

FANUC AC SERVO UNIT

MAINTENANCE MANUAL

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Should you wish to export or re-export these products, please contact FANUC for advice.

In this manual, we endeavor to include all pertinent matters.

There are, however, a very large number of operations that must not or cannot be performed, and if the manual contained them all, it would be enormous in volume.

It is, therefore, requested to assume that any operations that are not explicitly described as being possible are "not possible".

SAFETY PRECAUTIONS

The "Safety Precautions" section describes the safety precautions relating to the use of FANUC servo motors, spindle motors, and servo amplifiers (power supply modules, servo amplifier modules, and spindle amplifier modules). Users of any servo motor or amplifier model are requested to read the "Safety Precautions" carefully before using the servo motor or amplifier.

The users are also requested to read an applicable Descriptions manual carefully and understand each function of the motor or amplifier for correct use.

The users are basically forbidden to do any behavior or action not mentioned in the "Safety Precautions." They are invited to ask FANUC previously about what behavior or action is prohibited.

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1.1 DEFINITION OF WARNING, CAUTION, AND NOTE

This manual includes safety precautions for protecting the user and preventing damage to the machine. Precautions are classified into Warning and Caution according to their bearing on safety. Also, supplementary information is described as a Note. Read the Warning, Caution, and Note thoroughly before attempting to use the machine.

**WARNING**

Applied when there is a danger of the user being injured or when there is a damage of both the user being injured and the equipment being damaged if the approved procedure is not observed.

**CAUTION**

Applied when there is a danger of the equipment being damaged, if the approved procedure is not observed.

NOTE

The Note is used to indicate supplementary information other than Warning and Caution.

* Read this manual carefully, and store it in a safe place.

1.2 FANUC AC SERVO MOTOR series FANUC AC SPINDLE MOTOR series

1.2.1 Warning

WARNING

- **Be safely dressed when handling a motor.**
Wear safety shoes or gloves when handling a motor as you may get hurt on any edge or protrusion on it or electric shocks.
- **Use a crane or lift to move a motor from one place to another.**
A motor is heavy. If you lift the motor by hand, you may get a backache, or you may be seriously injured when you drop the motor. A suitable crane or lift must be used to move the motor. (For the weight of motors, refer to their respective Descriptions manual.)
When moving a motor using a crane or lift, use a hanging bolt if the motor has a corresponding tapped hole, or textile rope if it has no tapped hole.
If a motor is attached with a machine or any other heavy stuff, do not use a hanging bolt to move the motor as the hanging bolt and/or motor may get broken.
- **Before starting to connect a motor to electric wires, make sure they are isolated from an electric power source.**
A failure to observe this caution is very dangerous because you may get electric shocks.
- **Be sure to secure power wires.**
If operation is performed with a terminal loose or connector loose, the terminal block or connector may become abnormally hot, possibly causing a fire. Also, the terminal may become disconnected, causing a ground fault or short-circuit, and possibly giving you electric shocks. See the section in Descriptions manual that gives the tightening torque for attaching power wires and short-bars to the terminal block.
- **Be sure to ground a motor frame.**
To avoid electric shocks, be sure to connect the grounding terminal in the terminal box to the grounding terminal of the machine.
- **Do not ground a motor power wire terminal or short-circuit it to another power wire terminal.**
A failure to observe this caution may cause electric shocks or a burned wiring.
(*) Some motors require a special connection such as a winding changeover. Refer to their respective motor Descriptions manuals for details.

⚠ WARNING

- **Ground the machine side firmly.**
To avoid electric shock or fire, be sure to ground thickly and securely to power electric cabinet.
- **Do not supply the power to the motor while any terminal is exposed.**
A failure to observe this caution is very dangerous because you may get electric shocks if your body or any conductive stuff touches an exposed terminal.
- **Do not bring any dangerous stuff near a motor.**
Motors are connected to a power line, and may get hot. If a flammable is placed near a motor, it may be ignited, catch fire, or explode.
- **Do not get close to a rotary section of a motor when it is rotating.**
You may get your clothes or fingers caught in a rotary section, and may be injured. Before starting a motor, ensure that there is no stuff that can fly away (such as a key) on the motor.
- **Do not touch a motor with a wet hand.**
A failure to observe this caution is vary dangerous because you may get electric shocks.
- **Before touching a motor, shut off the power to it.**
Even if a motor is not rotating, there may be a voltage across the terminals of the motor.
Especially before touching a power supply connection, take sufficient precautions.
Otherwise you may get electric shocks.
- **Do not touch any terminal of a motor for a while (at least 5 minutes) after the power to the motor is shut off.**
High voltage remains across power line terminals of a motor for a while after the power to the motor is shut off. So, do not touch any terminal or connect it to any other equipment. Otherwise, you may get electric shocks or the motor and/or equipment may get damaged.
- **To drive a motor, use a specified amplifier and parameters.**
Driving a motor with other than the specified combinations of an amplifier and parameters may cause the motor to perform an unexpected operation; for example, the motor may get out of control, or produce excessively high torque. This may result in the motor or machine being damaged. Also, an object such as a workpiece or tool may fly off due to excessive rotation, possibly causing injury.

 **WARNING**

- **Do not touch a regenerative discharge unit for a while (at least 30 minutes) after the power to the motor is shut off.**
A regenerative discharge unit may get hot when the motor is running.
Do not touch the regenerative discharge unit before it gets cool enough. Otherwise, you may get burned.
- **Do not touch a motor when it is running or immediately after it stops.**
A motor may get hot when it is running. Do not touch the motor before it gets cool enough. Otherwise, you may get burned.
- **Ensure that motors and related components are mounted securely.**
If a motor or its component slips out of place or comes off when the motor is running, it is very dangerous.
- **Be careful not get your hair or cloths caught in a fan.**
Be careful especially for a fan used to generate an inward air flow. Be careful also for a fan even when the motor is stopped, because it continues to rotate while the amplifier is turned on.
- **When designing and assembling a machine tool, make it compliant with EN60204-1.**
To ensure the safety of the machine tool and satisfy European standards, when designing and assembling a machine tool, make it compliant with EN60204-1. For details of the machine tool, refer to its Descriptions manual.

1.2.2 Caution

CAUTION

- **FANUC motors are designed for use with machines. Do not use them for any other purpose.**
If a FANUC motor is used for an unintended purpose, it may cause an unexpected symptom or trouble. If you want to use a motor for an unintended purpose, previously consult with FANUC.
- **Ensure that a base or frame on which a motor is mounted is strong enough.**
Motors are heavy. If a base or frame on which a motor is mounted is not strong enough, it is impossible to achieve the required precision.
- **Be sure to connect motor cables correctly.**
An incorrect connection of a cable cause abnormal heat generation, equipment malfunction, or failure. Always use a cable with an appropriate current carrying capacity (or thickness). For how to connect cables to motors, refer to their respective Descriptions manuals.
- **Ensure that motors are cooled if they are those that require forcible cooling.**
If a motor that requires forcible cooling is not cooled normally, it may cause a failure or trouble. For a fan-cooled motor, ensure that it is not clogged or blocked with dust and dirt. For a liquid-cooled motor, ensure that the amount of the liquid is appropriate and that the liquid piping is not clogged.
For both types, perform regular cleaning and inspection.
- **When attaching a component having inertia, such as a pulley, to a motor, ensure that any imbalance between the motor and component is minimized.**
If there is a large imbalance, the motor may vibrates abnormally, resulting in the motor being broken.
- **Be sure to attach a key to a motor with a keyed shaft.**
If a motor with a keyed shaft runs with no key attached, it may impair torque transmission or cause imbalance, resulting in the motor being broken.

1.2.3 Note

NOTE

- **Do not step or sit on a motor.**
If you step or sit on a motor, it may get deformed or broken. Do not put a motor on another unless they are in packages.
- **When storing a motor, put it in a dry (non-condensing) place at room temperature (0 to 40°C).**
If a motor is stored in a humid or hot place, its components may get damaged or deteriorated. In addition, keep a motor in such a position that its shaft is held horizontal and its terminal box is at the top.
- **Do not remove a nameplate from a motor.**
If a nameplate comes off, be careful not to lose it. If the nameplate is lost, the motor becomes unidentifiable, resulting in maintenance becoming impossible.
For a nameplate for a built-in spindle motor, keep the nameplate with the spindle.
- **Do not apply shocks to a motor or cause scratches to it.**
If a motor is subjected to shocks or is scratched, its components may be adversely affected, resulting in normal operation being impaired. Be very careful when handling plastic portions, sensors, and windings, because they are very liable to break. Especially, avoid lifting a motor by pulling its plastic portion, winding, or power cable.
- **Do not conduct dielectric strength or insulation test for a sensor.**
Such a test can damage elements in the sensor.
- **When testing the winding or insulation resistance of a motor, satisfy the conditions stipulated in IEC60034.**
Testing a motor under a condition severer than those specified in IEC34 may damage the motor.
- **Do not disassemble a motor.**
Disassembling a motor may cause a failure or trouble in it.
If disassembly is in need because of maintenance or repair, please contact a service representative of FANUC.
- **Do not modify a motor.**
Do not modify a motor unless directed by FANUC. Modifying a motor may cause a failure or trouble in it.

NOTE

- **Use a motor under an appropriate environmental condition.**
Using a motor in an adverse environment may cause a failure or trouble in it.
Refer to their respective Descriptions manuals for details of the operating and environmental conditions for motors.
- **Do not apply a commercial power source voltage directly to a motor.**
Applying a commercial power source voltage directly to a motor may result in its windings being burned. Be sure to use a specified amplifier for supplying voltage to the motor.
- **For a motor with a terminal box, make a conduit hole for the terminal box in a specified position.**
When making a conduit hole, be careful not to break or damage unspecified portions.
Refer to an applicable Descriptions manual.
- **Before using a motor, measure its winding and insulation resistances, and make sure they are normal.**
Especially for a motor that has been stored for a prolonged period of time, conduct these checks. A motor may deteriorate depending on the condition under which it is stored or the time during which it is stored. For the winding resistances of motors, refer to their respective Descriptions manuals, or ask FANUC. For insulation resistances, see the following table.
- **To use a motor as long as possible, perform periodic maintenance and inspection for it, and check its winding and insulation resistances.**
Note that extremely severe inspections (such as dielectric strength tests) of a motor may damage its windings. For the winding resistances of motors, refer to their respective Descriptions manuals, or ask FANUC. For insulation resistances, see the following table.

MOTOR INSULATION RESISTANCE MEASUREMENT

Measure an insulation resistance between each winding and motor frame using an insulation resistance meter (500 VDC). Judge the measurements according to the following table.

Insulation resistance	Judgment
100M Ω or higher	Acceptable
10 to 100 M Ω	The winding has begun deteriorating. There is no problem with the performance at present. Be sure to perform periodic inspection.
1 to 10 M Ω	The winding has considerably deteriorated. Special care is in need. Be sure to perform periodic inspection.
Lower than 1 M Ω	Unacceptable. Replace the motor.

1.3 FANUC SERVO AMPLIFIER series

1.3.1 Warnings and Cautions Relating to Mounting

1.3.1.1 Warning

⚠ WARNING

- **Check the specification code of the amplifier.**
Check that the delivered amplifier is as originally ordered.
- **Mount a ground fault interrupter.**
To guard against fire and electric shock, fit the factory power supply or machine with a ground fault interrupter (designed for use with an inverter).
- **Securely ground the amplifier.**
Securely connect the ground terminal, ground connector and metal frame of the amplifier and motor to a common ground plate of the power magnetics cabinet.
- **Be aware of the weight of the amplifier and other components.**
Control motor amplifiers and AC reactors are heavy. When transporting them or mounting them in the cabinet, therefore, be careful not to injure yourself or damage the equipment. Be particularly careful not to jam your fingers between the cabinet and amplifier.
- **Never ground or short-circuit either the power supply lines or power lines.**
Protect the lines from any stress such as bending. Handle the ends appropriately.
- **Ensure that the power supply lines, power lines, and signal lines are securely connected.**
A loose screw, loose connection, or the like will cause a motor malfunction or overheating, or a ground fault.
Be extremely careful with power supply lines, motor power lines, and DC link connections through which a large amount of current passes, because a loose screw (or poor contact in a connector or poor connection between a connector terminal and a cable) may cause a fire.
- **Insulate all exposed parts that are charged.**

⚠ WARNING

- **Never touch the regenerative discharge resistor or radiator directly.**
The surface of the radiator and regenerative discharge unit become extremely hot. Never touch them directly. An appropriate structure should also be considered.
- **Close the amplifier cover after completing the wiring.**
Leaving the cover open presents a danger of electric shock.
- **Do not disassemble the amplifier.**
- **Ensure that the cables used for the power supply lines and power lines are of the appropriate diameter and temperature ratings.**
- **Do not apply an excessively large force to plastic parts.**
If a plastic section breaks, it may cause internal damage, thus interfering with normal operation. The edge of a broken section is likely to be sharp and, therefore, presents a risk of injury.

1.3.1.2 Caution

CAUTION

- **Do not step or sit on the amplifier.**
Also, do not stack unpacked amplifiers on top of each other.
- **Use the amplifier in an appropriate environment.**
See the allowable ambient temperatures and other requirements, given in the corresponding descriptions.
- **Protect the amplifier from corrosive or conductive mist or drops of water.**
Use a filter if necessary.
- **Protect the amplifier from impact.**
Do not place anything on the amplifier.
- **Connect the power supply lines and power lines to the appropriate terminals and connectors.**
- **Connect the signal lines to the appropriate connectors.**
- **Do not block the air inlet to the radiator.**
A deposit of coolant, oil mist, or chips on the air inlet will result in a reduction in the cooling efficiency. In some cases, the required efficiency cannot be achieved. The deposit may also lead to a reduction in the useful life of the semiconductors. Especially, when outside air is drawn in, mount filters on both the air inlet and outlet. These filters must be replaced regularly.
So, an easy-to-replace type of filter should be used.
- **Before connecting the power supply wiring, check the supply voltage.**
Check that the supply voltage is within the range specified in Descriptions manual, then connect the power supply lines. If the supply voltage is over than the range specified in descriptions manual, the equipment may be damaged or burned.
- **Ensure that the combination of motor and amplifier is appropriate.**
- **Ensure that valid parameters are specified.**
Specifying an invalid parameter for the combination of motor and amplifier may not only prevent normal operation of the motor but also result in damage to the amplifier.
- **Ensure that the amplifier and peripheral equipment are securely connected.**
Check that the magnetic contactor, circuit breaker, and other devices mounted outside the amplifier are securely connected to each other and that those devices are securely connected to the amplifier.

⚠ CAUTION

- **Check that the amplifier is securely mounted in the power magnetics cabinet.**

If any clearance is left between the power magnetics cabinet and the surface on which the amplifier is mounted, dust entering the gap may build up and prevent the normal operation of the amplifier.

- **Apply appropriate countermeasures against noise.**

Adequate countermeasures against noise are required to maintain normal operation of the amplifier. For example, signal lines must be routed away from power supply lines and power lines.

1.3.1.3 Note

NOTE

- **Keep the nameplate clearly visible.**
- **Keep the legend on the nameplate clearly visible.**
- **After unpacking the amplifier, carefully check for any damage.**
- **Mount the amplifier in a location where it can be easily accessed periodic inspection and daily maintenance.**
- **Leave sufficient space around the machine to enable maintenance to be performed easily.**
Do not place any heavy objects such that they would interfere with the opening of the doors.
- **Keep the parameter table and spare parts at hand.**
Also, keep the specifications at hand. These items must be stored in a location where they can be retrieved immediately.
- **Provide adequate shielding.**
A cable to be shielded must be securely connected to the ground plate, using a cable clamp or the like.

1.3.2 Warnings and Cautions Relating to a Pilot Run

1.3.2.1 Warning

WARNING

- **Before turning on the power, check that the cables connected to the power magnetism cabinet and amplifier, as well as the power lines and power supply lines, are securely connected. Also, check that no lines are slack.**
A loose screw, loose connection, or the like will cause a motor malfunction or overheating, or a ground fault.
Be extremely careful with power supply lines, motor power lines, and DC link connections through which a large amount of current passes, because a loose screw (or poor contact in a connector or poor connection between a connector or terminal to a cable) may cause a fire.
- **Before turning on the power, ensure that the power magnetism cabinet is securely grounded.**
- **Before turning on the power, check that the door of the power magnetism cabinet and all other doors are closed.**
Ensure that the door of the power magnetism cabinet containing the amplifier, and all other doors, are securely closed. During operation, all doors must be closed and locked.
- **Apply extreme caution if the door of the power magnetism cabinet or another door must be opened.**
Only a person trained in the maintenance of the corresponding machine or equipment should open the door, and only after shutting off the power supply to the power magnetism cabinet (by opening both the input circuit breaker of the power magnetism cabinet and the factory switch used to supply power to the cabinet).
If the machine must be operated with the door open to enable adjustment or for some other purpose, the operator must keep his or her hands and tools well away from any dangerous voltages. Such work must be done only by a person trained in the maintenance of the machine or equipment.
- **When operating the machine for the first time, check that the machine operates as instructed.**
To check whether the machine operates as instructed, first specify a small value for the motor, then increase the value gradually. If the motor operates abnormally, perform an emergency stop immediately.
- **After turning on the power, check the operation of the emergency stop circuit.**
Press the emergency stop button to check that the motor stops immediately, and that the power being supplied to the amplifier is shut off by the magnetic contactor.

 WARNING

- **Before opening a door or protective cover of a machine to enable adjustment of the machine, first place the machine in the emergency stop state and check that the motor has stopped.**

1.3.2.2 Caution

CAUTION

- **Note whether an alarm status relative to the amplifier is displayed at power-up or during operation.**
If an alarm is displayed, take appropriate action as explained in the maintenance manual. If the work to be done requires that the door of the power magnetics cabinet be left open, the work must be carried out by a person trained in the maintenance of the machine or equipment. Note that if some alarms are forcibly reset to enable operation to continue, the amplifier may be damaged. Take appropriate action according to the contents of the alarm.
- **Before operating the motor for the first time, mount and adjust the position and speed sensors.**
Following the instructions given in the maintenance manual, adjust the position and speed sensors for the spindle so that an appropriate waveform is obtained.
If the sensors are not properly adjusted, the motor may not rotate normally or the spindle may fail to stop as desired.
- **If the motor makes any abnormal noise or vibration while operating, stop it immediately.**
Note that if operation is continued in spite of there being some abnormal noise or vibration, the amplifier may be damaged. Take appropriate corrective action, then resume operation.
- **Observe the ambient temperature and output rating requirements.**
The continuous output rating or continuous operation period of some amplifiers may fall as the ambient temperature increases. If the amplifier is used continuously with an excessive load applied, the amplifier may be damaged.
- **Unless otherwise specified, do not insert or remove any connector while the power is turned on. Otherwise, the amplifier may fail.**

1.3.3 Warnings and Cautions Relating to Maintenance

1.3.3.1 Warning

WARNING

- **Read the maintenance manual carefully and ensure that you are totally familiar with its contents.**
The maintenance manual describes daily maintenance and the procedures to be followed in the event of an alarm being issued. The operator must be familiar with these descriptions.

- **Notes on replacing a fuse or PC board**
 - 1) Before starting the replacement work, ensure that the circuit breaker protecting the power magnetics cabinet is open.
 - 2) Check that the red LED that indicates that charging is in progress is not lit.
The position of the charging LED on each model of amplifier is given in Descriptions manual. While the LED is lit, hazardous voltages are present inside the unit, and thus there is a danger of electric shock.
 - 3) Some PC board components become extremely hot. Be careful not to touch these components.
 - 4) Ensure that a fuse having an appropriate rating is used.
 - 5) Check the specification code of a PC board to be replaced. If a modification drawing number is indicated, contact FANUC before replacing the PC board.
Also, before and after replacing a PC board, check its pin settings.
 - 6) After replacing the fuse, ensure that the screws are firmly tightened. For a socket-type fuse, ensure that the fuse is inserted correctly.
 - 7) After replacing the PC board, ensure that it is securely connected.
 - 8) Ensure that all power lines, power supply lines, and connectors are securely connected.

- **Take care not to lose any screws.**
When removing the case or PC board, take care not to lose any screws. If a screw is lost inside the nit and the power is turned on, the machine may be damaged.

⚠ WARNING

- **Notes on replacing the battery of the absolute pulse coder**
Replace the battery only while the power is on. If the battery is replaced while the power is turned off, the stored absolute positioning data will be lost. Some series servo amplifier modules have batteries in their servo amplifiers. To replace the battery of any of those models, observe the following procedure: Open the door of the power magnetics cabinet; Leave the control power of the power supply module on; Place the machine in the emergency stop state so that the power being input to the amplifier is shut off; Then, replace the battery. Replacement work should be done only by a person who is trained in the related maintenance and safety requirements. The power magnetics cabinet in which the servo amplifier is mounted has a high-voltage section. This section presents a severe risk of electric shock.
- **Check the number of any alarm.**
If the machine stops upon an alarm being issued, check the alarm number. Some alarms indicate that a component must be replaced. If the power is reconnected without first replacing the failed component, another component may be damaged, making it difficult to locate the original cause of the alarm.
- **Before resetting an alarm, ensure that the original cause of the alarm has been removed.**
- **Contact FANUC whenever a question relating to maintenance arises.**
- **Notes on removing the amplifier**
Before removing the amplifier, first ensure that the power is shut off. Be careful not to jam your fingers between the power magnetics cabinet and amplifier.

1.3.3.2 Caution

CAUTION

- **Ensure that all required components are mounted.**
When replacing a component or PC board, check that all components, including the snubber capacitor, are correctly mounted. If the snubber capacitor is not mounted, for example, the IPM will be damaged.
- **Tighten all screws firmly.**
- **Check the specification code of the fuse, PC board, and other components.**
When replacing a fuse or PC board, first check the specification code of the fuse or PC board, then mount it in the correct position. The machine will not operate normally if a fuse or PC board having other than the correct specification code is mounted, or if a fuse or PC board is mounted in the wrong position.
- **Mount the correct cover.**
The cover on the front of the amplifier carries a label indicating a specification code. When mounting a previously removed front cover, take care to mount it on the unit from which it was removed.
- **Notes on cleaning the heat sink and fan**
 - 1) A dirty heat sink or fan results in reduced semiconductor cooling efficiency, which degrades reliability. Periodic cleaning is necessary.
 - 2) Using compressed air for cleaning scatters the dust. A deposit of conductive dust on the amplifier or peripheral equipment will result in a failure.
 - 3) To clean the heat sink, do so only after turning the power off and ensuring that the heat sink has cooled to room temperature. The heat sink becomes extremely hot, such that touching it during operation or immediately after power-off is likely to cause a burn. Be extremely careful when touching the heat sink.

1.3.3.3 Note

NOTE

- **Ensure that the battery connector is correctly inserted.**
If the power is shut off while the battery connector is not connected correctly, the absolute position data for the machine will be lost.
- **Store the manuals in a safe place.**
The manuals should be stored in a location where they can be accessed immediately if so required during maintenance work.
- **Notes on contacting FANUC**
Inform FANUC of the details of an alarm and the specification code of the amplifier so that any components required for maintenance can be quickly secured, and any other necessary action can be taken without delay.

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I. AC SERVO UNIT FOR 1 AXIS

This chapter described the maintenance of AC servo unit for 1 axis which drives AC servo motor Model 5-0, 4-0, 3-0, 2-0, 1-0, 0, 5, 10, 20M, 20, 30 and 30R.

1. STRUCTURE

The AC servo unit consists basically of the velocity control unit and power transformer. In addition, the separate regenerative discharge unit may be required according to the load conditions.

Eight types of velocity control units are available according to AC servo motor models employed, and one velocity control unit applies to each servo motor. Six types of power transformers are also prepared according to the servo motor models, their combinations, loads, and primary input voltages. One power transformer applies to one to three servo motors.

Fig. 1.1 shows an example of the structure of the AC servo unit in a two-controlled axes NC system.

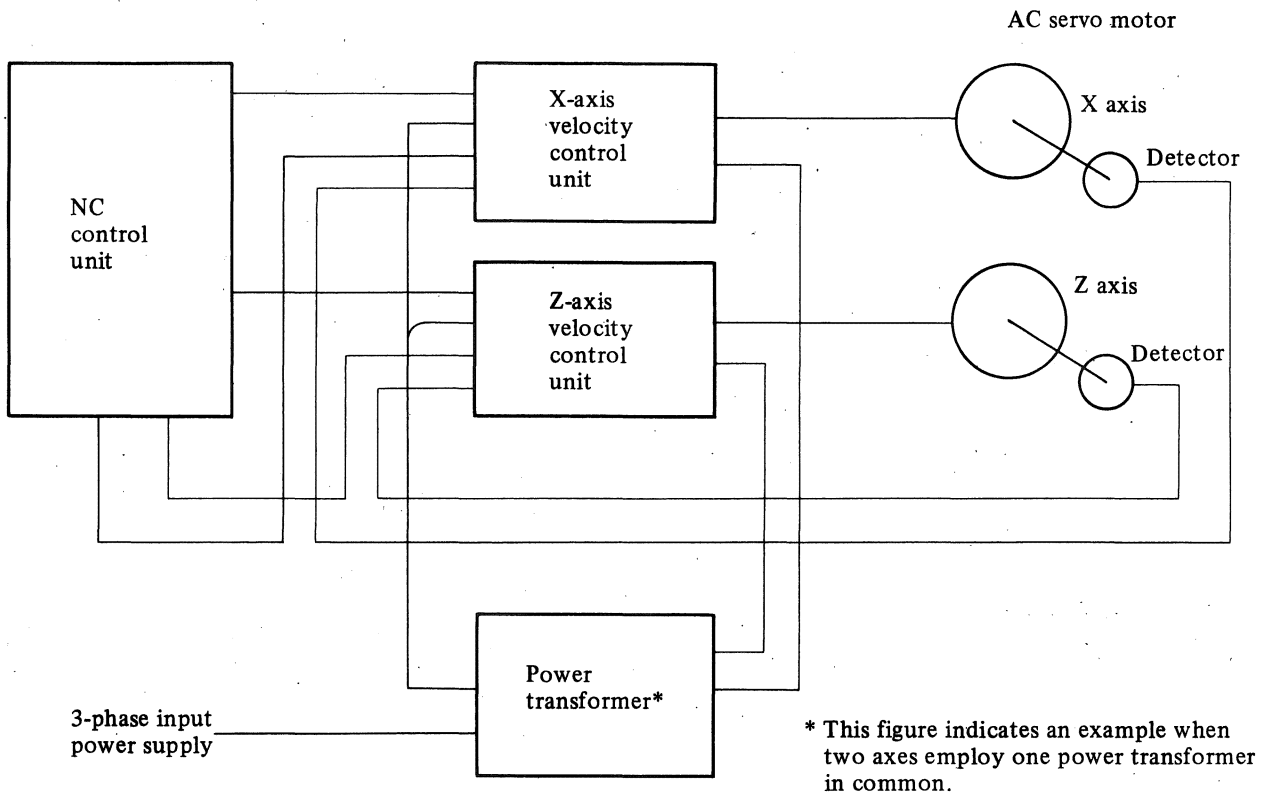


Fig. 1.1 Example of AC Servo Unit Structure

1.1 Models and Designated Specifications of Units

Table 1.1 (a)

Name		Specifications	
Velocity control unit	For Model 5-0	A06B-6050-H301	
	For Model 4-0, 3-0	" -H001	
	For Model 2-0, 1-0	" -H102 (Note 1)	
	For Model 0, 5, 10	" -H103 (Note 2)	
	For Model 20M	" -H113	
	For Model 20, 30	" -H104 (Note 3)	
	For Model 30R	" -H005	
Power transformer	For Japan 200V, 220V	Transformer AA	A06B-6050-H011
		Transformer MB	A06B-6047-H012
		Transformer MC	" -H013
	For other countries 190V-550V	Transformer MBE	" -H022
		Transformer MCE	" -H023
	Common 190V-550V	Transformer AAE	A06B-6050-H021
		Transformer ABE	" -H022
		Transformer ACE	" -H023
	Separate regenerative discharge unit (Note 4)		" -H050
Input connector (Note 5)	Soldering type	" -K100	
	Crimp style type	" -K103	
Spare part A		" -K101	

Note 1. The specification of unit shipped before May in 1984 is A06B-6050-H003.

Note 2. The specification of unit shipped before May in 1984 is A06B-6050-H003.

Note 3. The specification of unit shipped before May in 1984 is A06B-6050-H004.

Note 4. The unit (A06B-6050-H005) for Model 30R normally needs the separate regenerative discharge unit.

Note 5. The input connector is used for the cable connected to the velocity control unit, and it comprises the following parts.

One set of the input connector is required for each axis.

Table 1.1(b) shows the parts included in input connector (Soldering type).

Table 1.1(c) shows the parts included in input connector (Crimp style type).

Table 1.1 (b) The Parts Included in Input Connector (Soldering Type)

Name	Q'ty	Use	Model	FANUC specifications
Connector and cover	1	CN1	MR-20LFH*	A63L-0001-0134/02
Connector and cover	1	CN5	MR-20LWMH*	A63L-0001-0134/15
Connector and cover	1	CN6	MR-20LWFH*	A63L-0001-0134/05
Housing	1	CN2	SMS6PW-5**	A63L-0001-0202/6W
Pin	5	CN2	RC16M-SCT3**	A63L-0001-0226

Table 1.1 (c) The Parts Included in Input Connector (Crimp Style Type)

Name	Q'ty	Use	Model	FANUC specifications
Connector and cover	1	CN1	MR-20L, MRP-20F01*	A63L-0001-0134/22
Connector and cover	1	CN5	MR-20LW, MRP-20M01*	A63L-0001-0134/35
Connector and cover	1	CN6	MR-20LW, MRP-20F01*	A63L-0001-0134/25
Contact	40	CN1,6	MRP-F112*	A63L-0001-0135/F112
Contact	20	CN5	MRP-M112*	A63L-0001-0135/M112
Housing	1	CN2	SMS6PW-5**	A63L-0001-0202/6W
Pin	5	CN2	RC16M-S23A**	A63L-0001-0127/S23A

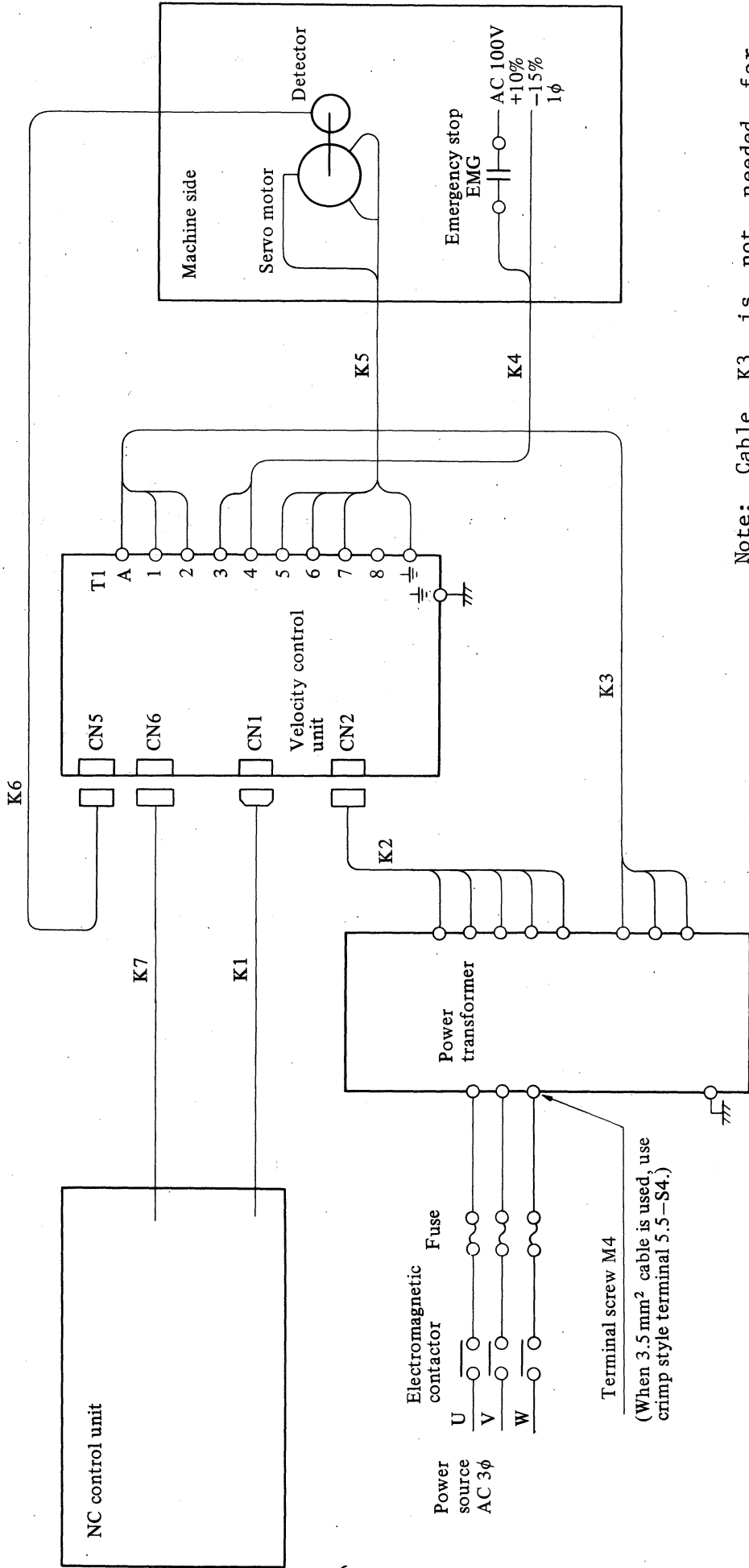
* Manufacturer: HONDA Tsushin Co., Ltd.

** Manufacturer: Burndy Japan Co., Ltd.

2. CONNECTIONS

2.1 Connection Diagram

Fig. 2.1(a) is a standard connection diagram.



Note: Cable K3 is not needed for velocity control unit of 5-0.

Fig. 2.1 (a)

Fig. 2.1(b) shows connection diagram when the separate regenerative discharge unit is employed.

