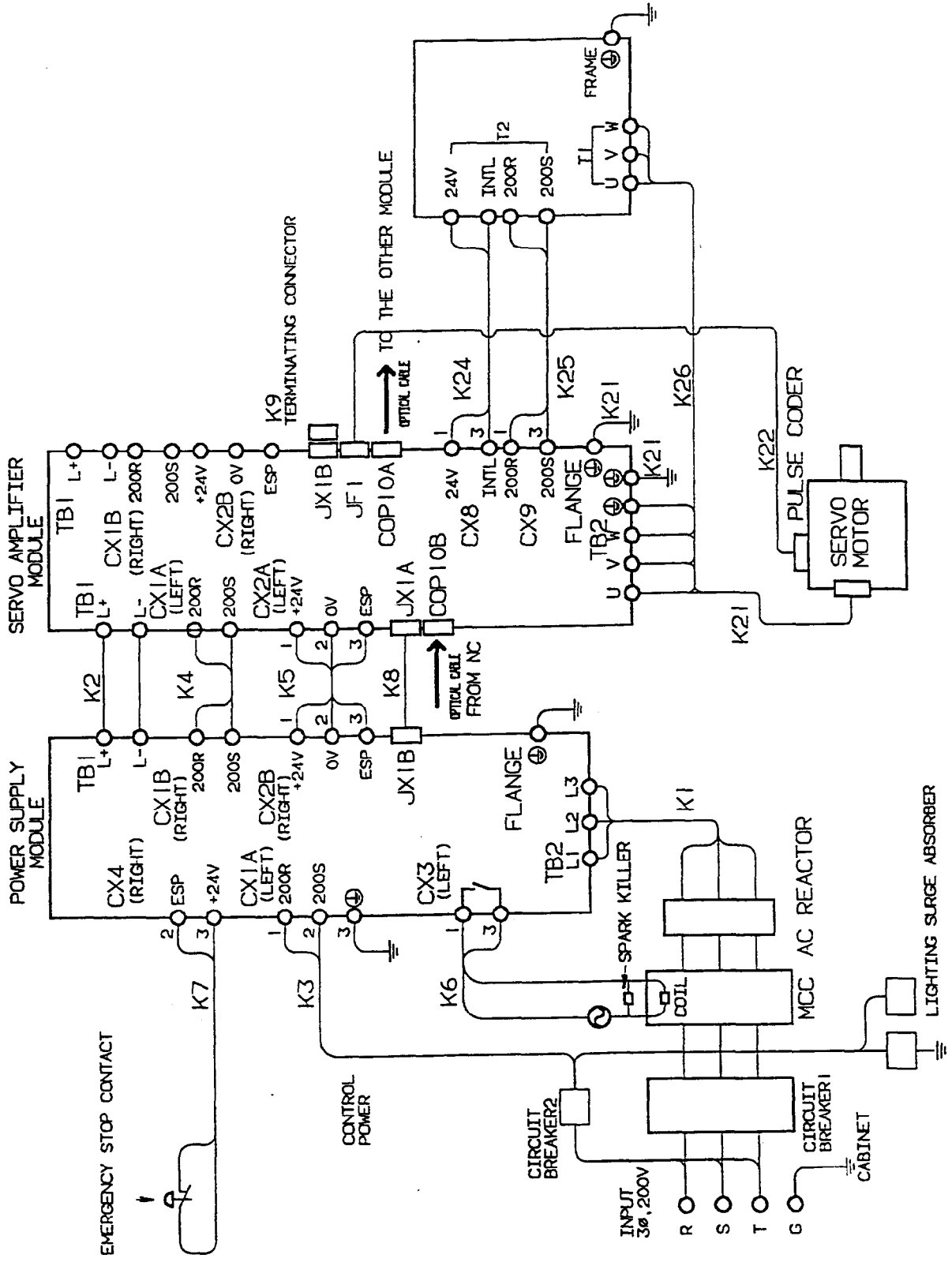
(b) SVM1-240, 360

EXAMPLE

SERVO AMPLIFIER MODULE

POWER SUPPLY MODULE

EMERGENCY STOP CONTACT

CONTROL POWER

TERMINATING CONNECTOR

TO THE OTHER MODULE

PULSE CODER

SERVO MOTOR

SPARK KILLER

MCC AC REACTOR

LIGHTING SURGE ABSORBER

CIRCUIT BREAKER2

CIRCUIT BREAKER1

CABINET

INPUT 3φ,200V

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2.2.3 DETAILED CONNECTION

(a) 1 AXIS and 2 AXES SVM
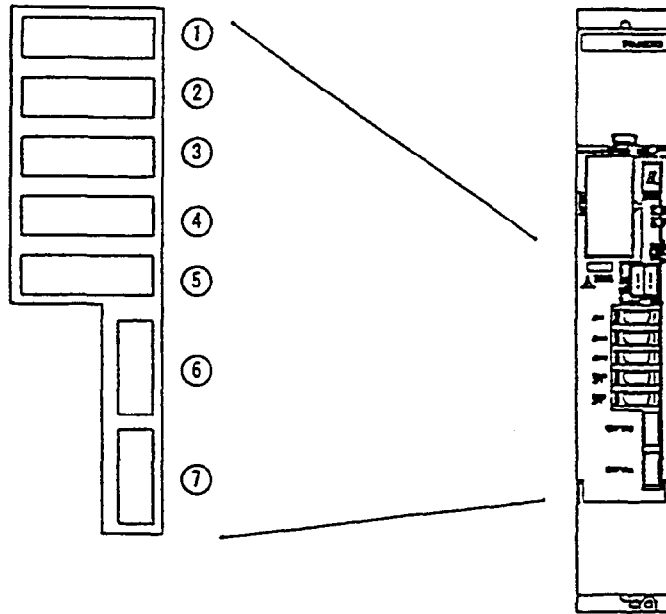

Tab. 2 Connectors

No.	Name	Indication
①	Signal check connector	JX5
②	Input connector for interface between modules	JX1A
③	Output connector for interface between modules	JX1B
④	Pulse coder connector:L-axis	JF1
⑤	Pulse coder connector:M-axis	JF2
⑥	Input connector for FSSB interface	COP10B
⑦	Output connector for FSSB interface	COP10A

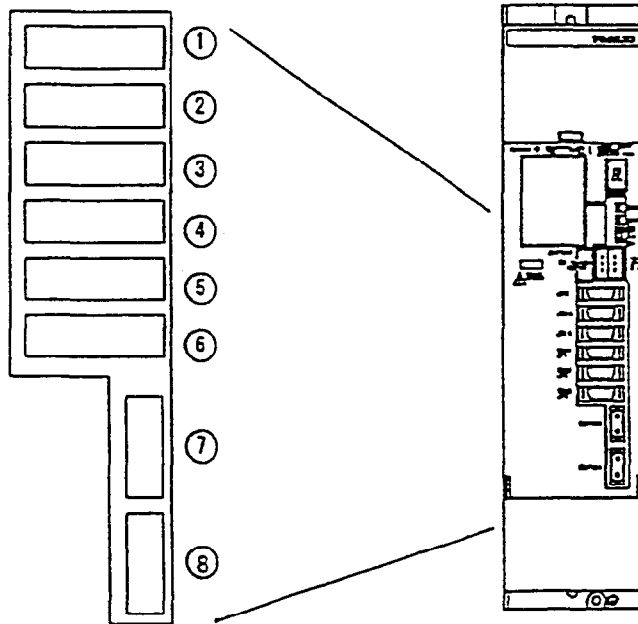| EDIT.	DATE	DESIG.	DESCRIPTION		TITLE	SERVO AMPLIFIER MODULE WITH FSSB DESCRIPTIONS		
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					FANUC LTD		SHEET	007 /10

(b) 3 AXES SVM

Tab. 3 Connectors

No.	Name	Indication
①	Signal check connector	JX5
②	Input connector for interface between modules	JX1A
③	Output connector for interface between modules	JX1B
④	Pulse coder connector:L-axis	JF1
⑤	Pulse coder connector:M-axis	JF2
⑥	Pulse coder connector:N-axis	JF3
⑦	Input connector for FSSB interface	COP10B
⑧	Output connector for FSSB interface	COP10A

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(c) SVM1-240, 360
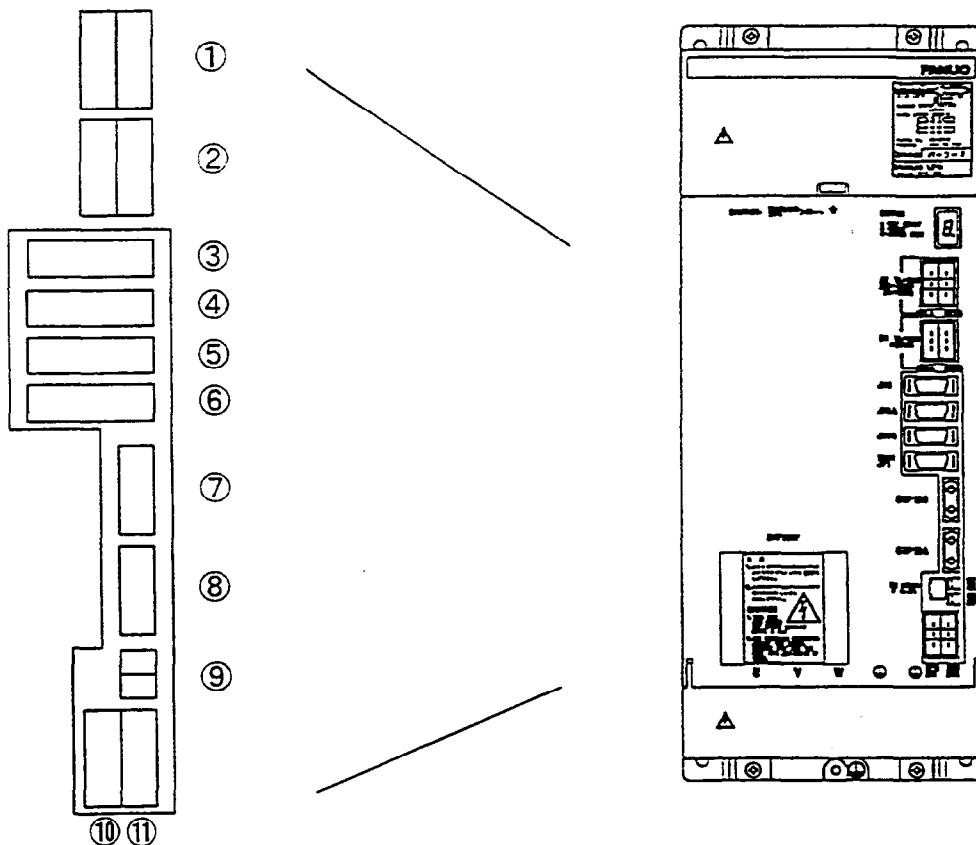
Tab. 4 Connectors

No.	Name	Indication
①	Input/Output connector for AC200V power supply	CX1A, CX1B
②	Input/Output connector for DC24V power supply	CX2A, CX2B
③	Signal check connector	JX5
④	Input connector for interface between modules	JX1A
⑤	Output connector for interface between modules	JX1B
⑥	Pulse coder connector	JF1
⑦	Input connector for FSSB interface	COP10B
⑧	Output connector for FSSB interface	COP10A
⑨	Power connector for ABS pulse coder battery	CX5X, CX5Y
⑩	Connector for Dynamic Brake interface	CX8
⑪	Connector for coil of Dynamic Brake	CX9

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2.2.4 ALARM

Alarms in the table below are added to the current SVM.
Those alarms are related with FSSB.

Type	Description	LED (Note 1)
FSSB disconnection (Type 1)	The disconnection of COP10A side. (See Fig.2) (There is the failure in the connector or the optical cable.)	L
FSSB disconnection (Type 2)	The disconnection of COP10B side. (See Fig.2) (There is the failure in the connector or the optical cable.)	U

(Note 1)
The detected alarm conditions are indicated by the 7-segment LED on the front of the SVM.
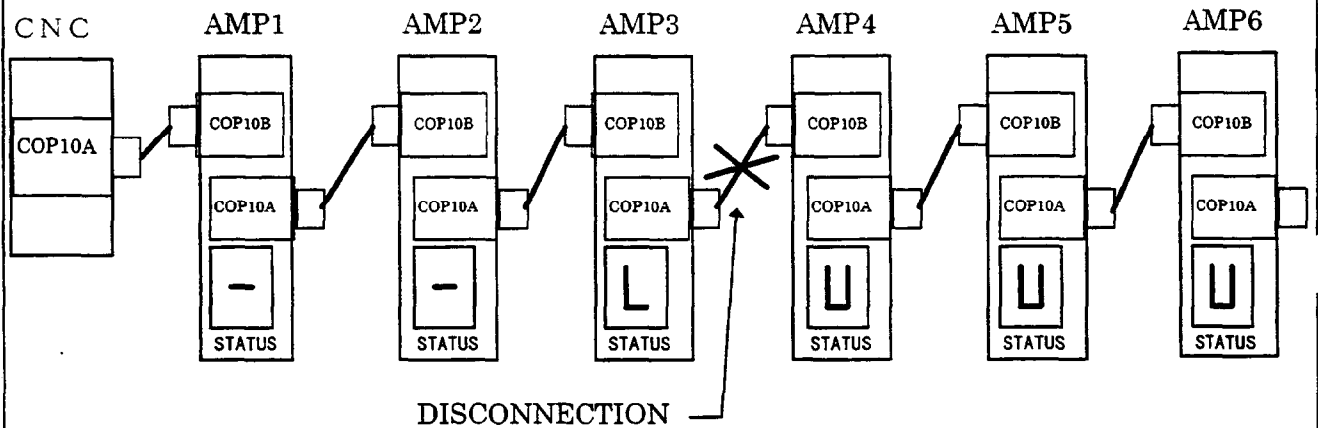
Fig. 2 FSSB disconnection

2.2.5 STANDARD

SVM with FSSB has been designed to comply with VDE0160.

3. OTHERS

3.1 ORDERING LIST

The ordering list for SVM with FSSB is included in "Order list for FANUC Servo amplifier α series (6th edition : B-65161EN/07).

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FSSB Setting Screens

Information pertaining to the amplifiers and axes connected to the CNC through Serial Servo Bus (FSSB) optical cables are set on the FSSB Setting screens.

There are three FSSB Setting screens:

- Amplifier Setting screen.

- Axis Setting screen.

- Amplifier Maintenance screen.

Displaying the FSSB Setting Screens

To display the FSSB Setting screens, press the **<SYSTEM>** function key, the most right soft key, several times and the **[FSSB]** soft key.

When the **[FSSB]** soft key is pressed, the Amplifier Setting screen, or one of the previously selected FSSB Setting screens, is displayed with the following soft keys.

```
[ AMP  ]    [ AXIS ]    [MAINTE]    [     ]    [     ]
```

Press the **[AMP]** soft key to display the Amplifier Setting screen.

Press the **[AXIS]** soft key to display the Axis Setting screen.

Press the **[MAINTE]** soft key to display the Amplifier Maintenance screen.

Amplifier Setting Screen

Information on each slave (amplifier or pulse module) is displayed on the Amplifier Setting screen.

```
AMPLIFIER SETTING                                01000  N00001

      NO.      AMP      SERIES      UNIT      CUR.    [AXIS]     NAME
       1       A1-L       α       SVM-HV     40AL     [ 1 ]       X
       2       A1-M       α        SVM        12A       2         Y
       3       A2-L       β        SVU        20A       3         Z
       4       A3-L       α        SVM        20A       4         A
       5       A3-M       α        SVM        40A       5         B
       7       A4-L       α        SVM       240A       6         C


      NO.      EXTRA     TYPE       PCB       ID
       6        M1        A        0000      DETECTOR(4AXES)
       8        M2        B        12AB      DETECTOR(4AXES)
>
MDI     ****    ***    ***                   13:11:56
    [   AMP   ]     [ AXIS  ]      [MAINTE ]     [       ]     [(OPRT) ]
```

The following information is displayed on the Amplifier Setting screen:

Table 2 - 1. Amplifier Setting Screen Information

Item	Name	Description
NO.	Slave Number	Each slave is assigned a number from **1** to **10**, according to its distance from the CNC.
AMP	Amplifier Type	The amplifier type consists of the letter **A** for Amplifier plus a number which shows its order in the list of amplifiers and an alphabetic character representing the axis number in the amplifier (**L** for the first axis, or **M** for the second axis). For example: **A2-L** : the first axis of the second amplifier.
AXIS	Axis Number	The axis number set in parameters (No. 1920 - 1929) is displayed. If the value set in the parameter is out of range (from **1** to the maximum number of controlled axes), a **0** is displayed.
NAME	Axis Name	The axis name (parameter No. 1020) is displayed.
Amplifier Information		
UNIT	Unit	Kind of Servo Amplifier Unit.
SERIES	Series	Servo Amplifier Series.
CUR.	Current	Maximum current.
Pulse Module Information		
EXTRA	Order	The letter **M** for Pulse Module plus a number which shows its order in the list of pulse modules
TYPE	Pulse Module Type	An alphabetic character representing the pulse module type is displayed.
PCB ID	Pulse Module ID	The pulse module ID is displayed in hexadecimal. If the pulse module is supplied for 4 axes, "DETECTOR(4AXES)" is also displayed. If two pulse modules are supplied for 8 axes, "DETECTOR(8AXES)" is displayed.