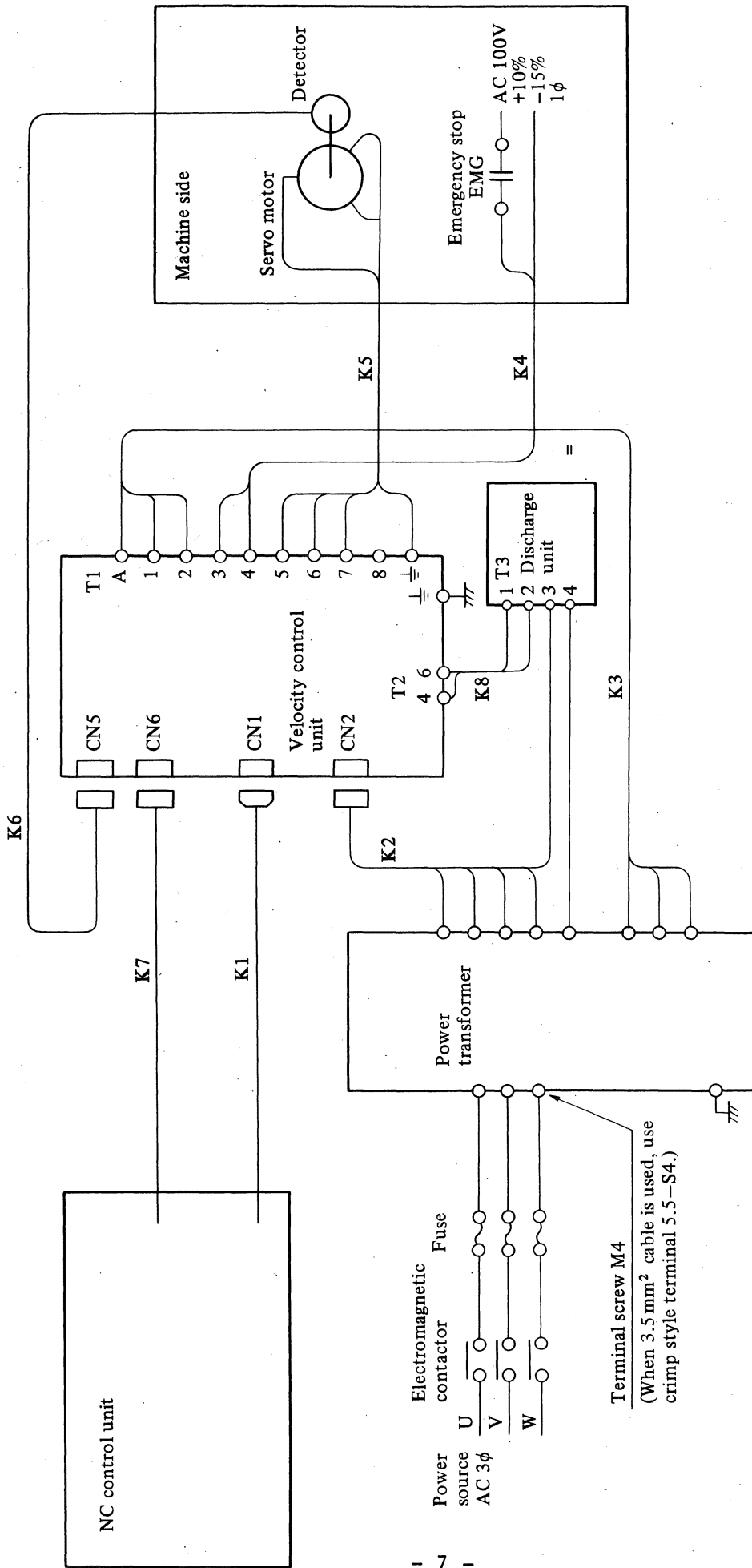
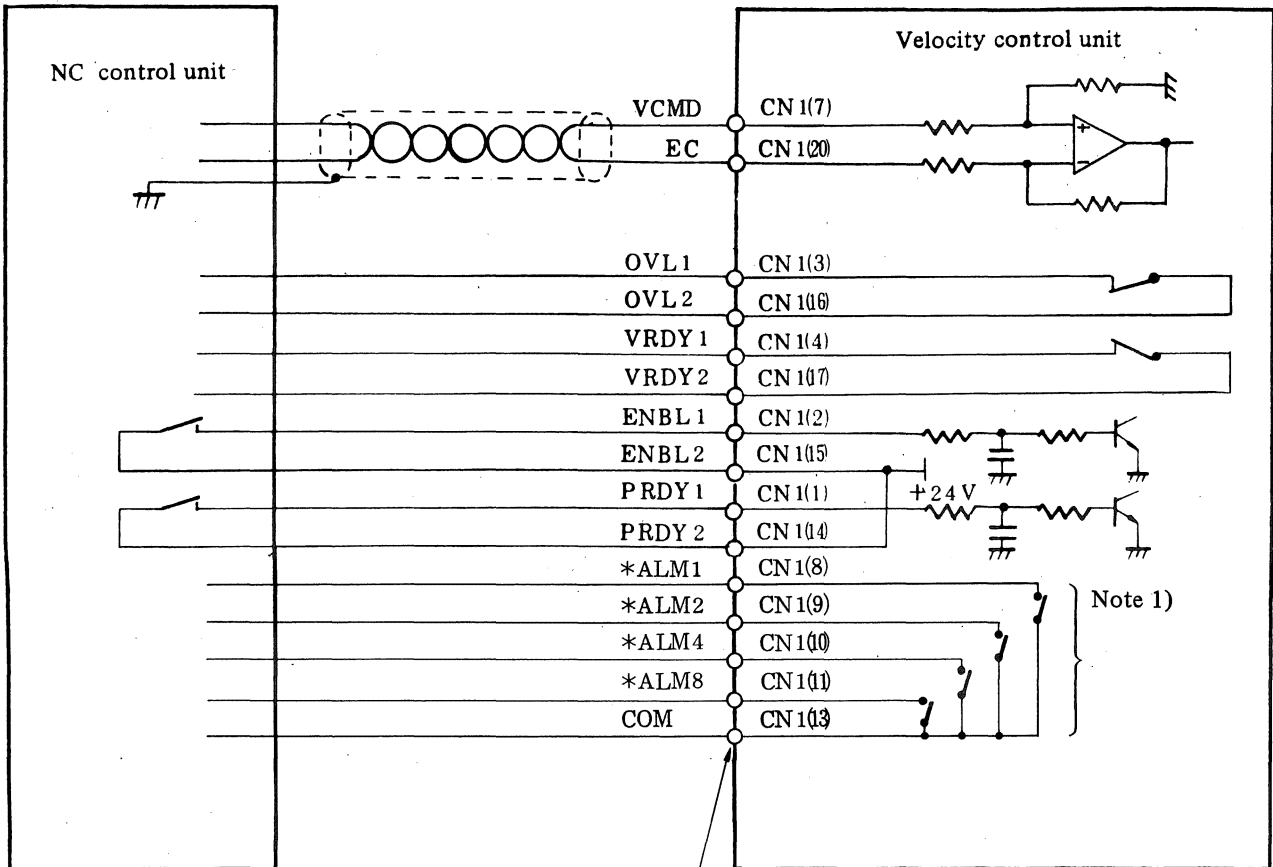


Fig. 2.1 (b)

2.2 Detailed Servo System Connection Diagrams

2.2.1 Details of connections of cable K1



Cable employed:
 For VCMD/EC,
 0.1 ~ 0.18mm² pair
 shielded cable.
 For others; 0.18 ~ 0.3mm²
 200V vinyl wire

Connector employed MR20LFH
 (Honda Tsushin Kogyo, Co. Ltd.)

Note: These signals are employed from edition c of velocity control PCB (A20B-1000-0560). These are not employed in velocity control unit for Model 5-0, 4-0 and 3-0.

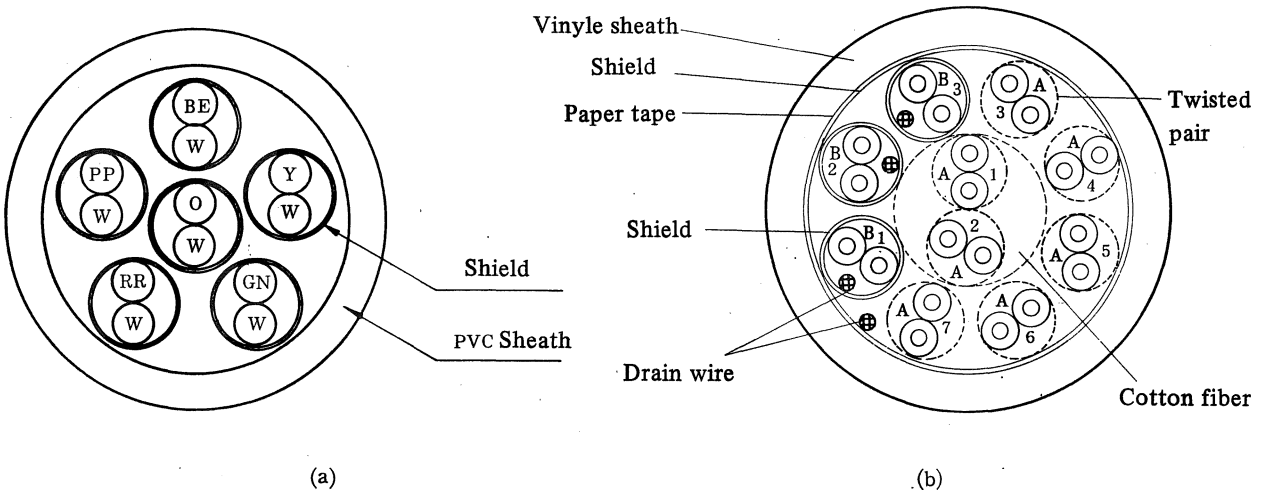


Fig. 2.2.1

2.2.2 Details of connections of cable K2

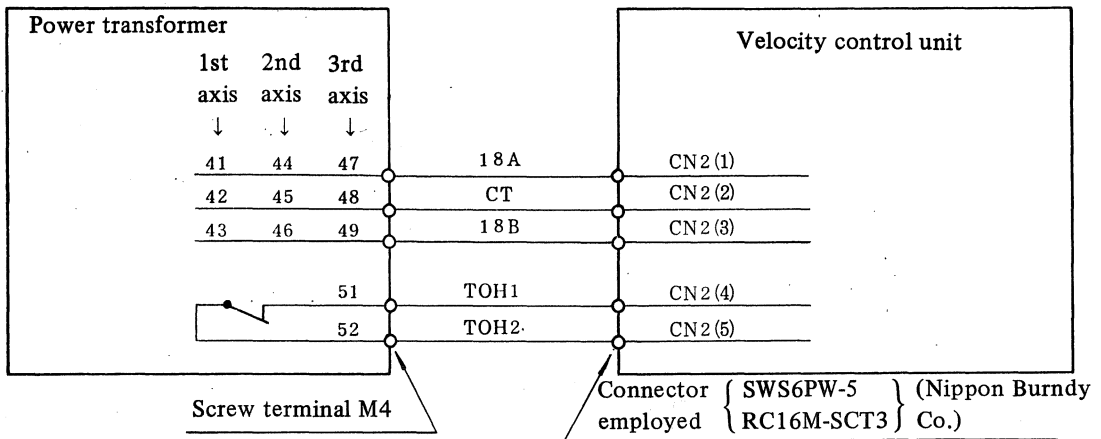
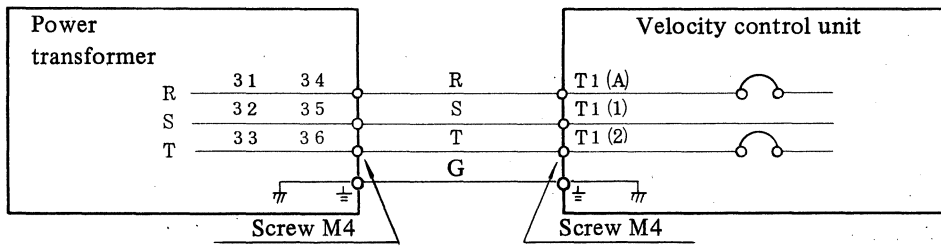


Fig. 2.2.2

2.2.3 Details of connections of cable K3



Cable employed: 0.75 mm² (30/0.18) 200V heat-resistive vinyl cable.

Fig. 2.2.3

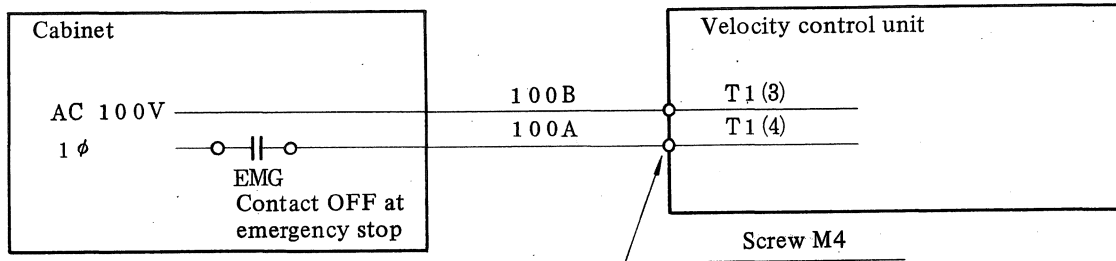
Table 2.2.3 (a)

Motor employed	Cable employed	
Model 3-0, 4-0	0.75 mm ²	600V heat-resistive vinyl cable
Model 2-0, 1-0 Model 0, 5	2.0 mm ²	
Model 10, 20M, 20, 30	3.5 mm ²	
Model 30R	5.5 mm ²	

Table 2.2.3 (b)

Motor employed	Input voltage of velocity control unit
Model 4-0, 2-0, 1-0	AC 120V
Model 3-0 Model 0, 5 Model 10, 20M, 20, 30 Model 30R	AC 185V

2.2.4 Details of connections of cable K4

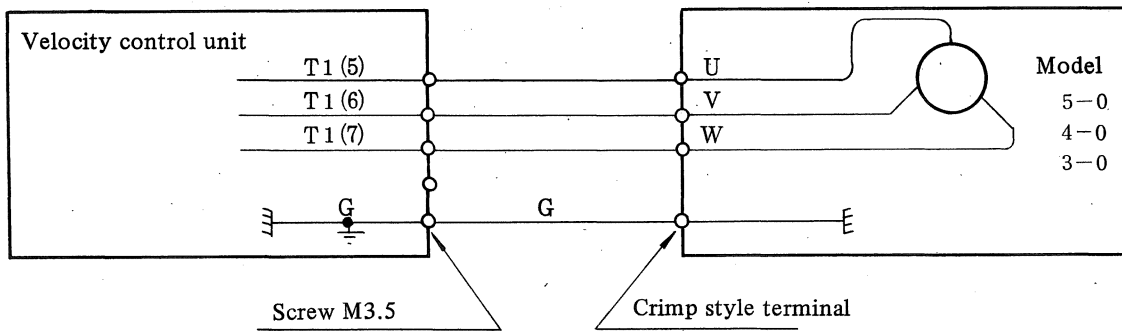


Cable material: 0.75mm² 200V vinyl wire.

Fig. 2.2.4

2.2.5 Details of connections of cable K5

(F) For Model 5-0, 4-0, 3-0

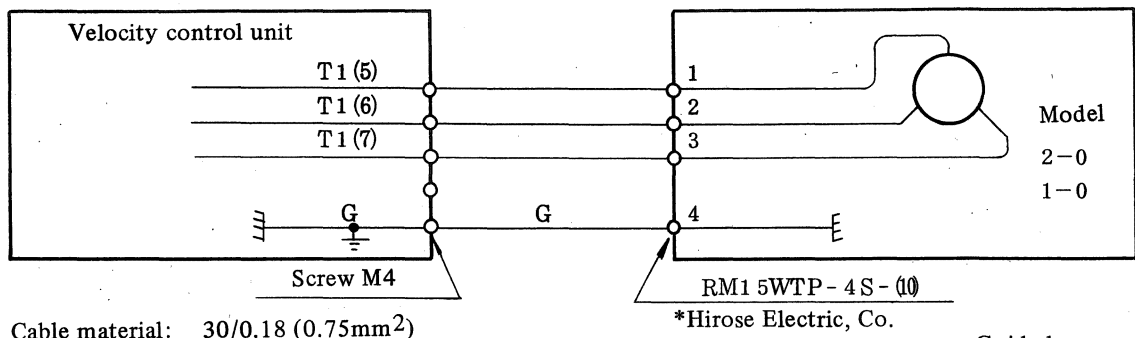


Cable material: 30/0.18 (0.75mm)
4-conductor vinyl cord

Color of reed wire
U: Red
V: White
W: Black
G: Connect motor body

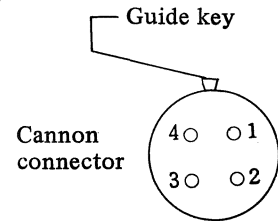
Fig. 2.2.5 (a)

(2) For Model 2-0, 1-0

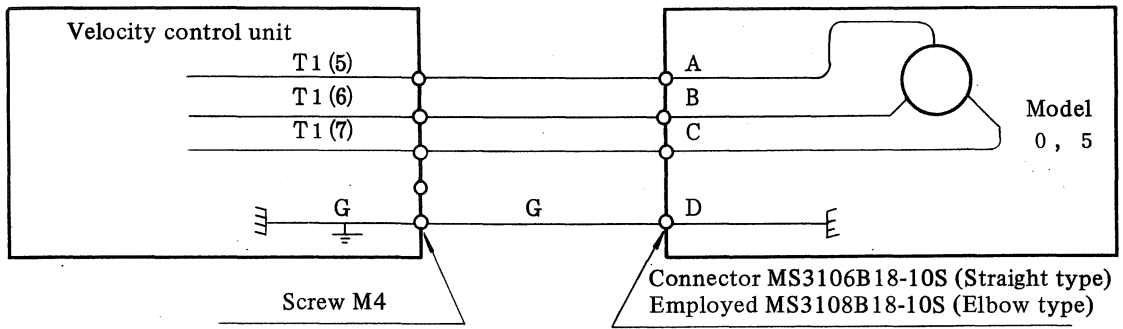


Cable material: 30/0.18 (0.75mm²)
4-conductor vinyl cabtyre cable

Fig. 2.2.5 (b)



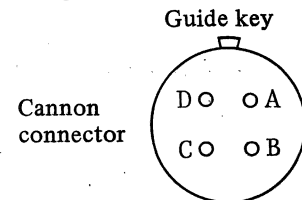
(3) For Model 0 and 5



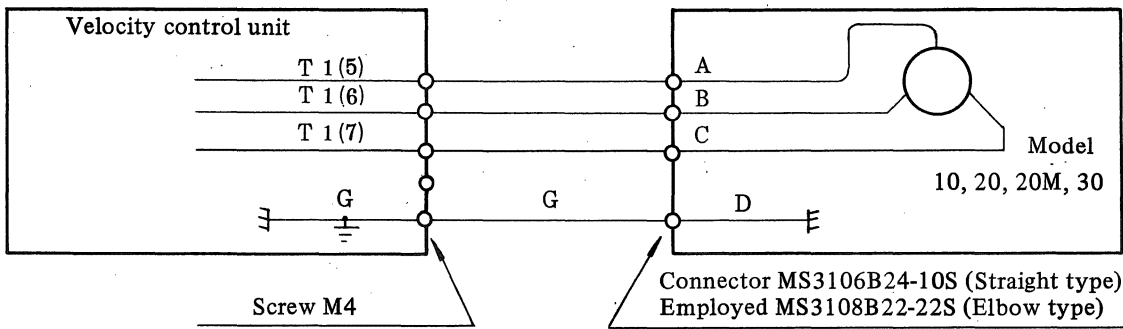
Cable material: 2.0mm² (37/0.26)
4-conductor vinyl cabtyre cable

Cable clamp MS3057-10A

Fig. 2.2.5 (c)



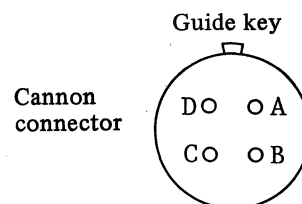
(4) For Model 10, 20M, 20, 30



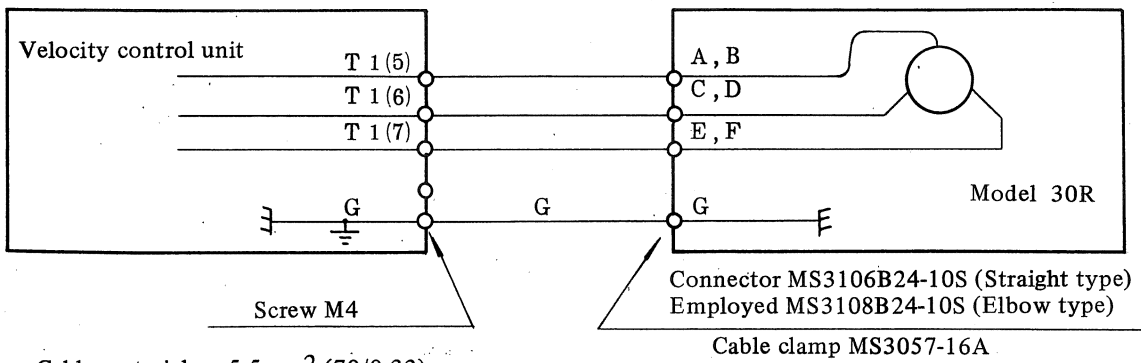
Cable material: 3.5mm² (45/0.32)
4-conductor vinyl cable

Cable clamp MS3057-12A

Fig. 2.2.5 (d)

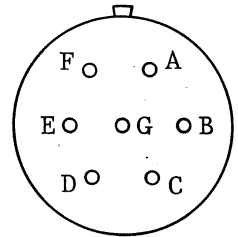


(5) For Model 30R



Cable material: 5.5mm² (70/0.32)
4-conductor vinyl cabtyre cable

Guide key



Cannon
connector

Fig. 2.2.5 (e)

2.2.6 Details of connections of cable K6

(1) Model 5-0

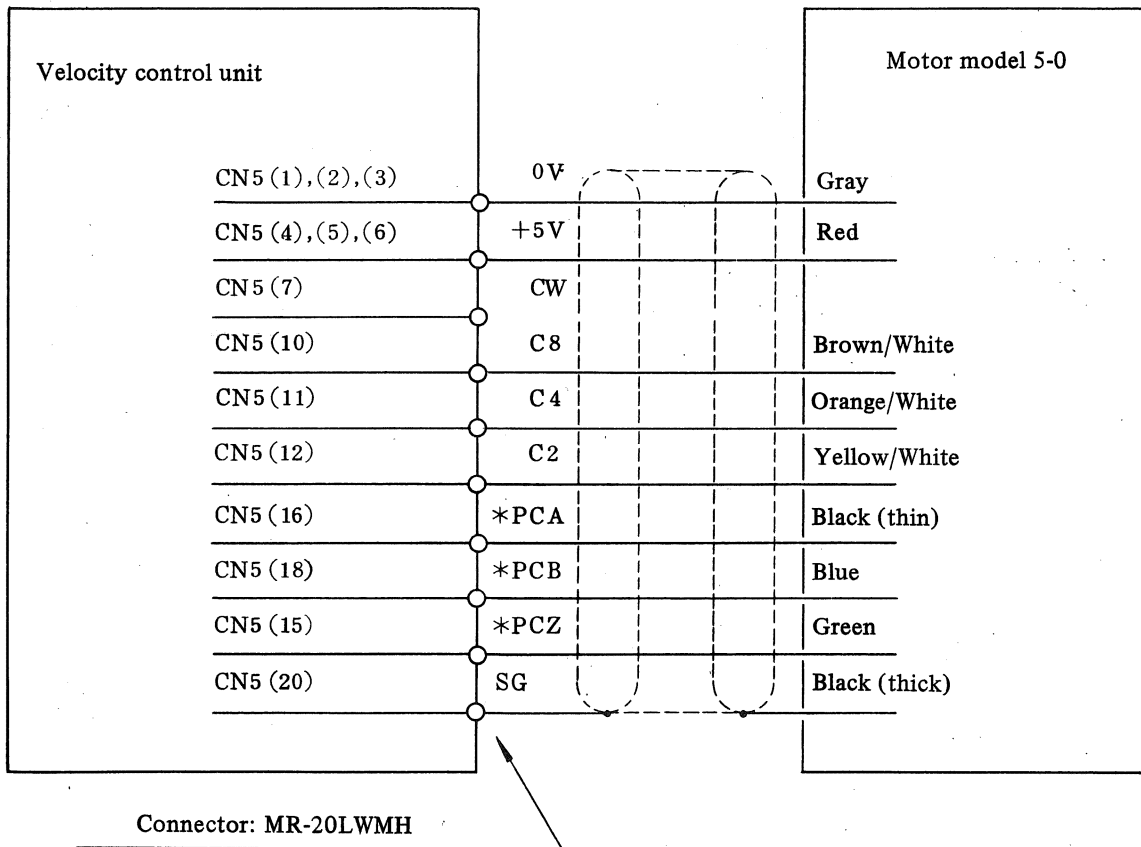


Fig. 2.2.6 (a)

(2) Model 4-0, 3-0

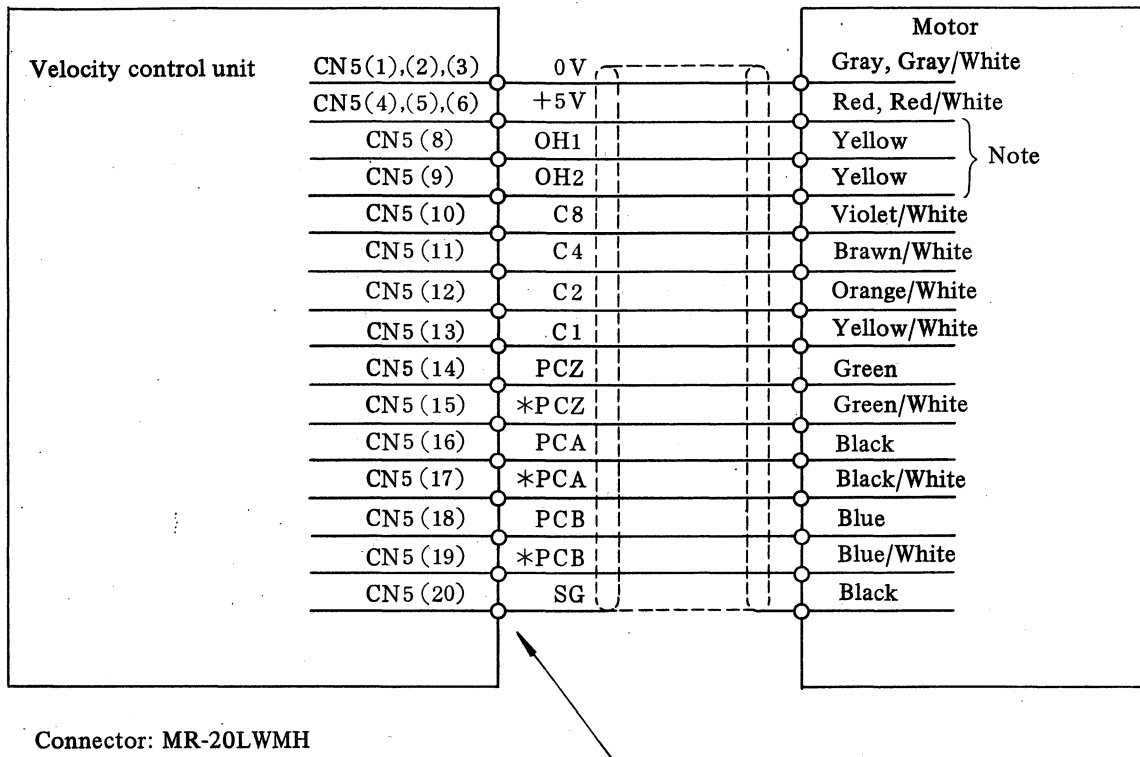


Fig. 2.2.6 (b)

(3) Model 2-0 - 30R

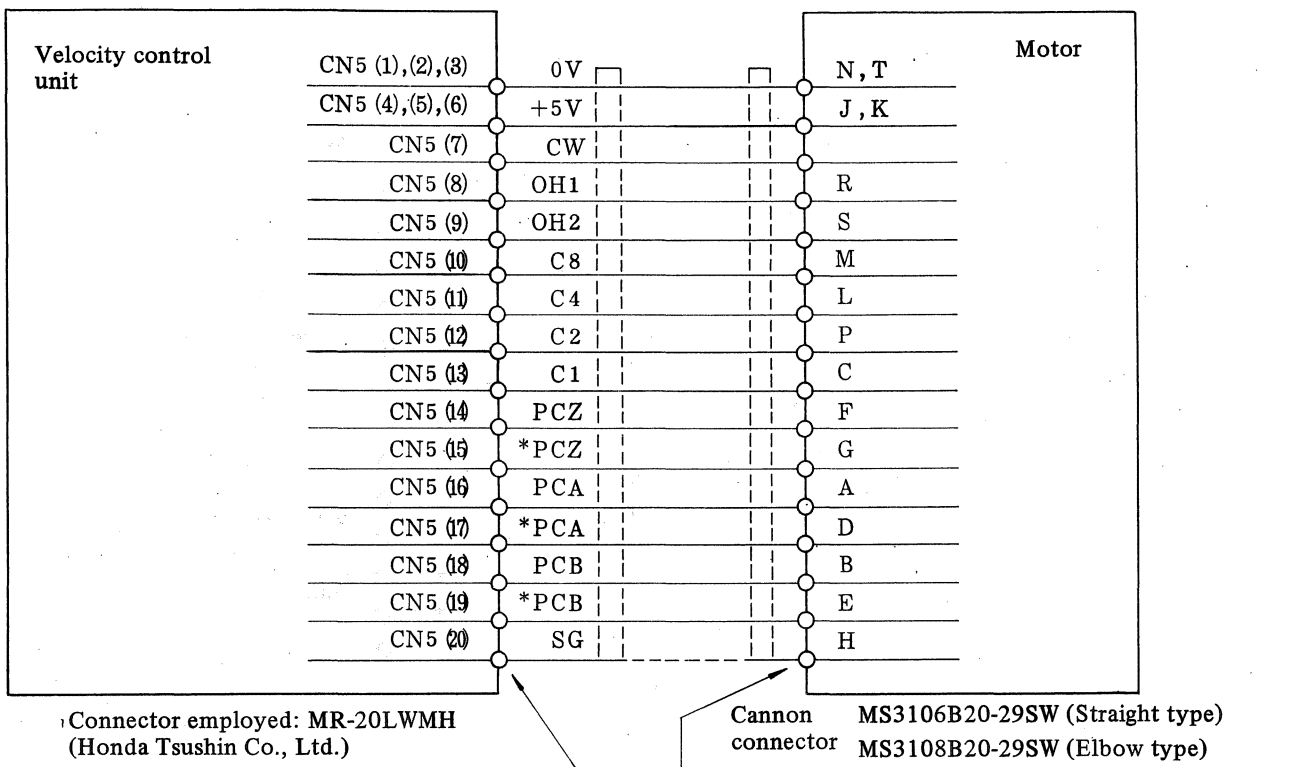
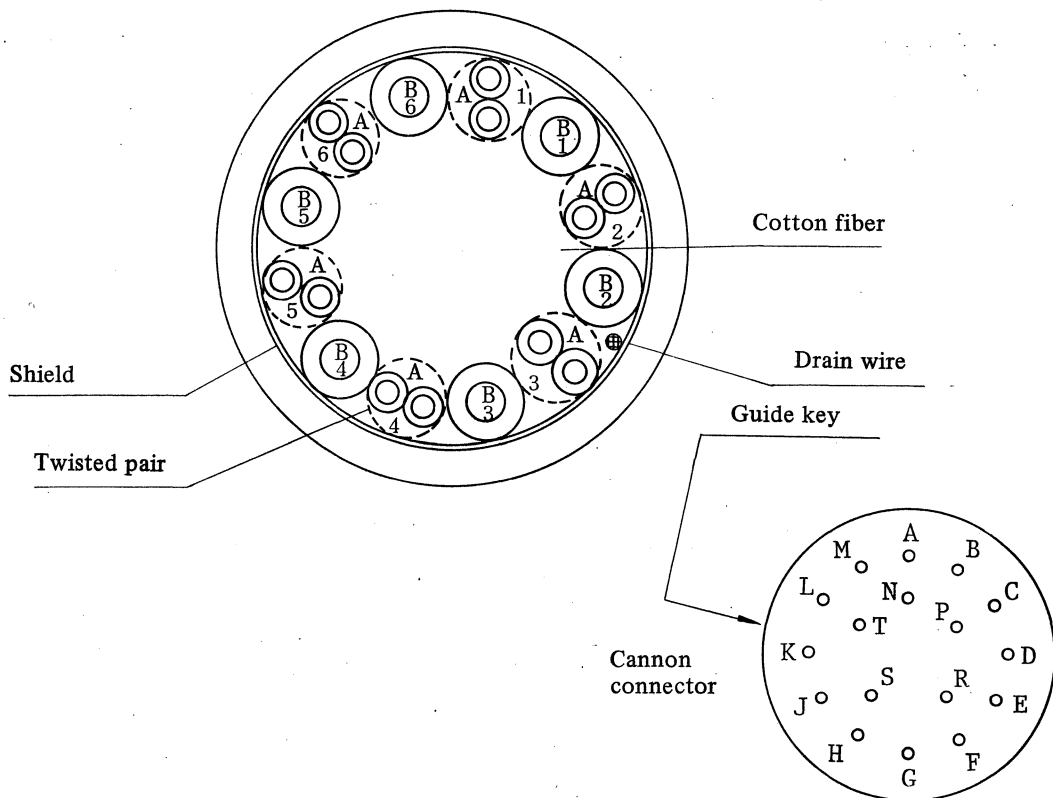


Fig. 2.2.6 (c)



2.2.7 Details of connections of cable K7

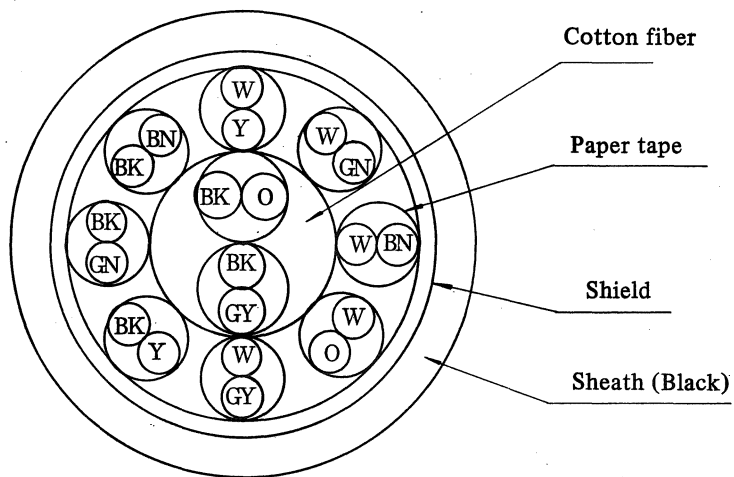
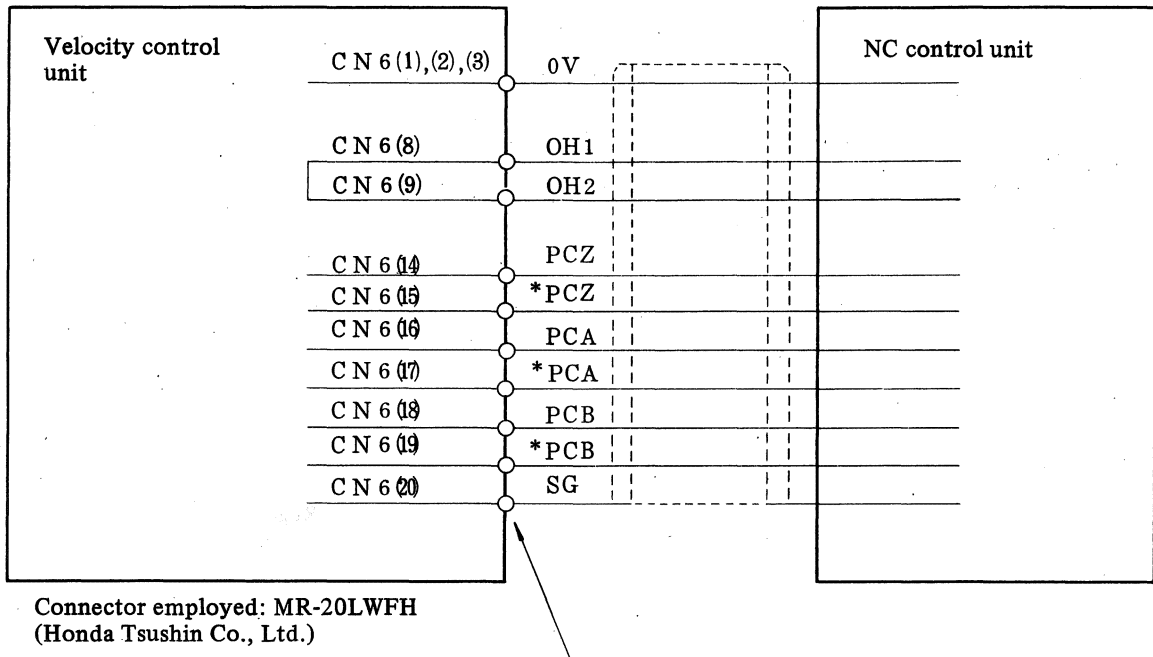


Fig. 2.2.7 (a)

2.2.8 Connections of separate regenerative discharge unit

(1) Details of connection of separate regenerative discharge unit.

Note 1)

Disconnect the jumper wire from terminals T2(5)-T2(6) in unit H003 and H004, T2(4)-T2(5) in unit H103, H113, and H104. When the separate regenerative discharge unit is employed.

Cable employed: 2.0mm² (37/0.26)
600V heat-resistive vinyl cable

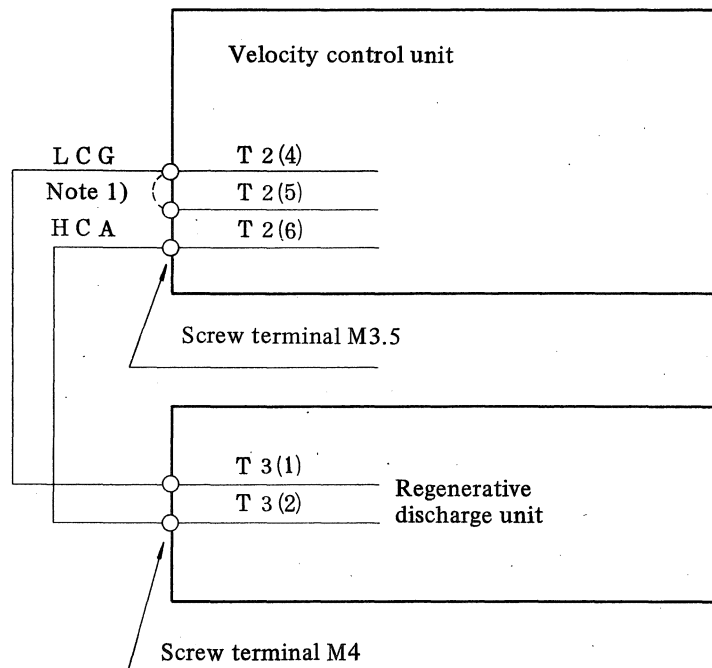


Fig. 2.2.8 (a)

(2) Details of cable K2

For connections of cable K2 in 2.2.2, change the connection of TOH1 and TOH2 as follows.

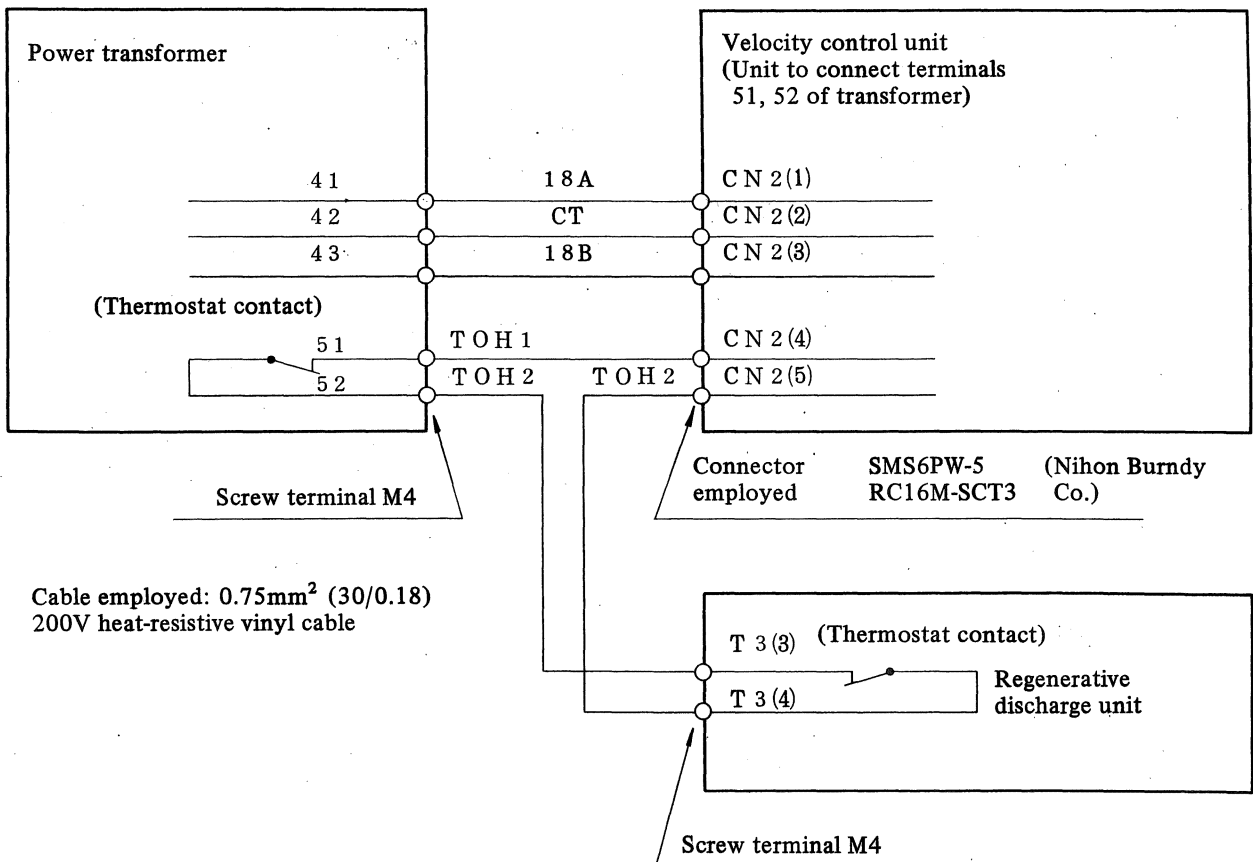


Fig. 2.2.8 (b)

2.3 Connection of Power Supply Transformer Tap

More sure the input tap of the power supply transformer is set according to the input voltage when connecting the power supply cable to the AC servo unit.

If set incorrectly, the AC servo unit may cause trouble.

2.3.1 Primary side connection

Connections of the transformer terminals and power supply cables U, V, and W must follow the input supply voltage specifications in Tables 2.3.1(a) and 2.3.1(b).

- (1) For Japanese model power supply transformers AA, MB, and MC.

Table 2.3.1 (a)

Supply voltage	Connection of primary-side terminals
200V	U-2, V-4, W-6
220V	U-1, V-3, W-5

- (2) For export model power supply transformers MBE, and MCE.

Table 2.3.1 (b)

Supply voltage	Connection of primary-side terminals	
	Connection of power supply cables U, V, W	Strapping transformer terminals
190V (Common to 200V)	U-3-7, V-11-15, W-19-23	4-8-12-16-20-24
230V (Common to 220V)	U-2-6, V-10-14, W-18-22	
380V	U-3, V-11, W-19	4-7, 12-15, 20-23, 8-16-24
420V (Common to 415V/440V)	U-3, V-11, W-19	4-6, 12-14, 20-22, 8-16-24
460V (Common to 480V)	U-2, V-10, W-18	4-6, 12-14, 20-22, 8-16-24
550V	U-1, V-9, W-17	4-5, 12-13, 20-21, 8-16-24

(3) For common model power supply transformers AAE, ABE and ACE.

Table 2.3.1 (c)

Supply voltage	Connection of primary-side terminals	
	Connection of power supply cables U, V, W	Strapping transformer terminals
200V	U-7, V-15, W-23	8-15, 16-23, 24-7
220V	U-6, V-14, W-22	8-14, 16-22, 24-6
230V	U-5, V-13, W-21	8-13, 16-21, 24-5
240V	U-4, V-12, W-20	8-12, 16-20, 24-4
Delta connection		
380V	U-6, V-14, W-22	8-16, 16-24 or (8-16-24)
420V	U-4, V-12, W-20	
460V	U-3, V-11, W-19	
480V	U-2, V-10, W-18	
550V	U-1, V-9, W-17	
Star connection		

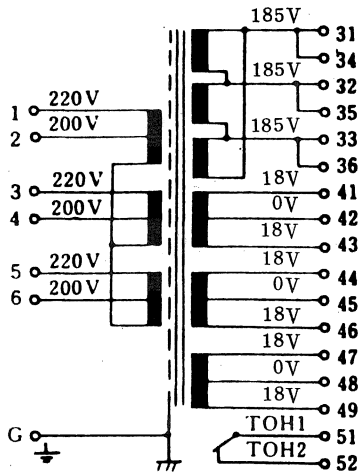
Remarks

If more than one power supply transformer is used, both must be connected to the tap in the same way. Also the connection of transformer overheat must be done in the same manner.

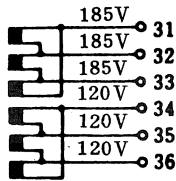
2.3.2 Connections in the power supply transformer

Domestic models

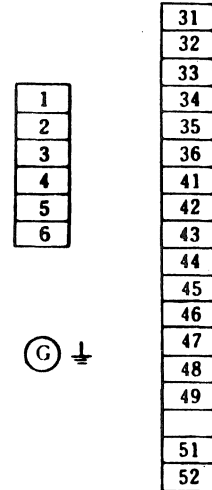
Connections for power supply transformers AA, MB, and MC (Connection for 31-36 of AA is as shown right.)



Connections for power supply transformers AA 31 to 36.

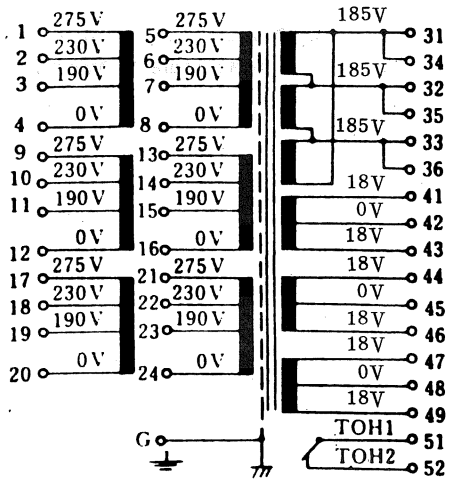


Terminal array of power supply transformers AA, MB, and MC

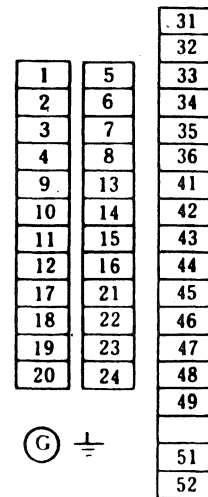


Export models

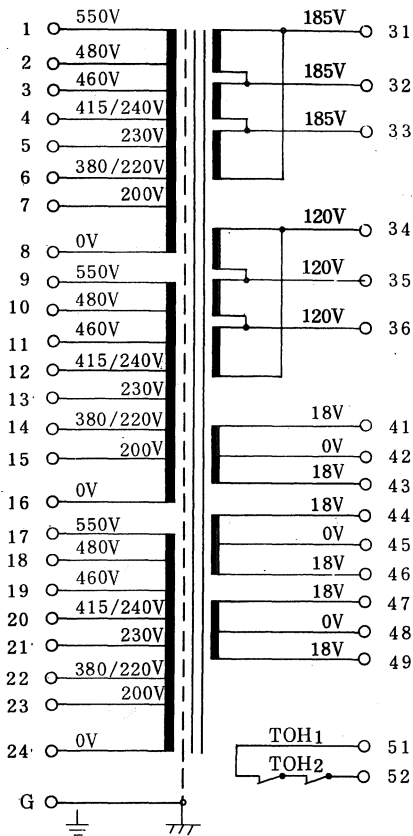
Connections for power supply transformers MBE, and MCE.



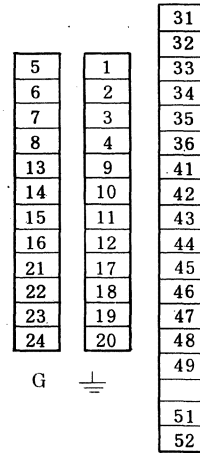
Terminal array of power supply transformers MBE, and MCE.



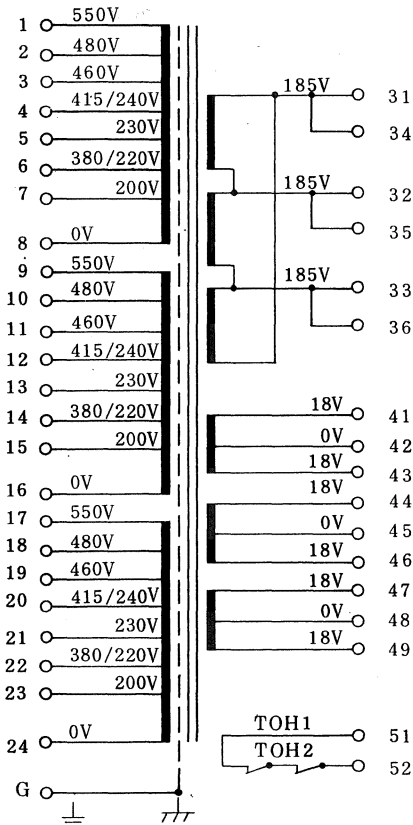
Connections for power supply transformer AAE.



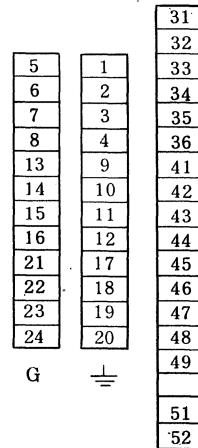
Terminal array of power supply transformer AAE.



Connection for power supply transformer ABE and ACE.

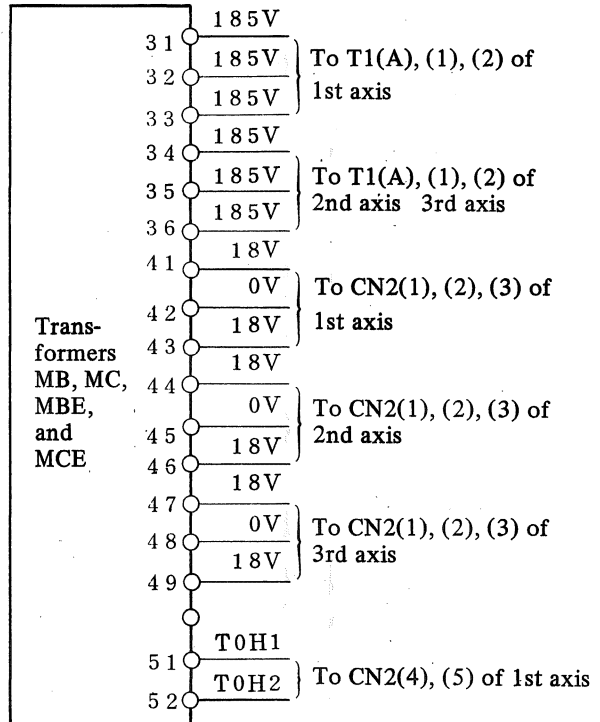
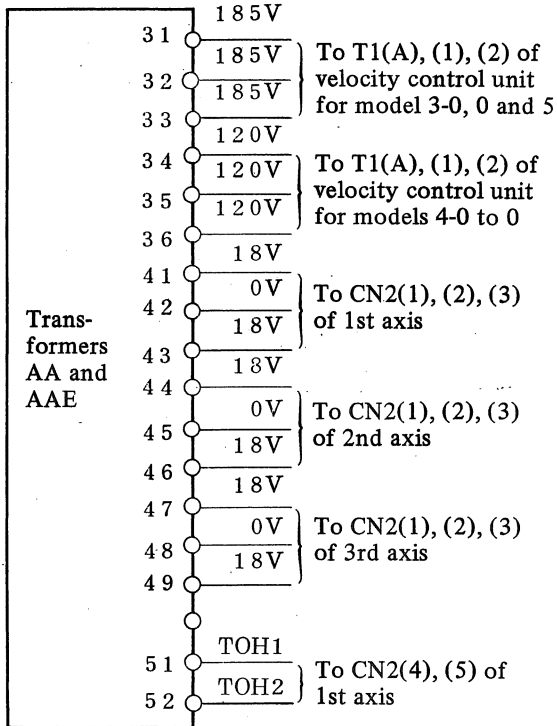


Terminal array of power supply transformer ABE and ACE.



(1) For power supply transformers AA and AAE

(2) For power supply transformers MB, MC, MBE, MCE, ABE and MCE



Note: The Model 4-0, 2-0 and 0 motor use a relatively low power supply transformer voltage. If the higher voltage used for the other models is applied to the velocity control unit for Model 4-0 to 0, it will cause a fault.

2.3.3 Motors and power transformers employed for each axis

Table 2.3.3

1st axis	2nd axis	3rd axis	Power transformer	Remarks
Model 4-0, 3-0, 2-0	Model 4-0, 3-0, 2-0	Model 4-0, 3-0, 2-0	Transformer AA(AAE) (1.5 kVA)	Model 4-0, 2-0, 1-0, and 0 employ transformer output terminals 34, 35, 36, while Model 3-0, and 0, 5 employ transformer output terminals 31, 32, 33.
Model 4-0, 3-0, 2-0	Model 4-0, 3-0, 2-0	Model 5		
Model 4-0, 3-0, 2-0, 1-0	Model 1-0, 0			
Model 4-0, 3-0, 2-0, 1-0, 0	Model 5			
Model 5	Model 5	Model 5	Transformer MB(MBE, ABE) (2.5 kVA)	
Model 5, 10	Model 10			
Model 20, 30				
Model 5	Model 5	Model 10	Transformer MC(MCE, ACE) (5 kVA)	See Note.
Model 5	Model 20, 30	Model 30		
Model 30R				

Note: Two or more transformers MC, MCE or ACE become necessary according to the load conditions in case of Model 10, 20, 30 x 3 axis. For details, contact FANUC LTD., referring to AC servo motor selection data sheet.

2.4 Connection Diagram of Velocity Control Unit

2.4.1 For Model 2-0, 1-0 (A06B-6050-H002)

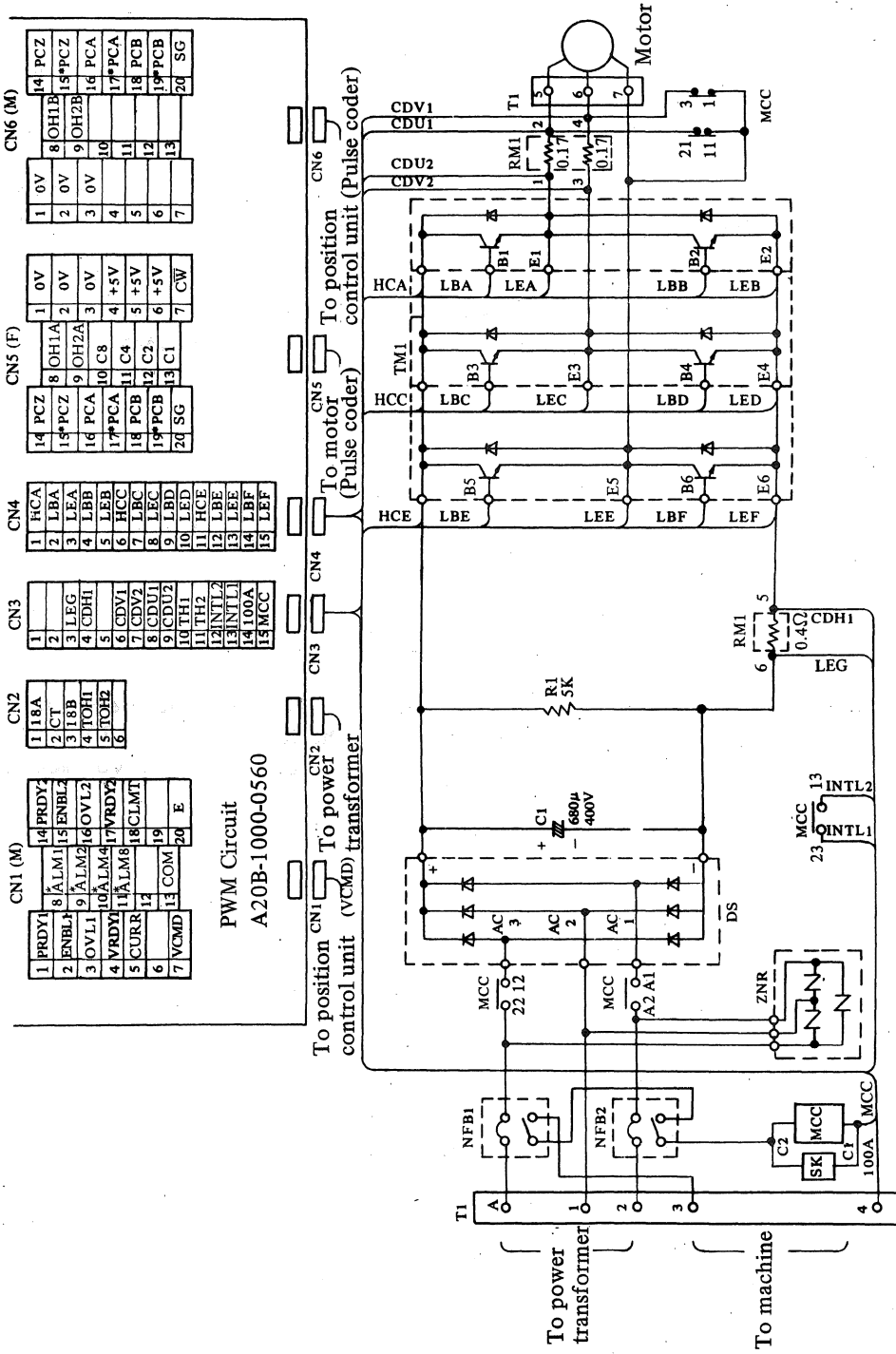


Fig. 2.4.1 Connection Diagram for Velocity Control Unit

2.4.2 For Model 0, 5 (A06B-6050-H102)

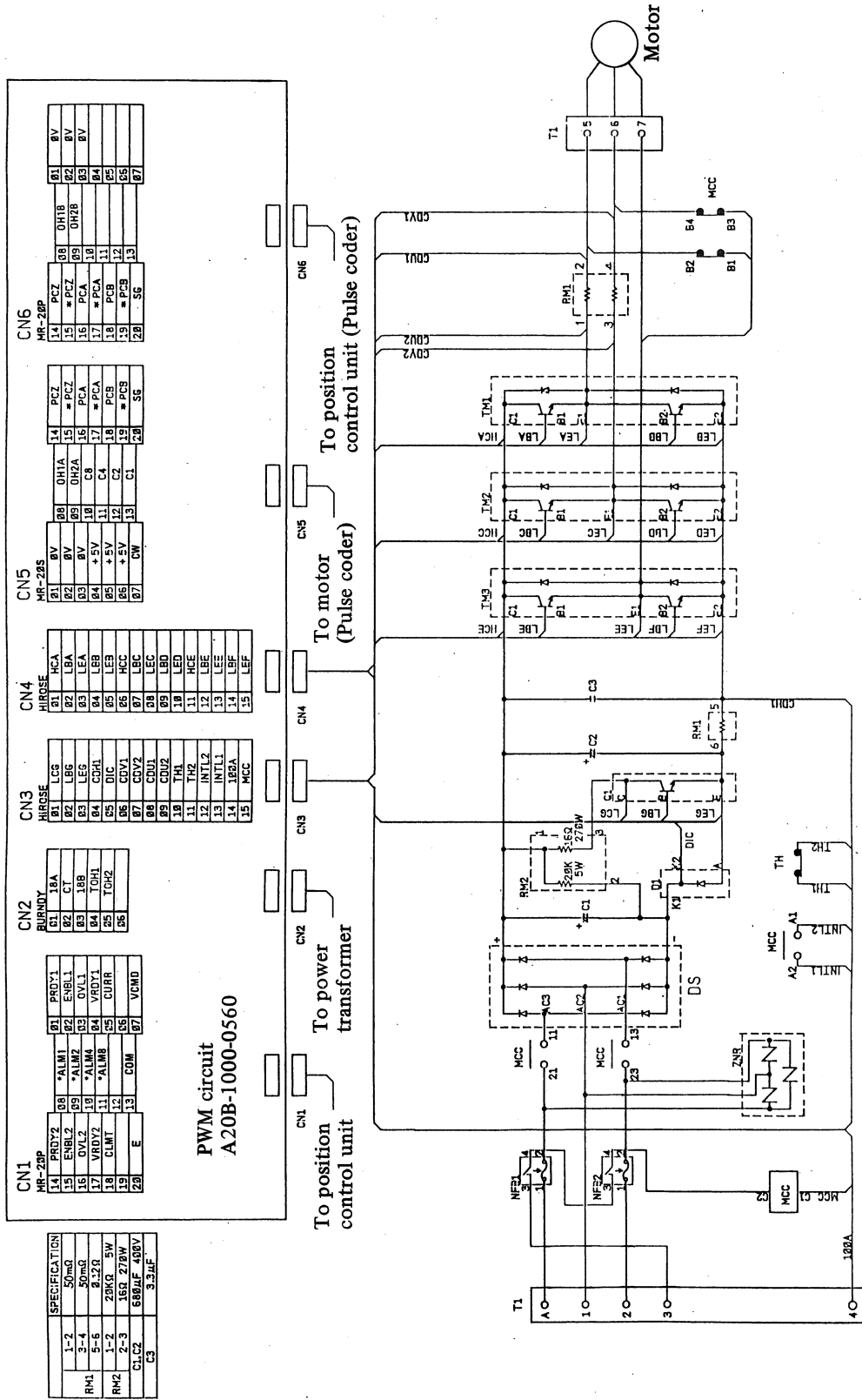


Fig. 2.4.2 Connection Diagram for Velocity Control Unit

Terminal	Specification
1-2	50mΩ
3-4	50mΩ
5-6	2.12Ω
RM1	28KΩ 5W
RM2	16Ω 270W
2-3	680μF 400V
C1, C2	3.3μF

PWM circuit
A20B-1000-0560

2.4.3 For Model 10, 20M, 20, 30 (A06B-6050-H103, H113, H104)

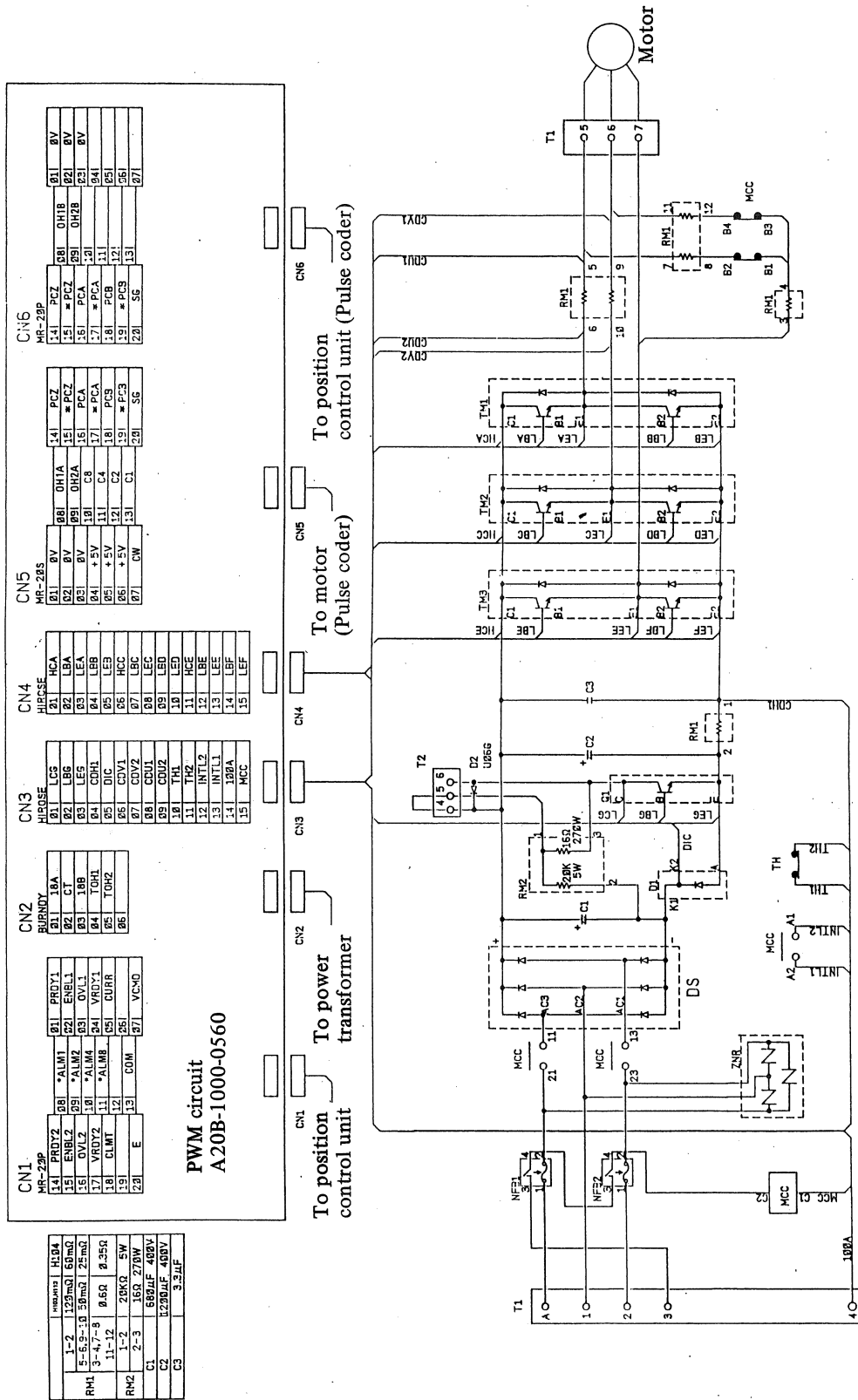


Fig. 2.4.3 Connection Diagram for Velocity Control Unit

2.4.4 In case Model 30R (A06B-6050-H005)

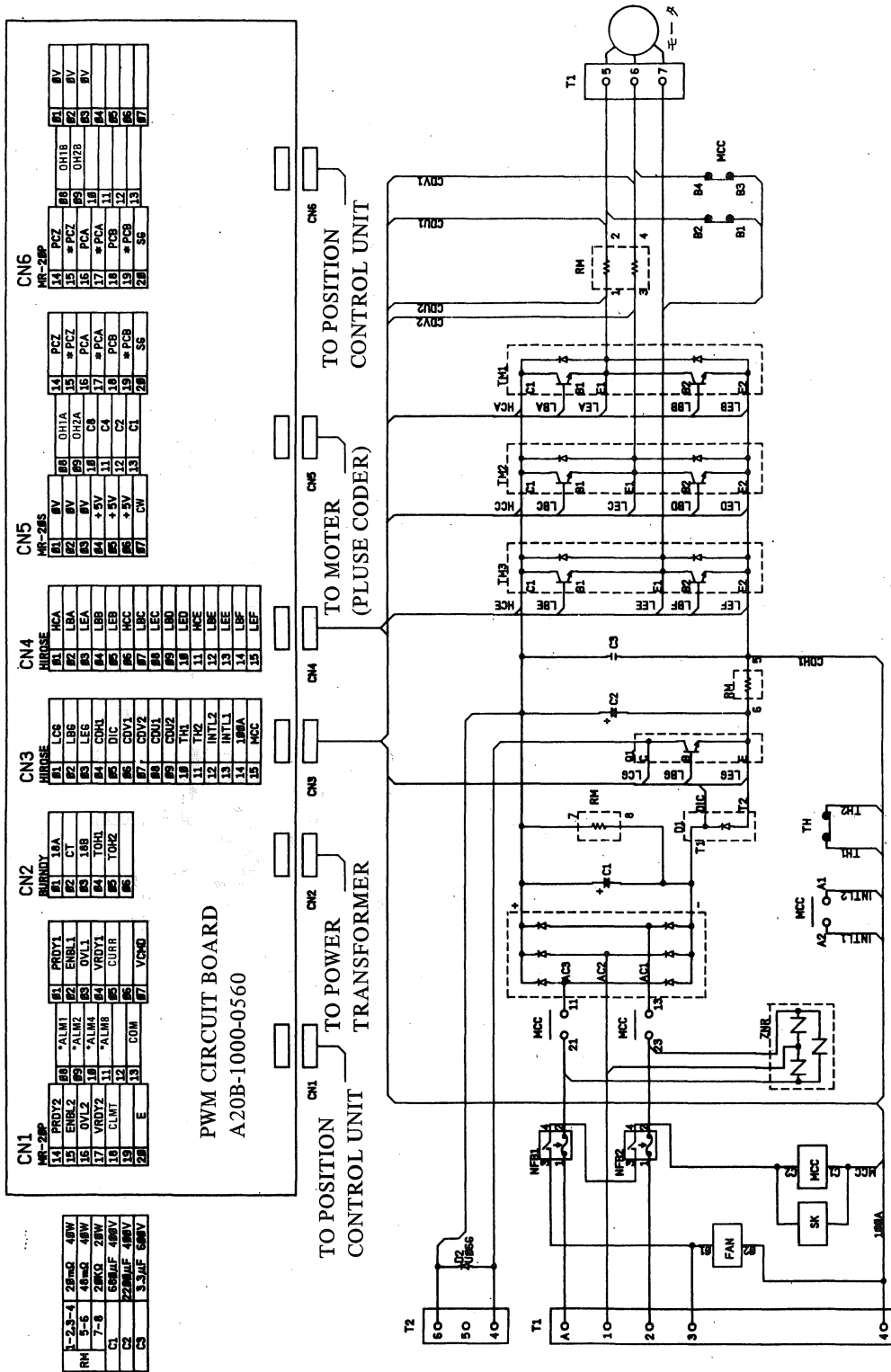


Fig. 2.4.3 Connection Diagram for Velocity Control Unit

2.4.5 For Model 0 - 30 (A06B-6050-H003, H004)

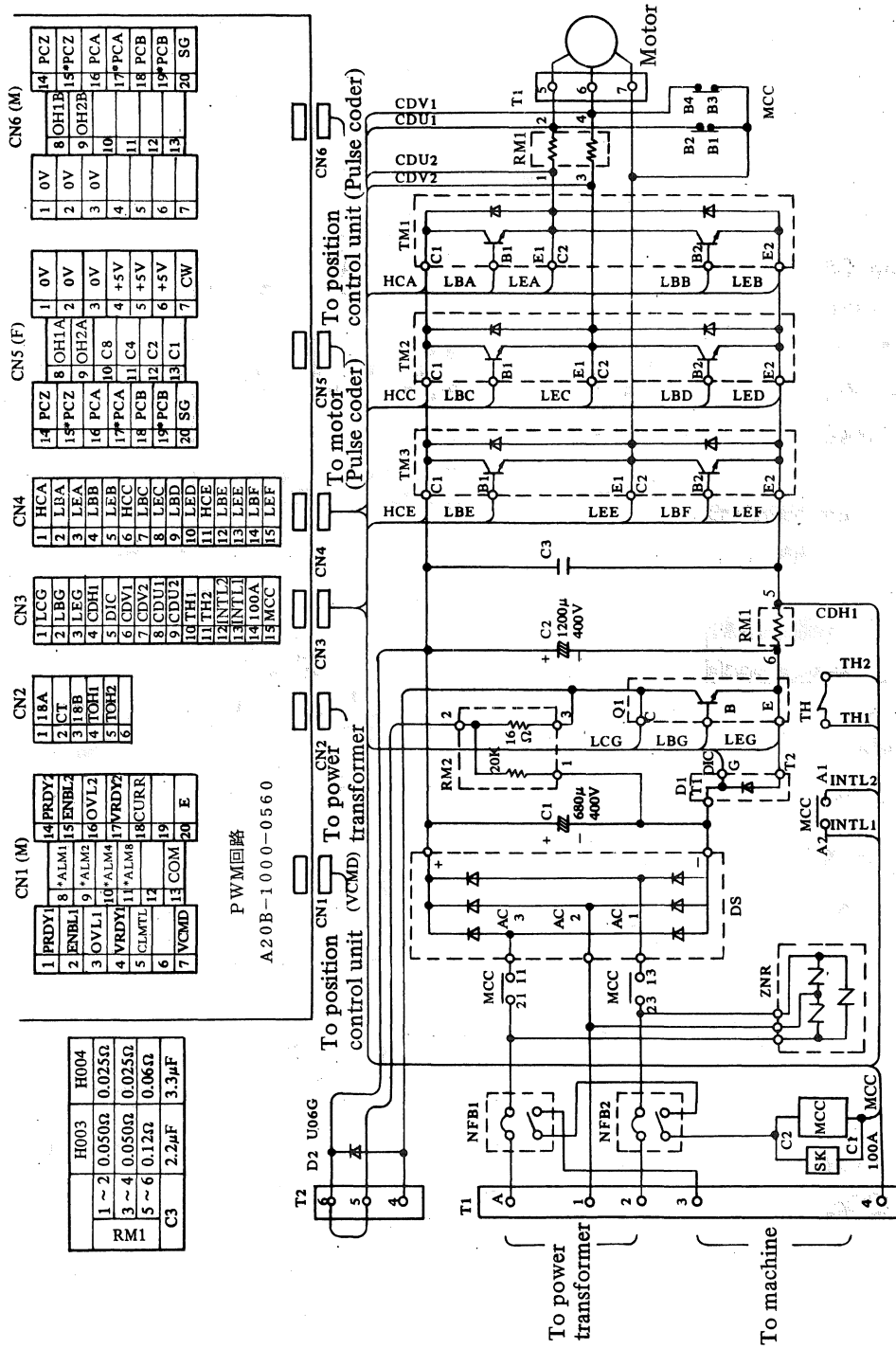


Fig. 2.4.5 Connection Diagram for Velocity Control Unit

3. SETTING AND ADJUSTMENT FOR VELOCITY CONTROL UNIT

3.1 Setting and Adjustment for Velocity Control PCB

3.1.1 Parts location

- (1) For Model 2-0 to 30R
 - (a) PCB A20B-1000-0560 (After edition number E)

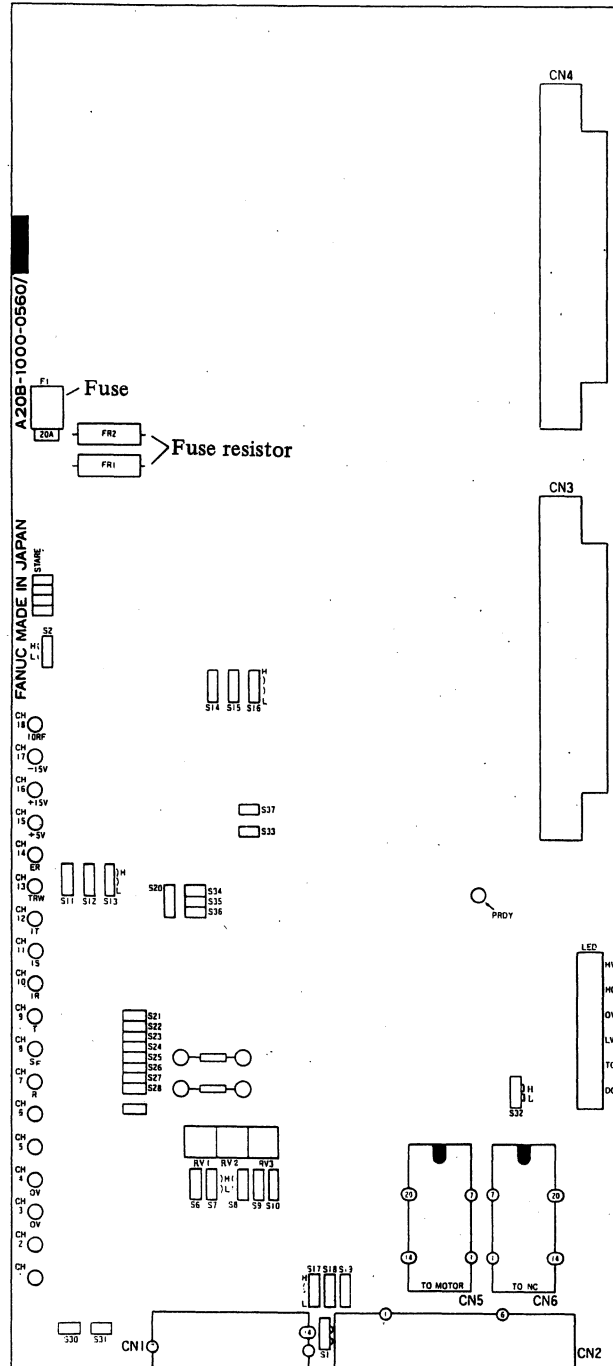


Fig. 3.1.1 (a)

Note: Parts location on PCB may be changed without notice.