Axis Setting Screen

Information on each axis is displayed on the Axis Setting screen.

```
AXIS SETTING                                  01000  N00001

   AXIS      NAME      AMP      M1      M2      1-DSP      Cs      TNDM
    1         X        A1-L     [0]      0        0         0        1
    2         Y        A1-M      1       0        1         1        0
    3         Z        A2-L      0       0        0         0        0
    4         A        A3-L      0       0        0         0        2
    5         B        A3-M      0       0        0         0        0
    6         C        A4-L      0       0        0         0        0




>
MDI      ****    ***    ***                13:11:56
   [  AMP  ]   [ AXIS  ]   [MAINTE ]   [        ]   [(OPRT) ]
```

The following information is displayed on the Axis Setting screen:

Table 2 - 2. Axis Setting Screen Information

Item	Name	Description
AXIS	Axis Number	Axis number.
NAME	Axis Name	Axis name.
AMP	Amplifier Type	Type of amplifier connected to each axis.
M1	Connector Number for the 1st Pulse Module	The connector number for the first pulse module set in parameter No. 1932 is displayed.
M2	Connector Number for the 2nd Pulse Module	The connector number for the second pulse module set in parameter No. 1932 is displayed.
1-DSP	1-DSP Axis	The value set in parameter No. 1904#0 is displayed. A **1** is displayed for the learning control axis, the 125 μ current loop control axis, and the high-speed interface axis.
CS	Cs Contour Control Axis	The value set in parameter No. 1933 is displayed. A **1** is displayed for Cs contour control axis.
TNDM	Tandem Control Axis	The value set in parameter No. 1934 is displayed. Two consecutive numbers, one odd for a master axis and one even for a slave axis, are displayed.

Amplifier Maintenance Screen

There are two Amplifier Maintenance screens. Information on each amplifier is displayed on these screens. Use the Page Up and Page Down keys to move from one screen to the other.

```
AMPLIFIER MAINTENANCE                            01000  N00001

   AXIS       NAME      AMP      SERIES     UNIT     AXES     CUR.
    1          X       A1-L       α        SVM-HV     2       40AL
    2          Y       A1-M       α        SVM        2       12A
    3          Z       A2-L       β        SVU        1       20A
    4          A       A3-L       α        SVM        2       20A
    5          B       A3-M       α        SVM        2       40A
    6          C       A4-L       α        SVM        1       240A




>
MDI     ****    ***   ***                13:11:56
   [   AMP   ]   [ AXIS  ]   [MAINTE ]   [       ]   [        ]
```

```
AMPLIFIER MAINTENANCE                            01000  N00001

   AXIS       NAME      EDITION       TEST       MAINTE-NO.
    1          X         01A         961127         01
    2          Y         01A         961127         01
    3          Z         01A         961127         01
    4          A         02B         961128         01
    5          B         02B         961128         01
    6          C         02B         961128         01




>
MDI     ****    ***   ***                13:11:56
   [   AMP   ]   [ AXIS  ]   [MAINTE ]   [       ]   [        ]
```

The following information is displayed on the Amplifier Maintenance screens:

Table 2 - 3. Amplifier Maintenance Screens Information

Item	Name	Description
AXIS	Axis Number	Axis number.
NAME	Axis Name	Axis name.
AMP	Amplifier Type	Type of amplifier connected to each axis.
SERIES	Series	Series of amplifier connected to each axis.
UNIT	Unit Kind of Amplifier	Unit kind of amplifier connected to each axis.
AXES	Axes	Maximum number of axes of the amplifier connected to each axis.
CUR.	Maximum Current	The maximum current of the amplifier connected to each axis.
EDITION	Unit Edition	Unit edition of the amplifier connected to each axis.
TEST	Test Date	Test date of the amplifier connected to each axis. For example: 961127 : November 27, 1996
MAINTE NO.	Maintenance Number	Maintenance number of the amplifier connected to each axis.

Settings

When the **[(OPRT)]** soft key is pressed on the Amplifier Setting or Axis Setting screen, the following soft keys are displayed:

```
[SETING]     [CANCEL]     [INPUT ]     [       ]     [       ]
```
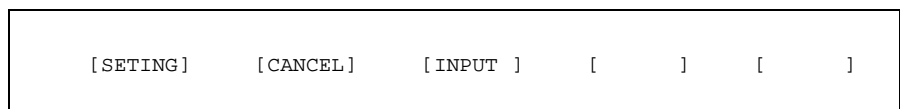
To set the parameters, move the cursor to each item in MDI mode or Emergency Stop condition, enter a number, and press the **[INPUT]** soft key (**<INPUT>** key on the MDI panel).

Then, press the **[SETING]** soft key. If a warning occurs, the values are incorrect and must be corrected.

To display the values set in the parameters, press the **[CANCEL]** soft key.

When the CNC is powered ON, the values set in the parameters are displayed.

Note

Do not set the values for the parameters by MDI input or G10 input. The values for these parameters can only be set on the FSSB Setting screens.

If a warning occurs when the **[SETING]** soft key is pressed, enter the correct value or press the **[CANCEL]** soft key to stop the warning. Pressing the **<RESET>** key will not release the warning.

Amplifier Setting Screen

The following item can be set on the Amplifier Setting screen:

Item	Name	Description
AXIS	Axis Number	Enter the axis number from **1** to the maximum number of controlled axes.
		If a value that is out of the data range is entered, the warning "FORMAT ERROR" occurs.
		When the [SETING] soft key is pressed, if **0** or overlapped numbers are set, the warning "DATA IS OUT OF RANGE" occurs, and input numbers are not set in their parameters.

Axis Setting Screen

The following item can be set on the Amplifier Setting screen:

Item	Name	Description
M1	Connector Number of the 1st Pulse Module	Enter the connector number for the axis using the first pulse module. The data range is from **1** to the maximum number of the first pulse module connector. **0** is set for the axis not using the first pulse module. If the input value is out of range, the warning "FORMAT ERROR" occurs.
M2	Connector Number for the 2nd Pulse Module	Enter the connector number for the axis using the second pulse module. The data range is from **1** to the maximum number of the second pulse module connector. **0** is set for the axis not using the second pulse module. If the input value is out of range, the warning "FORMAT ERROR" occurs.
1-DSP	1-DSP Axis	Enter **1** for the Cs contouring control axis. If a value other than **0** or **1** is entered, the warning "FORMAT ERROR" occurs.
CS	Cs Contour Control Axis	Enter **1** for the Cs contouring control axis. If a value other than **0** or **1** is entered, the warning "FORMAT ERROR" occurs.
TNDM	Tandem Control Axis	When tandem control is used, enter two consecutive numbers, one odd for a master and one even for a slave. The data range is from **1** to **8**. If a value that is out of range is entered, the warning "FORMAT ERROR" occurs.

Setting Parameters

The FANUC Serial Servo Bus (FSSB) system requires you to set the following parameters:

- Parameter No. 1023.

- Parameter No. 1905.

- Parameter No. 1910 – No. 1919.

- Parameter No. 1936 and 1937.

Setting Parameters

There are three ways to set these parameters:

1. Default setting.

2. Automatic setting.

3. Manual setting.

Note

Because of the limitations with the Default setting, it is recommended that you use either the Automatic or Manual setting.

Default Setting

Setting the parameter in No. 1023 enables the default settings for the remaining parameters. You do not need to set parameter No. 1905, 1910 – 1919, 1936, or 1937. However, the functions, which you can then use, are limited.

Automatic Setting

By using the FSSB Setting screen to enter the amplifier and axis information, the CNC automatically calculates the values of parameters No. 1905, 1910 –1919, 1936, and 1937, and sets these values in the parameters.

Manual Setting

Parameter No. 1905, 1910 – 1919, 1936, and 1937 can also be set manually. However, before you attempt to set these parameters manually, you must have a thorough understanding of the parameters.

Slave

In the FSSB system, the servo amplifier and pulse module are connected to the CNC by an optical cable. The servo amplifier and pulse module are referred to as *slaves*. A 2-axis amplifier consists of two slaves, while a 3-axis amplifier consists of three slaves. Each slave is assigned a slave number from 1 to 10, according to its distance from the CNC.

Note: M1/M2: 1st/2nd Pulse Module
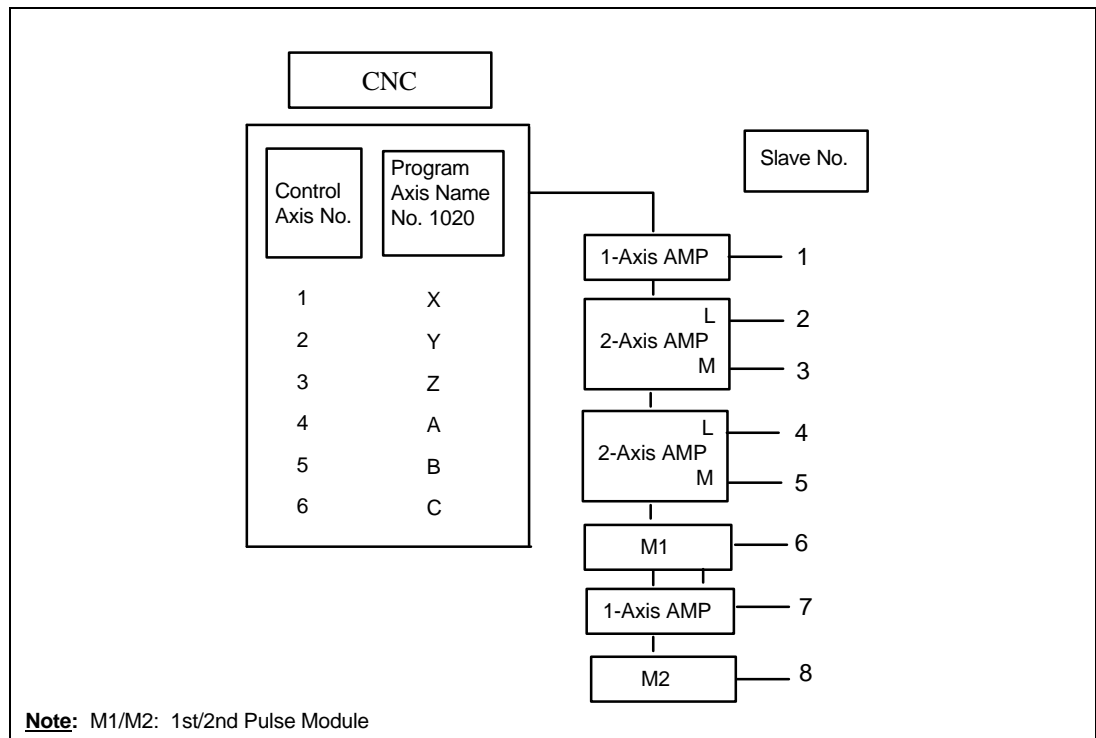
Default Setting

When the following parameters are set, the Default setting is in effect:

```
No. 1902#0  =  0
No. 1902#1  =  0
No. 1910 to 1919  =  0 (all parameters are 0)
```

In the Default setting, the value of parameter No. 1023 is set as the slave number. For example, an axis whose value of parameter No. 1023 is 1 is connected with the nearest amplifier to the CNC, and an axis whose parameter value is 2 is connected with the next amplifier.

CNC		
Control Axis No.	Program Axis Name No. 1020	Servo Axis Name No. 1023
1	X	1
2	Y	2
3	Z	3
4	A	4
5	B	5
6	C	6

2-Axis AMP — X, A
1-Axis AMP — Y
2-Axis AMP — Z, B
1-Axis AMP — C

Note: M1/M2: 1st/2nd Pulse Module
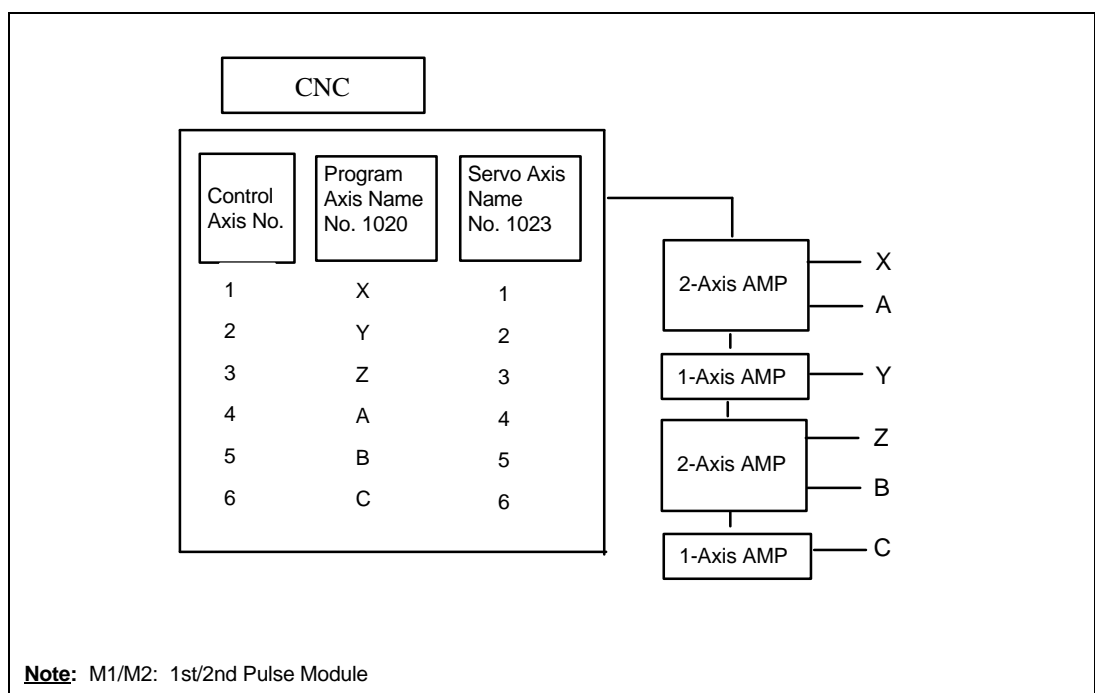
The following functions and settings cannot be used in the Default setting:

- The separate detector interface cannot be used.

- Values which are not consecutive cannot be set in parameter No. 1023. For example, the following setting is not allowed because 2 does not exist.

Axis	No. 1023
X	1
Y	3
Z	4

- The following servo functions are not allowed:

  □ Learning control.

  □ 125 μs current loop.

  □ High speed interface.

  □ Simple electrical gear box (EGB).

Automatic Setting

Under the following conditions, you can use the FSSB Setting screen to set the parameters automatically:

No. 1902#0=0

No. 1902#1=0

To set the parameters automatically using the FSSB Setting screen, follow this procedure:

1. Set servo axis No. 1023. Then, set the number of the axis to No. 1023 to correspond to the total number of amplifier axes.

2. Initialize the servo parameters on the Servo Initial Setting screen.

3. Turn power to the CNC OFF and then ON.

4. Press the **SYSTEM** function key.

5. Press the ▷ key several times to display the **[FSSB]** soft key. Then, press the **[FSSB]** soft key to display the Amplifier Setting screen.

```
 AMPLIFIER SETTING

     NO.     AMP      SERIES     UNIT      CUR.      [AXIS]     NAME
      1      A1-L       α        SVM       40AL      [ 1 ]       X
      2      A1-M       α        SVM       12A       [ 2 ]       Y
      3      A2-L       β        SVU       20A       [ 3 ]       Z
      4      A3-L       α        SVM       40A       [ 4 ]       A
      5      A3-M       α        SVM       80A       [ 5 ]       B
      7      A4-L       α        SVM       40AS      [ 6 ]       C


     NO.     EXTRA     PCB       ID
      6      M1         A        0008 DETECTOR(4AXES)
      8      M2         A        0008 DETECTOR(4AXES)
 >
 MDI    ****   ***   ***                    13:11:56
    [ AMP  ]    [ AXIS  ]    [MAINTE ]    [       ]    [(OPRT) ]
```

6. Enter the axis name for each amplifier on the Amplifier Setting screen.

Note

Do not set the control axis name to 0 or a duplicated value.

7. Press the **[SETING]** soft key. If a warning occurs, go back to Step 5 and re-enter the information on the Amplifier Setting screen.

8. Press the **SYSTEM** function key.

9. Press the ▷ key several times to display the **[FSSB]** soft key. Then, press the **[FSSB]** soft key to change the Amplifier Setting screen.

10. Press the **[AXIS]** soft key on the Amplifier Setting screen.

11. Set the information for each axis by entering the setting value for:

    - Using the separate detector interface.

    - Using 1 DSP / 1 axis.

    - Using Cs axis.

    - Using tandem control.

```
 AXIS SETTING

   AXIS      NAME      AMP       M1       M2      1-DSP      Cs       TNDM
    1         X        A1-L      1        0         0        0         0
    2         Y        A1-M      0        1         0        0         0
    3         Z        A2-L      0        0         0        0         0
    4         A        A3-L      2        0         0        0         0
    5         B        A3-M      0        2         0        0         0
    6         C        A4-L      0        0         0        0         0




 >
 MDI     ****    ***   ***                13:11:56
    [  AMP  ]  [ AXIS  ]  [MAINTE ]  [       ]  [(OPRT) ]
```

12. Press the **[SETING]** soft key. If a warning occurs, go back to Step 9 and re-enter the information on the Axis Setting screen.

    If you input nothing, press the **[SETING]** soft key after pushing **[(OPRT)]**.

13. Parameter No. 1023, 1905, 1910 – 1919, 1936, and 1937 are now set automatically. Parameter No. 1902#1 becomes 1. This procedure is completed after you turn the power to the CNC OFF and ON.

Examples

Semi-Closed Loop Example

1. Set parameter No. 1023 as follows:

    ```
    X  :  1
    Y  :  2
    Z  :  3
    A  :  4
    ```

2. Set the servo initial setting for each axis.

3. Turn power to the CNC OFF and then ON.

4. Enter the axis number on the Amplifier Setting screen.

```
AMPLIFIER SETTING

     NO.      AMP      SERIES     UNIT      CUR.     [AXIS]     NAME
      1       A1-L       α         SVM      40A      [ 2 ]       Y
      2       A2-L       α         SVM      40A      [ 1 ]       X
      3       A3-L       α         SVM      40A      [ 4 ]       A
      4       A3-M       α         SVM      80A      [ 3 ]       Z




     NO.      EXTRA     TYPE       PCB       ID



>
MDI     ****    ***    ***                       13:11:56
   [  AMP  ]     [ AXIS  ]     [MAINTE ]     [        ]     [(OPRT) ]
```

5. Press the **[SETING]** soft key.

6. Press the **SYSTEM** function key.

7. Press the ▷ key several times to display the **[FSSB]** soft key. Then, press the **[FSSB]** soft key to change the Amplifier Setting screen.

8. Press the **[AXIS]** soft key, the **[(OPRT)]** soft key, and then the **[SETING]** soft key. The setting will be complete after you turn the CNC OFF and then ON.

Fully Closed Loop Example

1. Set parameter No. 1023 as follows:

    ```
    X : 1
    Y : 2
    Z : 3
    A : 4
    ```

2. Set the servo initial setting for each axis.

3. Turn power to the CNC OFF and then ON.

4. Enter the axis number on the Amplifier Setting screen.

```
AMPLIFIER SETTING

   NO.     AMP      SERIES     UNIT      CUR.      [AXIS]      NAME
    1      A1-L       α        SVM       40A       [ 2 ]        Y
    2      A2-L       α        SVM       40A       [ 1 ]        X
    3      A3-L       α        SVM       40A       [ 4 ]        A
    4      A3-M       α        SVM       80A       [ 3 ]        Z




   NO.    EXTRA      TYPE      PCB       ID
    5      M1         A        0008      DETECTOR(4AXES)


>
MDI    ****   ***   ***                    13:11:56
  [ AMP  ]    [ AXIS  ]    [MAINTE ]    [      ]    [(OPRT) ]
```

5. Press the **[SETING**] soft key.

6. Press the **SYSTEM** function key.

7. Press the [▷] key several times to display the **[FSSB]** soft key. Then, press the **[FSSB]** soft key to change the Amplifier Setting screen.

8. Press the **[AXIS]** soft key to display the Axis Setting screen.

```
AXIS SETTING

   AXIS      NAME      AMP      M1      M2      1-DSP      Cs      TNDM
    1         X       A2-L      0       0         0        0        0
    2         Y       A1-L      1       0         0        0        0
    3         Z       A3-M      0       0         0        0        0
    4         A       A3-L      2       0         0        0        0




>
MDI     ****    ***    ***                  13:11:56
  [  AMP  ]   [ AXIS  ]   [MAINTE ]   [        ]   [(OPRT) ]
```

9. Press the **[SETING]** soft key.

10. Enter input No. 1815#1=1 for the Y and A axes. The setting will be complete after you turn the CNC OFF and then ON.

Cs Axis Example

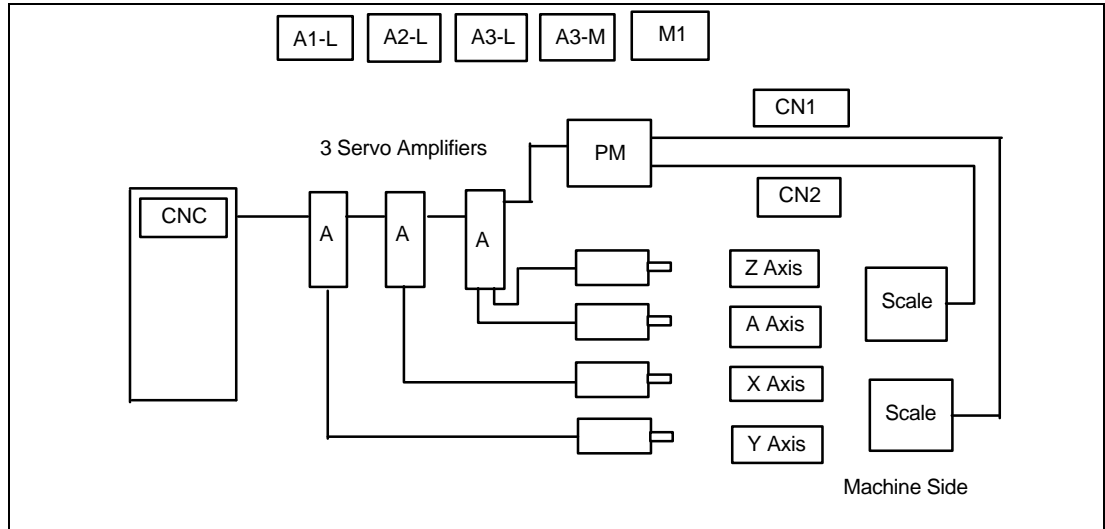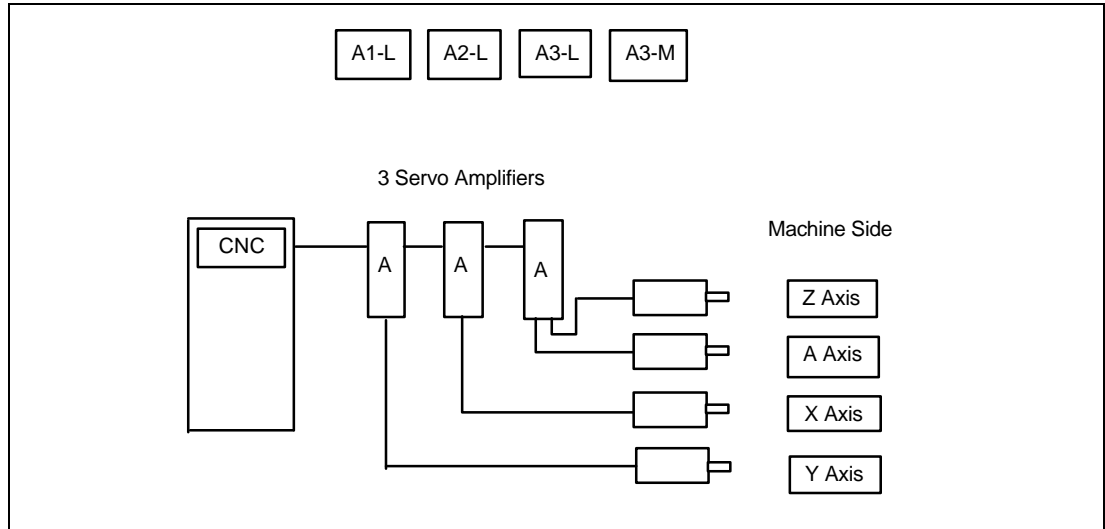1. Set parameter No. 1023 as follows:

   ```
   X  :   1
   Y  :   2
   Z  :   3
   A  :   4
   C  :  -1
   ```

2. Set the servo initial setting for each axis.

3. Turn power to the CNC OFF and then ON.

4. Enter the axis number on the Amplifier Setting screen.

```
AMPLIFIER SETTING

    NO.     AMP     SERIES    UNIT     CUR.    [AXIS]    NAME
    1       A1-L     α        SVM      40A     [ 2 ]      Y
    2       A2-L     α        SVM      40A     [ 1 ]      X
    3       A3-L     α        SVM      40A     [ 4 ]      A
    4       A3-M     α        SVM      80A     [ 3 ]      Z


    NO.     EXTRA   TYPE      PCB      ID



>
MDI    ****   ***   ***                    13:11:56
   [ AMP ]     [ AXIS ]    [MAINTE ]    [      ]    [(OPRT) ]
```

5.   Press the **[SETING**] soft key.

6.   Press the **SYSTEM** function key.

7.   Press the 　　▷　　 key several times to display the **[FSSB]** soft key. Then, press the **[FSSB]** soft key to change the Amplifier Setting screen.

8.   Press the **[AXIS]** soft key.

```
AXIS SETTING

  AXIS      NAME    AMP     M1     M2     1-DSP     Cs     TNDM
   1         X      A2-L    0      0       0         0      0
   2         Y      A1-L    0      0       0         0      0
   3         Z      A3-M    0      0       0         0      0
   4         A      A3-L    0      0       0         0      0
   5         C      --      0      0       0         1      0




>
MDI     ****    ***    ***                 13:11:56
   [  AMP  ]   [ AXIS  ]   [MAINTE ]   [      ]   [(OPRT) ]
```

9.   Press the **[SETING]** soft key. The setting will be complete after you turn the CNC OFF and then ON.

Tandem Control Example (Master = X Axis; Slave = A Axis)

A1-L   A2-L   A3-L   A3-M   A4--L

4 Servo Amplifiers   Machine Side

CNC   A   A   A   A   B Axis

                                                Z Axis

                                                A Axis

                                                X Axis

                                                Y Axis
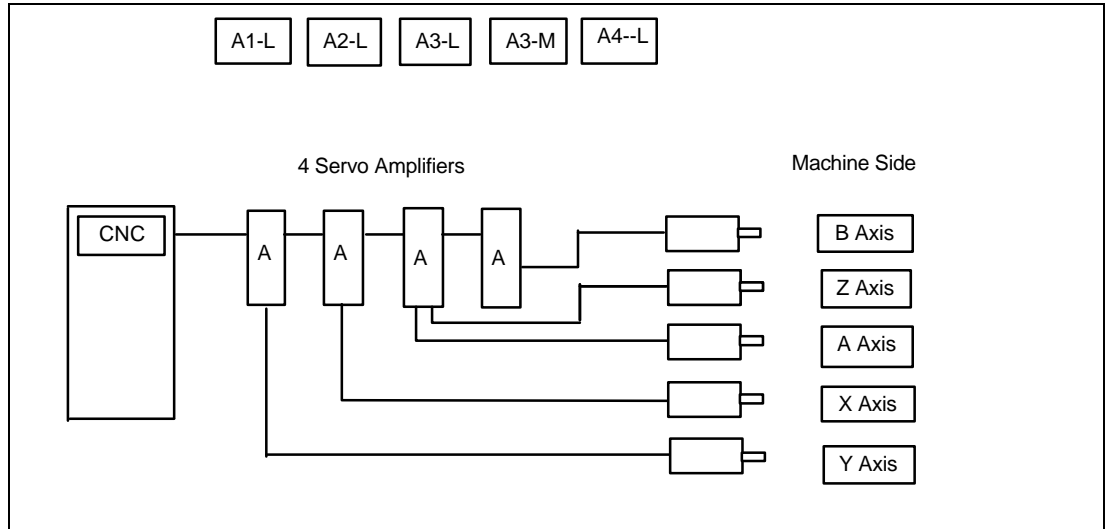
1. Set parameter No. 1023 as follows:

    ```
    X  :  1
    Y  :  3
    Z  :  5
    A  :  2
    B  :  4
    ```

2. Set the servo initial setting for each axis.

3. Turn power to the CNC OFF and then ON.
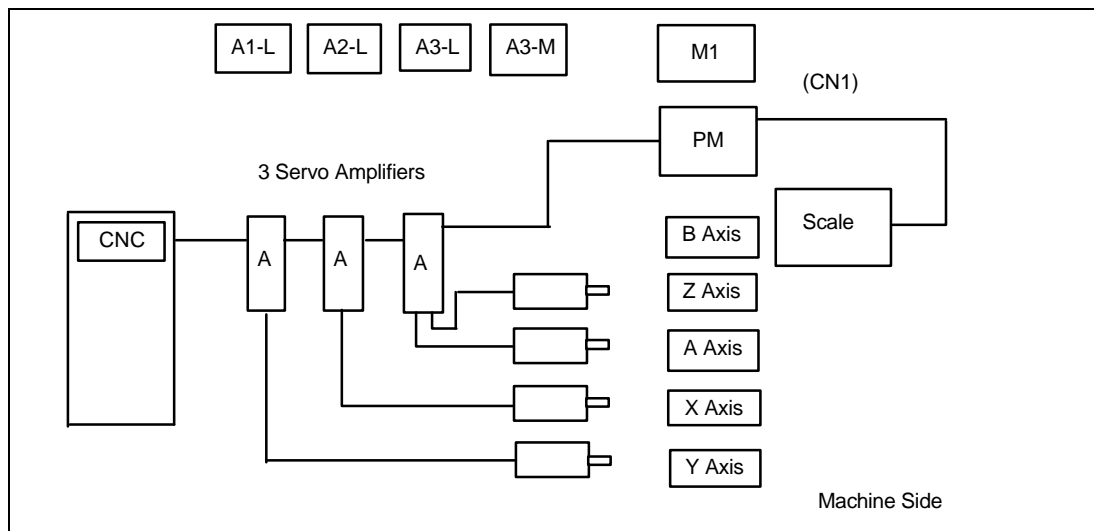
4. Enter the axis number on the Amplifier Setting screen.

```
AMPLIFIER SETTING

   NO.     AMP      SERIES     UNIT      CUR.     [AXIS]     NAME
    1      A1-L       α        SVM       40A      [ 2 ]       Y
    2      A2-L       α        SVM       40A      [ 1 ]       X
    3      A3-L       α        SVM       40A      [ 4 ]       A
    4      A3-M       α        SVM       80A      [ 3 ]       Z
    5      A4-L       α        SVM       40A      [ 5 ]       B



   NO.     EXTRA     TYPE      PCB       ID

>
MDI     ****    ***    ***                    13:11:56
  [ AMP  ]    [ AXIS  ]    [MAINTE ]    [       ]    [(OPRT) ]
```

5. Press the **[SETING**] soft key.

6. Press the **SYSTEM** function key.

7. Press the [▷] key several times to display the **[FSSB]** soft key. Then, press the **[FSSB]** soft key to change the Amplifier Setting screen.