(b) PCB A20B-1000-0560 (Edition number E)

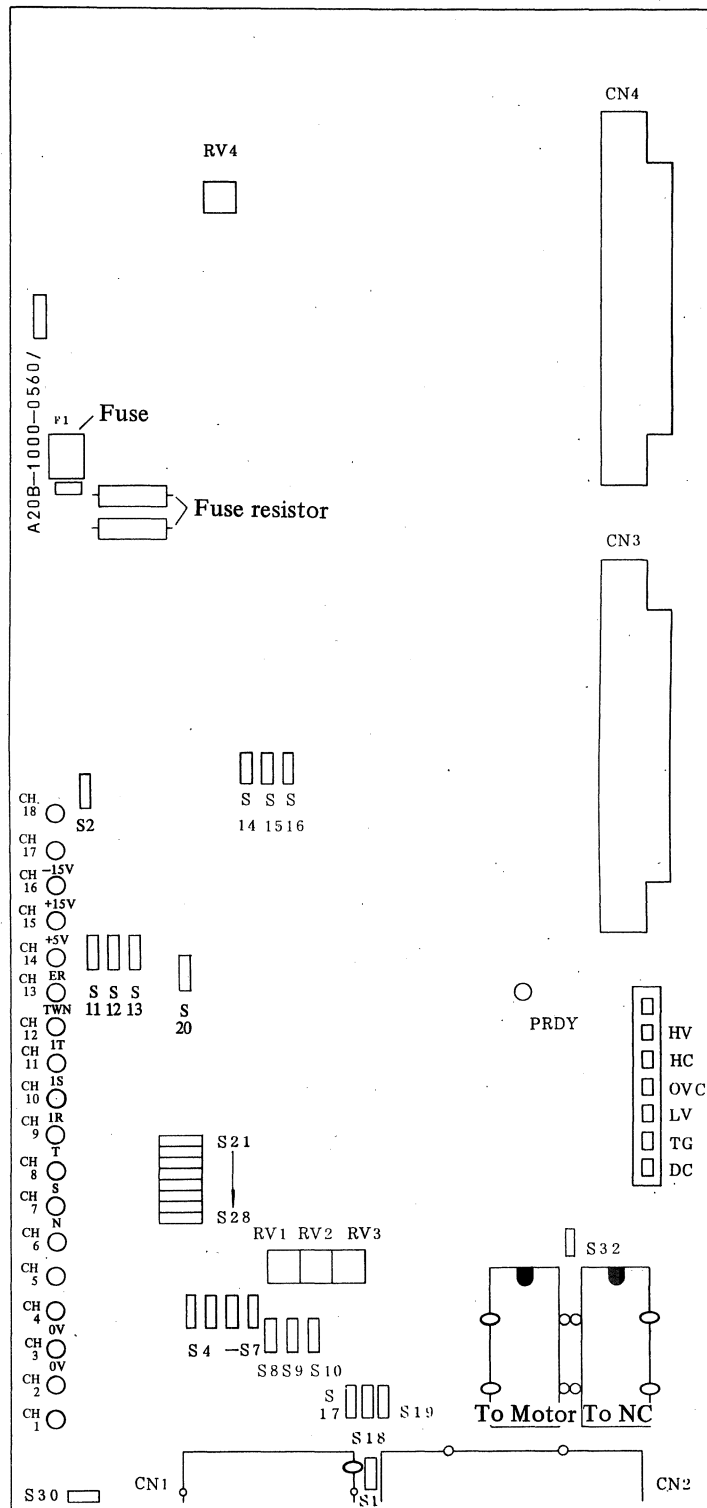


Fig. 3.1.1 (b)

Note: Parts location on PCB may be changed without notice.

(c) PCB A20B-1000-0560 (Edition number C or D)

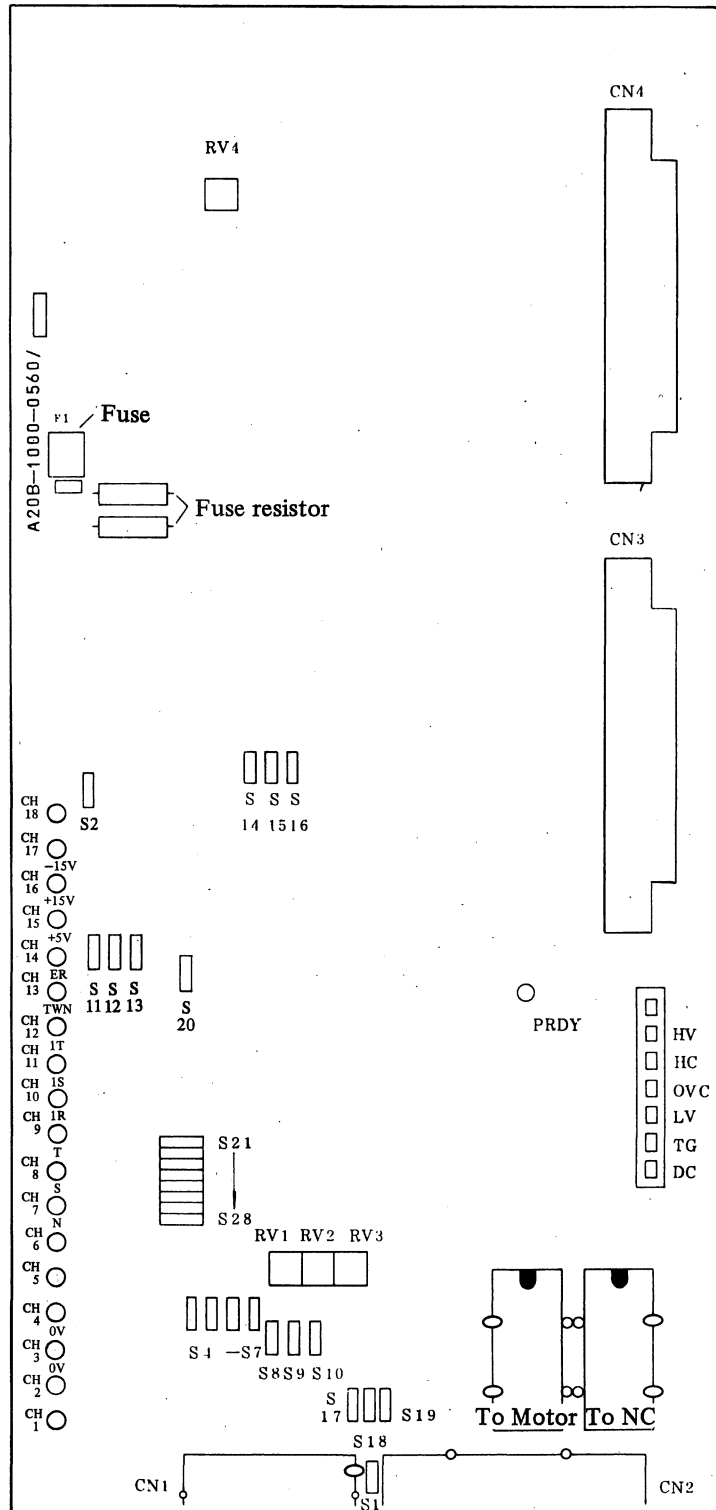


Fig. 3.1.1 (c)

Note: Parts location on PCB may be changed without notice.

(d) PCB A20B-1000-0560 (Edition number A or B)

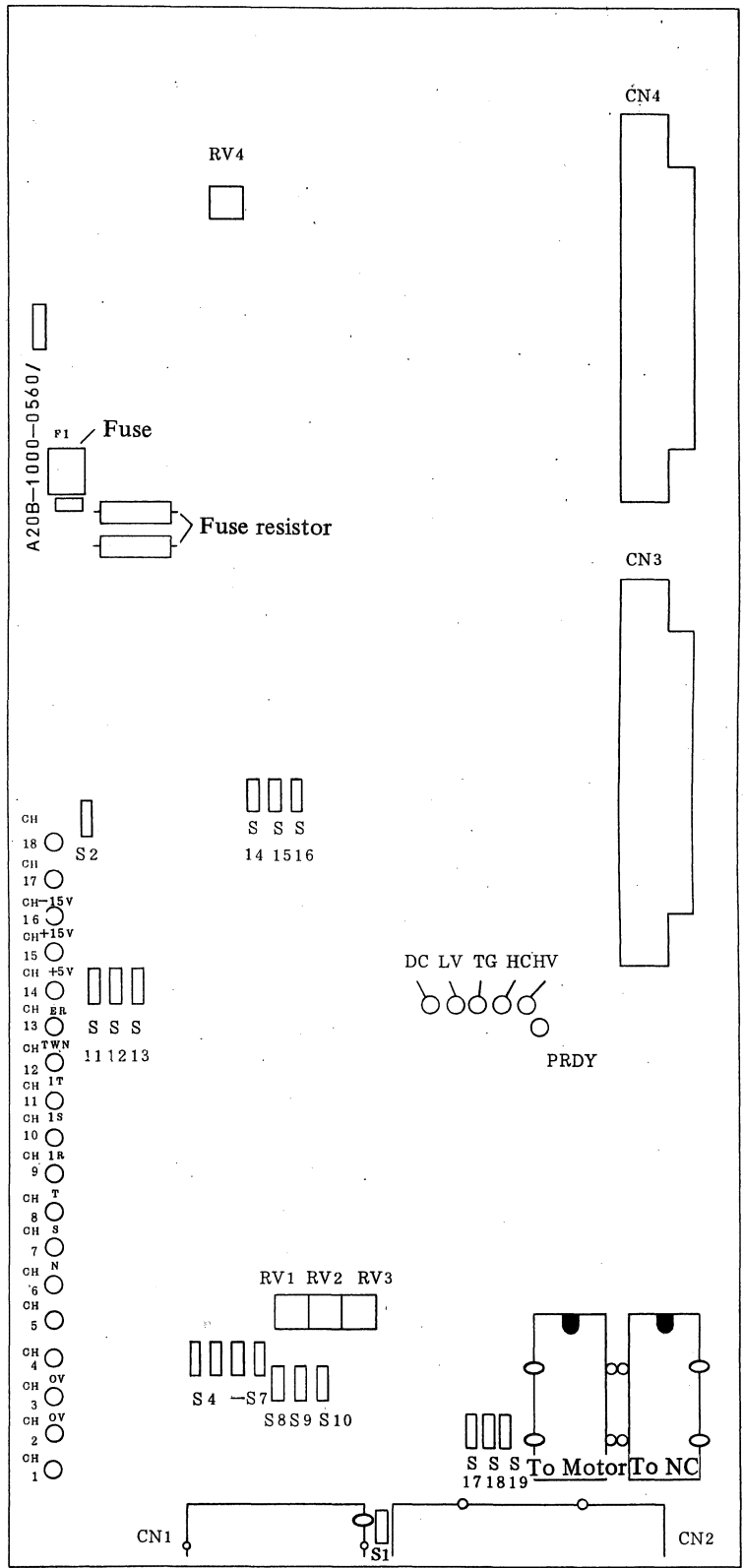


Fig. 3.1.1 (d)

Note: Parts location on PCB may be changed without notice.

(2) Model 4-0, 3-0

(a) PCB A20B-1000-0590 (After edition number B)

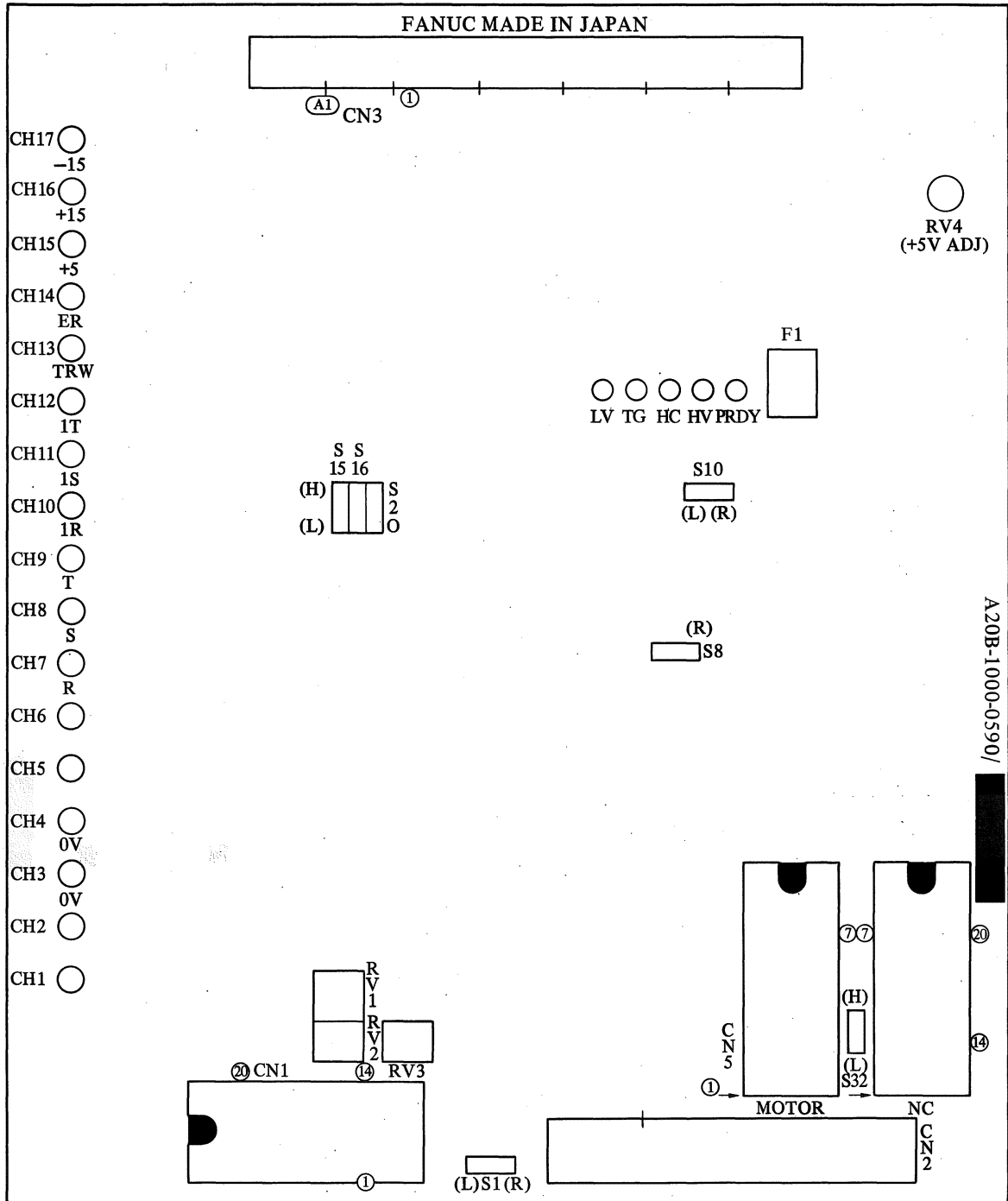


Fig. 3.1.1 (e)

Note: Parts location on PCB may be changed without notice.

(b) A20B-1000-0590 (Edition number A)

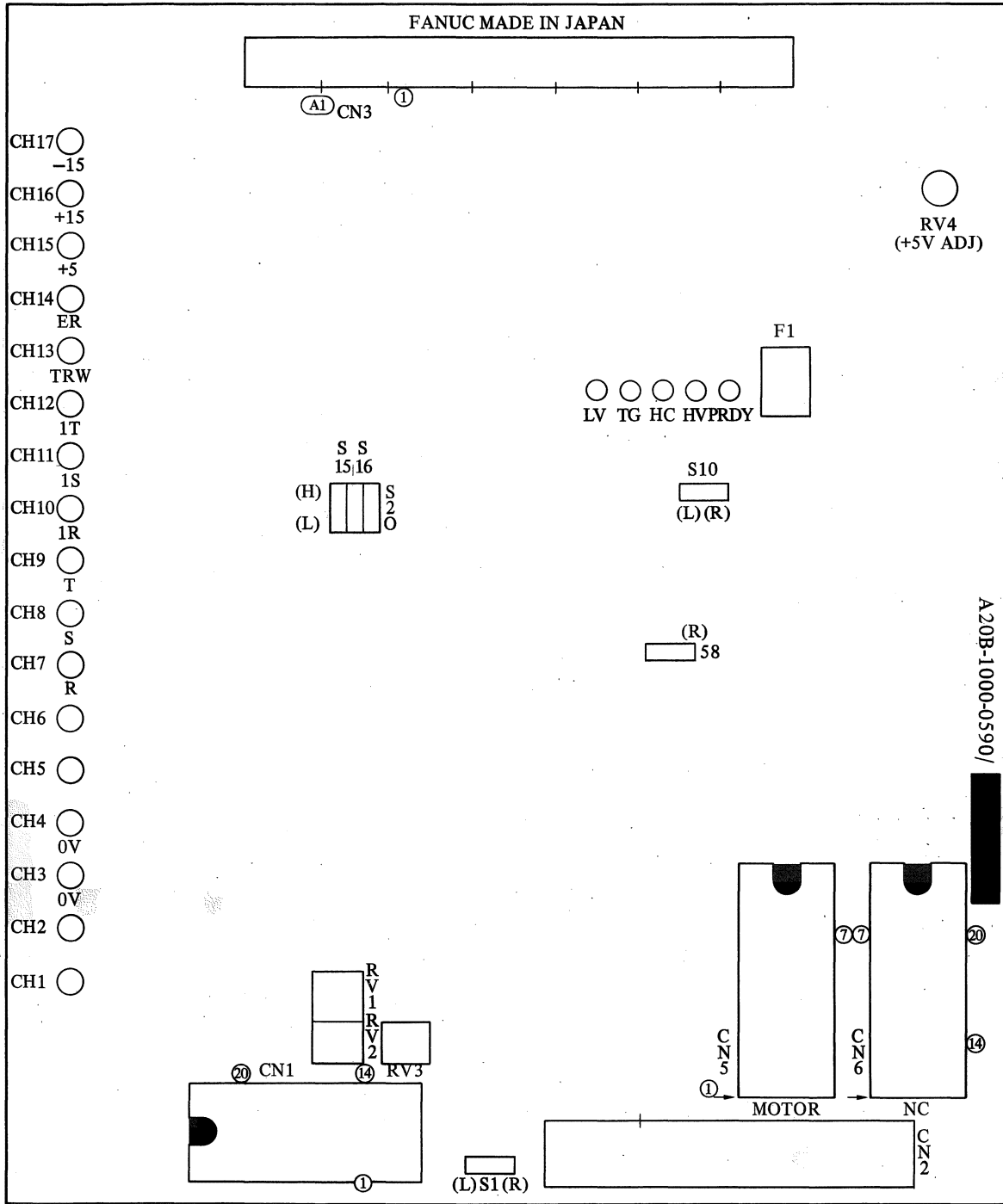


Fig. 3.1.1 (f)

Note: Parts location on PCB may be changed without notice.

(c) For Model 4-0, 3-0 (A20B-1000-0600)

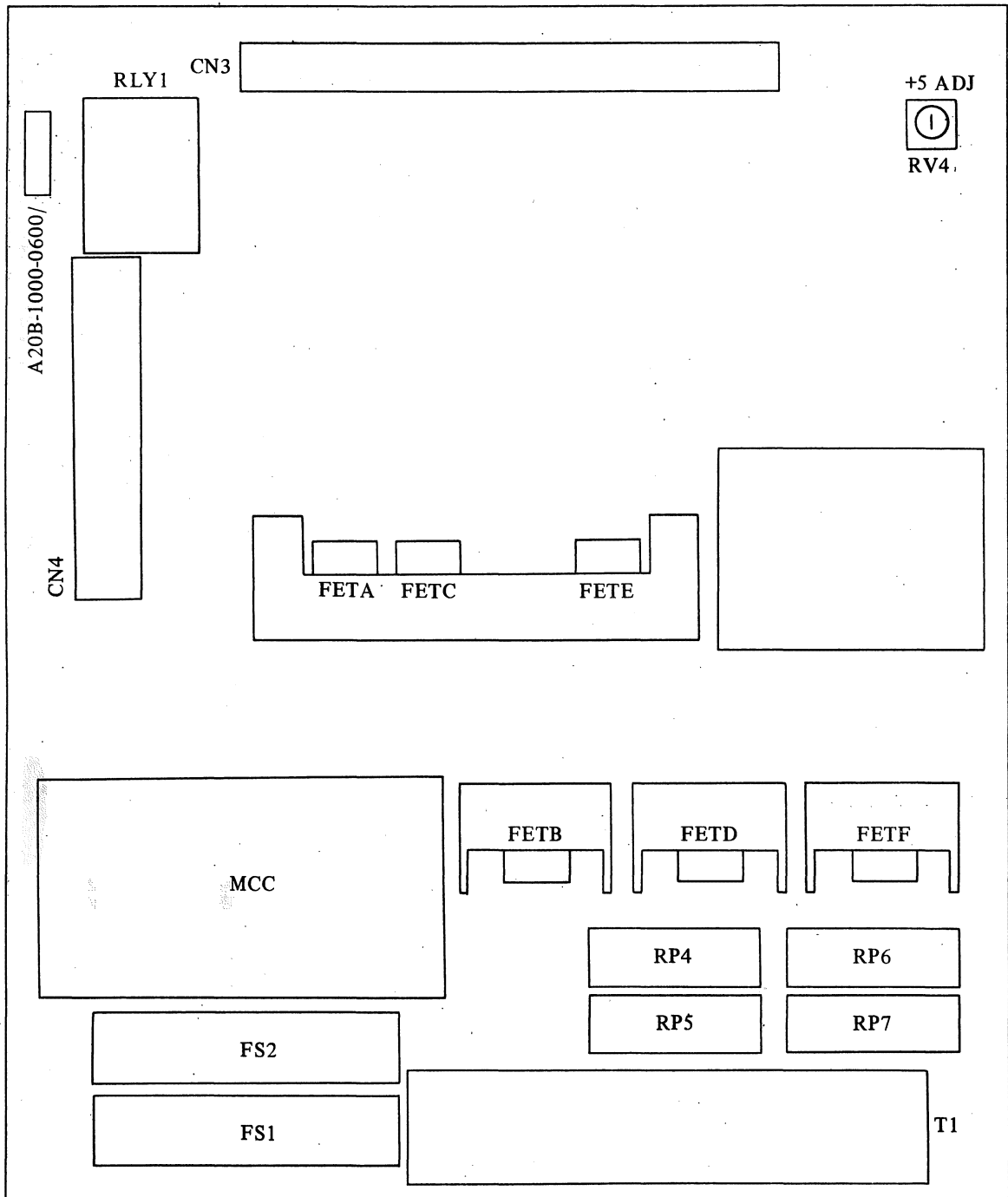


Fig. 3.1.1 (g)

(3) Model 5-0
 (a) PCB A20B-1001-0420

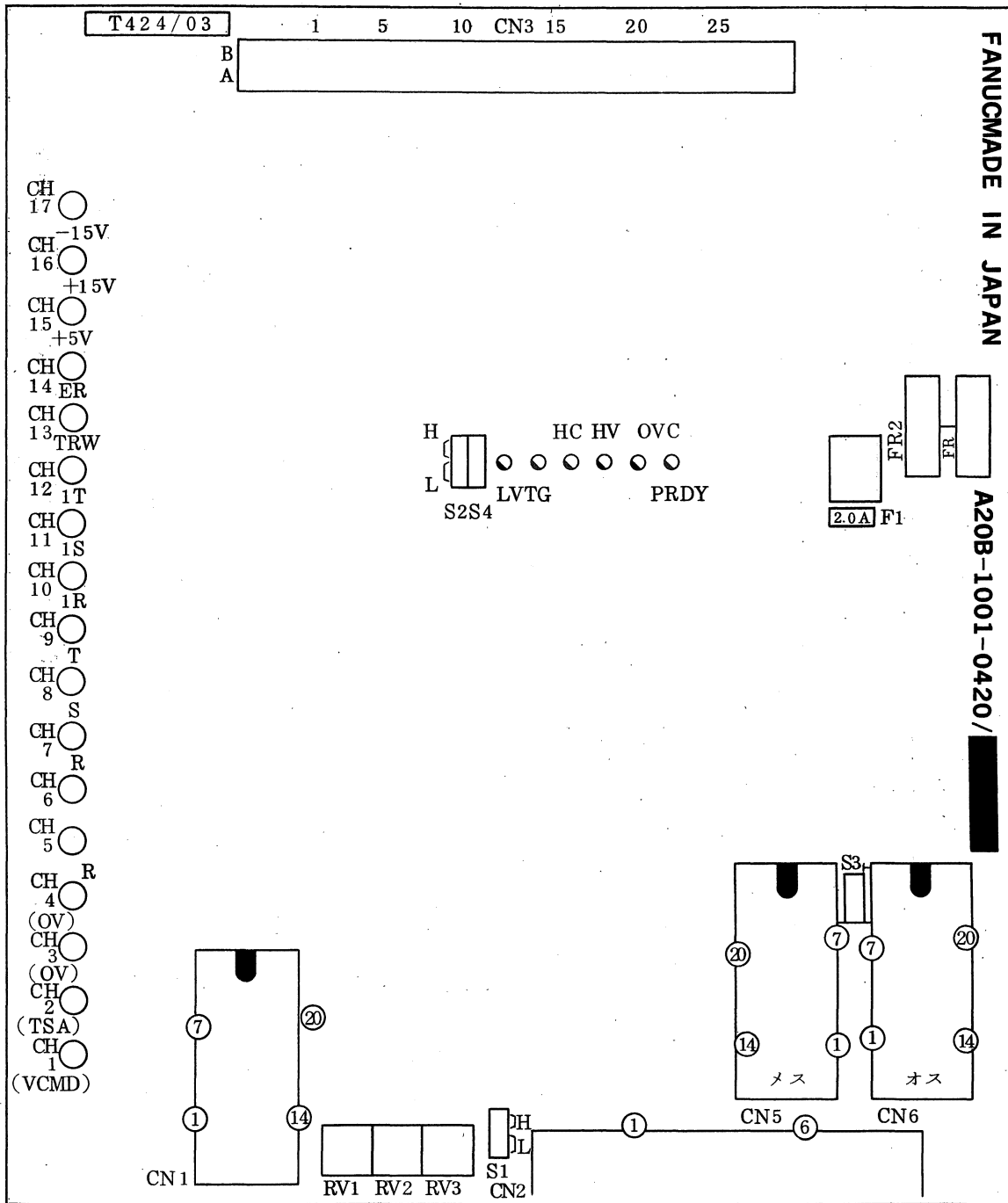


Fig. 3.1.1 (h)

Note: Parts location on PCB may be changed without notice.

(b) PCB A20B-1001-0410

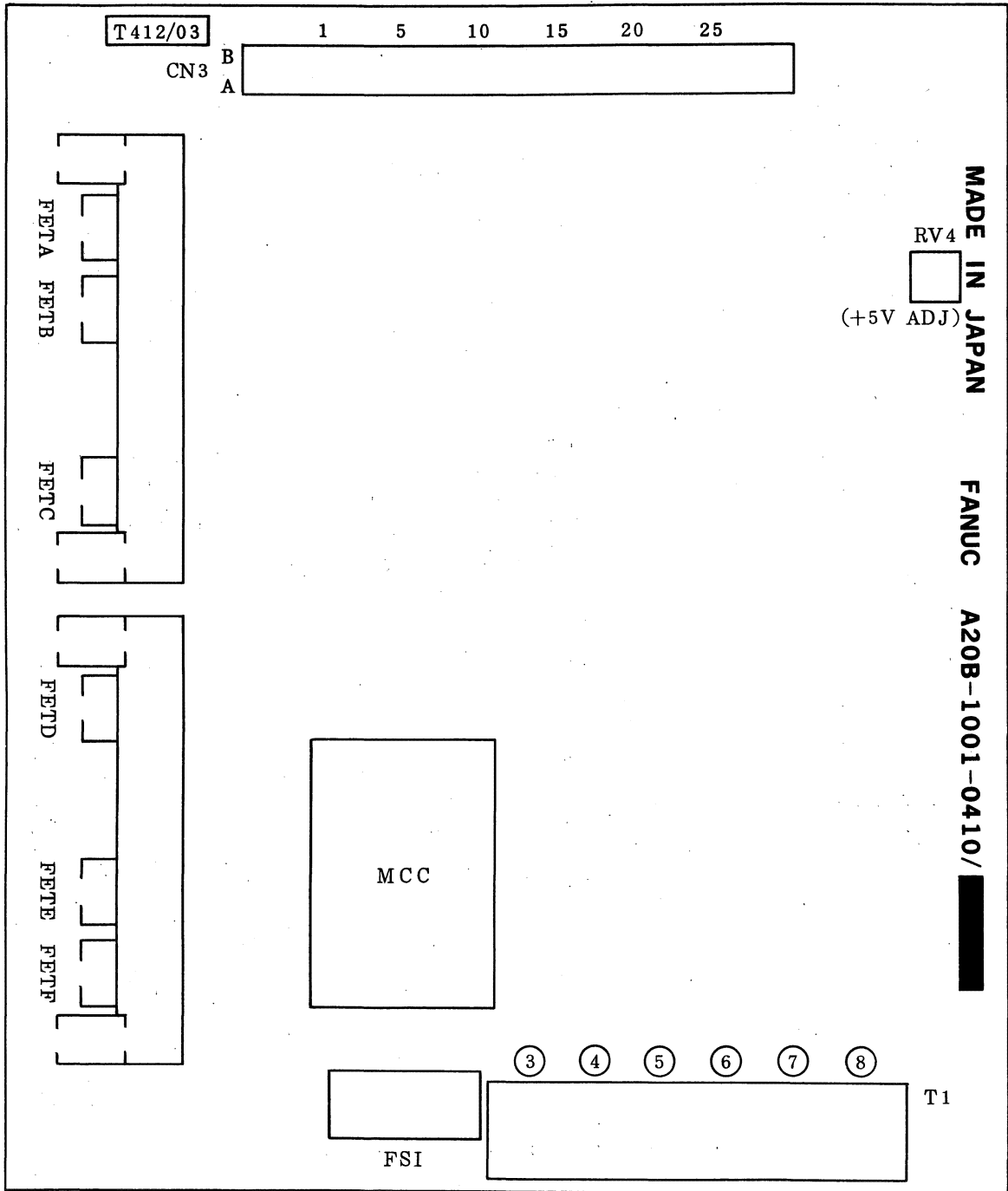


Fig. 3.1.1 (i)

Note: Parts location on PCB may be changed without notice.