8. Press the **[AXIS]** soft key.

```
AXIS SETTING

   AXIS      NAME      AMP      M1      M2      1-DSP      Cs      TNDM
    1         X        A2-L     0       0         0        0       1
    2         Y        A1-L     0       0         0        0       3
    3         Z        A3-M     0       0         0        0       0
    4         A        A3-L     0       0         0        0       2
    5         B        A4-L     0       0         0        0       4




>
MDI     ****    ***    ***                  13:11:56
   [  AMP   ]   [ AXIS  ]   [MAINTE ]   [       ]   [(OPRT) ]
```

9. Press the **[SETING]** soft key. The setting will be complete after you turn the CNC OFF and then ON.

Electrical Gear Box Function Example

In this example, the Electrical Gear Box works the A axis, and the Electrical Gear Box dummy works the B Axis (Parameter No. 7771=5).

```
                    Caution
```

For the Electrical Gear Box Function, set parameter No. 7771 first. Then, proceed with the Automatic setting on the FSSB Setting screen. If you do not set parameter No. 7771 first, the Automatic setting will not be done correctly.

1. Set parameter No. 1023 as follows:

```
X  :  1              (No. 7771=5)
Y  :  2              (No. 7772)
Z  :  5              (No. 7773)
A  :  3              (No. 2011#0=1) (A Axis, B Axis)
B  :  4
```

2. Set the servo initial setting for each axis.

3. Turn power to the CNC OFF and then ON.

4. Enter the axis number on the Amplifier Setting screen.

```
┌─────────────────────────────────────────────────────────────────────┐
│                                                                       │
│  AMPLIFIER SETTING                                                     │
│                                                                       │
│      NO.      AMP      SERIES      UNIT      CUR.     [AXIS]     NAME   │
│       1      A1-L        α         SVM       40A      [ 2 ]       Y     │
│       2      A2-L        α         SVM       40A      [ 1 ]       X     │
│       3      A3-L        α         SVM       40A      [ 4 ]       A     │
│       4      A3-M        α         SVM       80A      [ 3 ]       Z     │
│                                                                       │
│                                                                       │
│                                                                       │
│      NO.     EXTRA     TYPE       PCB       ID                         │
│       5       M1         A        0008     DETECTOR(4AXES)             │
│                                                                       │
│  >                                                                    │
│  MDI     ****   ***   ***                      13:11:56               │
│     [  AMP  ]     [ AXIS ]    [MAINTE ]    [       ]     [(OPRT) ]     │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
```

5. Press the **[SETING]** soft key.

6. Press the **SYSTEM** function key.

7. Press the ▷ key several times to display the **[FSSB]** soft key. Then, press the **[FSSB]** soft key to change the Amplifier Setting screen.

8. Press the **[AXIS]** soft key.

```
┌─────────────────────────────────────────────────────────────────────┐
│                                                                       │
│  AXIS SETTING                                                          │
│                                                                       │
│   AXIS     NAME     AMP      M1      M2     1-DSP     Cs      TNDM      │
│    1        X       A2-L      0       0       0        0        0       │
│    2        Y       A1-L      0       0       0        0        0       │
│    3        Z       A3-M      0       0       0        0        0       │
│    4        A       A3-L      0       0       0        0        0       │
│    5        B        —        1       0       0        0        0       │
│                                                                       │
│                                                                       │
│                                                                       │
│                                                                       │
│  >                                                                    │
│  MDI     ****   ***   ***                      13:11:56               │
│     [  AMP  ]   [ AXIS ]    [MAINTE ]    [       ]   [(OPRT) ]        │
│                                                                       │
└─────────────────────────────────────────────────────────────────────┘
```

9. Press the **[SETING]** soft key. The setting will be complete after you turn the CNC OFF and then ON.

Manual Setting

Parameter No. 1905, 1910 – 1919, 1936, and 1937 may be set manually.

Refer to Chapter 4, "Description of Parameters," for information on each parameter before attempting to change or set a parameter manually.

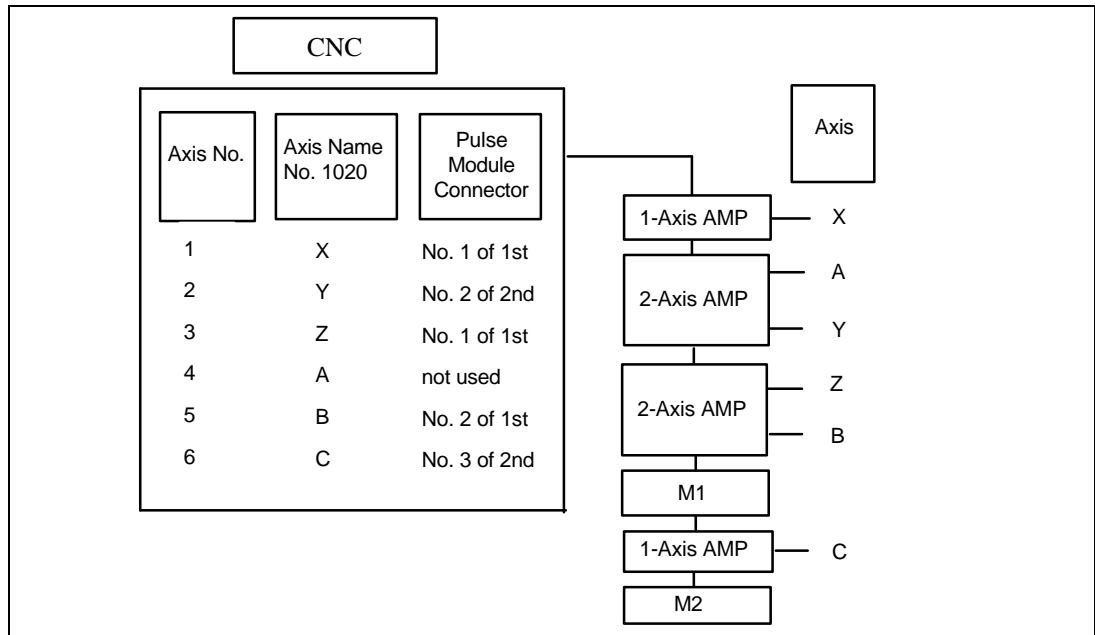An example using the Manual setting is provided on the next page.

Example: Axis Configuration and Parameter Settings

When parameter No. 1902 is set as shown below, you can then set the parameters for each axis manually:

```
Parameter No. 1902#0=1
Parameter No. 1902#1=0
```

Note

When parameter No. 1902 is set, parameter No. 1023, 1905, 1910 – 1919, 1936, and 1937 must be set manually.

	CNC					Axis
Axis No.	Axis Name No. 1020	Pulse Module Connector		1-Axis AMP	X	
1	X	No. 1 of 1st		2-Axis AMP	A	
2	Y	No. 2 of 2nd			Y	
3	Z	No. 1 of 1st		2-Axis AMP	Z	
4	A	not used			B	
5	B	No. 2 of 1st		M1		
6	C	No. 3 of 2nd		1-Axis AMP	C	
				M2		

No.	1902#0
	1

No.	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
	0	1	2	3	4	16	5	48	40	40

No.	1023	1905#0	1905#6	1905#7	1936	1937
X	1	0	1	0	0	0
Y	3	0	0	1	0	1
Z	4	1	0	1	0	0
A	2	1	0	0	0	0
B	5	0	1	0	1	0
C	6	1	0	1	0	2

Description of Parameters

Parameter No. 1902

No.	7	6	5	4	3	2	1	0
1902							ASIGN	FSBMD

Data Type: Bit

Parameter	Setting	Description
FSBMD	0	Automatic setting mode. After the axis information is entered on the FSSB Setting screen, parameter No. 1023, 1905, 1910 - 1919, 1936, and 1937 are set automatically.
	1	Manual setting mode. You must enter parameter No. 1023, 1905, 1910 - 1919, 1936, and 1937 manually.
ASIGN	0	Automatic setting is completed.
	1	Automatic setting is not completed. **Note:** When the automatic setting is done, this bit automatically becomes 1.

Parameter No. 1904

No.	7	6	5	4	3	2	1	0
1904								1DSP
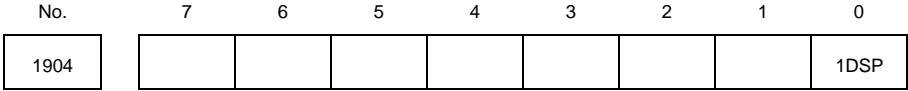
Data Type: Bit Axis

Parameter	Setting	Description
1DSP	0	An axis uses a DSP with another axis.
	1	An axis uses a DSP without any other axis (e.g., the learning control axis).

Note

Do not set this bit manually because this bit is set by the FSSB setting screens.
It is not necessary to set this bit when the FSSB setting screens are not used.

Parameter No. 1905

No.	7	6	5	4	3	2	1	0
1905	FSBM2	FSBM1						FSBSL
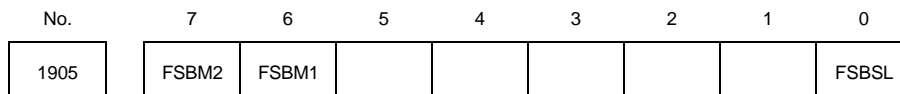
Data Type: Bit Axis

Parameter	Setting	Description
FSBSL	0	The servo data transmission interface is Fast type.
	1	The servo data transmission interface is Slow type.
FSBM1	0	The first pulse module is not used.
	1	The first pulse module is used.
FSBM2	0	The second pulse module is not used.
	1	The second pulse module is used.

Note

When parameter No. 1902#0=0, these bits are set automatically. When parameter No. 1902#0=1, these bits must be set manually. When using the pulse module, you must also set the connector number for parameter No. 1936 and 1937.

Interface Type

There are two types of interface (Fast and Slow) for transferring servo data. Each type **must** accept all of the following conditions:

- For a one-axis amplifier, either type (Fast or Slow) is accepted.

- For a two-axis amplifier, a combination of Fast-Fast cannot be used. Use Fast-Slow, Slow-Fast, or Slow-Slow.

- For a three-axis amplifier, the first and second axes are applied to a two-axis amplifier, and the third axis is applied to a one-axis amplifier.

- The axis whose value of parameter No. 1023 is odd uses the Fast type interface.

- The axis whose value of parameter No. 1023 is even can use only the Slow type interface.

- The EGB work axis, the learning control axis, the 125 µs current loop control axis, and the high-speed interface axis can use the Slow type.

Example for Figure 1905
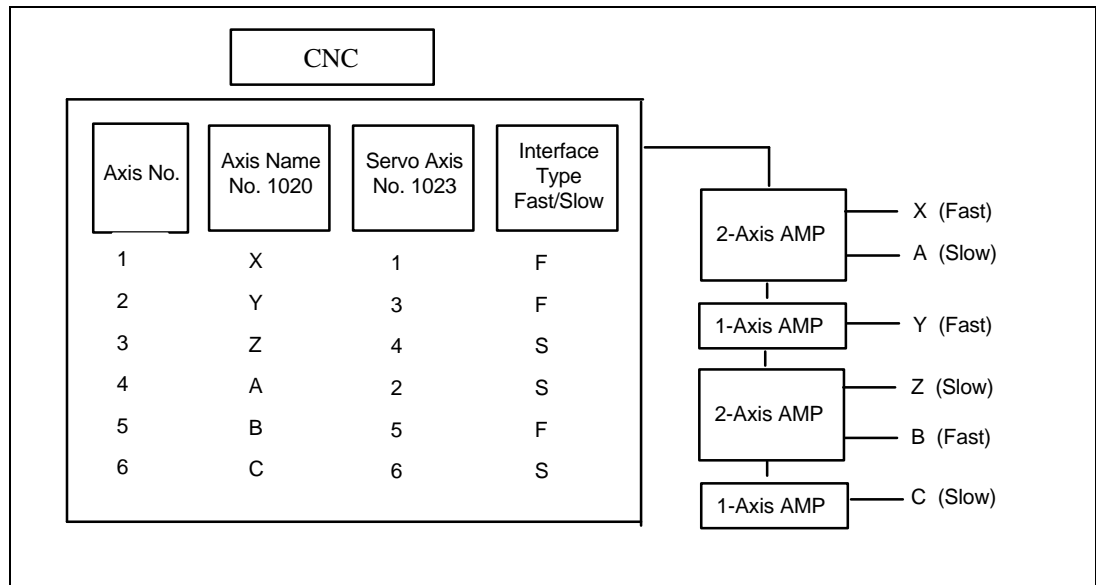
Parameter No. 1910 – 1919

No.

| 1910 | The value of the Address Conversion Table (ATR) for Slave No. 1 |

| 1911 | The value of the Address Conversion Table (ATR) for Slave No. 2 |

| 1912 | The value of the Address Conversion Table (ATR) for Slave No. 3 |

| 1913 | The value of the Address Conversion Table (ATR) for Slave No. 4 |

| 1914 | The value of the Address Conversion Table (ATR) for Slave No. 5 |

| 1915 | The value of the Address Conversion Table (ATR) for Slave No. 6 |

| 1916 | The value of the Address Conversion Table (ATR) for Slave No. 7 |

| 1917 | The value of the Address Conversion Table (ATR) for Slave No. 8 |

| 1918 | The value of the Address Conversion Table (ATR) for Slave No. 9 |

| 1919 | The value of the Address Conversion Table (ATR) for Slave No. 10 |

Data Type: Byte

Data Range: 0 - 7, 16, 40, 18

The ATR for each slave must be set. A slave consists of a servo amplifier and pulse module connected to the CNC by an optical cable. A 2-axis amplifier has two slaves, and a 3-axis amplifier has three slaves. Each slave is assigned a number, from 1 to 10, according to its distance from the CNC.
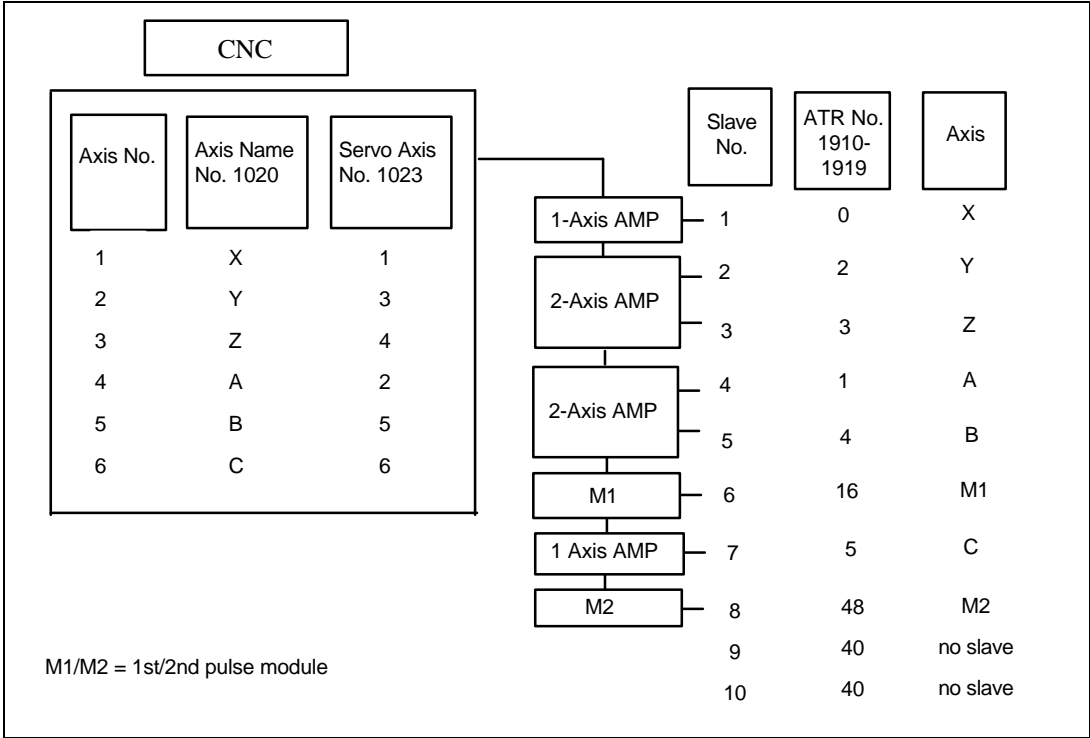
- For an amplifier, set the value which is one less than the value of parameter No. 1023.

- For a pulse module, set 16 for the first pulse module (closest to the CNC) and 48 for the second pulse module (farthest from the CNC).

- If there is no slave, set 40.

- For the Electric Gear Box function, the EGB dummy axis, designated in parameter No. 7771, does not require an amplifier. However, do not set 40. Instead, set the values which is one smaller than the value of parameter No. 1023 for the EGB axis.
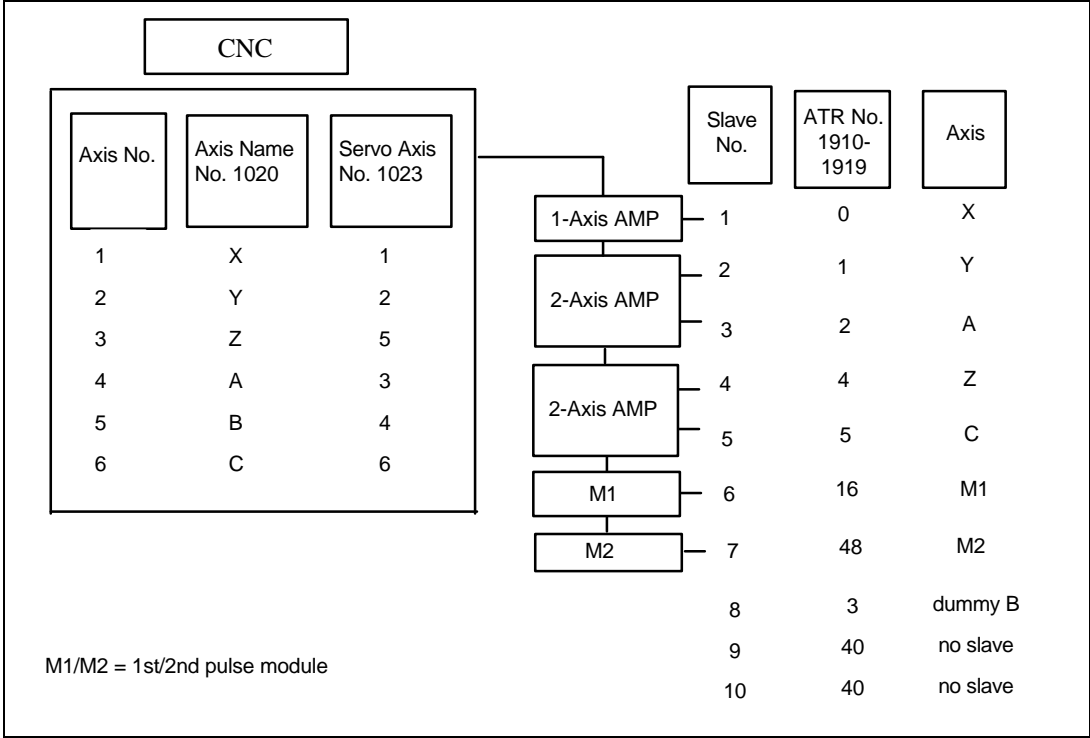
Note

When parameter No. 1902#0=0, these bits are set automatically. When parameter No. 1902#0=1, these bits must be set manually.

Examples of Axis Configuration and Parameter Settings

Axis No.	Axis Name No. 1020	Servo Axis No. 1023		Slave No.	ATR No. 1910-1919	Axis
			CNC			
			1-Axis AMP	1	0	X
1	X	1	2-Axis AMP L	2	1	A
2	Y	3	2-Axis AMP M	3	2	Y
3	Z	4	2-Axis AMP L	4	3	Z
4	A	2	2-Axis AMP M	5	4	B
5	B	5	M1	6	16	M1
6	C	6	1 Axis AMP	7	5	C
			M2	8	48	M2
				9	40	no slave
				10	40	no slave

M1/M2 = 1st/2nd pulse module

CNC

Axis No.	Axis Name No. 1020	Servo Axis No. 1023
1	X	1
2	Y	3
3	Z	4
4	A	2
5	B	5
6	C	6

(module)	Slave No.	ATR No. 1910-1919	Axis
1-Axis AMP	1	0	X
2-Axis AMP	2	2	Y
	3	3	Z
2-Axis AMP	4	1	A
	5	4	B
M1	6	16	M1
1 Axis AMP	7	5	C
M2	8	48	M2
	9	40	no slave
	10	40	no slave

M1/M2 = 1st/2nd pulse module

Example: Electronic Gear Box (EGB) Function

CNC

Axis No.	Axis Name No. 1020	Servo Axis No. 1023
1	X	1
2	Y	2
3	Z	5
4	A	3
5	B	4
6	C	6

(module)	Slave No.	ATR No. 1910-1919	Axis
1-Axis AMP	1	0	X
2-Axis AMP	2	1	Y
	3	2	A
2-Axis AMP	4	4	Z
	5	5	C
M1	6	16	M1
M2	7	48	M2
	8	3	dummy B
	9	40	no slave
	10	40	no slave

M1/M2 = 1st/2nd pulse module

Parameter No. 1920 – 1929

No.

1920	Axis number for Slave No. 1 (for the FSSB setting screens)
1921	Axis number for Slave No. 2 (for the FSSB setting screens)
1922	Axis number for Slave No. 3 (for the FSSB setting screens)
1923	Axis number for Slave No. 4 (for the FSSB setting screens)
1924	Axis number for Slave No. 5 (for the FSSB setting screens)
1925	Axis number for Slave No. 6 (for the FSSB setting screens)
1926	Axis number for Slave No. 7 (for the FSSB setting screens)
1927	Axis number for Slave No. 8 (for the FSSB setting screens)
1928	Axis number for Slave No. 9 (for the FSSB setting screens)
1929	Axis number for Slave No. 10 (for the FSSB setting screens)

Data Type: Byte

Data Range: 0 - 8

The axis number for each slave is set.

Note

Do not set these parameters manually because these parameters are set with the FSSB setting screens. It is not necessary to set these parameters when the FSSB setting screens are not used.

Parameter No. 1931 – 1932

No.

| 1931 | Connector number for the first pulse module (for the FSSB setting screens) |

| 1932 | Connector number for the second pulse module (for the FSSB setting screens) |

Data Type: Byte Axis

Data Range: 0 - the number of each pulse module connectors

When the pulse module is used, the connector number is set.

Note

Do not set these parameters manually because these parameters are set with the FSSB setting screens. It is not necessary to set these parameters when the FSSB setting screens are not used.

Parameter No. 1933

No.

| 1933 | Cs contour control axis (for the FSSB setting screens) |

Data Type: Byte Axis

Data Range: 0, 1

When the Cs contour control is used, set 1 for the Cs contour control axis.

Note

Do not set these parameters manually because these parameters are set with the FSSB setting screens. It is not necessary to set these parameters when the FSSB setting screens are not used.

Parameter No. 1934

No.

| 1934 | Tandem control master/slave axis number (for the FSSB setting screens) |

Data Type: Byte Axis

Data Range: 0 - 8

When tandem control is used, assign two consecutive numbers, one odd and the other even, to the master and slave axes.

Note

Do not set these parameters manually because these parameters are set with the FSSB setting screens. It is not necessary to set these parameters when the FSSB setting screens are not used.

Parameter No. 1936 – 1937

No.

| 1936 | Connector number for the first pulse module |

| 1937 | Connector number for the second pulse module |

Data Type: Byte Axis

Data Range: 0 - 7

For a pulse module, set a value which is one less than the connector number for each axis. Use zero (0) for an axis where the pulse module is not used.

You can use any combination of axis and connector, but you must use the lowest available number. For example, you cannot use Connector No. 3 without using No. 2.

Example:

Axis	1st Module Connector No.	2nd Module Connector No.	No. 1936	No. 1937	No. 1905 (#7, #6)
X	1	not used	0	0	0, 1
Y	not used	2	0	1	1, 0
Z	not used	1	0	0	1, 0
A	not used	not used	0	0	0, 0
B	2	not used	1	0	0, 1
C	not used	3	0	2	1, 0

Note

When parameter No. 1902#0=0, these bits are set automatically. When parameter No. 1902#0=1, these bits must be set manually.

Chapter 5

Troubleshooting

Pulse Coder

Number of NC Alarms	Message	Meaning
360	n axis : abnormal checksum (int)	Checksum alarm occurred in the pulse coder (int).
361	n axis : abnormal phase data (int)	Abnormal phase data alarm occurred in the pulse coder (int).
362	n axis : abnormal rev. data (int)	Abnormal rev. data alarm occurred in the pulse coder (int).
363	n axis : abnormal clock (int)	Clock alarm occurred in the pulse coder (int).
364	n axis : soft phase alarm (int)	Internal pulse coder data is abnormal.
365	n axis : broken LED (int)	Pulse coder LED is abnormal
366	n axis : pulse miss (int)	Pulse miss alarm occurred in the pulse coder (int).
367	n axis : count miss (int)	Count miss alarm occurred in the pulse coder (int).
368	n axis : serial data error (int)	Serial data was not received from the internal pulse coder.
369	n axis : data transmission error (int)	CRC error or stop bit error occurred in the pulse coder (int).
380	n axis : broken LED (ext)	External pulse coder LED is abnormal.
381	n axis : abnormal phase (ext lin)	Abnormal phase data alarm occurred in the external linear scale.
382	n axis : count miss (ext)	Count miss alarm occurred in the external pulse coder.
383	n axis : pulse miss (ext)	Pulse miss alarm occurred in the external pulse coder.
384	n axis : soft phase alarm (ext)	External pulse coder data is abnormal.
385	n axis : serial data error (ext)	Serial data was not received from the external pulse coder.
386	n axis : data transmission error (ext)	External pulse coder data is CRC error or stop bit error

Servo Amplifier

Number of NC Alarms	Message	Meaning
430	n axis : servo motor overheat	Servo motor overheated.
431	n axis : cnv. overload (OH)	Temperature of the converter (PSM) is abnormally high.
432	n axis : cnv. lowvolt con./powfault (LV)	Control circuit power supply is abnormally low.
433	n axis : cnv. low volt DC link (DCLV)	DC voltage of the voltage main circuit power supply is abnormally low, or the outer circuit breaker trips.
436	n axis : softthermal (OVC)	Overheat alarm detected by the software.
438	n axis : inv. abnormal current (HC)	Abnormal over-current flowed into the servo amplifier unit.
439	n axis : overvolt power (HV)	The DC voltage of the main circuit power supply is abnormally high.
440	n axis : cnv. ex deceleration pow. (DCOH)	The average regenerative discharge energy is too high (too frequent acceleration / deceleration).
441	n axis : abnormal current offset	Current feedback is abnormal.
443	n axis : cnv. cooling fan failure (FAL)	The fan, built into the servo amplifier unit, stopped.
445	n axis : soft disconnection alarm	Disconnection alarm detected by software.
446	n axis : hard disconnection alarm	Disconnection alarm detected by hardware (see note below).
447	n axis : hard disconnection (ext)	External pulse coder cable is disconnected.
448	n axis : unmatched feedback alarm	Feedback data of pulse coder was not matched to its external pulse coder.
460	n axis : FSSB disconnection	FSSB communication is open: 1. Optical fiber cable is open or disconnected. 2. Control power supply shut down. 3. LV alarm for the control power supply occurred.
461	n axis : illegal amp interface	Both axes are Fast interface in a 2-axis amplifier.
462	n axis : send CNC data failed	The slave side amplifier did not receive normal data because of an FSSB communication error.
463	n axis : send slave data failed	The servo side amplifier did not receive normal data because of an FSSB communication error.
464	n axis : write ID data failed	The amplifier cannot write maintenance data on the maintenance screen.
465	n axis : read ID data failed	The amplifier cannot read maintenance data on the maintenance screen.
466	n axis : motor / amp combination	The value of the amplifier maximum current is illegal for the motor maximum current.
467	n axis : illegal setting of axis	The amplifier is set to two axes on the Axis Setting screen, but the following is not possible: 1. Learning control (PRM2008#5=1). 2. High current loop (PRM2004#0=1). 3. High interface axis (PRM2005#4=1)

Note: Hard disconnection alarm has not occurred to the Series 16C or 16*i*.
The possibility of FBAL (ALARM 1 Bit 1=1).
External hardware disconnection FBAL (ALARM 1 Bit 1=1, ALARM 2 Bit 7=1, Bit 4=1.
Software disconnection (ALARM 1 Bit 1=1).
Count miss error (ALARM 1 Bit 1=1, ALARM 2 Bit 7=1, ALARM 3 Bit 3=1).

P/S Alarm

Number of NC Alarms	Message	Meaning
5134	FSSB : open ready time out	FSSB is not ready when power is turned ON.
5135	FSSB : error mode	FSSB is abnormal.
5136	FSSB : number of amps is small	The number of the amplifier is smaller than the setting number.
5137	b : configuration error	FSSB has a configuration error.
5138	FSSB : axis setting not complete	The axis is not set in Auto mode.
5197	FSSB : open time out	FSSB is not communicating.
5198	FSSB : ID data not read	ID data was not read.

Frequently Asked Setup Questions

Question / Problem	Solution

Cannot input the parameter in MDI mode.	Remember that you cannot input a parameter in MDI mode unless you cycle power , OFF and ON.
	
	After turning power OFF and then ON and disconnecting the optical cable on the CNC side, check the following items:
	
	1. Check parameter No. 1902:
	
	   A. If No. 1902=00000000, set No. 1905=00000000 and No. 1910 - 1919=0.
	
	   B. If No. 1902=00000001 or 00000010, set No. 1905 and No. 1910 - 1919 to the correct value.
	
	2. If No. 1815 B1=1, check No. 1910 - 1919. If the value is not 16 or 48, set No. 1815 B1=0.
	
	3. Check that the FSSB Ready to Operate green LED is ON. If not, check the power to the amplifier and the connection of the optical cable.

Although the outer detector is recognized on the FSSB, the feedback pulses are not correct.	Check parameter No. 1902. 1. If No. 1902=00000001, set No. 1905=01000000 or 10000000. Also set No. 1910 - 1919, 1936, and 1937 to the correct value. 2. If No. 1902=00000010, set the M0 and M1 connector numbers on the FSSB Axis screen.
Cannot input the M1 or M2 connector number on the FSSB Axis screen.	Check the ID of the pulse module on the FSSB screen. If the ID is not read correctly, check the connection of the separate detector interface unit.
The setting value on the FSSB screen changes the former setting value after turning power OFF/ON.	After inputting the value, remember to press the **[SETING]** soft key on both the Amplifier and Axis Setting screens.
P/S Alarm 5138 occurred. (FSSB : axis set not complete)	Automatic setting has not completed yet. After inputting the value, remember to press the **[SETING]** soft key on both the Amplifier and Axis Setting screens. When using the manual setting, remember to set the parameters for No. 1902, 1905, 1910 - 1919, 1936, and 1937 to 0.
SV Alarm 466 occurred. (n axis : motor / amp combination)	1. Check the combination between the motor and amp. 2. Check the current value in parameter No. 2165 and the FSSB Amplifier screen. 3. Load the servo initial parameter.
System Alarm 920 occurred after changing parameter No. 1902 and turning power OFF and then ON.	1. Disconnect the optical cable on the CNC side. 2. Turn power OFF and ON. 3. Set parameter No. 1902, 1905, 1910 - 1919, 1936, and 1937 to 0.
FSSB Automatic setting was not done successfully in a two-path control CNC.	Change CNC software (B0F1 / B1F1 / BDF1 / BEF1) version 04 or later.
The setting which uses the axis of another path in the two-path control CNC was not done successfully.	Change CNC software (B0F1 / B1F1 / BDF1 / BEF1) version 04 or later.