3.1.2 Setting terminal

(1) Model 2-0 - 30R

(a) PCB A20B-1000-0560 (After edition number F)

Table 3.1.2 (a)

Setting terminal	Standard setting						Remarks
	2-0,1-0	0,5	10	20M	20,30	30R	
S1	L	L	L	L	L	L	TOH setting (Note 1)
S2	L	L	L	L	L	L	DC alarm setting (Note 2)
S6	H	H	H	H	H	H	Compensation circuit setting
S7	H	H	H	H	H	H	
S10	H	H	H	H	H	H	TG alarm enable (Note 3)
S11	H	H	L	L	L	H	Current loop gain setting
S12	H	H	L	L	L	H	
S13	H	H	L	L	L	H	
S17	H	H	H	H	H	L	Current limit setting
S18	H	L	L	L	H	H	
S19	H	H	H	H	H	H	
S20	H	H	H	H	H	H	Absolute code output enable (Note 4)
S32	L	L	L	L	L	L	Setting for absolute pulse coder (Note 5)

Setting terminal	2-0,1-0,0,5,10,20M,20,30,30R			Remarks
	Pulse coder			
	2000P	2500P	3000P	
S8	L	L	H	Pulse coder F/V gain setting
S9	H	L	L	
S14	L	H	H	Pulse coder pole number, and pulse number setting
S15	H	L	L	
S16	H	L	H	

Setting terminal	Standard setting							Remarks
	2-0,1-0	0	5	10	20M	20,30	30R	
S21								Compensation circuit setting
S22								
S23	o	o	o					VCMD gain setting (Note 6)
S24	o	o	o	o	o	o	o	F/V circuit filter setting
S25	o	o	o	o	o	o	o	Compensation circuit setting
S26								
S27								
S28								
S29								
S30								External analog current limiter setting
S31								Connect CN1(19) pin and 0V
S33		o						OVC alarm level setting
S34			o					
S35		o	o	o	o			Current feedback gain setting (Note 7)
S36		o	o	o	o			
S37								Speed feedback gain setting (Note 8)
S38		o	o	o	o			Compensation circuit setting

(b) PCB A20B-1000-0560 (Edition number E)

Table 3.1.2 (b)

Setting terminal	Standard setting					Remarks
	2-0,1-0	0,5	10,20M	20,30	30R	
S1	L	L	L	L	L	TOH setting (Note 1)
S2	L	L	L	L	L	DC alarm setting (Note 2)
S4	L	L	L	L	L	Compensation circuit setting
S5	L	L	L	L	L	
S6	H	H	H	H	H	
S7	H	H	H	H	H	
S10	H	H	H	H	H	TG alarm enable (Note 3)
S11	H	H	L	L	H	Current loop gain setting
S12	H	H	L	L	H	
S13	H	H	L	L	H	
S17	H	H	H	H	L	Current limit setting
S18	H	H	H	H	H	
S19	H	H	H	H	H	
S20	H	H	H	H	H	Absolute code output enable (Note 4)
S32	L	L	L	L	L	Setting for absolute pulse coder (Note 5)

Setting terminal	2-0,1-0,0,5,10,20M,20,30,30R			Remarks
	Pulse coder			
	2000P	2500P	3000P	
S8	L	L	H	Pulse coder F/V gain setting
S9	H	L	L	
S14	L	H	H	Pulse coder pole number, and pulse number setting
S15	H	L	L	
S16	H	L	H	

Setting terminal	Standard setting					Remarks
	2-0,1,0	0,5	10,20M	20,30	30R	
S21						Compensation circuit setting
S22						
S23	o	o				VCMD gain setting (Note 6)
S24	o	o	o	o	o	F/V circuit filter setting
S25	o	o	o	o	o	Compensation circuit setting
S26						
S27						
S28						
S30						External analog current limiter setting

(c) PCB A20B-1000-0560 (Edition number C or D)

Table 3.1.2 (c)

Setting terminal	Standard setting					Remarks
	2-0,1-0	0,5	10	20,30	30R	
S1	L	L	L	L	L	TOH setting (Note 1)
S2	L	L	L	L	L	DC alarm setting (Note 2)
S4	L	L	L	L	L	Compensation circuit setting
S5	L	L	L	L	L	
S6	H	H	H	H	H	
S7	H	H	H	H	H	
S10	H	H	H	H	H	TG alarm enable (Note 3)
S11	H	H	L	L	H	Current loop gain setting
S12	H	H	L	L	H	
S13	H	H	L	L	H	
S17	H	H	L	L	L	Current limit setting
S18	H	H	H	H	H	
S19	H	H	H	H	H	
S20	H	H	H	H	H	Absolute code output enable (Note 4)

Setting terminal	2-0,1-0,0,5,10,20,30,30R			Remarks
	Pulse coder			
	2000P	2500P	3000P	
S8	L	L	H	Pulse coder F/V gain setting
S9	H	L	L	
S14	L	H	H	Pulse coder pole number, and pulse number setting
S15	H	L	L	
S16	H	L	H	

Setting terminal	Standard setting					Remarks
	2-0,1,0	0,5	10	20,30	30R	
S21						Compensation circuit setting
S22						
S23	o	o				VCMD gain setting (Note 6)
S24	o	o	o	o	o	F/V circuit filter setting
S25	o	o	o	o	o	Compensation circuit setting
S26						
S27						
S28						

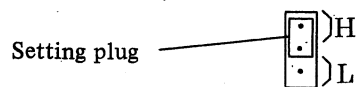
d) PCB A20B-1000-0560 (Edition number A and B)

Table 3.1.2 (d)

Setting terminal	Standard setting					Remarks
	2-0,1-0	0,5	10	20,30	30R	
S1	L	L	L	L	L	TOH setting (Note 1)
S2	L	L	L	L	L	DC alarm setting (Note 2)
S4	All H or All L					Compensation circuit setting
S5						
S6						
S7						
S10	H	H	H	H	H	TG alarm enable (Note 3)
S11	H	H	H	L	H	Current loop gain setting
S12	H	H	H	L	H	
S13	H	H	H	L	H	
S17	H	H	H	H	L	Current limit setting
S18	H	H	H	H	H	
S19	H	H	H	H	H	

Setting terminal	2-0,1-0,0,5,10,20,30,30R			Remarks
	Pulse coder			
	2000P	2500P	3000P	
S8	L	L	H	Pulse coder F/V gain setting
S9	H	L	L	
S14	L	H	H	Pulse coder pole number, and pulse number setting
S15	H	L	L	
S16	H	L	H	

- Note 1. If either power transformer or regenerative discharge unit is connected across terminals CN2 (4) and (5), set S1 to open (L side). If neither power transformer nor regenerative discharge unit is connected across terminals CN2 (4) and (5), set S1 to short (H side).
- Note 2. Set S2 to open (L side), if the regenerative discharge unit is not mounted, and set it to short (H side), if the regenerative discharge unit is mounted.
- Note 3. Set S10 to L side, if it is needed to check with motor power cable disconnected.
- Note 4. If S20 is set at L side, absolute codes from the pulse coder is output to NC while VRDY is on. If VRDY is turned OFF, the alarm code is output. If S20 is set at H side, the alarm code is always output.
- Note 5. When the absolute value pulse coder is used, set S32 at H side.
- Note 6. If S23 is short-circuited, 7V/2000 rpm will be set. If it is open, 7V/1000 rpm will be set. If models 10, 20, and 30R are used over 1500 rpm, change the above settings and NC parameters (loop gain multipliers).
- Note 7. Models 0, 5, 10, and 20M only may be short-circuited. If S35 and S36 are short-circuited, conversion of current feedback signals (CH10, 11, 12) is 0.183 V/A.
- Note 8. If S37 is short-circuited, the rate feedback voltage is changed from 3V/1000 rpm to 1.5V/1000 rpm. Normally, set it in the open state.
- Note 9. The way of setting is shown as following figures.



(a) Setting of H side



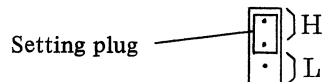
(b) Setting of L side

(2) For Model 4-0, 3-0 (PCB A20B-1000-0590)

Table 3.1.2(e)

Setting terminal	Pulse coder		Remarks
	2000P	2500P	
S1	R		TOH setting (Note 1)
S8	R	OPEN	Pulse coder F/V Gain
S10	L		TG alarm enable (Note 2)
S15	L	L	Pulse coder Pole number, pulse number setting
S16	L	H	
S20	L	L	

- Note 1. If power transformer is connected across terminals CN2 (4) and (5), set S1 to open (R side).
If power transformer is not connected across terminals CN2 (4) and (5), set S1 to short (L side).
- Note 2. Set S10 to R side, if it is needed to check with motor power cable disconnected.
- Note 3. If the absolute pulse coder is used set S32 at H side.
- Note 4. The way of setting is shown as following figures.



(a) Setting of H side



(b) Setting of L side



(c) Setting of L side



(d) Setting of R side

(3) For Model 5-0

Terminal setting	Standard setting	Remarks
S1	L	TOH setting (Note 1)
S2	L	Pulse coder setting (Note 2)
S3	L	Absolute pulse coder setting (Note 3)
S4	L	TG, OVC alarm desable setting (Note 4)

- Note 1. If the power transformer connected to CN2-(4) and (5), set S1 at L. If there is no connection, set S1 at H.
- Note 2. If the pulse coder is 1000P/rev, set S2 at L, and if 2000P/rev, set it at H.
- Note 3. If the absolute pulse coder is used, set S3 at H, and if not used set it at L.
- Note 4. If TG and OVC alarms are made invalid, set S4 at H.
- Note 5. If a 1000P/rev pulse coder is used, care should be taken in DMR setting. (DMR setting should be double that in a normal 2000P/rev pulse coder.)

3.1.3 Variable resistor

Table 3.1.3

Volume	Standard setting	Remarks
RV1	40%	Gain setting
RV2	-	Offset voltage adjustment
RV3	-	Tachogenerator voltage adjustment
RV4	-	+5V power supply fine adjustment

Note 1. RV2-RV4 have been adjusted before the shipment from works.

Note 2. RV4 is not employed after edition number F of PCB A20B-1000-0560.

3.1.4 Check terminals

Check terminal	Symbol	Description	
CH 1		0.687 x velocity command voltage (Note 1)	
2		0.8 x velocity feedback voltage (Note 2)	
3	OV	OV	
4	OV	OV	
5		Compensation circuit	
6			
7	R	R-phase current command	
8	S	S-phase current command	
9	T	T-phase current command	
10	IR	R-phase current feedback	4V/A for motor 5-0 2.4V/A for motor 4-0, 3-0 0.85V/A for motor 2-0, 1-0 0.25V/A for motor 0,5,10,20M (Note 3)
11	IS	S-phase current feedback	
12	IT	T-phase current feedback	
13	TRW	Traiangle wave (Note 4)	
14	ER	Error voltage (Torque command)	
15	+5V	+5V	
16	+15V	+15V	
17	-15V	-15V	
18	10RF	10V reference voltage	

Note 1. a = 0.344 when VCMD is 7V/1000 rpm

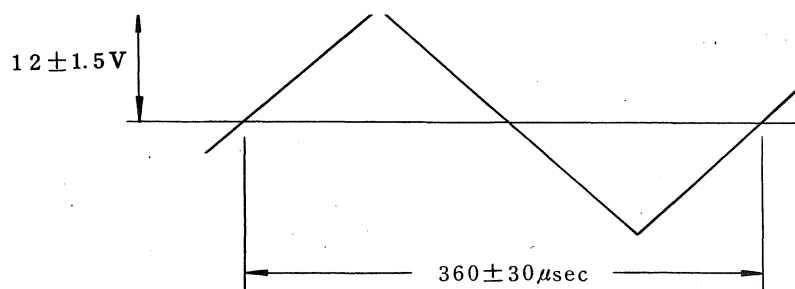
a = 0.687 when VCMD is 7V/2000 rpm

Note 2. Motor Model 4-0 - 30R: 2.4V/1000 rpm

Motor Model 5-0 : 1.2V/1000 rpm

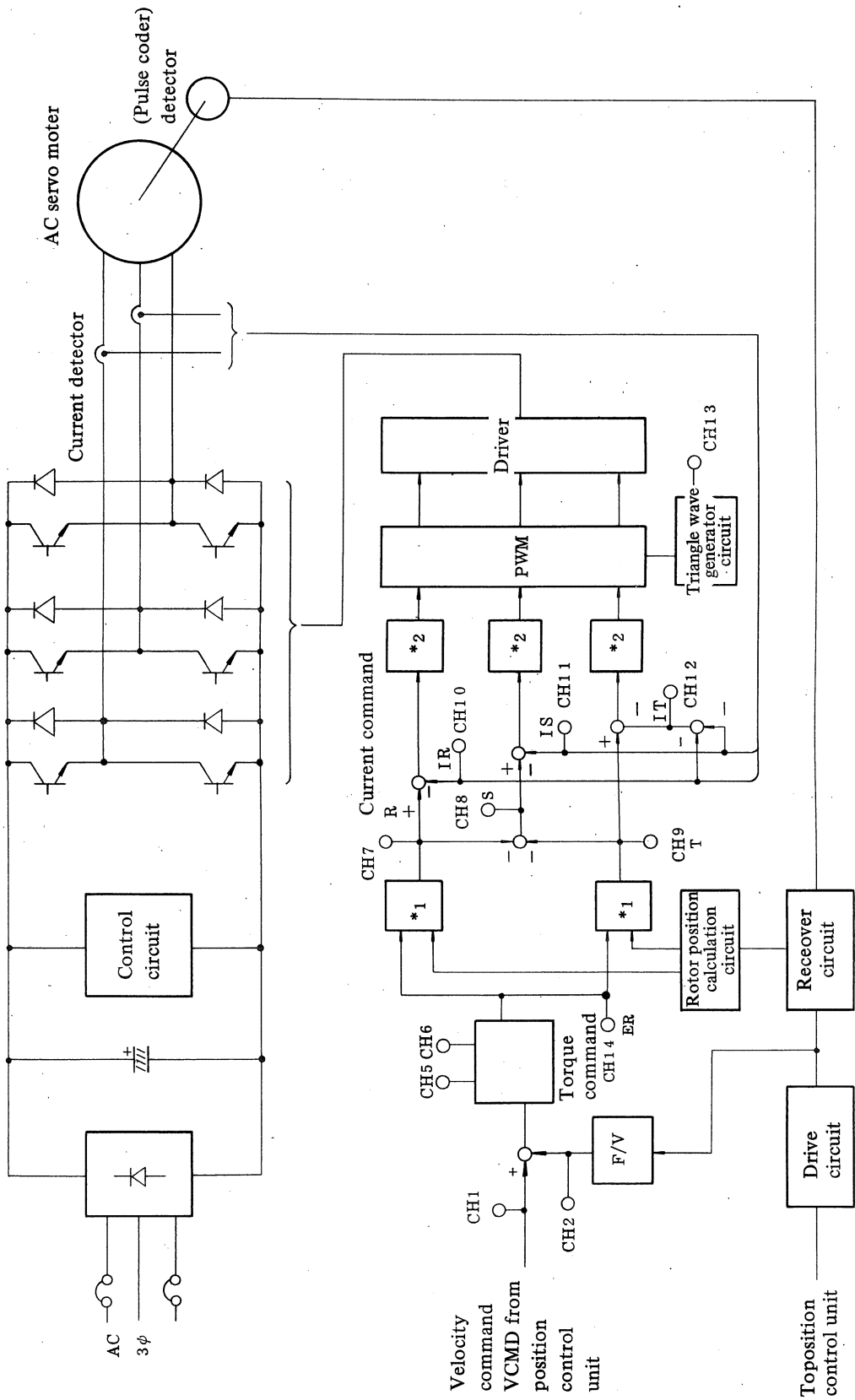
Note 3. 0.183V/A after edition number F of PCB A20B-1000-0560.

Note 4. Triangle wave



Note 5. Motor load currents (peak values) can be monitored using the same conversion as CH10-12. Effective value can be obtained by multiplying $1/\sqrt{2}$.

3.2 Block Diagram of Velocity Control Unit



*1: Multiplication circuit
 *2: Amplifier circuit

Fig. 3.2

4. TROUBLESHOOTING

4.1 Protection and Fault Detecting Functions

The AC servo unit provides the following functions to protect the motor from being overloaded and also detecting abnormal conditions inside the servo loop.

Table 4.1

No.	Kinds of functions	Indications	Description
1	Overload	Contacts' signal comes out at connector CN1	If the temperature of the radiation fin of the unit exceeds the set value to operate the thermostat or if the thermostat of power transformer operates, or if the thermostat of motor operates, this overload alarm is generated.
2	Velocity feedback disconnection detection	Light-emitting diode (LED) TG lights	If the feedback cable is disconnected, TG lamp lights. If a motor does not make a speedy start because of extremely large motor torque, the motor is stopped by dynamic braking with this alarm lamp lit.
3	No-use breaker	On button of NFB is protruded	If an abnormal current exceeding the operating current of no-fuse breaker flows, this NFB operates, causing the motor to be stopped by dynamic braking.
4	High voltage alarm	LED HV lights	If the DC voltage of the main power supply is abnormally high, the motor is stopped by dynamic braking with HV lamp lit.
5	Low voltage alarm	LED LV lights	If control voltage is abnormally low, or if the fuse for +5V on the PCB has blown out, the motor is stopped by dynamic braking with LV lamp lit.
6	Circuit fault Detection	LED HC lights	If abnormal current flows to the main circuit, the motor is stopped by dynamic braking with HC lamp lit.
		LED DC lights	If the regenerative discharge circuit becomes defective, the motor is stopped by dynamic braking with DC lamp lit. If the acceleration/ deceleration rate is too high, DC lights.
7	Overcurrent alarm	LEC OVC lights	If current exceeding specified value is continuously applied longer than a certain time, the motor is stopped by dynamic braking with OVC lamp lit.

4.2 Troubleshooting

Troubleshooting and fault recovery are discussed in this section. The manual should be used to determine the causes of problems.

(1) Overload alarm

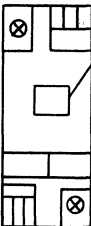
Item	Causes of troubles	Check procedures	Countermeasures
1	PCB setting failure	Check if setting pin S1 of PCB is set as specified.	Set S1 properly.
2	Thermostat of the servo transformer is operating	Remove the wires connected to transformer terminals 51 and 52 and measure the resistance across them. (See section 2.3.2.) The normal value is 10 ohms or less, if the circuit is open (more than 100k Ω), the thermostat is operating. If the thermostat is operating and the surface temperature of the transformer is 80 to 90°C, check the motor current during cutting. If the surface temperature is 60° or less, the transformer is defective.	Change the cutting conditions. Replace the transformer.
3	Radiation fins of the unit are overheated.	Check the motor current.	Change the cutting conditions.
4	Thermostat of the servo motor is operating.	Check the motor current.	Change the cutting conditions.

(2) TG alarm

Item	Causes of troubles	Check procedures	Countermeasures
1	Motor power line is not connected to terminals (5), (6), (7) of terminal board T1 of velocity control unit, or the motor power line is disconnected halfway.	If TG alarm occurs without giving any move command after turning on the power supply, it may possibly be caused by the disconnection failure.	Reconnect power cable.
2	PCB setting failure	Check the set condition according to 3.1.	Change the setting properly.
3	Pulse coder feedback signal is disconnected	Check the feedback cable.	Reconnect the feedback cable.
4 Note	Motor current exceeds the ratings	Check the motor current.	Change the cutting conditions.

Note) OVC alarm is detected after PCB A20B-1000-0560 edition number is d.

(3) Circuit breaker operates

Item	Causes of troubles	Check procedures	Countermeasures
1	Circuit breaker is operating	<p>The operating condition of the circuit breaker is as illustrated below.</p>  <p>This button is protruded forward during operation. Depress this button after turning off the power supply for resetting the circuit breaker.</p>	Reset the circuit breaker after turning off the power supply. (If the circuit breaker cannot be reset soon, wait for about 10 minutes before resetting it).
2	Diode module DS or other parts are defective in velocity control unit	The circuit breaker operates just when turning on the power supply after countermeasure in Item 1.	Replace diode module DS or velocity control unit.
3	Mechanical load is abnormal	Observe PCB CH10, CH11 or CH12-CH3 on an oscilloscope to check if the load current of the motor exceeds the rated current during rapid traverse mode.	Eliminate abnormal load of the machine side.

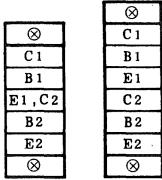
(4) HV alarm

Item	Causes of troubles	Check procedures	Countermeasures
1	Input AC power voltage is higher than specified	Check if the servo transformer taps are properly connected.	Repair tap connection
2	Servo motor is defective	Check if the insulation resistance is normal between the motor armature (power line) and the body.	Replace motor
3	Load inertia is excessive		Increase the acceleration/ deceleration time constant
4	PCB is defective	HV alarm occurs without any defect in Items 1, 2, 3.	Replace PCB

(5) LV alarm

Item	Causes of troubles	Check procedures	Countermeasures
1	Input AC power voltage is lower than specified	Check if the input AC power voltage and tap connection of servo transformer are correct.	Correct the tap connection
2	Connection failure between servo transformer and PCB CN2	Check if +24V, $\pm 5V$, and +5V of PCB are normal. Check if servo transformer terminals 41 - 49 (AC 18V) and PCB CN2 (1, 2, 3) are connected properly.	Correct connections
3	Fuse for +5V is blown	check if the fuse for +5V is blown.	Replace the fuse
4	PCB is defective	The LV alarm occurs without any defect in item 1, 2, and 3.	Replace PCB

(6) HC alarm

Item	Causes of troubles	Check procedures	Countermeasures
1	Wrong connection of motor power line	<p>HC alarm does not occur when turning on the power supply after disconnecting the motor power line.</p> <p>(Since the gravity axis may drop in this case, support it or disconnect the drive cable of gravity axis brake)</p>	<p>Reconnect the motor power line correctly.</p> <p>If the motor power line is checked with disconnecting it, set setting terminal S10 to L side, otherwise TG alarm occurs.</p>
2	Transistor module is defective	<p>Check if HC alarm occurs when turning on the power supply after disconnecting the power line according to item 1.</p> <p>Turn off the power supply, remove PCB, and observe the right terminal of the transistor module by a circuit tester.</p> <p>The transistor module is defective, if the resistance between terminals is several Ω (within 10Ω).</p>	<p>Replace transistor module.</p> <p>*Check resistance between C1-E1, C2 also between E1, C2-E2.</p> <p>**Check resistance between C1-E1 and also between C2-E2.</p> <div style="text-align: center;">  <p>(H103, H113) (H104, H005)</p> </div>
3	Internal short-circuit failure of motor windings	Check motor windings for normal insulation.	Replace motor
4	PCB is defective	If HC alarm occurs without any defect in items 1, 2, 3, PCB is defective.	Replace PCB

(7) DC alarm

Item	Causes of troubles	Check procedures	Countermeasures
1	Discharge transistor Q1 is defective or PCB is defective	DC alarm occurs soon after turning on the power supply.	Replace transistor Q1. Replace PCB.
2	PCB setting is improper	Setting terminal S2 is set to L side although the separate regenerative discharge unit is used.	Set S2 properly
3	Frequent acceleration/ deceleration	Check if the positioning frequency exceeds 1 - 2 times/sec at high speed. In this case, DC alarm will not occur when the positioning frequency is reduced.	Decrease the acceleration/ deceleration frequency by providing the dwell

(8) Servo ready signal is not output

Item	Causes of troubles	Check procedures	Countermeasures
1	AC 100V is not supplied to velocity control unit	Check if AC 100V is supplied across terminals No. (3) and (4) of terminal board T1 of velocity control unit.	Check the emergency stop button on the operation panel
2	The velocity control unit is in alarm status	Check if red alarm LED indicators light on PCB or not.	For countermeasures against these alarms, see (2), (4)-(7)
3	PCB control power voltage +5V or +15V is abnormal	Check the voltage at check terminals CH15, CH16, CH17-CH3 on PCB mounting diagram. Check the connection between servo transformer terminals and PCB CH2.	Change the tap connection of servo transformer. Correct the connection between servo transformer and PCB CH2, and replace PCB.
4	Hybrid IC M2 or relays RLY1, RLY2 of PCB are defective	Check if relays RLY1 and RLY2 are operating.	Replace PCB
5	Circuit breaker off	Check the indicating button circuit breaker.	See (3).

(9) Motor does not rotate when the move command is given.

Item	Causes of troubles	Check procedure	Countermeasures
1	Power line is not connected	TG alarm occurs and the motor does not rotate at all.	Connect the power line properly
2	Enable signal (ENBL1, ENBL2) are not applied to PCB		Check enable signals (ENBL1, ENBL2)
3	PCB is defective or PCB is not properly connected	Check if +24V, +15V, and +5V on PCB are normal.	Replace PCB or reconnect the cable properly
4	Velocity command voltage (VCMD) is not applied	Observe PCB CH1 (VCMD)-CH3 (GND) on an oscilloscope.	Give the velocity command voltage (VCMD)

(10) OVC alarm

(This protection is applied from edition number C of velocity control PCB A20B-1000-0560.)

Item	Causes of troubles	Check procedure	Countermeasures
1	Feedback signal of pulse coder is not connected	Check feedback cable connection.	Connect the feedback cable
2	Motor current exceed nominal value	Check motor current.	Change the cutting condition