Appendix	*Separate Type Detector Interface Unit*
A	

Appendix A contains A-73402E, *Separate Type Detector Interface Unit Connecting Manual (Preliminary).*

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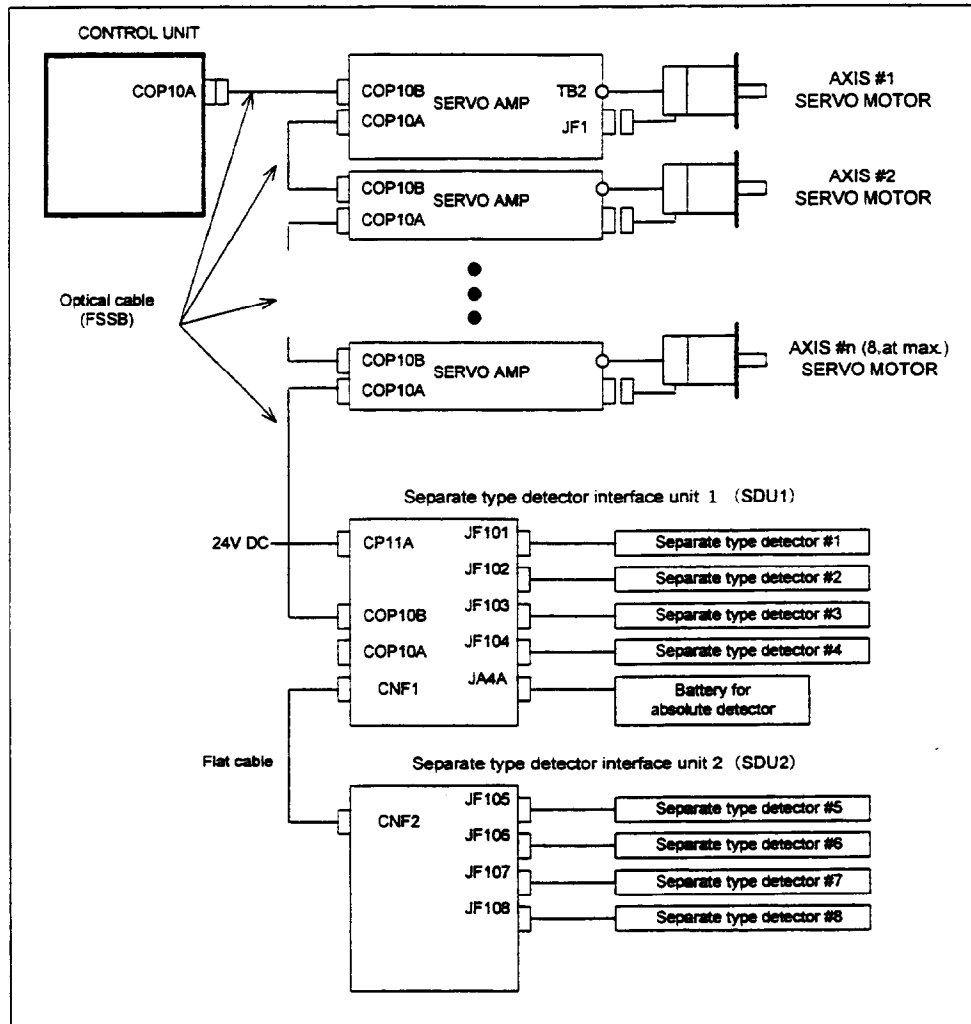# Separate type detector interface unit Connecting manual (PRELIMINARY)

Contents

FANUC

EDIT.	DATE	DESIG.	DESCRIPTION			
				TITLE Separate type detector interface unit Connecting manual (PRELIMINARY)		
01	96.12.25	Y. Kubo		DRAW. NO. A-7 3 4 0 2 E		CUST.
EDIT.	DATE	DESIG.	DESCRIPTION	FANUC LTD	SHEET	001/16

1.Outline.

This material explains the method of connecting of the separate type detector interface unit for the FANUC serial servo bus (FSSB).

2.Types of the separate type detector interface unit.

Separate type detector interface unit 1 (SDU1)	This unit is necessary when the machine is equipped with the separate type detectors. The SDU1 has 4 detector interfaces.
Separate type detector interface unit 2 (SDU2)	This unit is optional and it has additional 4 detector interfaces. It should be used with SDU1. The cable to connect SDU1 and SDU2 are necessary.

3.Supply Voltage and Current.

24V DC (±10%)   0.9A   (When only SDU1 is used.)
                   1.5A   (When SDU1 and SDU2 are used.)

4.Heat loss.

9W (When only SDU1 is used.)
14W(When SDU1 and SDU2 are used.)

Note
    The heat loss of detectors is not included .
    5V DC power for detectors is available from the SDU. Its allowed maximum current is 0.35A per a detector.

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5.Connection diagram.

The SDU is connected to the CNC control unit via optical cable of "FANUC serial servo bus (FSSB)". Another units like servo amplifiers are also connected to the FSSB. In above figure, the SDU is connected as the last slave of the FSSB. Another configuration is also possible, that is the SDU can be inserted between the CNC control unit and the servo amplifier or between two servo amplifiers.

The signal from the separate type detector of the axis #1 is usually connected to JF101. In the same manner, signals corresponding to the axis #2 ~ #8 are connected to JF102 ~ JF108 respectively.
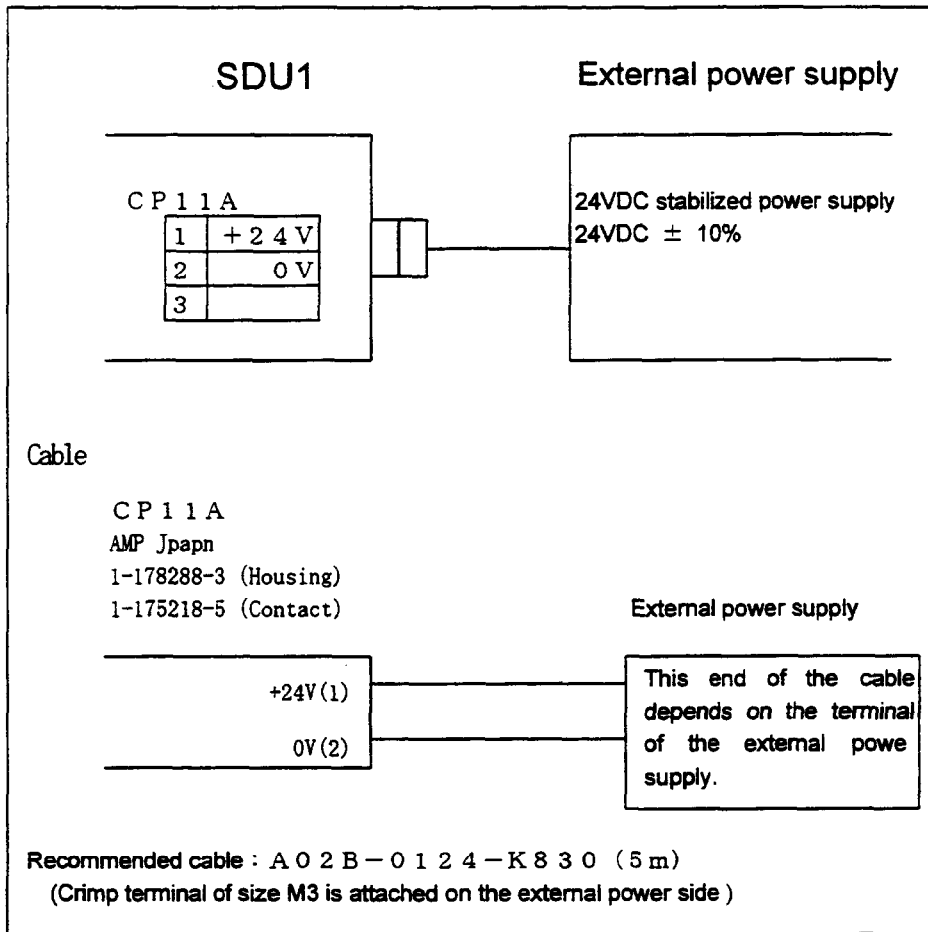
If necessary, the relationship between connectors JF101 ~ JF108 and axes numbered 1 ~ 8 can be varied. In above figure, when the axes numbered 2, 4, 6, 8 have the separate type detector, for example, the SDU2 does not need to be used by assigning the connector JF101 ~ JF104 of the SDU1 to the axis 2, 4, 6, 8. Please refer to the corresponding manual of the CNC controller for how to change the assignment.

				TITLE		
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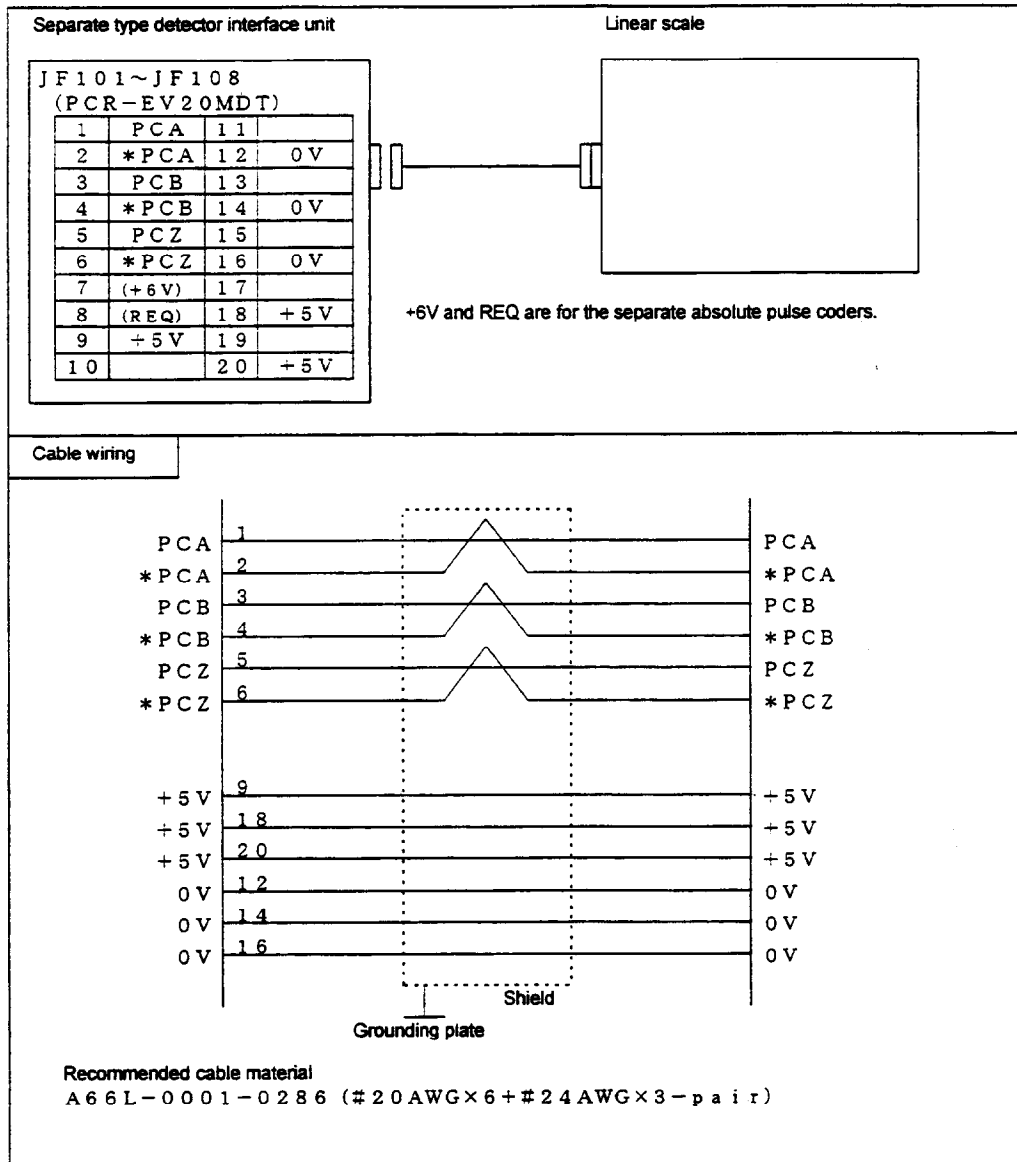# 6.Details of connection.

6.1.Connection of power line

Supply power (24V DC) to the SDU1 from an external source.

SDU1   External power supply

CP11A

1	+24V
2	0V
3	

24VDC stabilized power supply
24VDC ± 10%

Cable

CP11A
AMP Jpapn
1-178288-3 (Housing)
1-175218-5 (Contact)

External power supply

+24V(1)

0V(2)

This end of the cable depends on the terminal of the external powe supply.

Recommended cable : A02B－0124－K830 (5m)
(Crimp terminal of size M3 is attached on the external power side)

The power of 24V DC that is supplied into CP11A can be branched out from CP11B.
Pins assignment ,connector housing, contacts are same as that of CP11A.

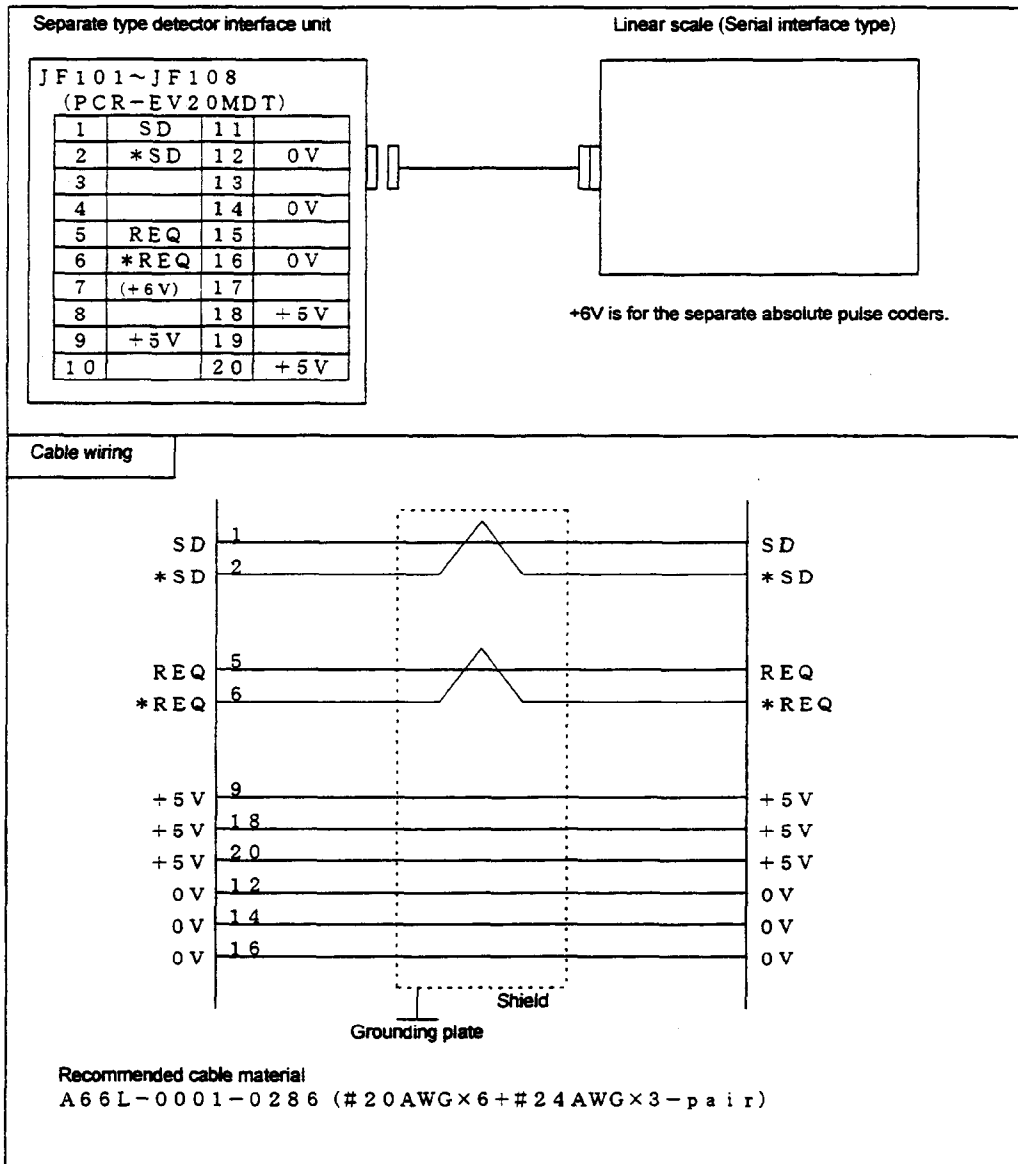|				TITLE		
				DRAW. NO. A-73402E		CUST.
EDIT.	DATE	DESIG.	DESCRIPTION	FANUC LTD	SHEET	004/

6.2.Linear scale interface (Parallel interface)

Separate type detector interface unit   Linear scale

JF101~JF108
(PCR-EV20MDT)

1	P C A	1 1	
2	*P C A	1 2	0 V
3	P C B	1 3	
4	*P C B	1 4	0 V
5	P C Z	1 5	
6	*P C Z	1 6	0 V
7	(+6 V)	1 7	
8	(R E Q)	1 8	+ 5 V
9	+ 5 V	1 9	
1 0		2 0	+ 5 V

+6V and REQ are for the separate absolute pulse coders.

Cable wiring


```
P C A      1                          P C A
*P C A     2                          *P C A
P C B      3                          P C B
*P C B     4                          *P C B
P C Z      5                          P C Z
*P C Z     6                          *P C Z

+ 5 V      9                          + 5 V
+ 5 V      18                         + 5 V
+ 5 V      20                         + 5 V
0 V        12                         0 V
0 V        14                         0 V
0 V        16                         0 V
```

Shield
Grounding plate

Recommended cable material
A66L-0001-0286 (#20AWG×6+#24AWG×3-pair)

The power of +5V DC is available as the supplying power of the linear scales.
Maximum allowed current of +5V DC is 0.35A per a scale.

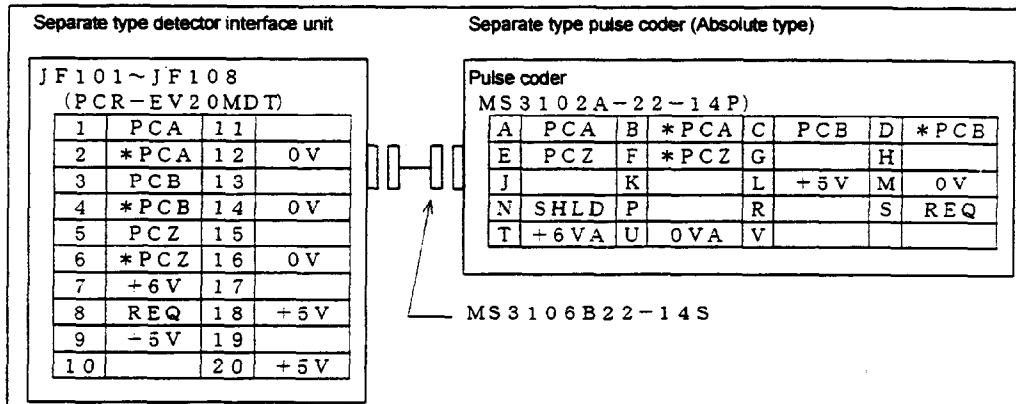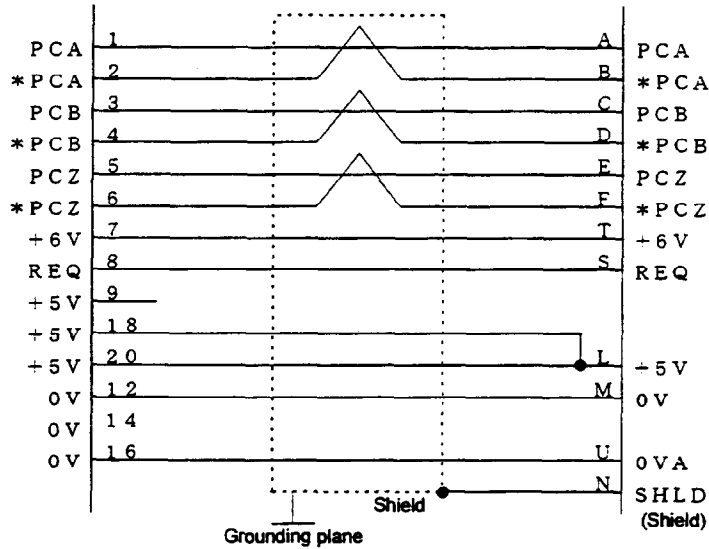|				TITLE		
				DRAW. NO. A-73402E		CUST.
EDIT.	DATE	DESIG.	DESCRIPTION	FANUC LTD	SHEET	005/

6.3.Linear scale interface (Serial interface)

Separate type detector interface unit

Linear scale (Serial interface type)

JF101~JF108 (PCR-EV20MDT)			
1	SD	11	
2	*SD	12	0V
3		13	
4		14	0V
5	REQ	15	
6	*REQ	16	0V
7	(+6V)	17	
8		18	+5V
9	+5V	19	
10		20	+5V

+6V is for the separate absolute pulse coders.

Cable wiring

```
SD    1 ─────────────────── SD
*SD   2 ─────────────────── *SD

REQ   5 ─────────────────── REQ
*REQ  6 ─────────────────── *REQ

+5V   9 ─────────────────── +5V
+5V  18 ─────────────────── +5V
+5V  20 ─────────────────── +5V
0V   12 ─────────────────── 0V
0V   14 ─────────────────── 0V
0V   16 ─────────────────── 0V
```
Shield
Grounding plate

Recommended cable material
A66L-0001-0286 (#20AWG×6+#24AWG×3-pair)

The power of +5V DC is available as the supplying power of the linear scales. Maximum allowed current of +5V DC is 0.35A per a scale.

6.4. Separate type pulse coder interface (Absolute type)

Separate type detector interface unit

JF101~JF108
(PCR-EV20MDT)

1	PCA	11	
2	*PCA	12	0V
3	PCB	13	
4	*PCB	14	0V
5	PCZ	15	
6	*PCZ	16	0V
7	+6V	17	
8	REQ	18	+5V
9	-5V	19	
10		20	+5V

Separate type pulse coder (Absolute type)

Pulse coder
MS3102A-22-14P)

A	PCA	B	*PCA	C	PCB	D	*PCB
E	PCZ	F	*PCZ	G		H	
J		K		L	+5V	M	0V
N	SHLD	P		R		S	REQ
T	+6VA	U	0VA	V			

MS3106B22-14S

Cable wiring

Shield
Grounding plane

SHLD (Shield)

Recommended cable material
A66L-0001-0286 (#20AWG×6+#24AWG×3-pair)

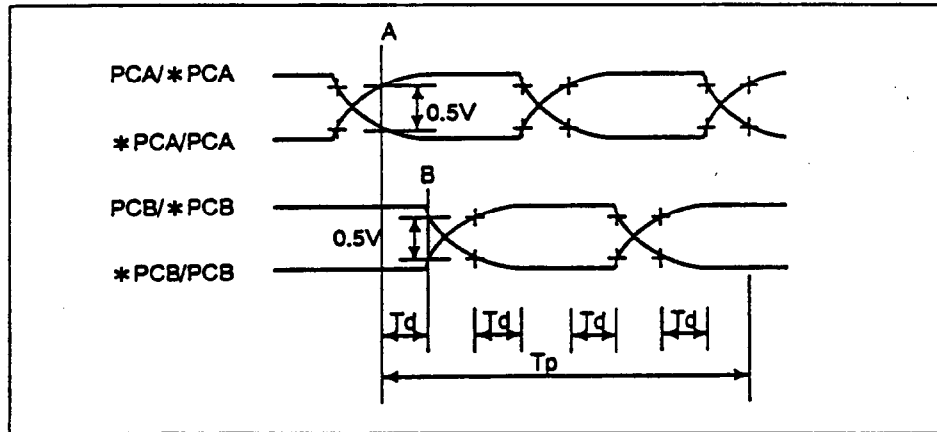|				TITLE		
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6.5.Separate type pulse coder interface (Incremental type)

Separate type detector interface unit	Separate type pulse coder (Incremental type)

JF101~JF108
(PCR-EV20MDT)

1	PCA	11	
2	*PCA	12	0V
3	PCB	13	
4	*PCB	14	0V
5	PCZ	15	
6	*PCZ	16	0V
7	(+6V)	17	
8	(REQ)	18	+5V
9	+5V	19	
10		20	+5V

Pulse coder
MS3102A-20-29P)

A	PCA	B	PCB	C	+5V	D	*PCA
E	*PCB	F	PCZ	G	*PCZ	H	SHLD
J	+5V	K	+5V	L		M	
N	0V	P	0V	R		S	
T	0V						

MS3106B20-29SW

+6V and REQ are not used.

Cable wiring

Detector side	Pin		Pin	Coder side
PCA	1		A	PCA
*PCA	2		D	*PCA
PCB	3		B	PCB
*PCB	4		E	*PCB
PCZ	5		F	PCZ
*PCZ	6		G	*PCZ
+5V	9		C	+5V
+5V	18		I	+5V
+5V	20		K	+5V
0V	12		N	0V
0V	14		P	0V
0V	16		T	0V
			H	SHLD (Shield)

Shield

Grounding plate

Recommended cable material
A66L-0001-0286 (♯20AWG×6+♯24AWG×3-pair)

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6.6.Input signal requirements

(1) A and B phase signal input

This is a method to input position information by the mutual 90 degree phase slip of A and B phase signals. Detection of the position is performed with the state in which the B phase is leading taken as a shift in the plus direction, and the state in which the A phase is leading as a shift in the minus direction.
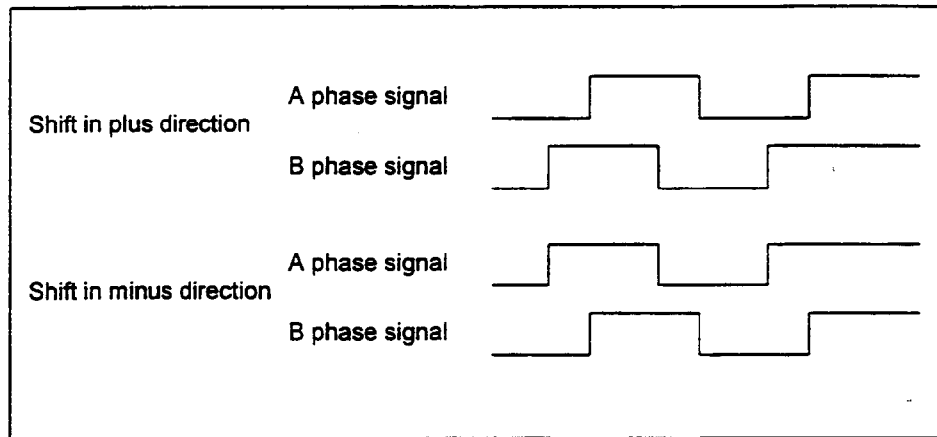
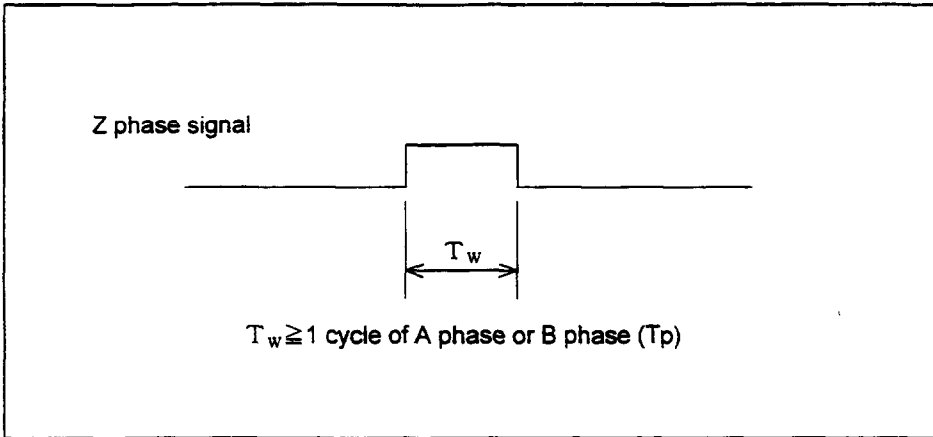### (2)Phase difference and minimum repeat frequency

The minimum value of Td in above diagram is

$$Td \geqq 0.15\ \mu sec$$

The period and pulse width of the signals must be long enough to satisfy the above requirements.

EDIT.	DATE	DESIG.		DESCRIPTION	TITLE			
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					FANUC LTD		SHEET	009/

(3) Z phase signal input

For the Z phase signal (1 rotation signal), a signal width of more than 1 cycle of the A phase or B phase signals is necessary.

Z phase signal

$$T_w$$

$$T_w \geqq 1 \text{ cycle of A phase or B phase (Tp)}$$

6.7. Connecting the battery for the separate type absolute pulse coder

Separate type detector interface unit 1 (SDU1)   Battery case

JA4A
PCR−EV20MDT)

1		11	
2		12	
3	0 V	13	
4		14	
5		15	
6		16	
7	÷6 V	17	
8		18	
9		19	
10		20	

M3 terminal

+	−
÷ 6 V	0 V

Cable wiring

+ 6 V — 7 ———————————— − — + 6 V
0 V — 3 ———————————— — — 0 V

Recommended cable material
$\geqq 0.2 \text{mm}^2 (7 / 0.18)$
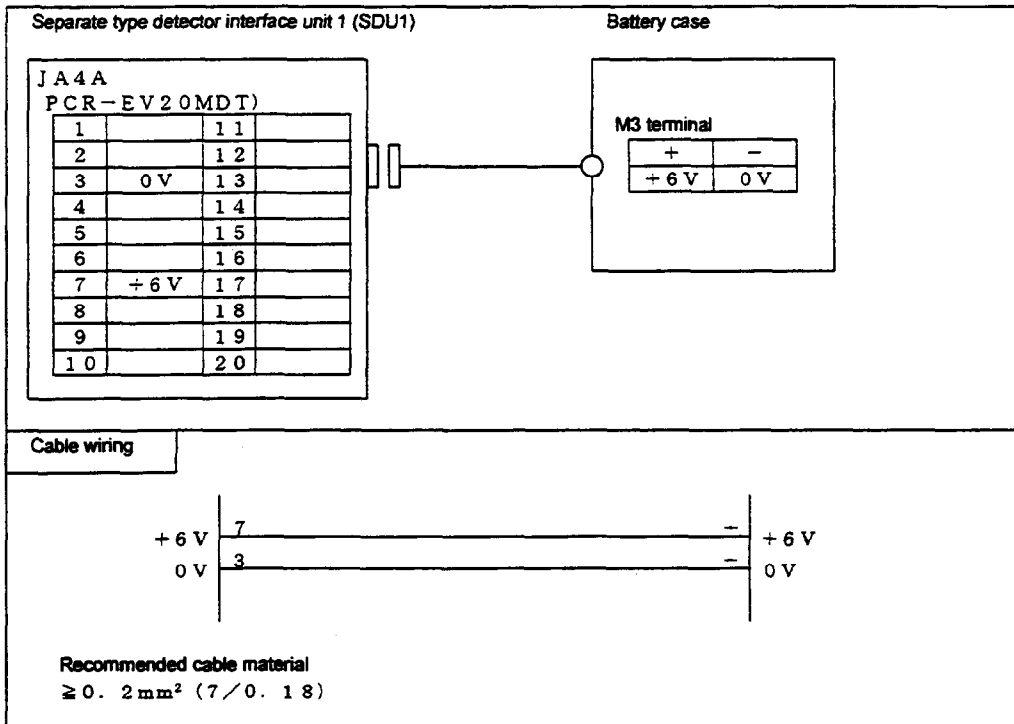
EDIT.	DATE	DESIG.		DESCRIPTION	TITLE		
					DRAW. NO. A-73402E		CUST.
					FANUC LTD	SHEET	010/

6.8.Connecting SDU1 and SDU2

SDU1 and SDU2 are connected by a flat cable. The maximum length of the flat cable is 100mm.

View from the upper side of the SDU.

SDU1   SDU2

Cabinet wall

CNF1   CNF2

Cable marking

Connector marking "▼"   Connector marking "▼"
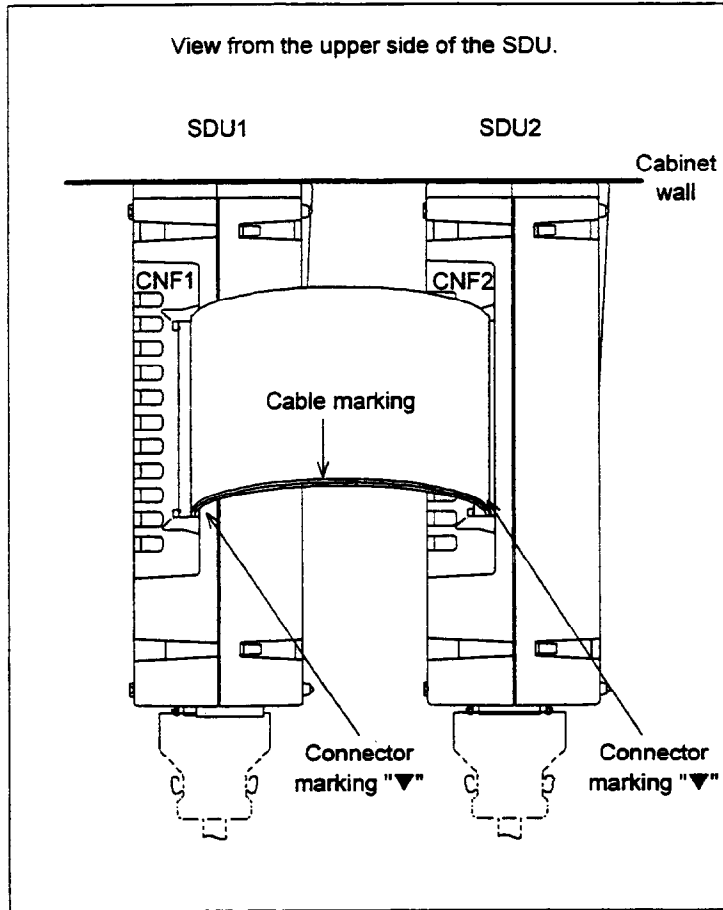
The flat cable should be ordered together with SDU1 and SDU2.