5. PARTS SPECIFICATIONS AND LOCATIONS ON VELOCITY UNIT

5.1 Model 5-0 Velocity Control Unit (A06B-6050-H301)

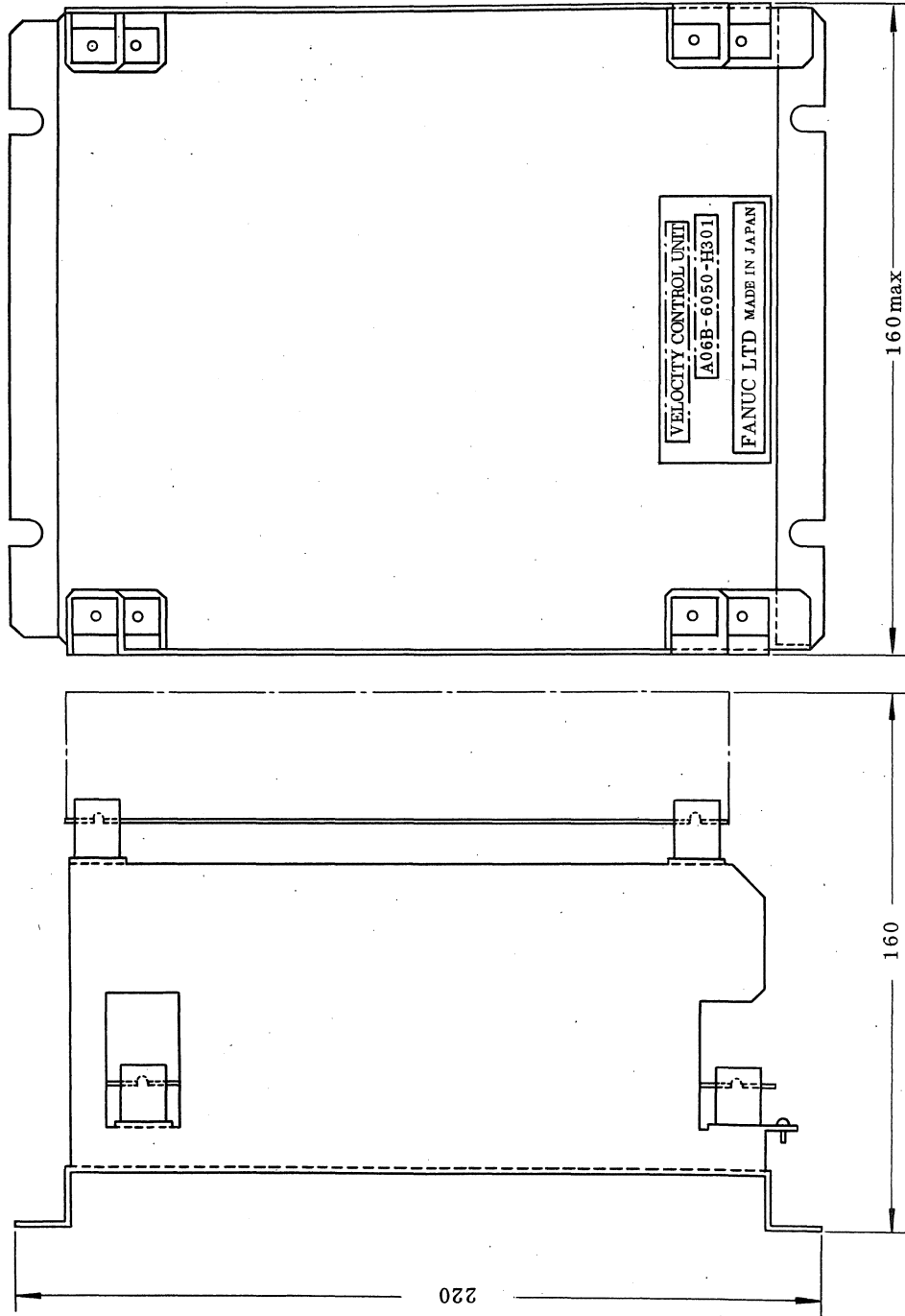


Fig. 5.1

5.2 Model 4-0, 3-0 Velocity Control Unit (A06B-6050-H001)

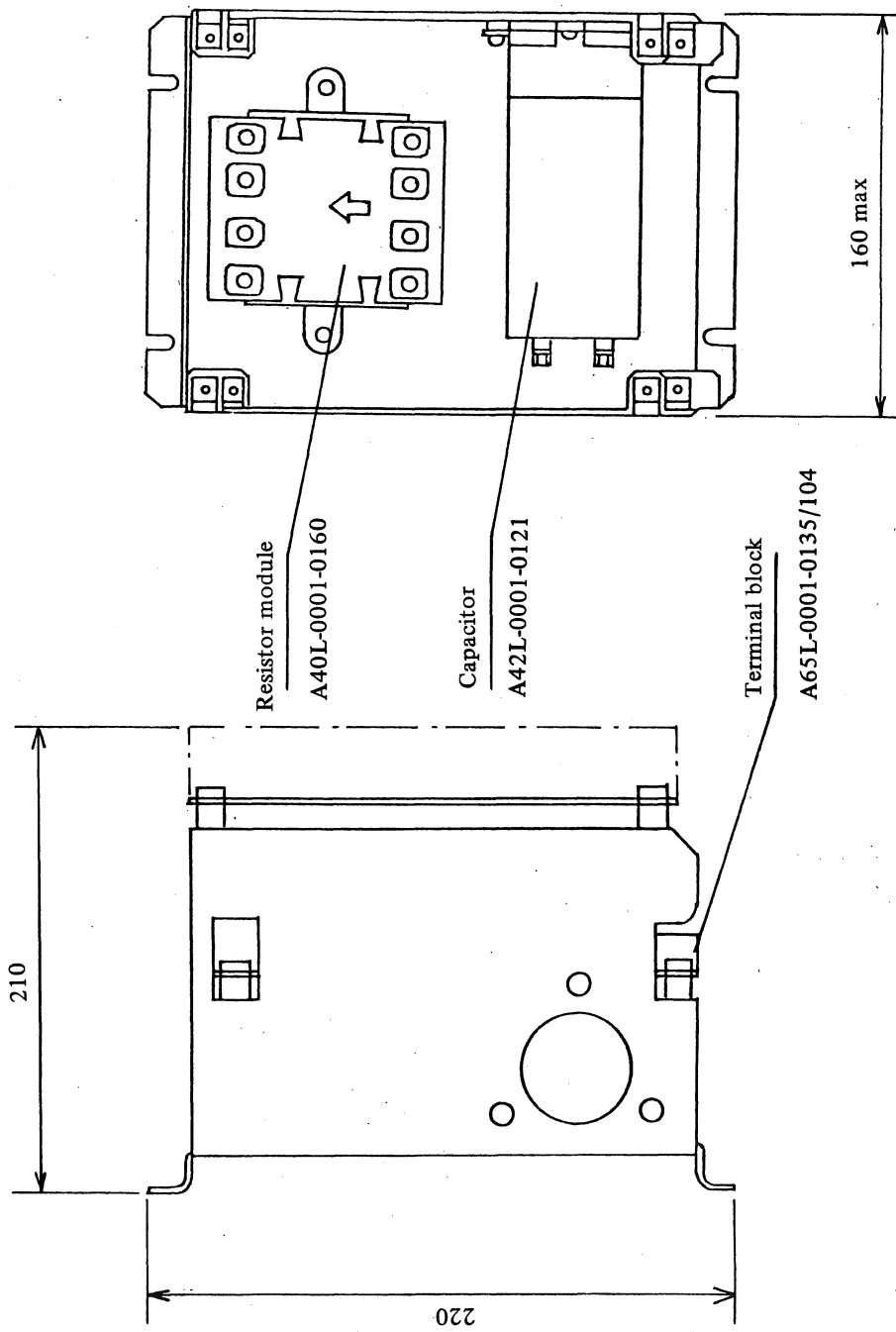


Fig. 5.2

5.3 Model 2-0, 1-0, Velocity Unit (A06B-6050-H002)

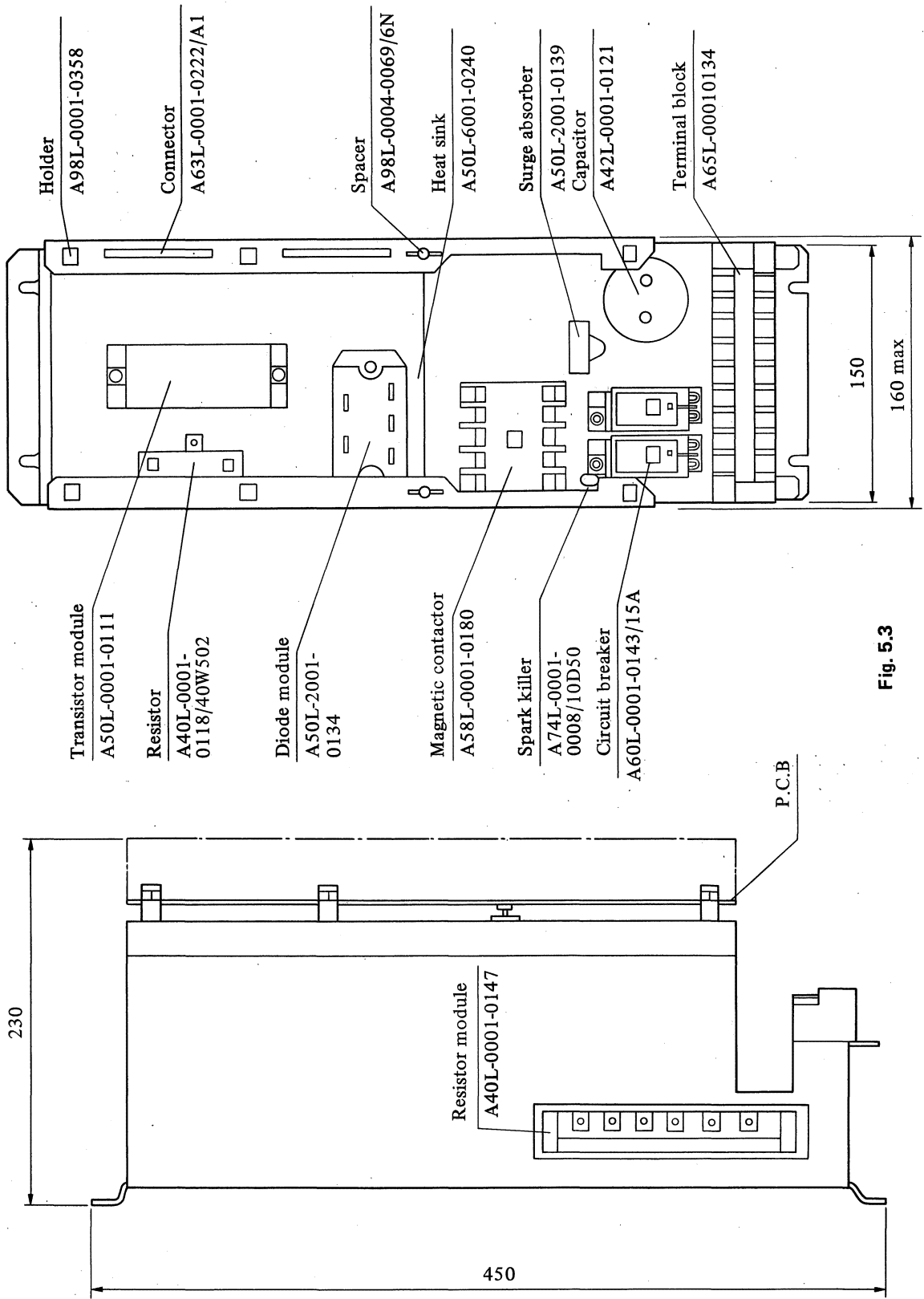


Fig. 5.3

5.4 Model 0, 5 Velocity Unit (A06B-6050-H102)

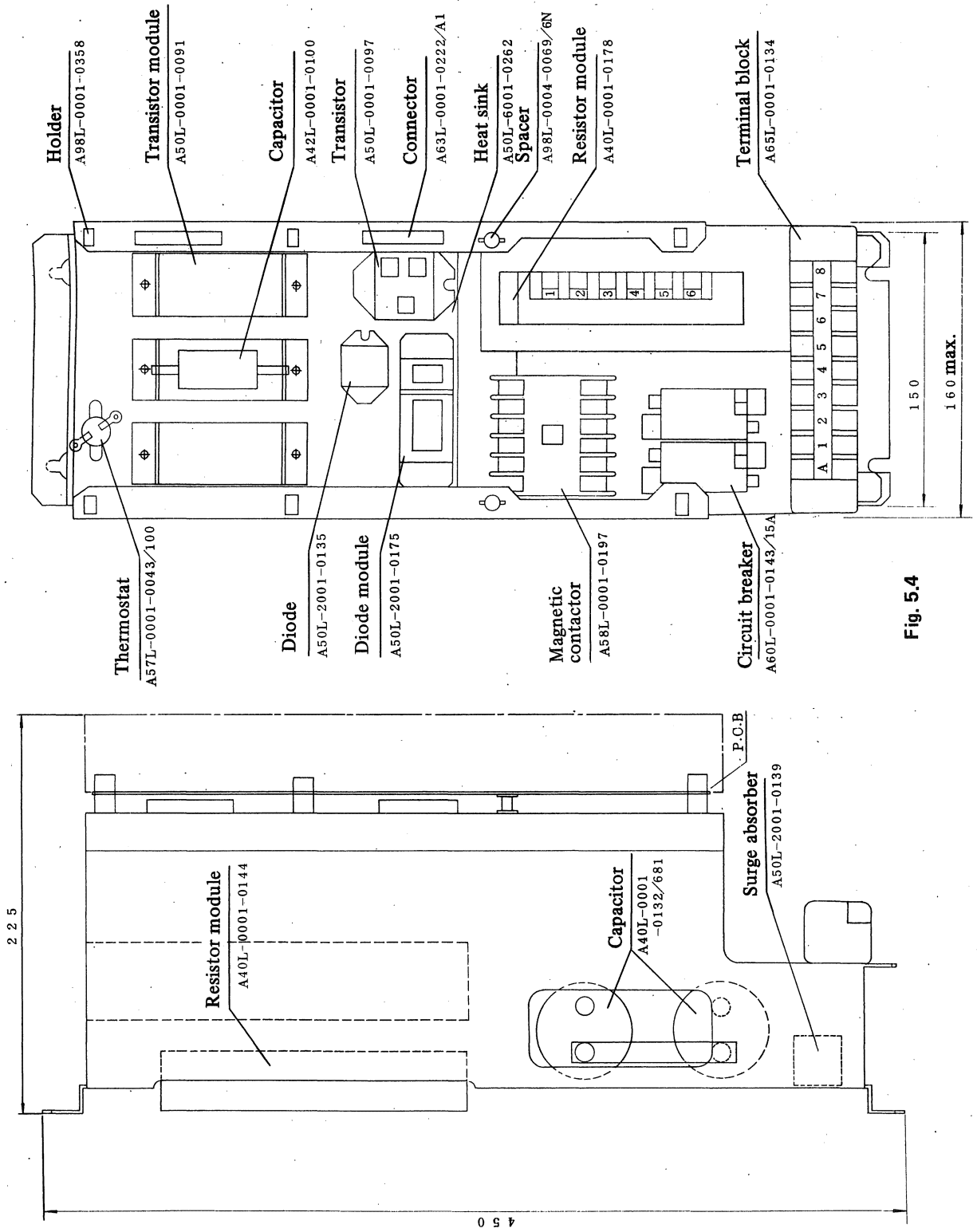


Fig. 5.4

5.5 Model 10 Velocity Unit (A06B-6050-H103)

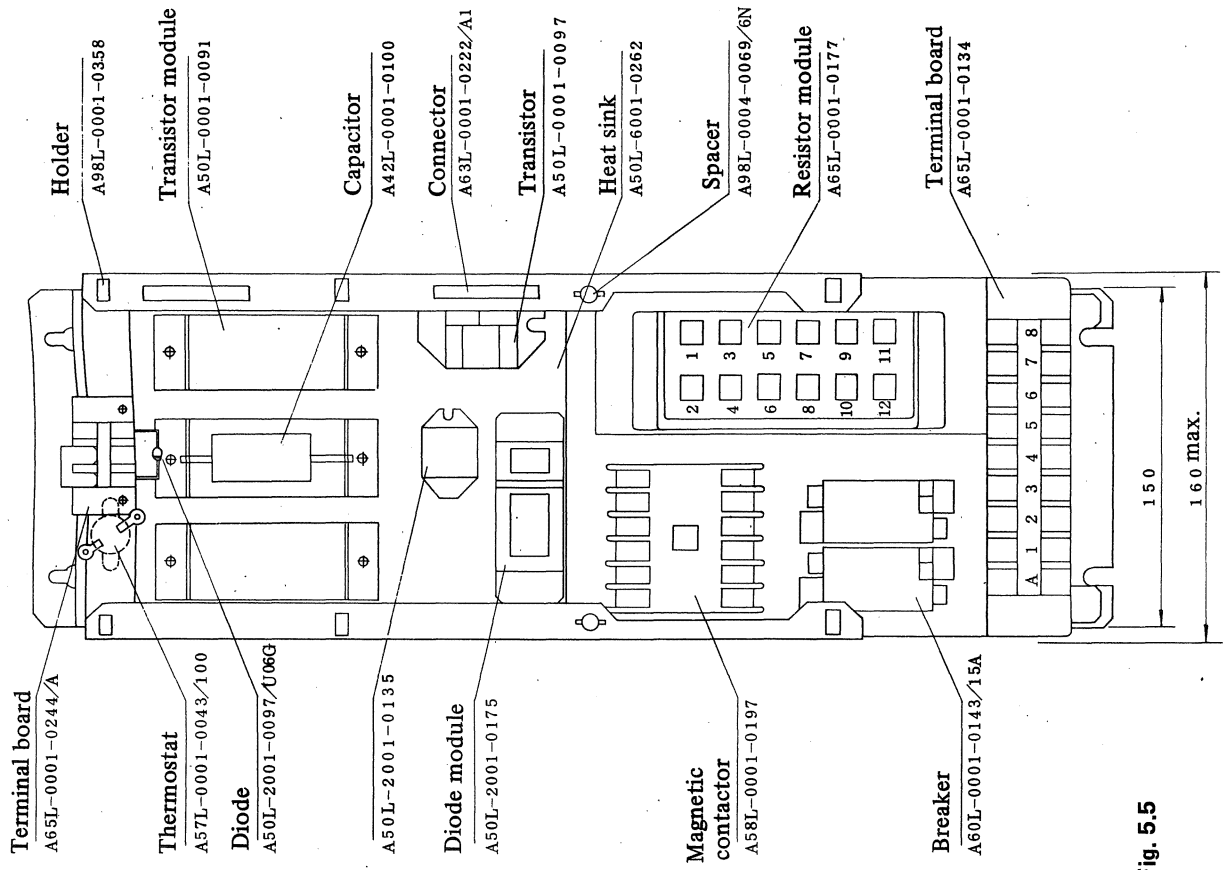
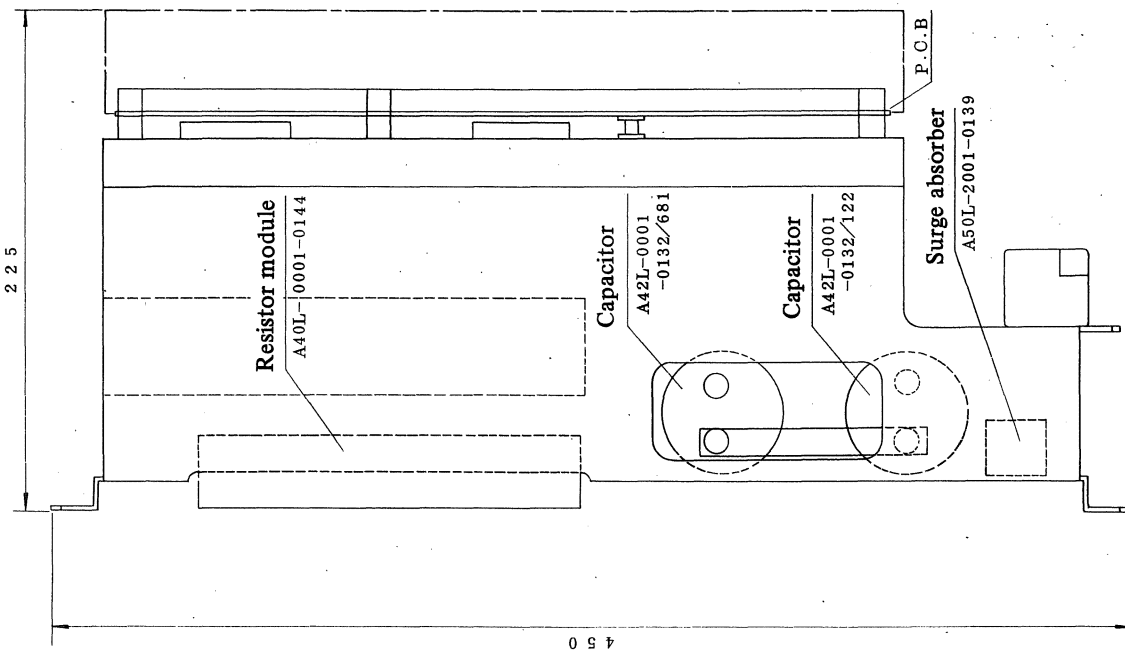


Fig. 5.5

5.6 Model 20M Velocity Unit (A06B-6050-H113)

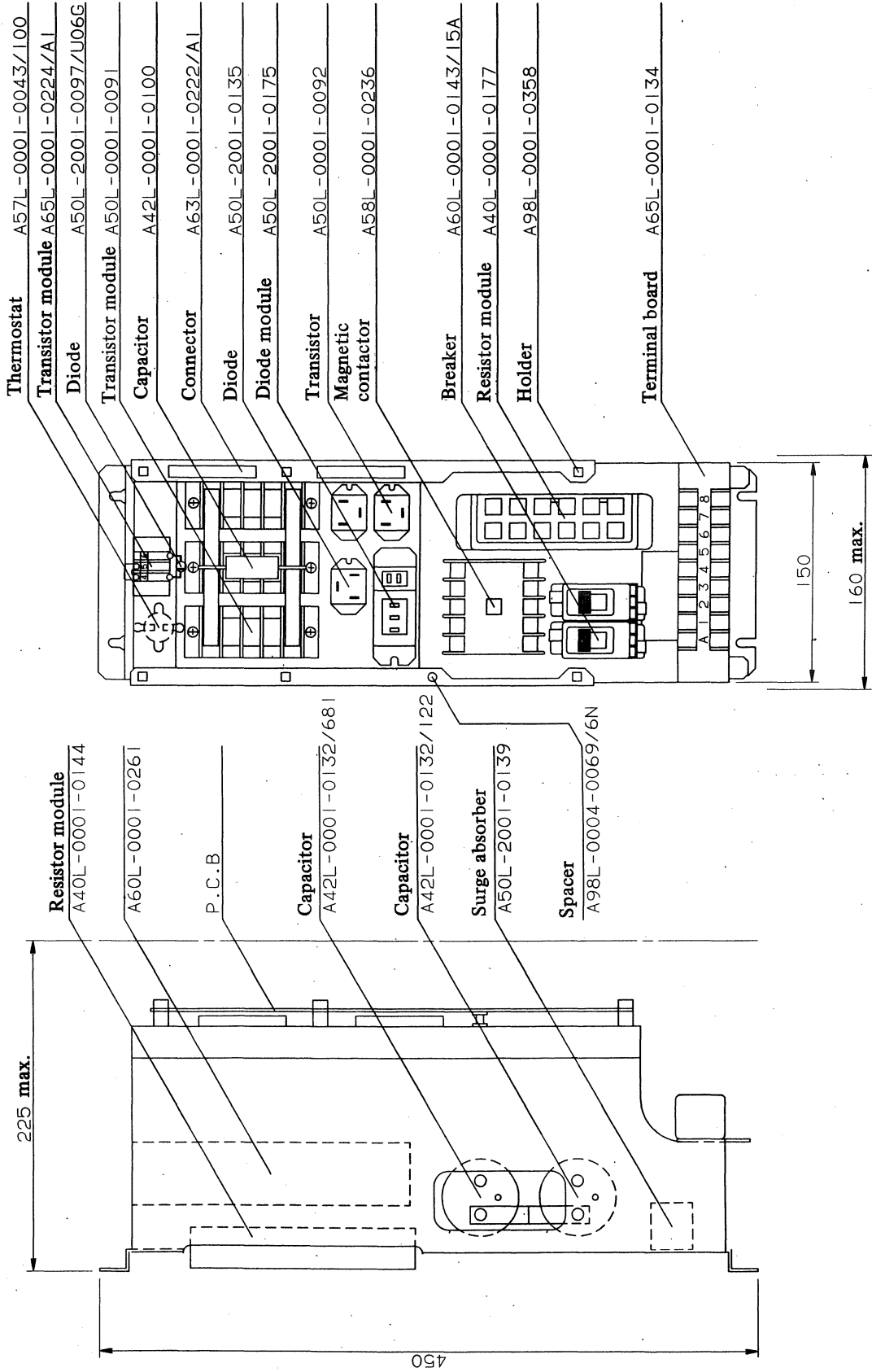


Fig. 5.6

5.7 Model 20, 30 Velocity Unit (A06B-6050-H104)

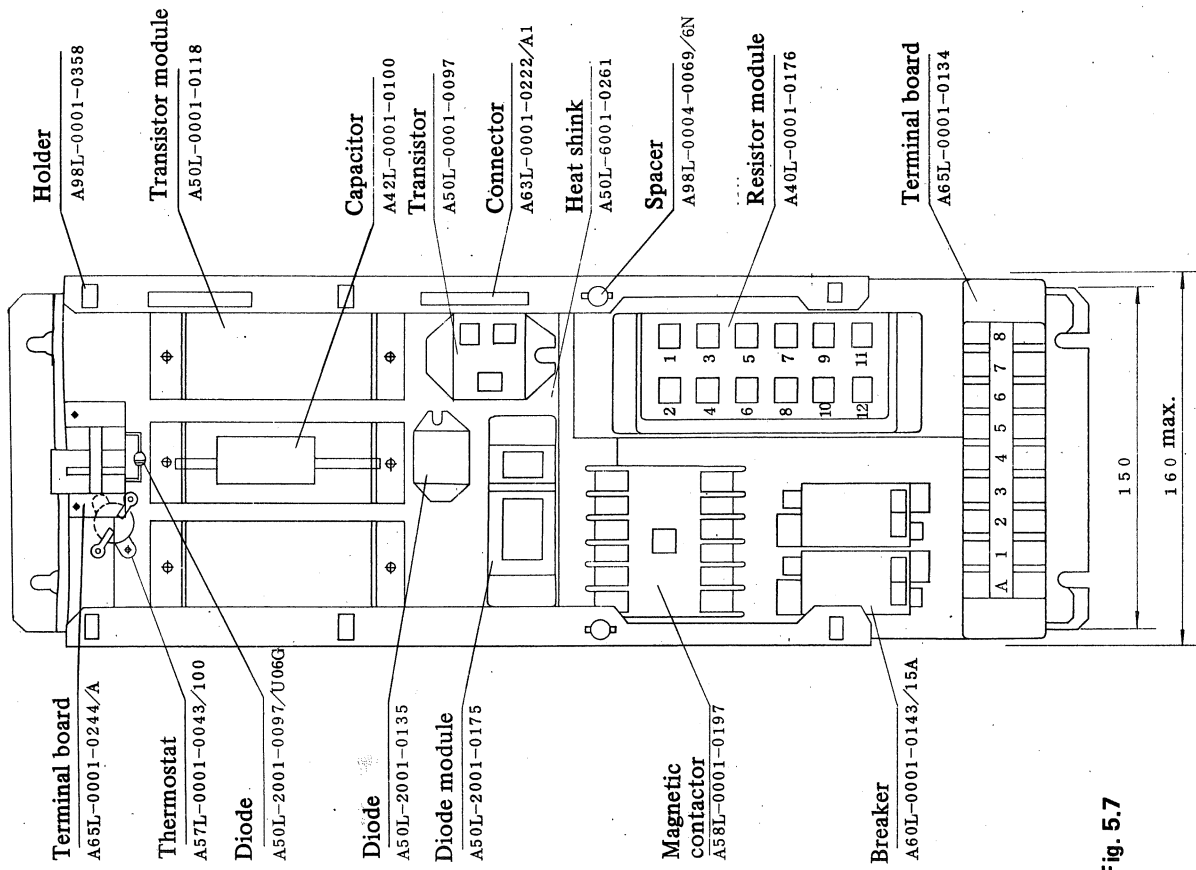
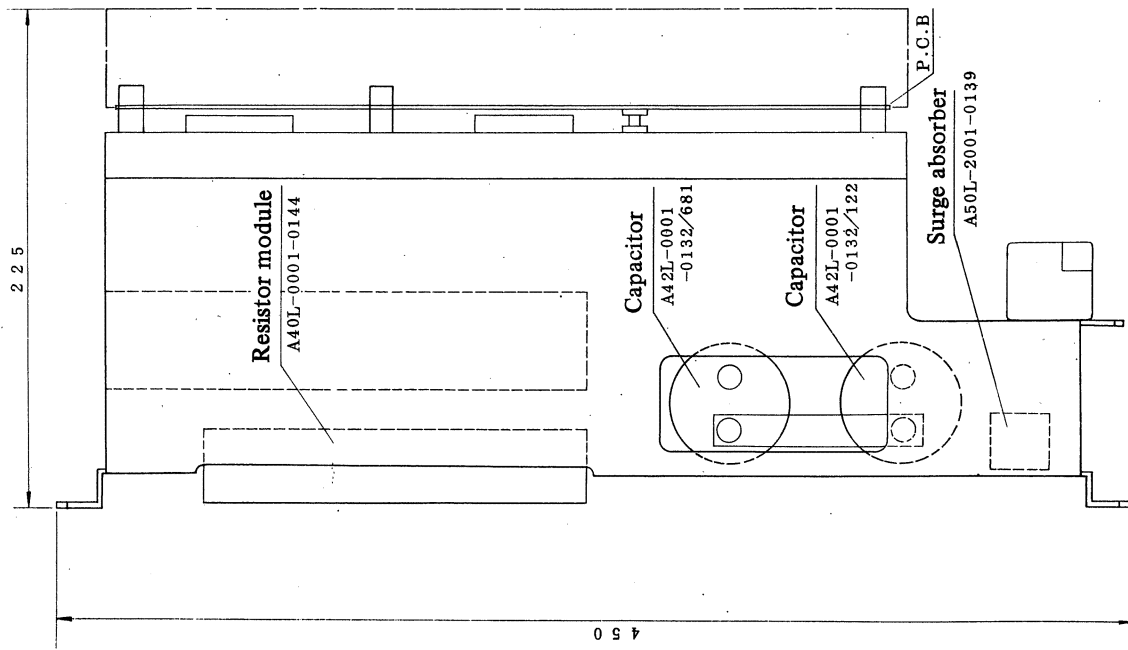


Fig. 5.7

5.8 Model 30R Velocity Unit (A06B-6050-H0050)

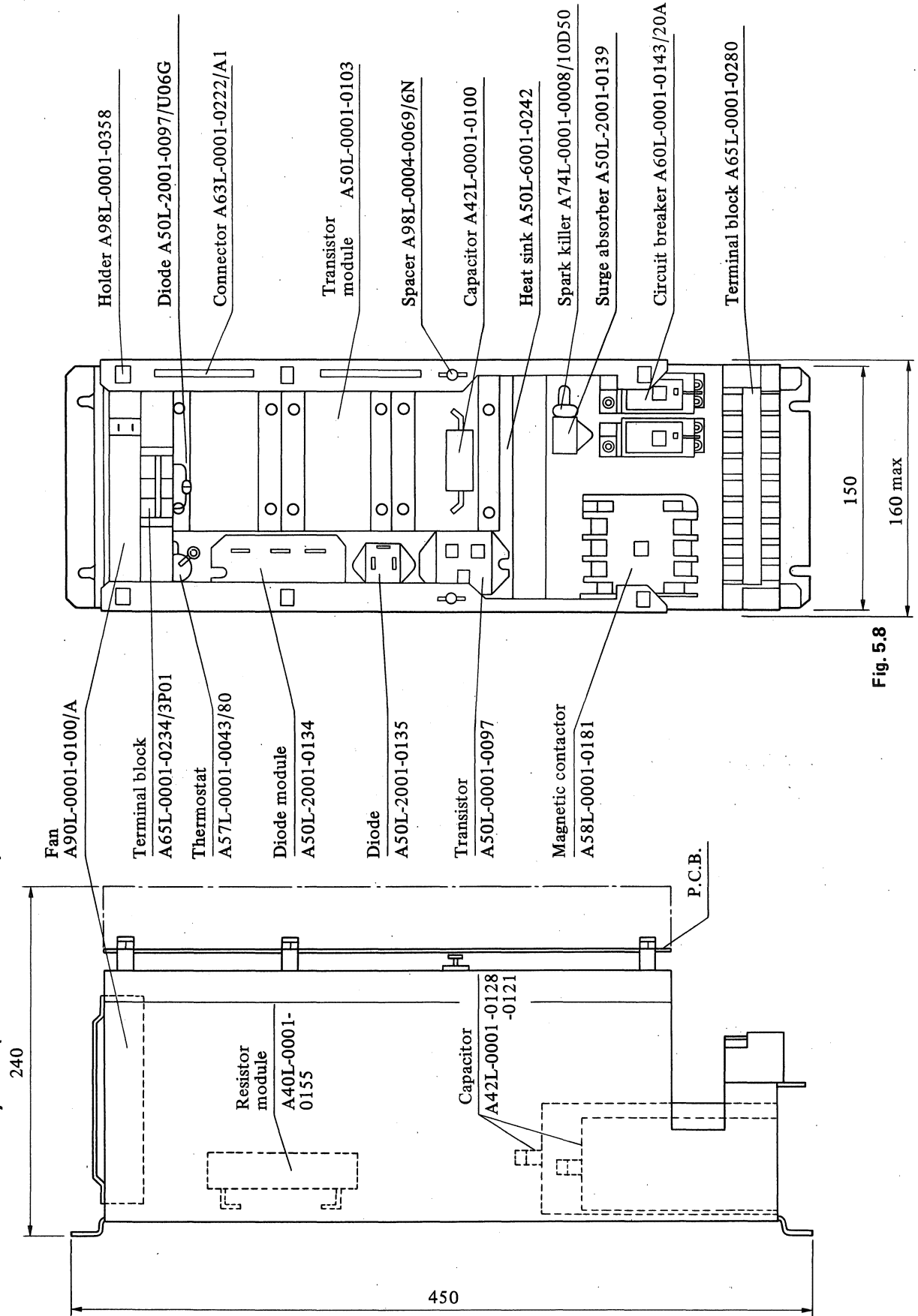


Fig. 5.8

5.9 Model 0, 5, 10 Velocity Unit (A06B-6050-M003)

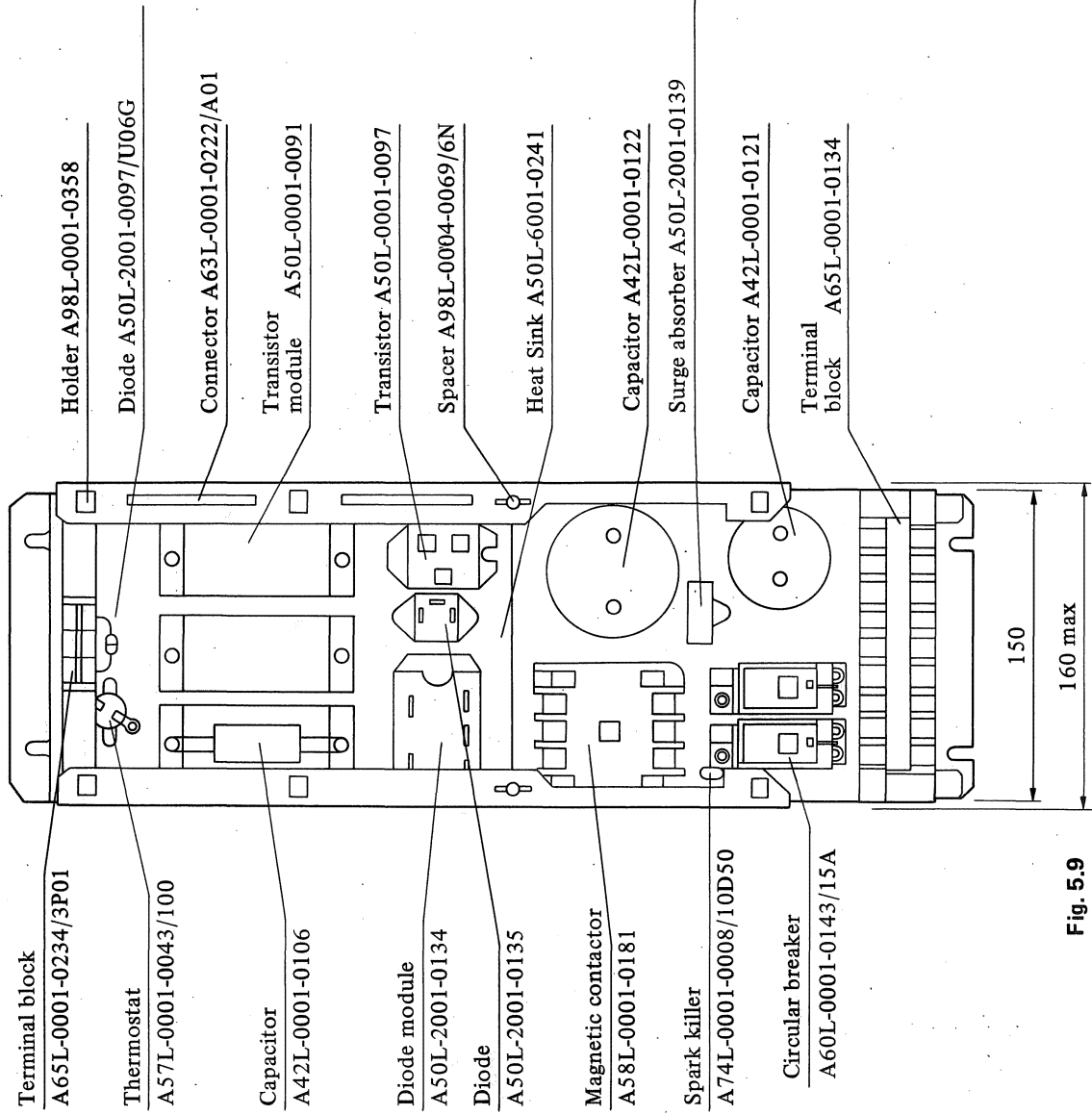
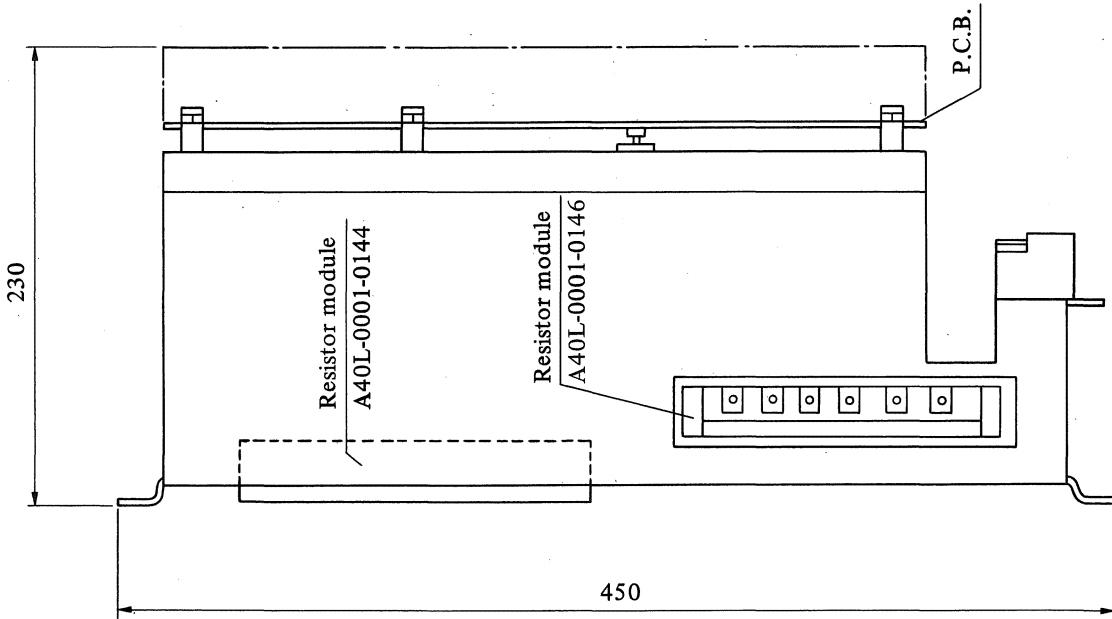


Fig. 5.9

5.10 Model 20, 30 Velocity Unit (A06B-6050-H004)

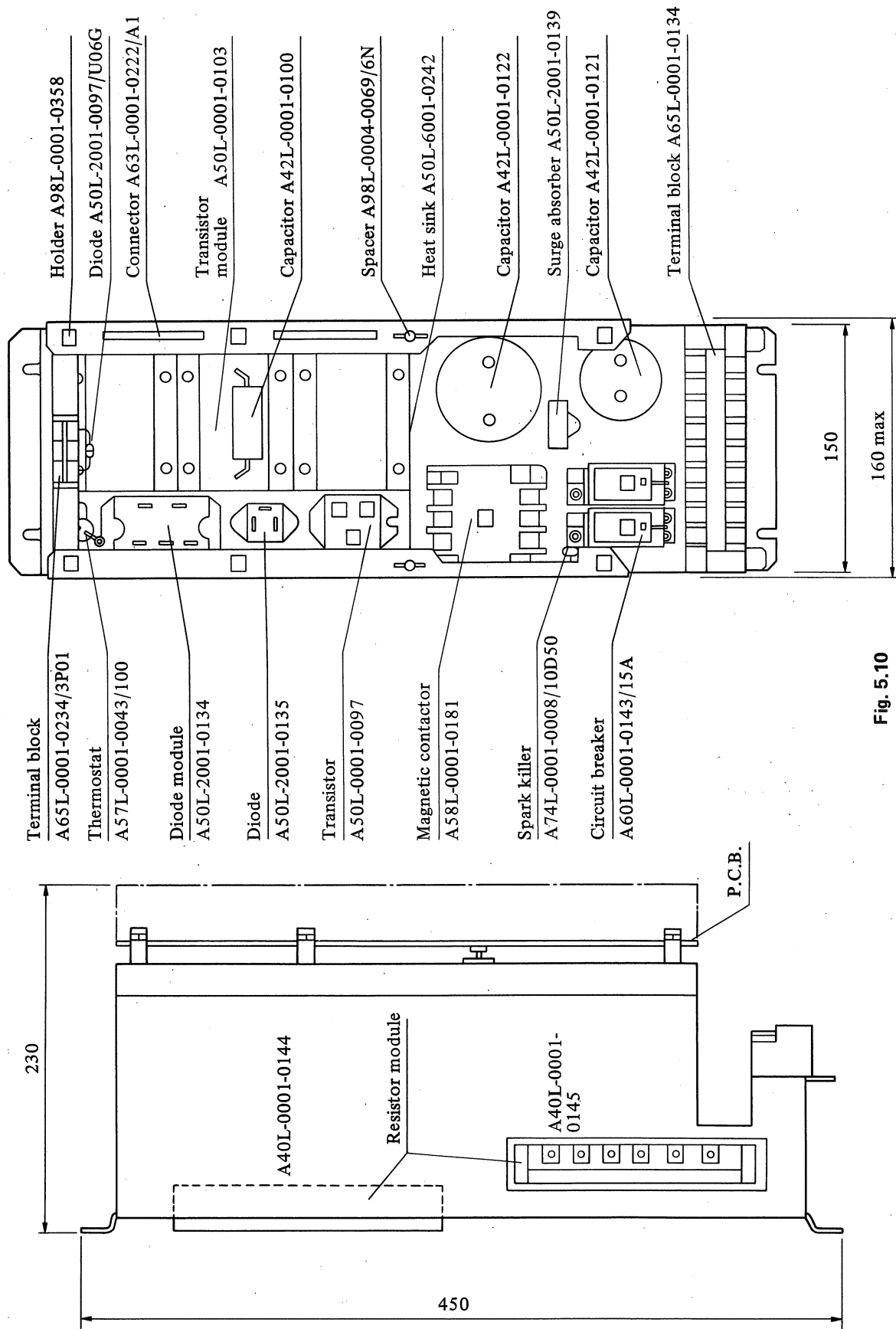


Fig. 5.10

II. AC SERVO UNIT FOR 2 AXES

This chapter describes the maintenance of AC servo unit for 2 axes which drives AC servo motor Model 2-0, 1-0, 0, 5.

Combination of two motors are described in Table 1.1.1. Refer to Table 1.1.1.

1. STRUCTURE

The AC servo unit for 2 axes consists of the velocity control unit and power transformer. Three types of velocity control units are available according to the combinations of AC servo motor models employed. One velocity control unit applies to two servo motors. The specifications of the power transformer are the same as those of a power transformer employed when two servo units for one axis are used according to the combinations of motor models.

Fig. 1.1 shows a configuration example in an NC system of 2 controlled axes.

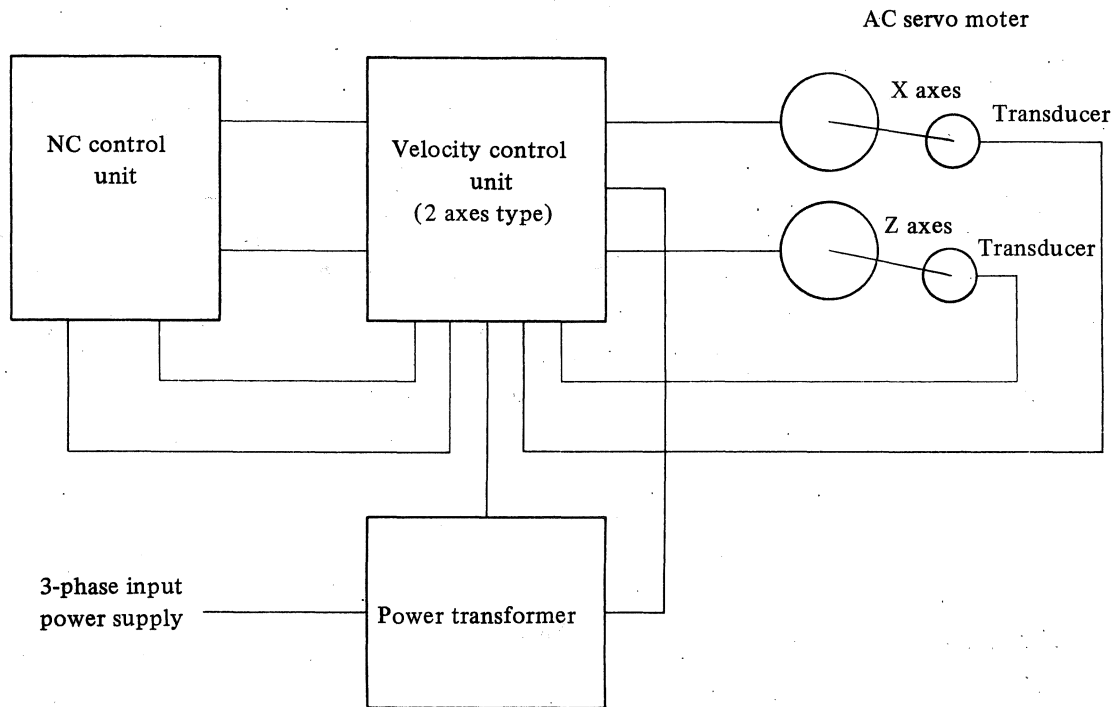


Fig. 1 A Configuration Example of Using AC Servo Unit for 2 Axes

1.1 Types of Units and Designated Specifications

Table 1.1 (a) Types of Units and Designated Specifications

Name	Applicable motor		Specifications	Remarks
	L axis	M axis		
Velocity control unit	2-0/1-0	2-0/1-0	A06B-6050-H201	
	2-0/1-0	0/5	A06B-6050-H202	
	0/5	0/5	A06B-6050-H203	
Power transformer			Refer to 2.1 in Chapter 2 in the descriptions for FANUC AC SERVO MOTOR series (B-54762E).	
Input connector (Note)			A06B-6050-K200 Soldering type	

Note: The input connector is used for the cable connected to the velocity control unit, and it comprises the following parts. One set of the input connector is required for 2 axes.
 Parts contained in the input connector (soldered type) are indicated in the Table 1.1(b).
 Parts contained in the input connector (crimp style type) are indicated in the Table 1.1(c).

Table 1.1 (b) Parts Included in Input Connector

Name	Q'ty	Use	Model	FANUC specifications
Connector + cover	2	CN1L,M	MR-20LFH *	A63L-0001-0134/02
Connector + cover	2	CN5L,M	MR-20LWMH *	A63L-0001-0134/15
Connector + cover	2	CN6L,M	MR-20LWFH *	A63L-0001-0134/05
Housing	1	CN2	SMS6PW-5 **	A63L-0001-0202/6W
Pin	5	CN2	RC16M-SCT3 **	A63L-0001-0226

* Manufacturer: HONDA Tsushin Co., Ltd.
 ** Manufacturer: Burndy Japan Ltd.

Table 1.1 (c) Parts Included in Input Connector (Crimp style type)

Name	Q'ty	Use	Model	FANUC specifications
Connector + cover	2	CN1L,M,N	MR-20L, MRP-20F01 *	A63L-0001-0134/22
Connector + cover	2	CN5L,M,N	MR-20LW, MRP-20M01*	A63L-0001-0134/35
Connector + cover	2	CN6L,M,N	MR-20LW, MRP-20F01*	A63L-0001-0134/25
Contact	80	CN1,6	MRP-F112 *	A63L-0001-0134/F112
Contact	40	CN5	MRP-M112 *	A63L-0001-0134/M112
Housing	1	CN2	SMS6PW-5 **	A63L-0001-0202/6W
Pin	5	CN2	RC16M-S23A **	A63L-0001-0127/S23A

* Manufacturer: HONDA Tsushin Co., Ltd.
 ** Manufacturer: Burndy Japan Ltd.