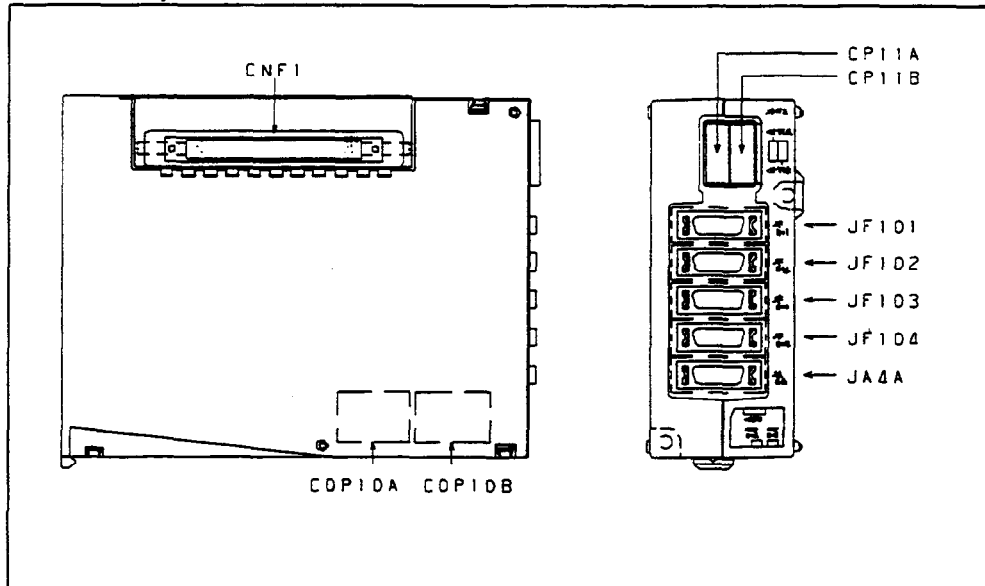|				TITLE		
				DRAW. NO. A-7 3 4 0 2 E		CUST.
EDIT.	DATE	DESIG.	DESCRIPTION	FANUC LTD	SHEET	011/

7.Assembly.

7.1.Requirement on assembling the units

(1) This unit should be installed in a cabinet that is always completely closed.

(2) This unit should be fixed on the vertical wall in the cabinet. Clearances of 100mm or more both above and below the units are required.
Equipment radiating too much heat must not be put below the unit.

(3) When both SDU1 and SDU2 are installed, they should be configured as shown in the figure below so that the flat cable should not cover the ventilation holes of the SDU1. Maximum length of flat cable is 100mm.

Ventilation holes   Flat cable

Top

↑

↓

Bottom

SDU1   SDU2
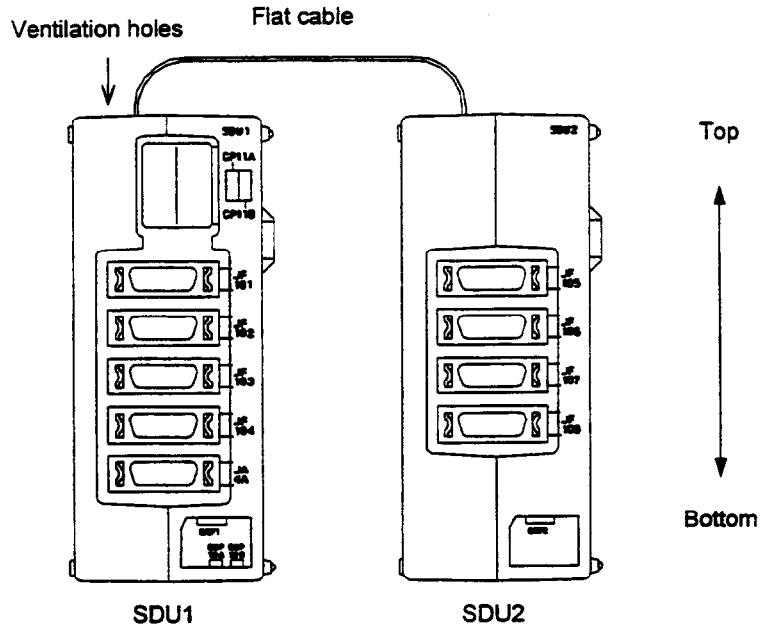
				TITLE	
				DRAW. NO. A-73402E	CUST.
EDIT.	DATE	DESIG.	DESCRIPTION	FANUC LTD	SHEET 012/

7.2.Size of the unit

[Unit : mm]
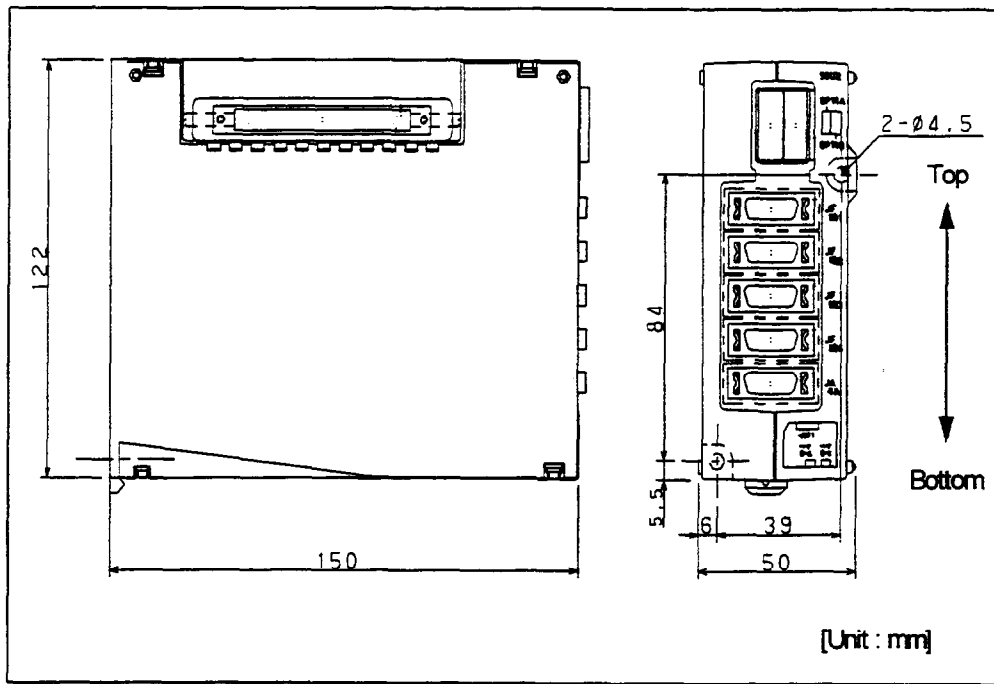
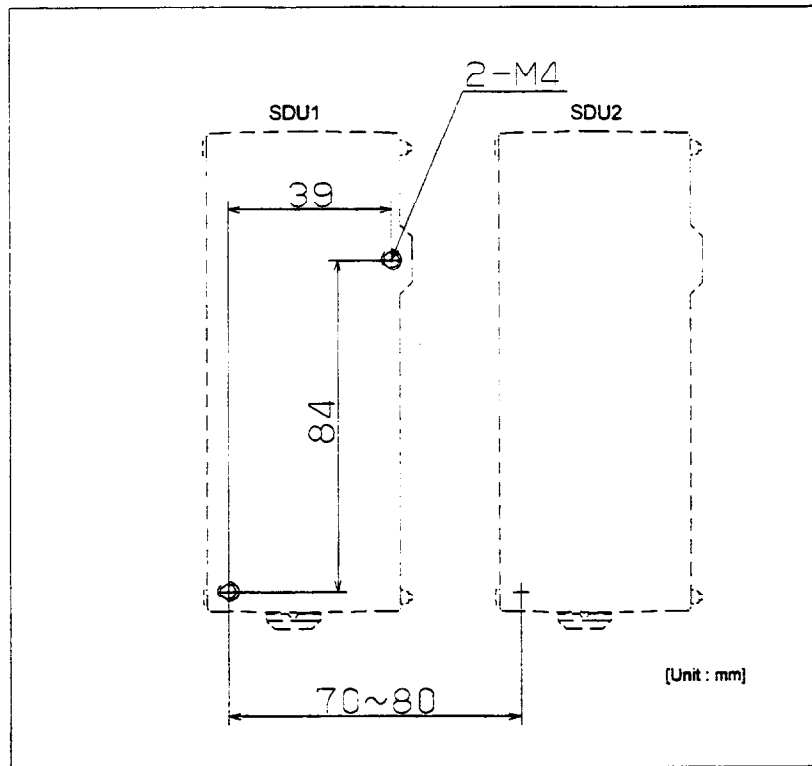|				TITLE		
				DRAW. NO. A-73402E		CUST.
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7.3.Connector layout

Connector layout of the SDU1

Connector layout of the SDU2
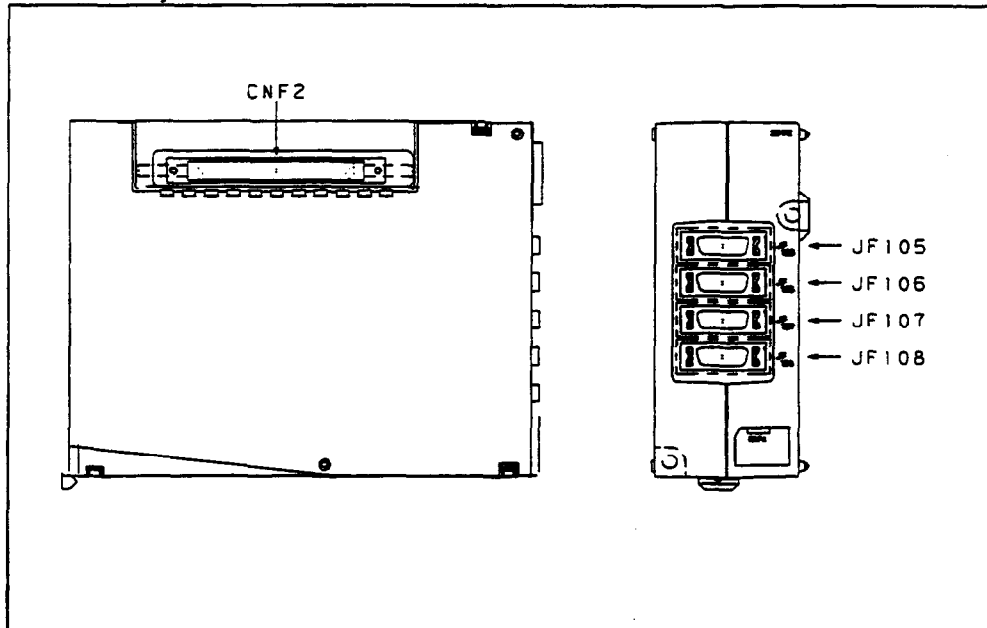
				TITLE		
				DRAW. NO. A-73402E		CUST.
EDIT.	DATE	DESIG.	DESCRIPTION	FANUC LTD	SHEET	014/

7.4.Details of screw hole

Drilling works of screw hole

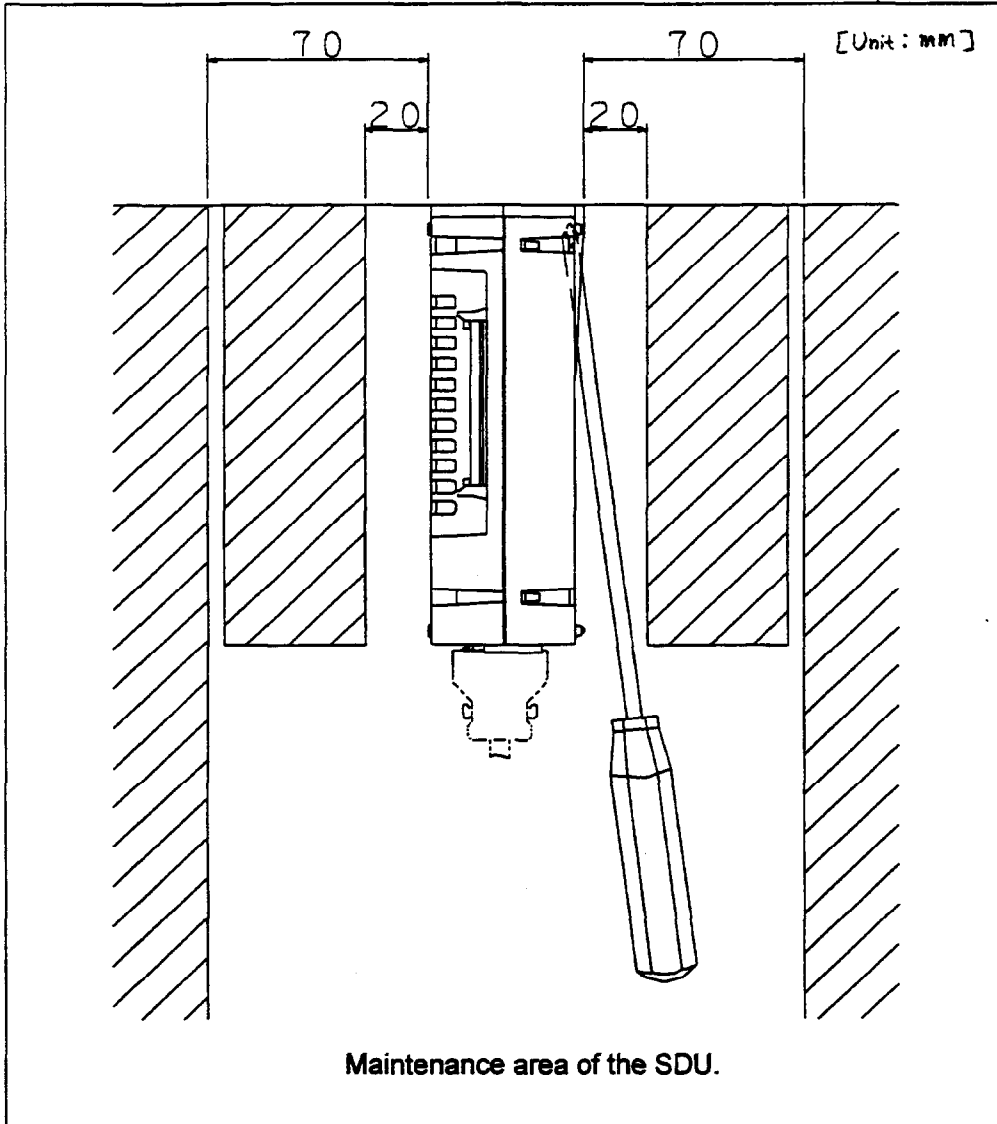When both SDU1 and SDU2 are installed, the space between screw hole of two units should be 70 to 80 mm.

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				TITLE	
				DRAW. NO. A-73402E	CUST.
				FANUC LTD	SHEET 015/

Note
   An enough maintenance area is necessary for both sides of the unit. Because, the space to insert the screw driver diagonally is necessary (see the figure below).
   As guideline, when the depth of the neighbor units are same as or less than the SDU, the clearance of 20mm is required. When the depth of the neighbor units are much more than the SDU, the clearance of 70mm is required.
   The clearance of 70mm is also required between the SDU and the cabinet wall.

70   70   [Unit: mm]

20   20

Maintenance area of the SDU.

				TITLE		
				DRAW. NO. A-73402E		CUST.
EDIT.	DATE	DESIG.	DESCRIPTION	FANUC LTD	SHEET	016/16