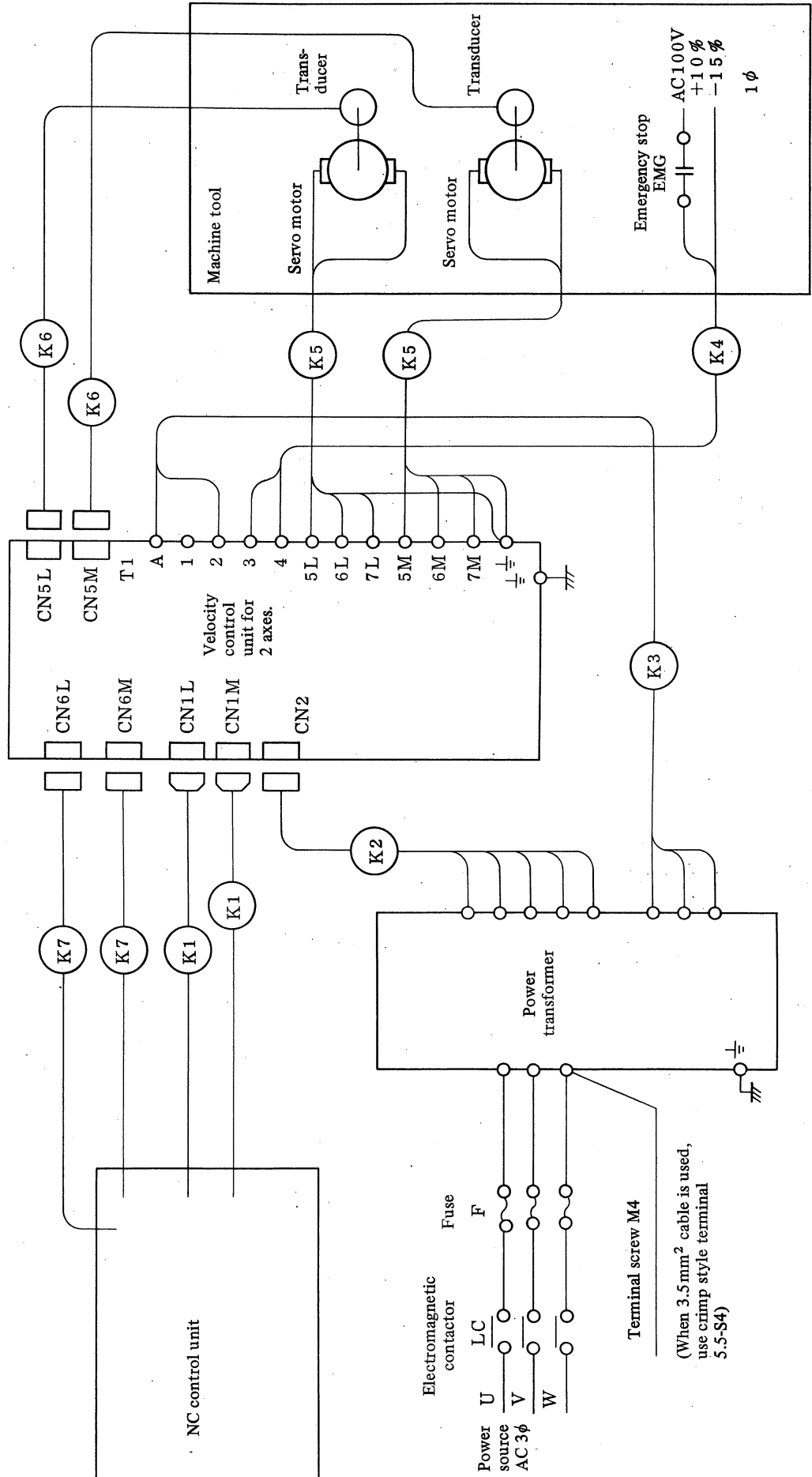
2. CONNECTIONS

2.1 Connection Diagram

Note 1. For details of cables K1 - K7, see 9.1.1.1 - 9.1.1.7.

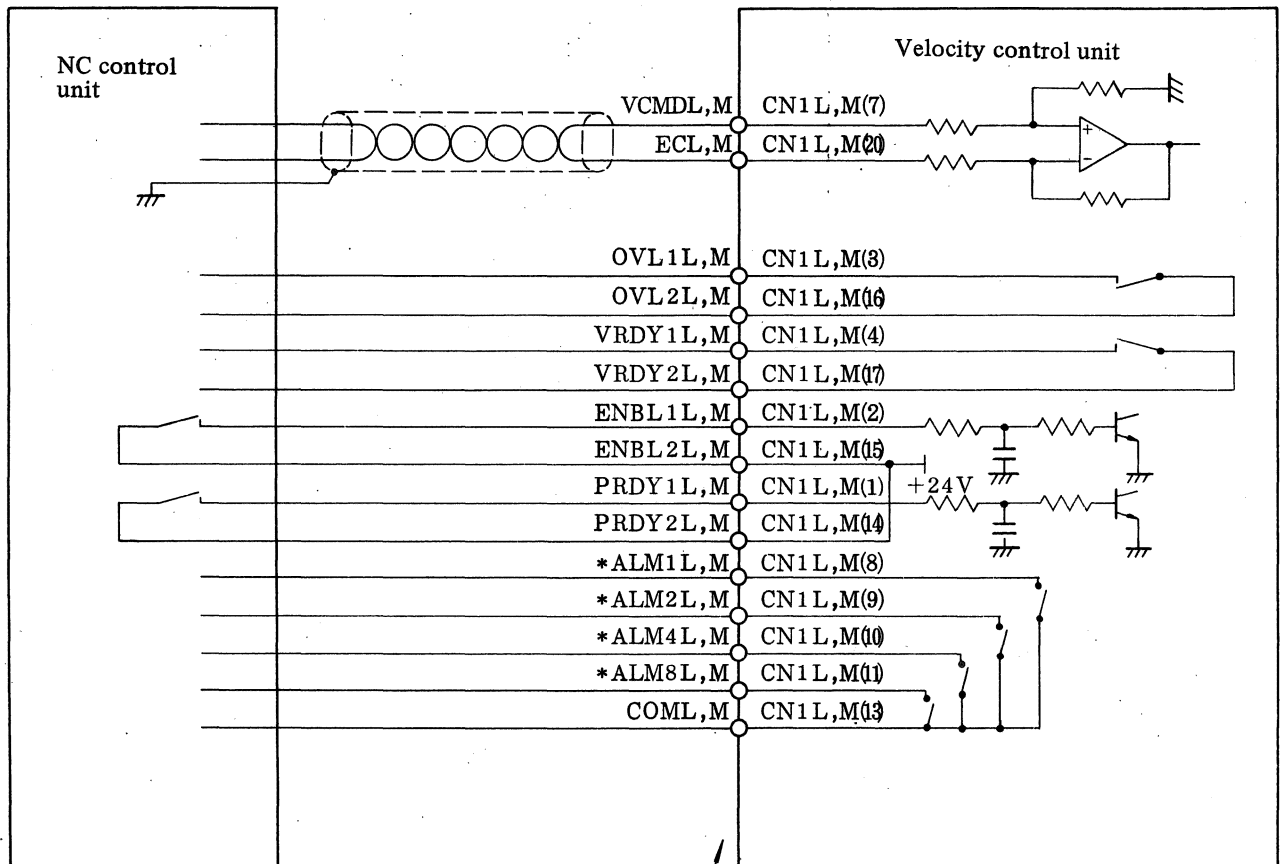
Note 2. Connections of cables K1 and K7 differ according to NC control unit.

For details, see the connecting manual for each NC.



2.2 Detailed Servo System Connection Diagram

2.2.1 Details of connections of cable K1



Cable employed:
 VCMD/EC; 0.1~0.18mm² paired
 shielded cable
 Other cases; 0.18~0.3mm² 200V
 vinyl wire

Connector MR20LFH (Honda Tsushin Co., Ltd.)
 (For the connector terminal arrangement, see 8.4)

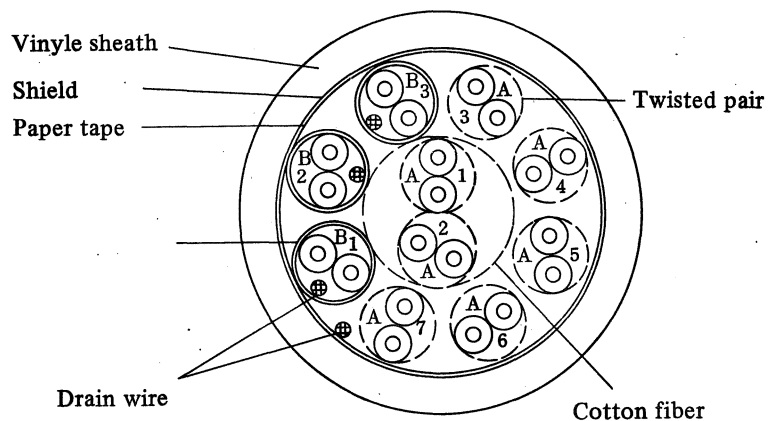


Fig. 2.2.1

2.2.2 Details of connections of cable K2

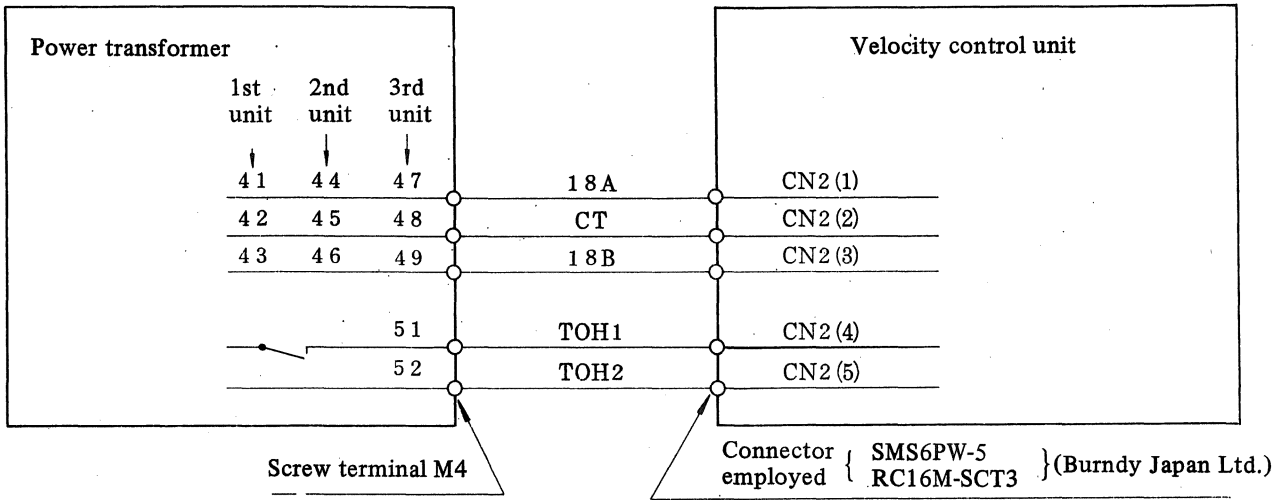


Fig. 2.2.2

2.2.3 Details of connections of cable K3

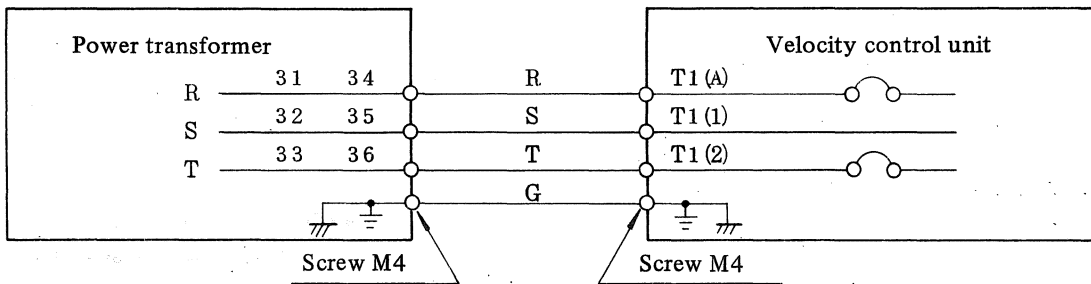


Fig. 2.2.3

2.2.4 Details of connections of cable K4

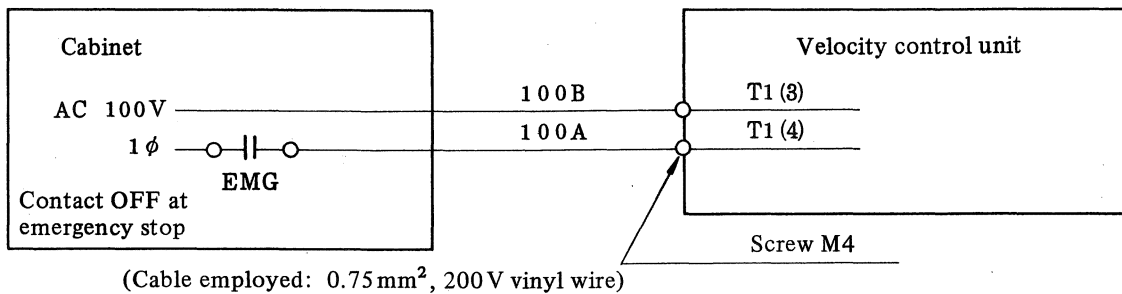


Fig. 2.2.4

2.2.5 Details of connections of cable K5

(1) Model 2-0, 1-0

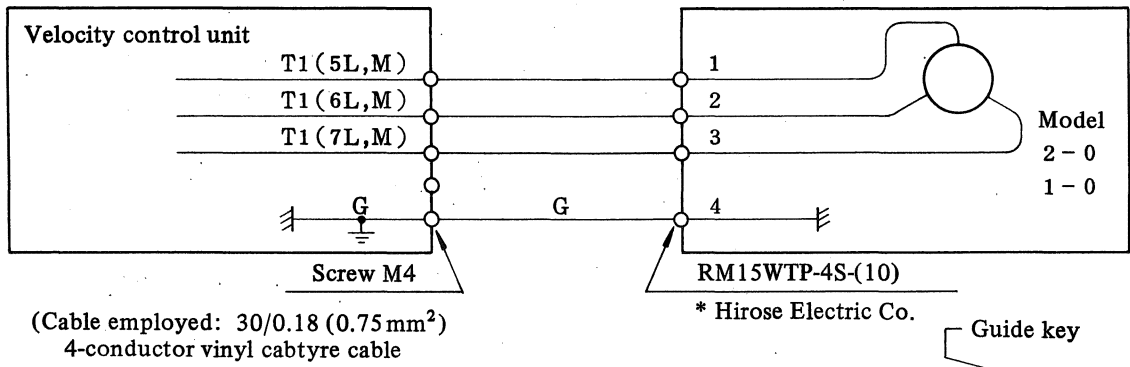


Fig. 2.2.5 (a)

(2) Model 0 and 5

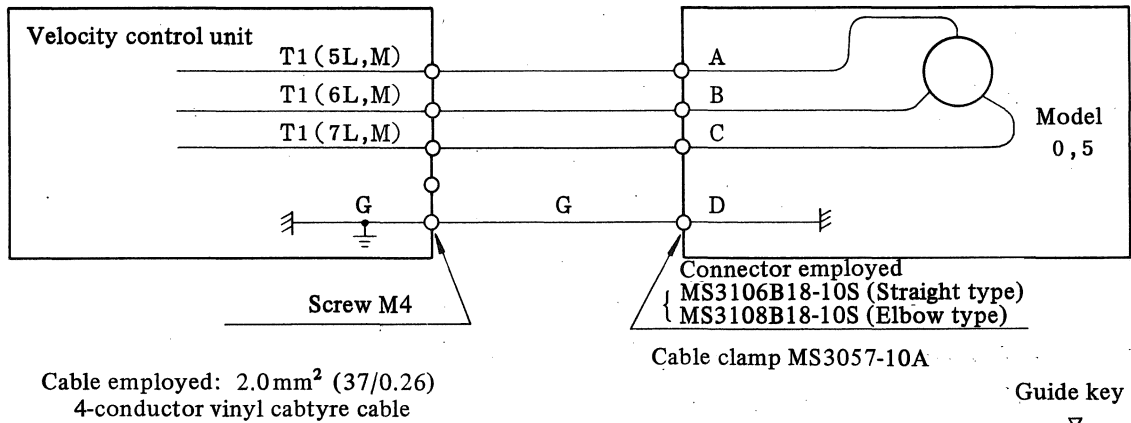


Fig. 2.2.5 (b)

2.2.6 Details of connections of cable K6

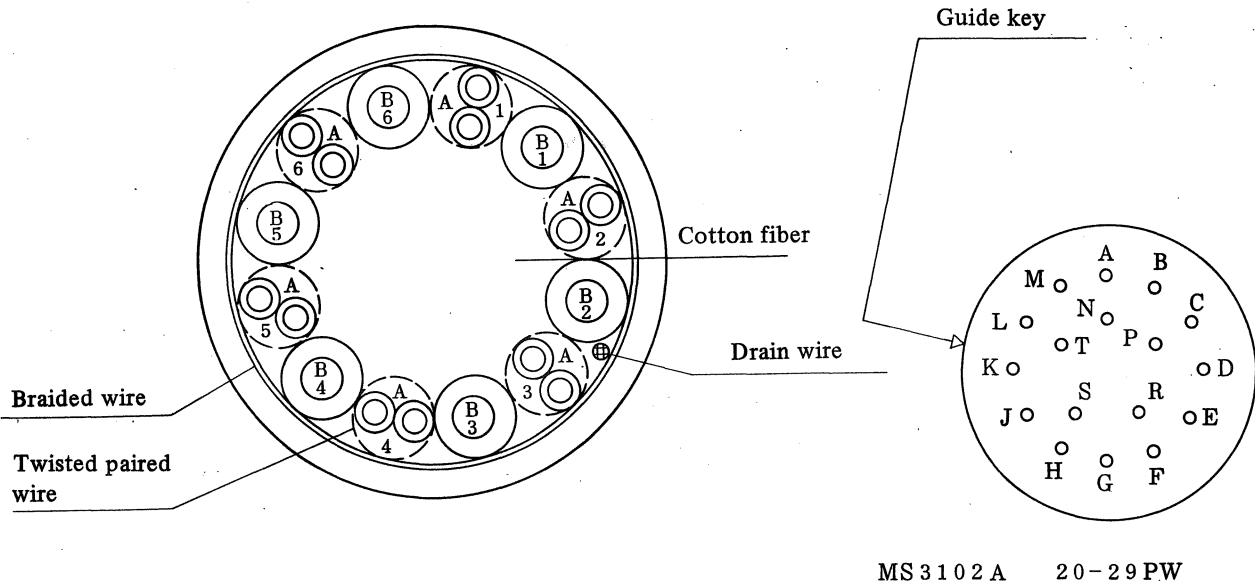
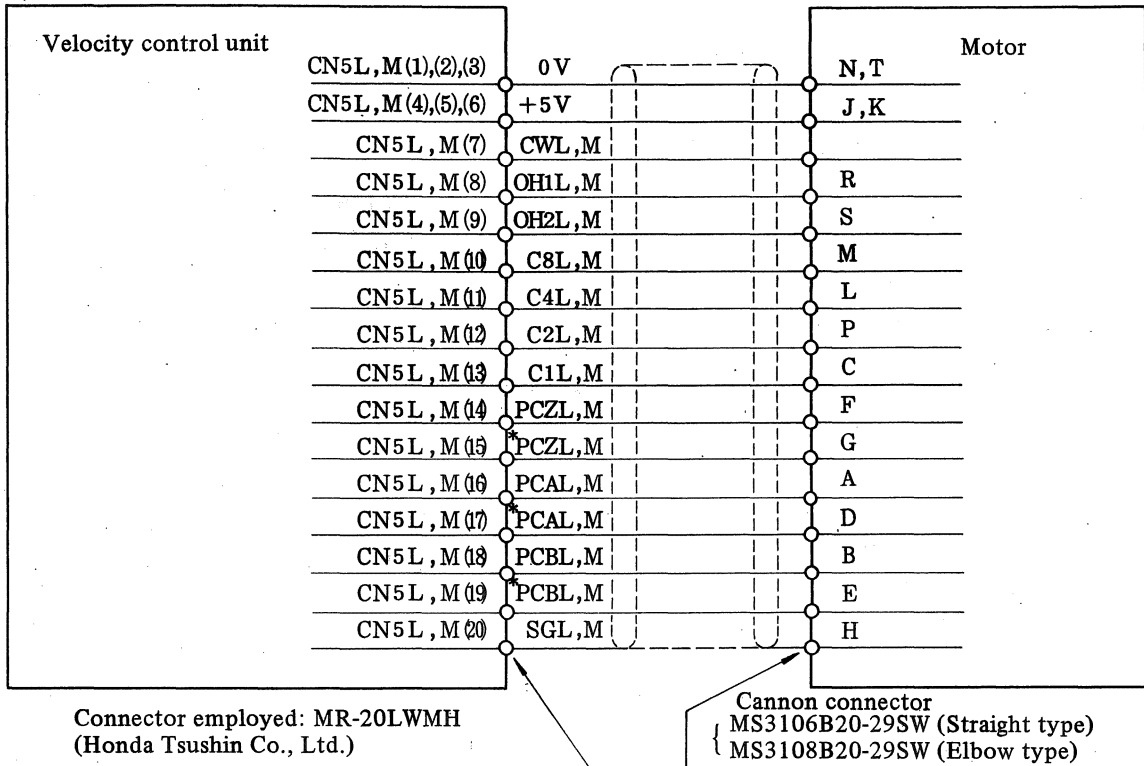


Fig. 2.2.6

2.2.7 Details of connections of cable K7

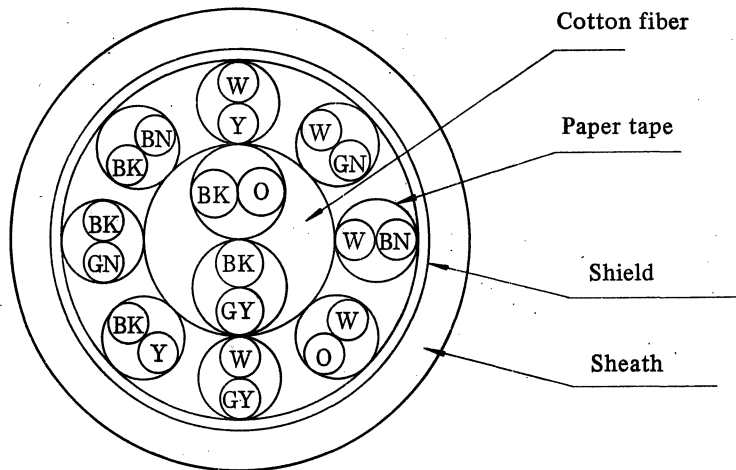
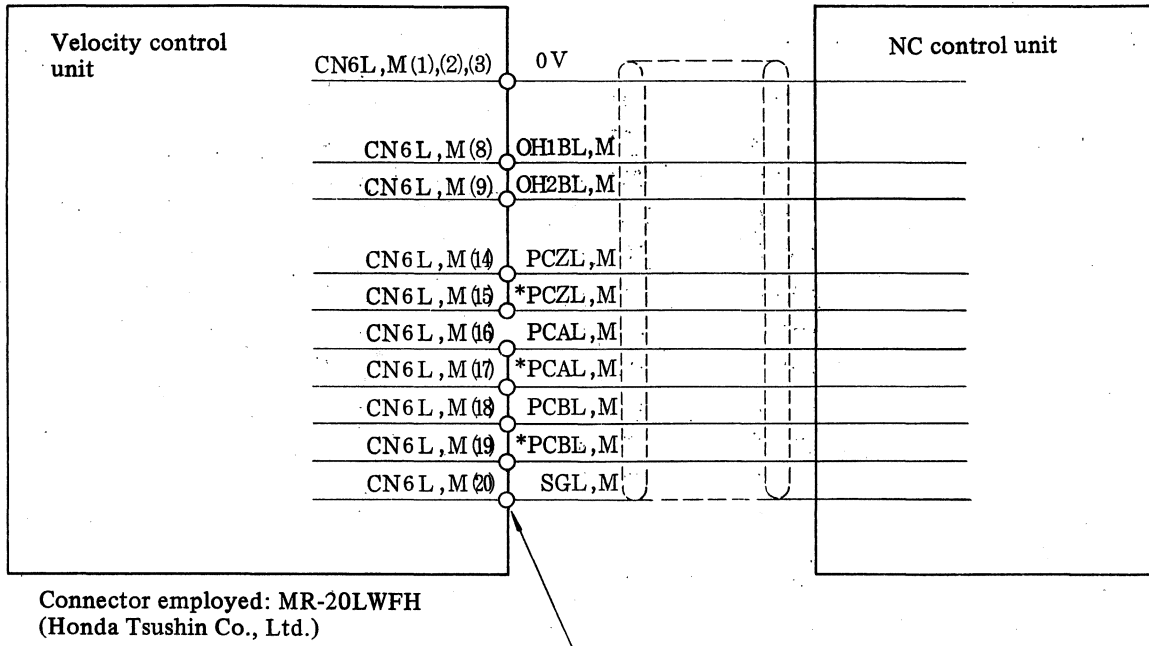
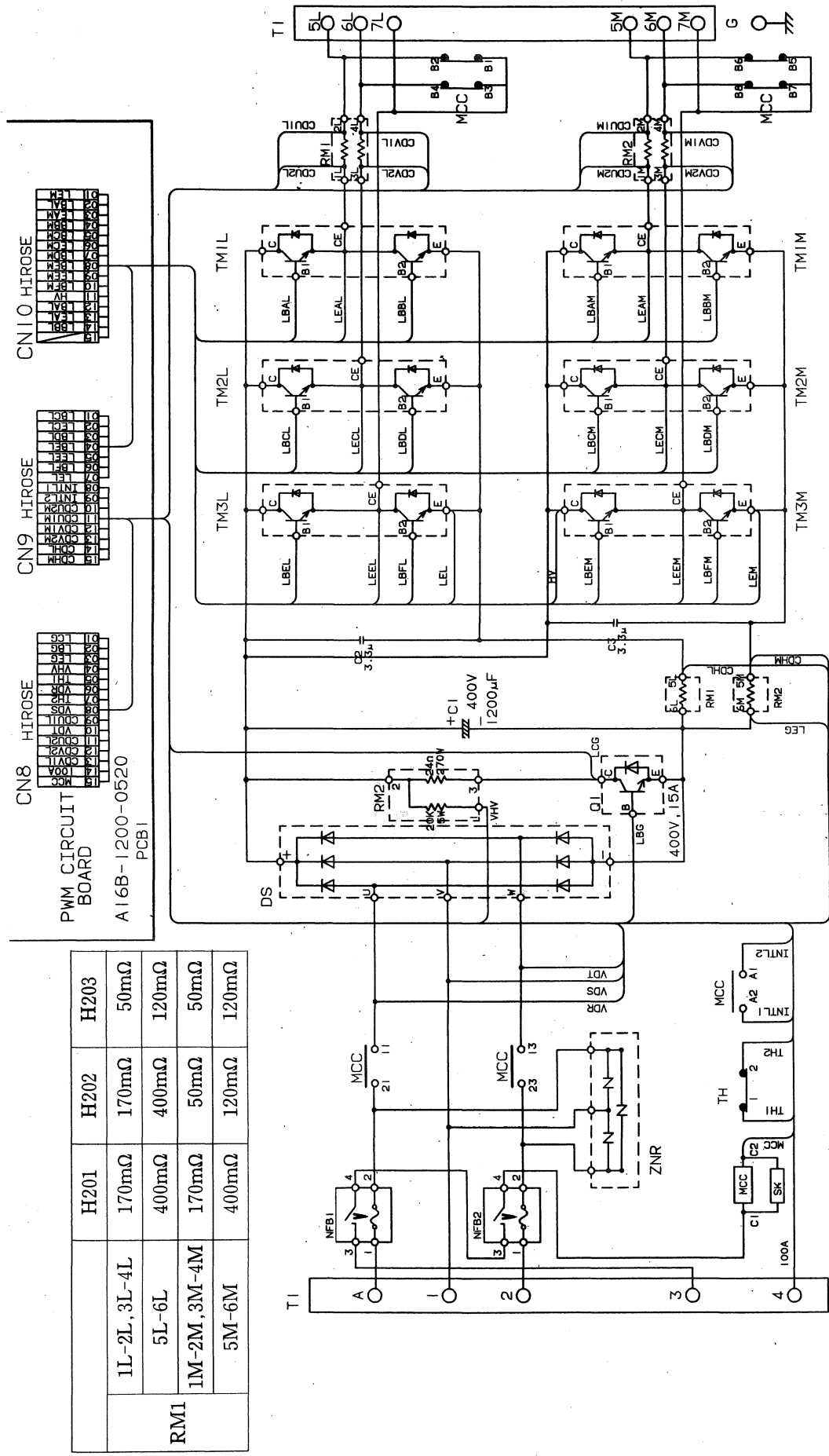


Fig. 2.2.7

2.3 Connection of Power Transformer

Refer to the same subsections in Chapter I in this manual.

2.4 Connection Diagram of Velocity Control Unit



	H201	H202	H203
RM1	1L-2L, 3L-4L	170mΩ	50mΩ
	5L-6L	400mΩ	120mΩ
	1M-2M, 3M-4M	170mΩ	50mΩ
	5M-6M	400mΩ	120mΩ

G H201 AC2-0/1-0 + AC2-0/1-0
 H202 AC2-0/1-0 + AC0/5
 H203 AC0/5 + AC0/5

CN11 (TO NC, VCMD)

1	4	PROY2L	08	*ALM1L	01	PROY1L
15	ENBL	2	09	*ALM2L	02	ENBL1L
16	OV	2	10	*ALM4L	03	OV1L
17	VRODY2L	11	*ALM4L	04	VRODY1L	
18	CLRT1L	12		05	CURR	
19		13	CURR	05		
20	EL	MR	20P-071	VCMD		

TO NC
(VCMD)

CN1M (TO NC, VCMD)

1	4	PROY2M	08	*ALM1M	01	PROY1M
15	ENBL	2	09	*ALM2M	02	ENBL1M
16	OV	2	10	*ALM4M	03	OV1M
17	VRODY2M	11	*ALM4M	04	VRODY1M	
18	CLRT1M	12		05	CURRM	
19		13	CURRM	05		
20	EM	MR	20P-071	VCMD		

CN5L (TO MOTOR)

01	OV	08	CH1AL	14	PCZL
02	OV	09	CH2AL	15	PCZM
03	OV	10	CH4AL	16	PCZM
04	+5V	11	C4M	17	*PCAM
05	+5V	12	C2M	18	*PCSM
06	+5V	13	C1M	19	*PCSM
07	CM	MR	20S-03	SBL	

TO MOTOR
(PULCO)

CN5M (TO MOTOR)

01	OV	08	CH1AM	14	PCZM
02	OV	09	CH2AM	15	*PCZM
03	OV	10	C8M	16	PCAM
04	+5V	11	C4M	17	*PCAM
05	+5V	12	C2M	18	*PCSM
06	+5V	13	C1M	19	*PCSM
07	CM	MR	20S-03	SBM	

CN6L (TO NC, PULCO)

1	4	PCZM	08	CH1BM	01	OV
15	*PCZM	09	CH2BM	02	OV	
16	PCAM	10		03	OV	
17	*PCAL	11		04	+5V	
18	PCBL	12	CLMT1L	05	+5V	
19	*PCBL	13	CLMT1L	06	+5V	
20	SG	MR	20P-071	CLMT1L		

TO NC
(PULCO)

CN6M (TO NC, PULCO)

1	4	PCZM	08	CH1BM	01	OV
15	*PCZM	09	CH2BM	02	OV	
16	PCAM	10		03	OV	
17	*PCAM	11		04	+5V	
18	PCBM	12	CLMT1M	05	+5V	
19	*PCBM	13	CLMT1M	06	+5V	
20	SG	MR	20P-071	CLMT1M		

A20B-1001-0470

PCB2

CN7 (TO PCB1)
YAMAICHI 50P

01A	INTL	01B	INTL2	
02A	OV	1L	02B	OV1L2
03A	OV	1M	03B	OV1M2
04A	18V	04B	+15V	
05A	18V	05B	+15V	
06A	18V	06B	+15V	
07A	18V	07B	+15V	
08A	HVAL	08B	HVAL2	
09A	HVAL	09B	HVAL2	
10A	AL	10B	PROY	
11A	LVAL	11B	DCAL	
12A	*ICLR	12B	+24V	
13A	PHF	13B	+24V	
14A	PHF	14B	+24V	
15A	PHC	15B	-15V	
16A	PHC	16B	-15V	
17A	PHB	17B	-15V	
18A	PVAL	18B	+5V	
19A	+5V	19B	+5V	
20A	PHFM	20B	OV	
21A	PHFM	21B	OV	
22A	PHDM	22B	OV	
23A	PHCM	23B	OV	
24A	PHVM	24B	OV	
25A	PHVM	25B	OV	

CN2
BURNDY

1	18A
2	CT
3	18B
4	TOH1
5	TOH2
6	

TO POWER
TRANSFORMER

A16B-1200-0520

PCB1

CN7 (TO PCB2)
YAMAICHI 50P

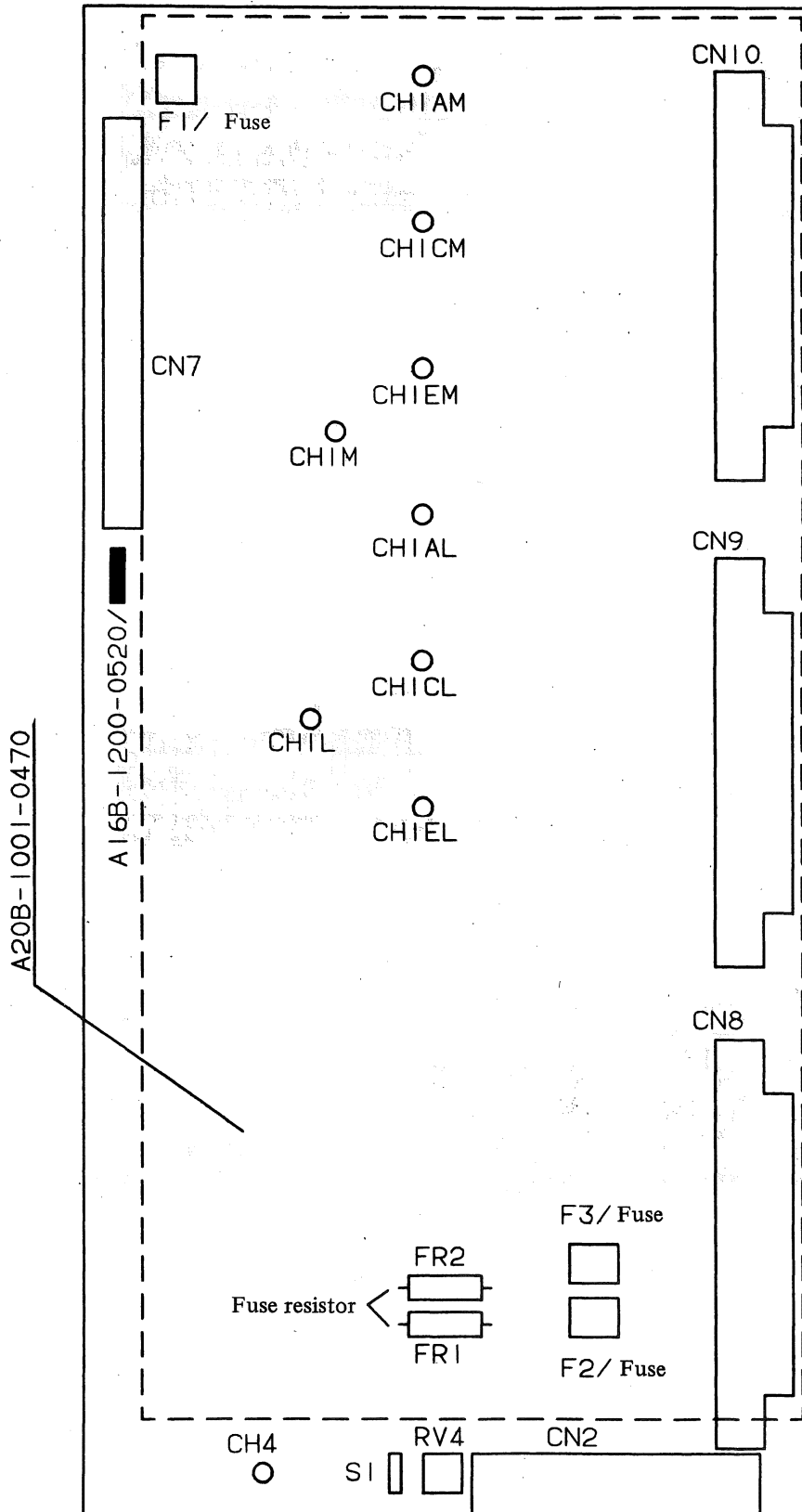
01A	INTL	01B	INTL2	
02A	OV	1L	02B	OV1L2
03A	OV	1M	03B	OV1M2
04A	18V	04B	+15V	
05A	18V	05B	+15V	
06A	18V	06B	+15V	
07A	18V	07B	+15V	
08A	HVAL	08B	HVAL2	
09A	HVAL	09B	HVAL2	
10A	AL	10B	PROY	
11A	LVAL	11B	DCAL	
12A	*ICLR	12B	+24V	
13A	PHF	13B	+24V	
14A	PHF	14B	+24V	
15A	PHC	15B	-15V	
16A	PHC	16B	-15V	
17A	PHB	17B	-15V	
18A	PVAL	18B	+5V	
19A	+5V	19B	+5V	
20A	PHFM	20B	OV	
21A	PHFM	21B	OV	
22A	PHDM	22B	OV	
23A	PHCM	23B	OV	
24A	PHVM	24B	OV	
25A	PHVM	25B	OV	

3. SETTING AND ADJUSTMENT OF VELOCITY CONTROL UNIT

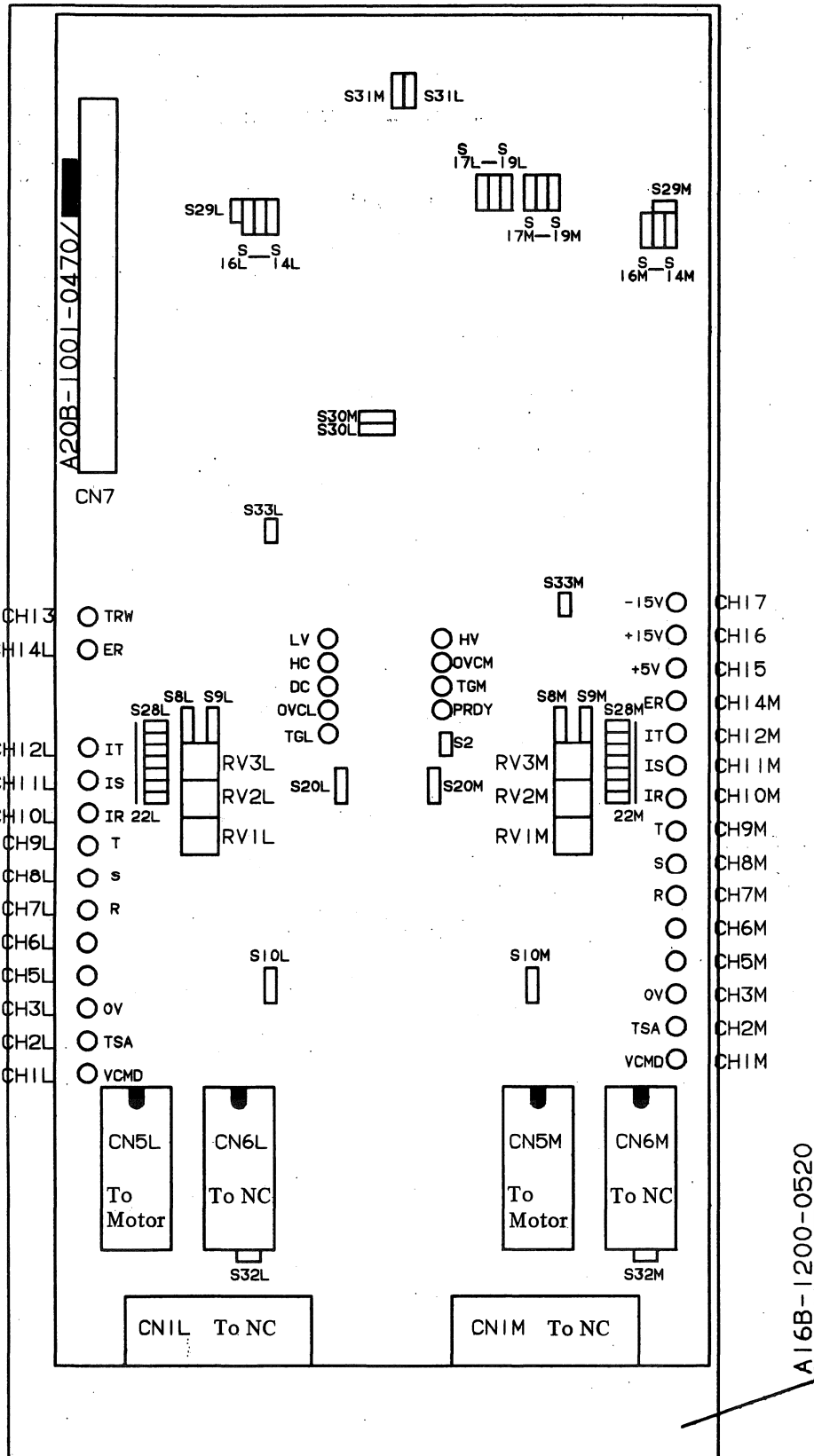
3.1 Setting and Adjustment of Velocity Control Unit PCB

3.1.1 Parts location

(1) A16B-1200-0520 (Mother board)



(2) A20B-1001-0470 (Child board)



Note 1. Two PCB is 1 sets.

Note 2. Part location on PCB may be changed without notice.

3.1.2 Setting terminal

PCB A20B-1001-0470
A16B-1200-0520

Table 3.1.2

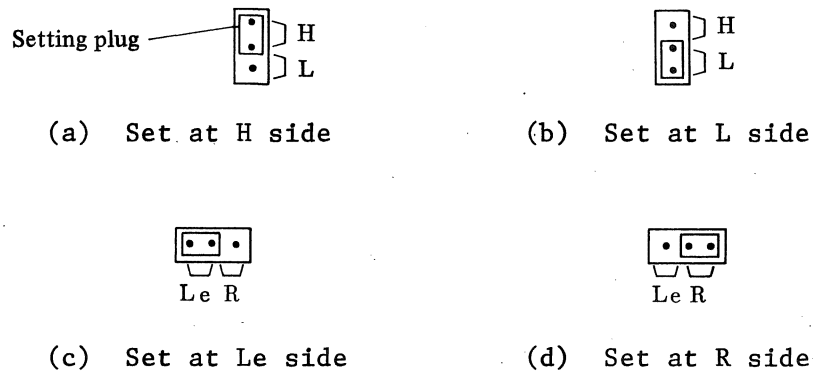
Terminal setting	Standard setting		Remarks
	2-0/1-0	0/5	
S1	L	L	TOH setting (Note 1)
S2	x	x	DC alarm setting (Note 2)
S10L,M	H	H	TG alarm enable (Note 3)
S17L, M	H	H	Current limit setting
S18L,M	H	H	
S19L,M	H	H	
S20L,M	H	H	Absolute code output enable (Note 4)
S22L,M	o	o	Compensation circuit setting
S23L,M	o	o	VCMD gain setting (Note 5)
S24L,M	o	o	F/V circuit filter setting
S25L,M	x	x	Compensation circuit setting
S26L,M	x	x	
S27L,M	o	o	
S28L,M	x	x	
S29L,M	x	x	F/V input pulse width setting (Note 6)
S30L,M	Le	R	Current loop gain setting
S31L,M	H	H	TG alarm enable
S32L,M	o	o	Setting for absolute pulse coder (Note 7)
S33L,M	x	x	OVC alarm level setting

Terminal setting	Pulse coder			Remarks
	2000P	2500P	3000P	
S8L,M	L	L	H	Pulse coder F/V gain setting
S9L,M	H	L	L	
S14L,M	L	H	H	Pulse coder pole number and pulse number setting
S15LM,	H	L	L	
S16L,M	H	L	H	

Note 1. If the power transformer is connected to terminals CN2(4) and (5), set S1 at L side.

Note 2. If the regenerative discharge unit is mounted, set S2 in the short-circuit state. If it is not mounted, set S2 in the open state.

- Note 3. If check is required without connection of the motor power cable, set S10 at L side.
- Note 4. If S20 is set at L side, absolute codes from the pulse coder is output to NC while VRDY is on. If VRDY is turned OFF, the alarm code is output. If S20 is set at H, the alarm code is always output.
- Note 5. If S23 is short-circuited, 7V/2000 rpm is set, and if it is open, 7V/1000 rpm is set.
- Note 6. If S29 is short-circuited, the velocity feedback voltage is changed from 3V/1000 rpm to 1.5V/1000 rpm. Normally, set it in the open state.
- Note 7. If ABS pulse coder is used, set S32 in the open state.
- Note 8. Setting operations are shown in the Fig. below.



3.1.3 Variable resistor

Table 3.1.3

Volume	Standard setting	Remarks
RV1L, RV1M, RV1N	50%	Gain setting
RV2L, RV2M, RV2N	-	Adjustment of offset voltage
RV3L, RV3M, RV3N	-	Adjustment of velocity feedback voltage

- Note 1. RV2L, M, N and RV3L, M, N are adjusted before shipping from the factory.
- Note 2. Settings of RV1L, M, and L are the same regardless of the number of versions.

3.1.4 Check terminals

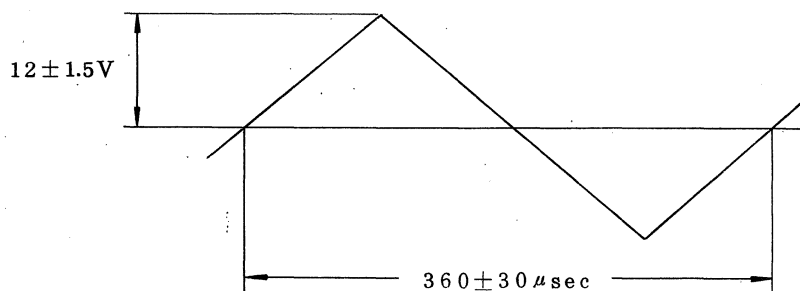
Table 3.1.4

Check terminal	Symbol	Contents	
CH1L,M	VCMD	a x velocity command voltage	(Note 1)
CH2L,M	TSA	0.8 x velocity feedback voltage	
CH3L,M	0V	0V	
CH4	0V	0V	(Note 2)
CH5L,M		Compensation circuit	
CH6L,M			
CH7L,M	R	R-phase current command	
CH8L,M	S	S-phase current command	
CH9L,M	T	T-phase current command	
CH10L,M	IR	R-phase current feedback	1.18 A/V (Motor 1-0, 2-0)
CH11L,M	IS	S-phase current feedback	
CH12L,M	IT	T-phase current feedback	4.00 A/V (Motor 0, 5)
CH13	TRW	Triangle wave (Note 3)	
CH14L,M	ER	Error voltage (Torque command voltage) (Note 4)	
CH15	+5V	+5V	
CH16	+15V	+15V	
CH17	-15V	-15V	

Note 1. a = 0.344 when VCMD is 7V/1000 rpm
a = 0.687 when VCMD is 7V/2000 rpm

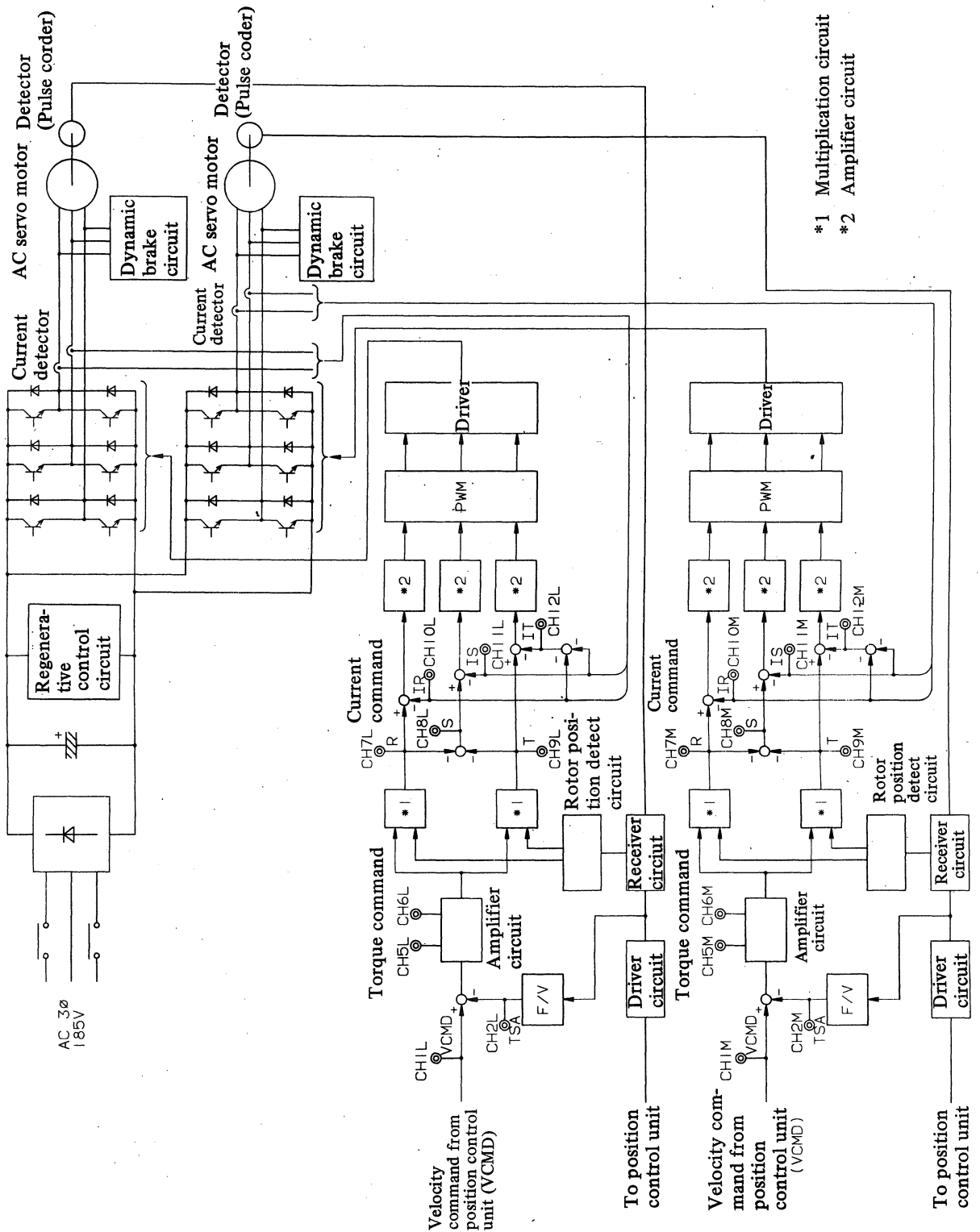
Note 2. Setting terminal S4 is on the PCB A16B-1200-0520.

Note 3. Waveform of triangle wave is as follows.



Note 4. Motor load currents (peak values) can be monitored using the same conversion as CH10-12. Effective values can be obtained by multiplying $1/\sqrt{2}$.

3.2 Block Diagram of Velocity Control Unit



4. TROUBLESHOOTING

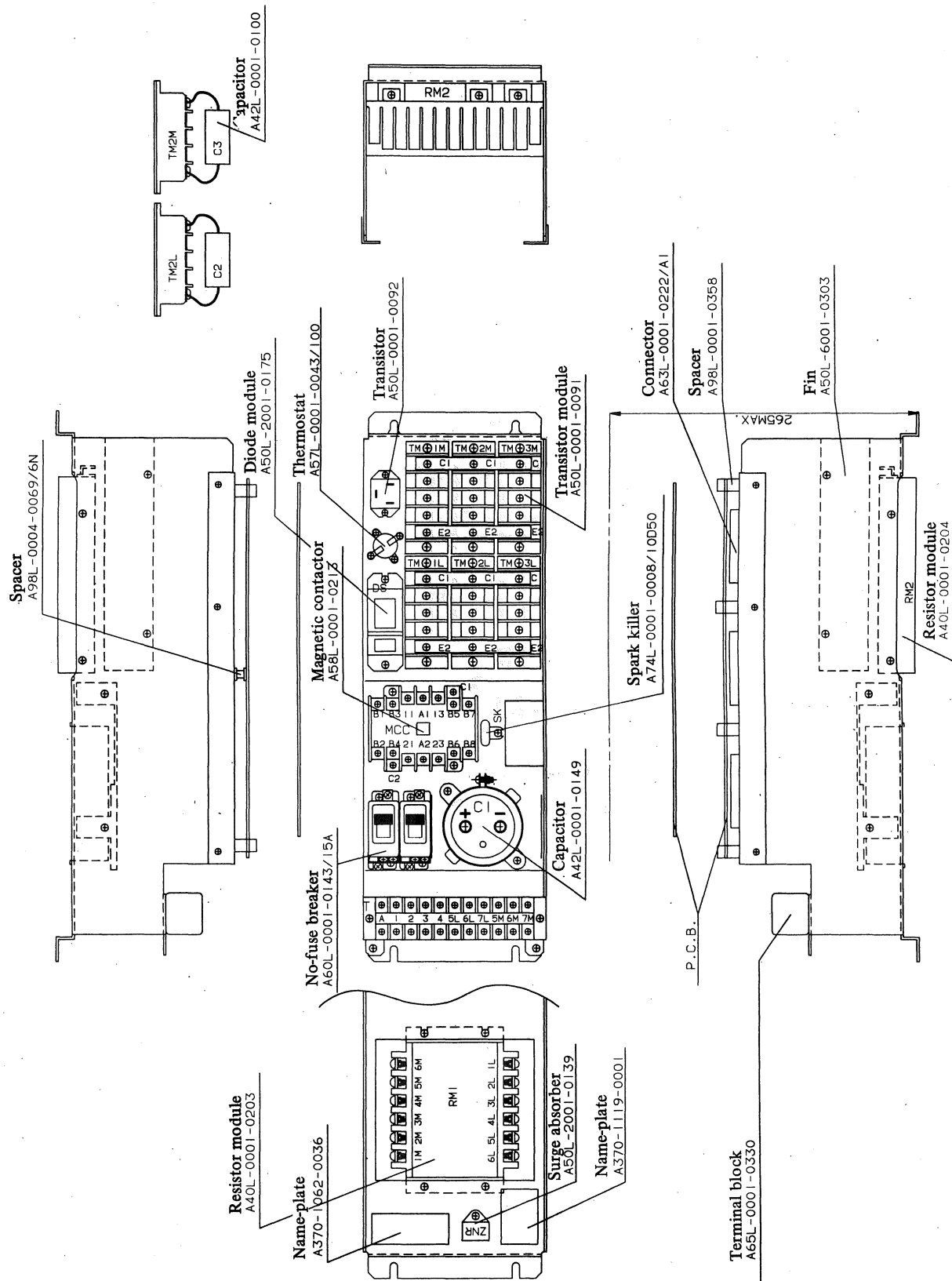
4.1 Protection and Fault Detect Function

4.2 Troubleshooting

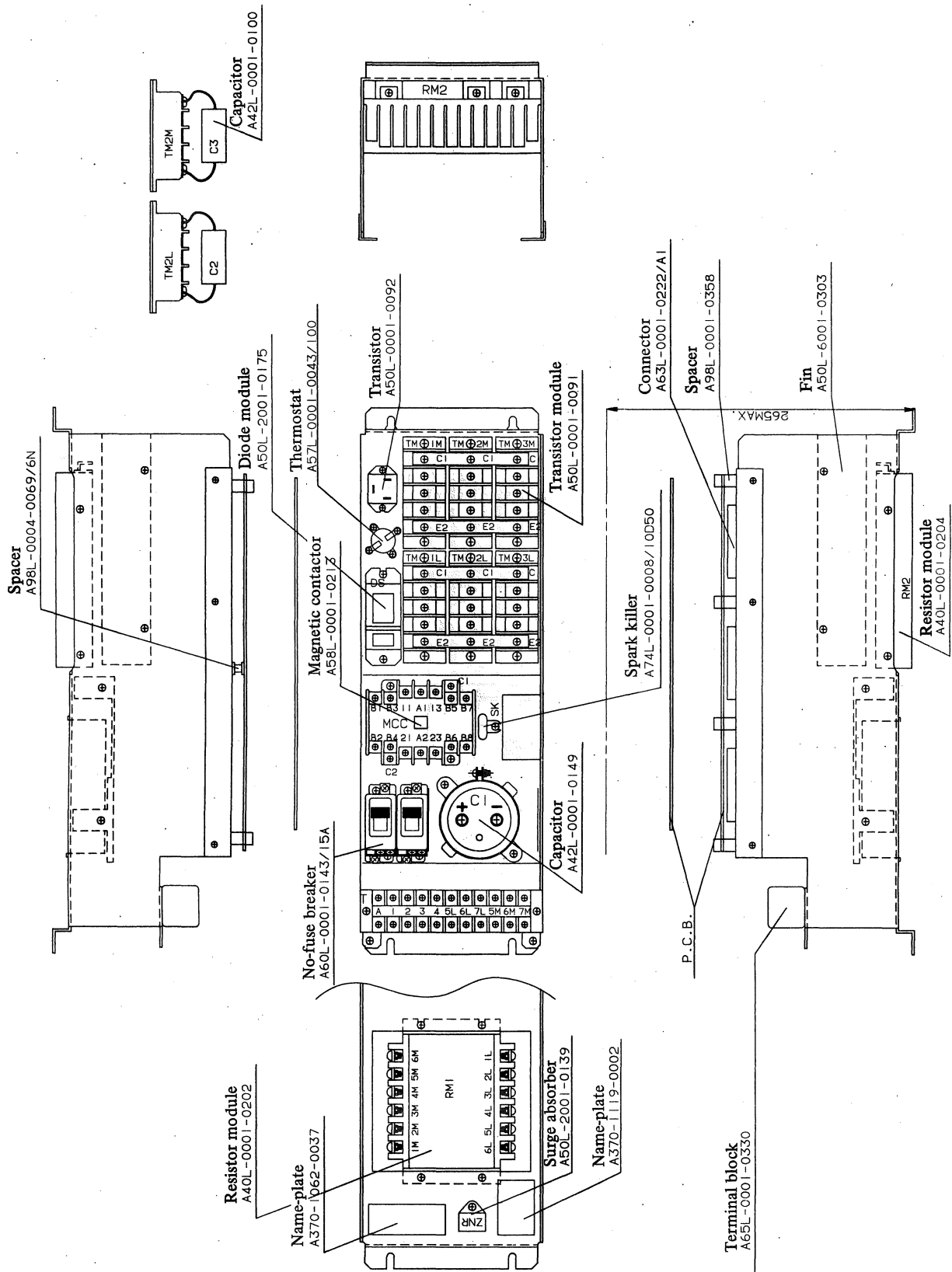
For subsection 4 - 4.2 refer to the same subsection in Chapter I in this manual.

5. PARTS SPECIFICATION AND LOCATIONS ON VELOCITY UNIT

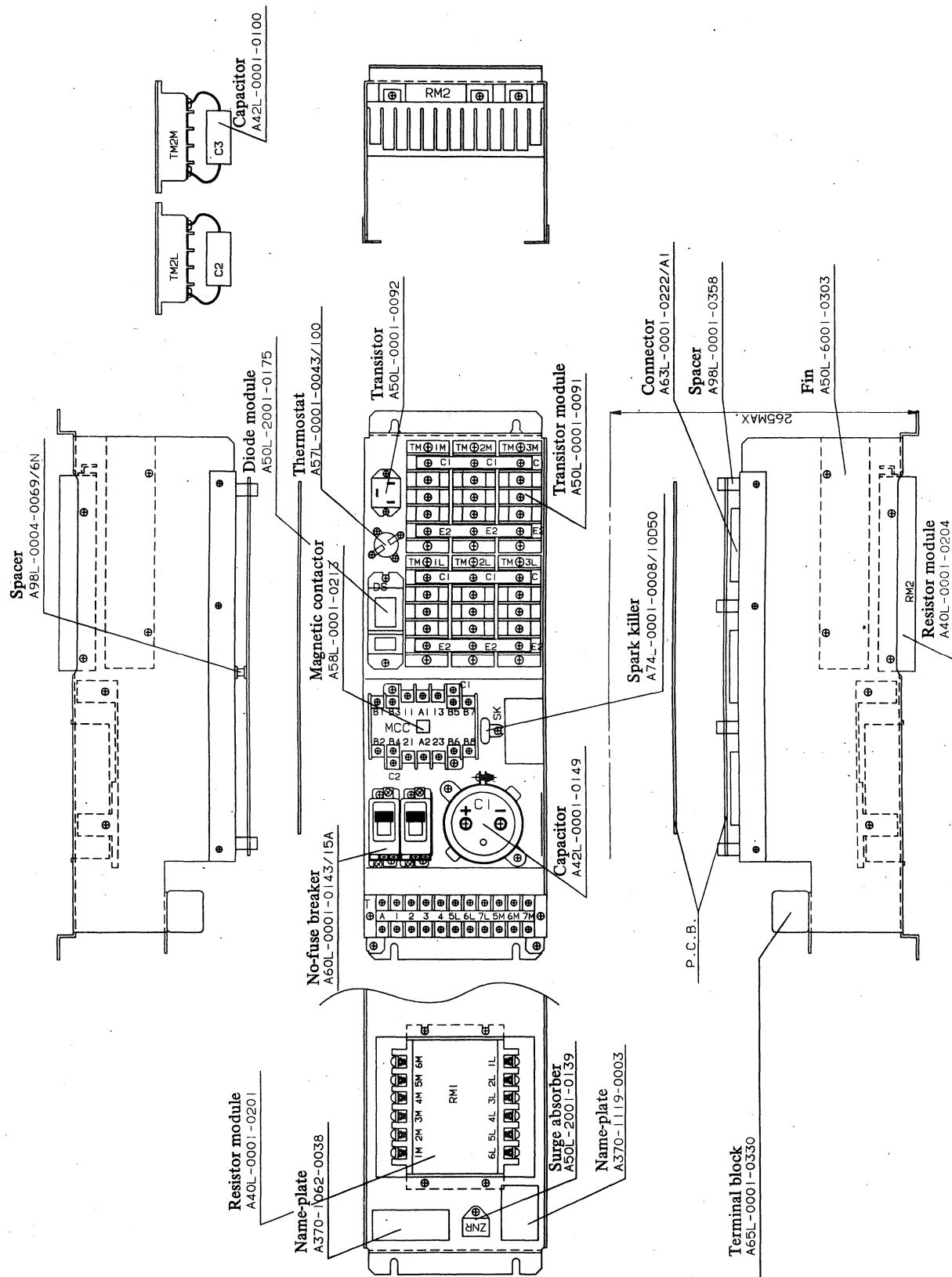
5.1 Model 1-0/2-0 and Model 1-0/2-0 (A06B-6050-H201)



5.2 Model 1-0/2-0 and Model 0/5 (A06B-6050-H202)



5.3 Model 0/5 and Model 0/5 (A06B-6050-H203)



III. AC SERVO UNIT FOR 3 AXES

This chapter describes the maintenance of AC servo unit for 3 axes which drives AC servo motor Model 0, 5, and 10.

Combination of three motors are described in Table 1.1.1. Refer to Table 1.1.1.

1. STRUCTURE

The AC servo unit for 3 axes consists of the velocity control unit, the power transformer and the discharge unit.

Four types of velocity control unit are available according to the combinations of AC servo motor models employed. One velocity control unit applies to three servo motors.

One power transformer is employed according to the combinations of motor model.

A regenerative discharge unit is a resistor unit which consumes the regenerated energy by the motor.

If the AC servo motor models employed are rather small type having a little regenerative energy, a regenerative discharge unit may be unnecessary. Fig. 1.1 shows a configuration example of an NC system with 3 controlled axes.

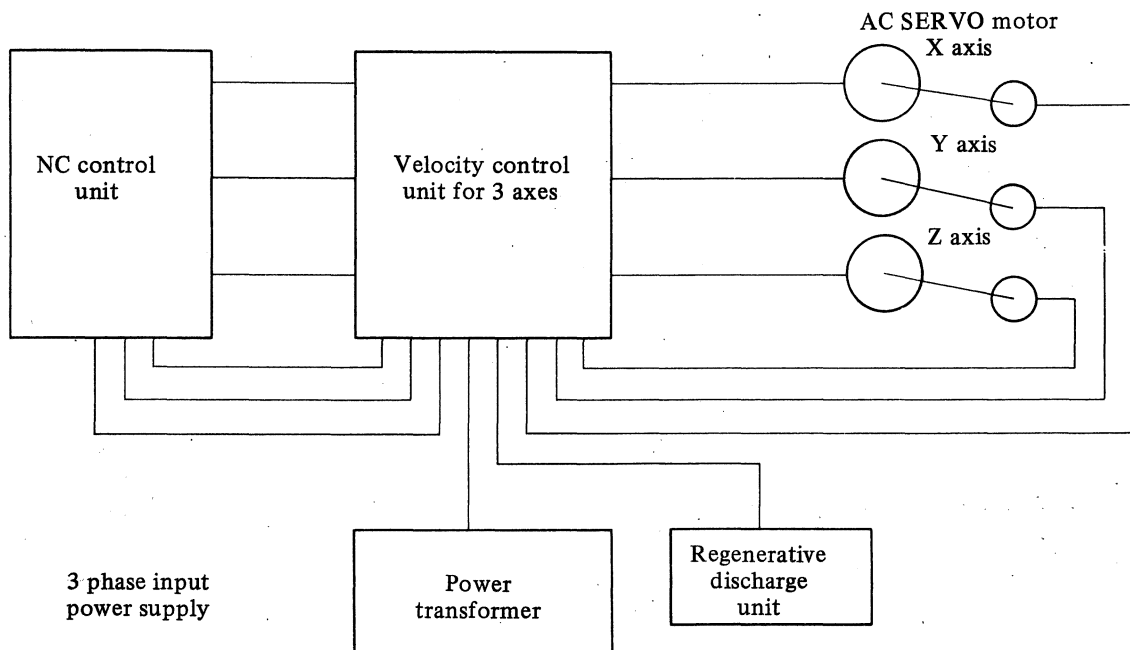


Fig. 1.1 A Typical Configuration Using an AC Servo Unit for 3 Axes

1.1 Types of Unit and Specification Number

Table 1.1 (a) Types of Units and Specification Number

Name	Applicable motor			Specification	Remarks
	L	M	N		
Velocity control unit Note 1	0/5	0/5	0/5	A06B-6050-H401	
	0/5	0/5	10	A06B-6050-H402	
	0/5	10	10	A06B-6050-H403	
	10	10	10	A06B-6050-H404	
Power transformer Note 2	For Japan 200V 220V		Transformer MB	A06B-6047-H012	
			Transformer MC	A06B-6047-H013	
	For other countries 190V - 550V		Transformer MBE	A06B-6047-H022	
			Transformer MCE	A06B-6047-H023	
	Common to All countries 190V - 550V		Transformer ABE	A06B-6050-H022	
			Transformer ACE	A06B-6050-H023	
Regenerative discharge unit DCUA				A06B-6050-H050	Note 3
Regenerative discharge unit DCUB				A06B-6050-H052	Note 4
Regenerative discharge unit DCUC				A06B-6050-H051	Note 5
Input connector (Soldering type)				A06B-6050-K202	Note 6
Input connector (Crimp style type)				A06B-6050-K203	Note 7

Note 1. Specification number differs according to a motor combination.

Note 2. If the specifications of the velocity control unit are A06B-6050-H401 or -H402, one of transformers MB, MBE and ABE should be used.

If the specifications of velocity control units are A06B-6050-H403 or -H404, one of transformers MC, MCE and ACE should be used.

Note 3. To be used when the regenerative energy from the motors of three axes is rather large employing the velocity control unit A06B-6050-H401.

Note 4. To be used when the regenerative energy from the motors of three axes is rather large employing the velocity control unit A06B-6050-H402 or A06B-6050-H403.

Note 5. One set should be used for one velocity control unit A06B-6050-H404.

Note 6. Input connector includes connectors to be employed on the connecting cables to the velocity control unit. One set should be used for 3 axes.

Parts contained in the input connector (soldered type) are indicated in the Table 1.1(b).

Parts contained in the input connector (crimp style type) are indicated in the Table 1.1(c).

Table 1.1 (b) Parts Included in Input Connector (Soldering type)

Name	Q'ty	Use	Model	FANUC specifications
Connector + cover	3	CN1L,M,N	MR-20LFH *	A63L-0001-0134/02
Connector + cover	3	CN5L,M,N	MR-20LWMH *	A63L-0001-0134/15
Connector + cover	3	CN6L,M,N	MR-20LWFH *	A63L-0001-0134/05
Housing	1	CN2	SMS6PW-5 **	A63L-0001-0202/6W
Pin	5	CN2	RC16M-SCT3 **	A63L-0001-0226

Table 1.1 (c) Parts Included in Input Connector (Crimp style type)

Name	Q'ty	Use	Model	FANUC specifications
Connector + cover	3	CN1L,M,N	MR-20L, MRP-20F01 *	A63L-0001-0134/22
Connector + cover	3	CN5L,M,N	MR-20LW, MRP-20M01*	A63L-0001-0134/35
Connector + cover	3	CN6L,M,N	MR-20LW, MRP-20F01*	A63L-0001-0134/25
Contact	120	CN1,6	MRP-F112 *	A63L-0001-0134/F112
Contact	60	CN5	MRP-M112 *	A63L-0001-0134/M112
Housing	1	CN2	SMS6PW-5 **	A63L-0001-0202/6W
Pin	5	CN2	RC16M-S23A **	A63L-0001-0127/S23A

* Manufacturer: HONDA Tsushin Co., Ltd.
 ** Manufacturer: Burndy Japan Ltd.

2. CONNECTIONS

2.1 Connection Diagram

Fig. 2.1(a) shows standard connection diagram of A06B-6050-H401 - H403.

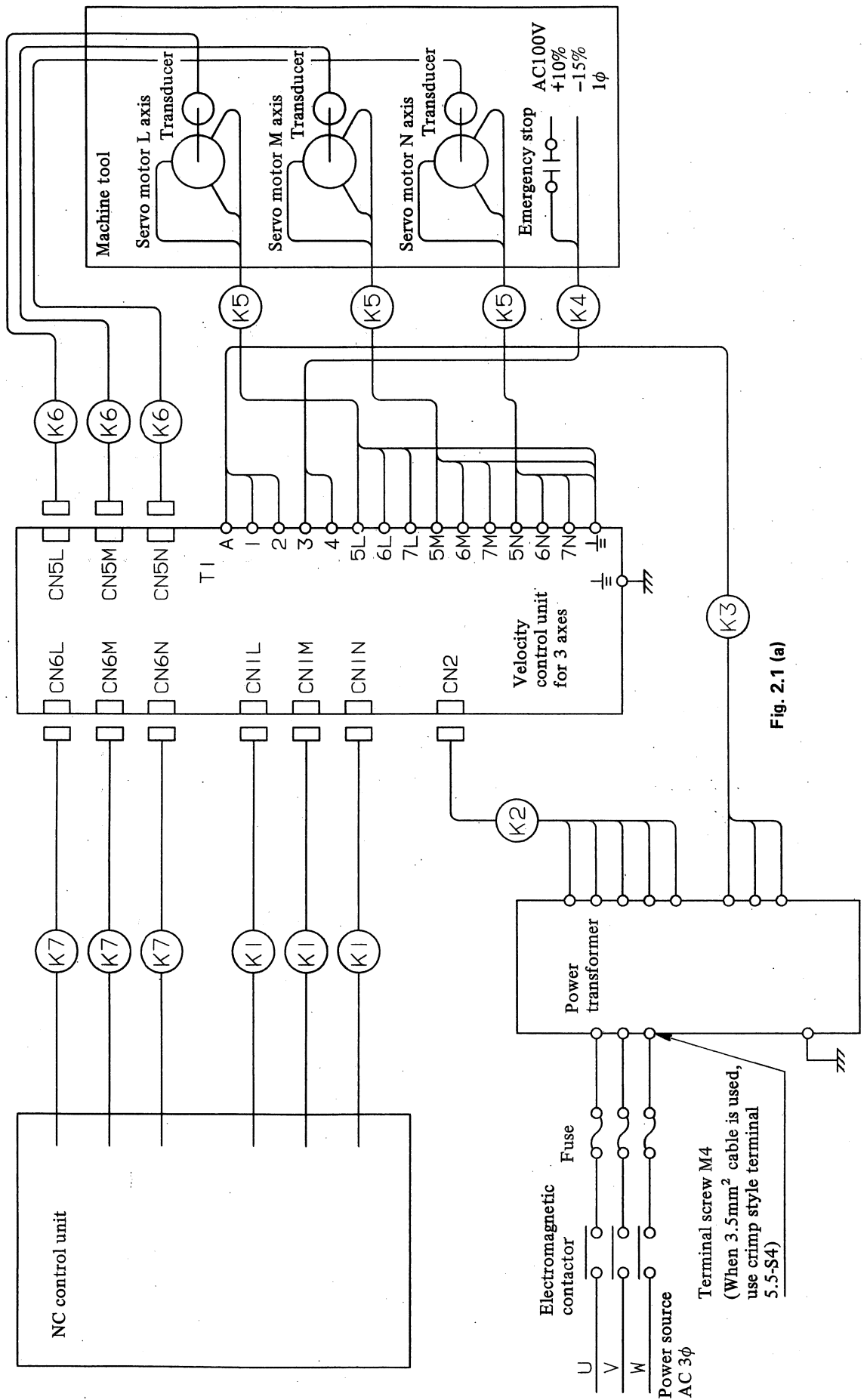
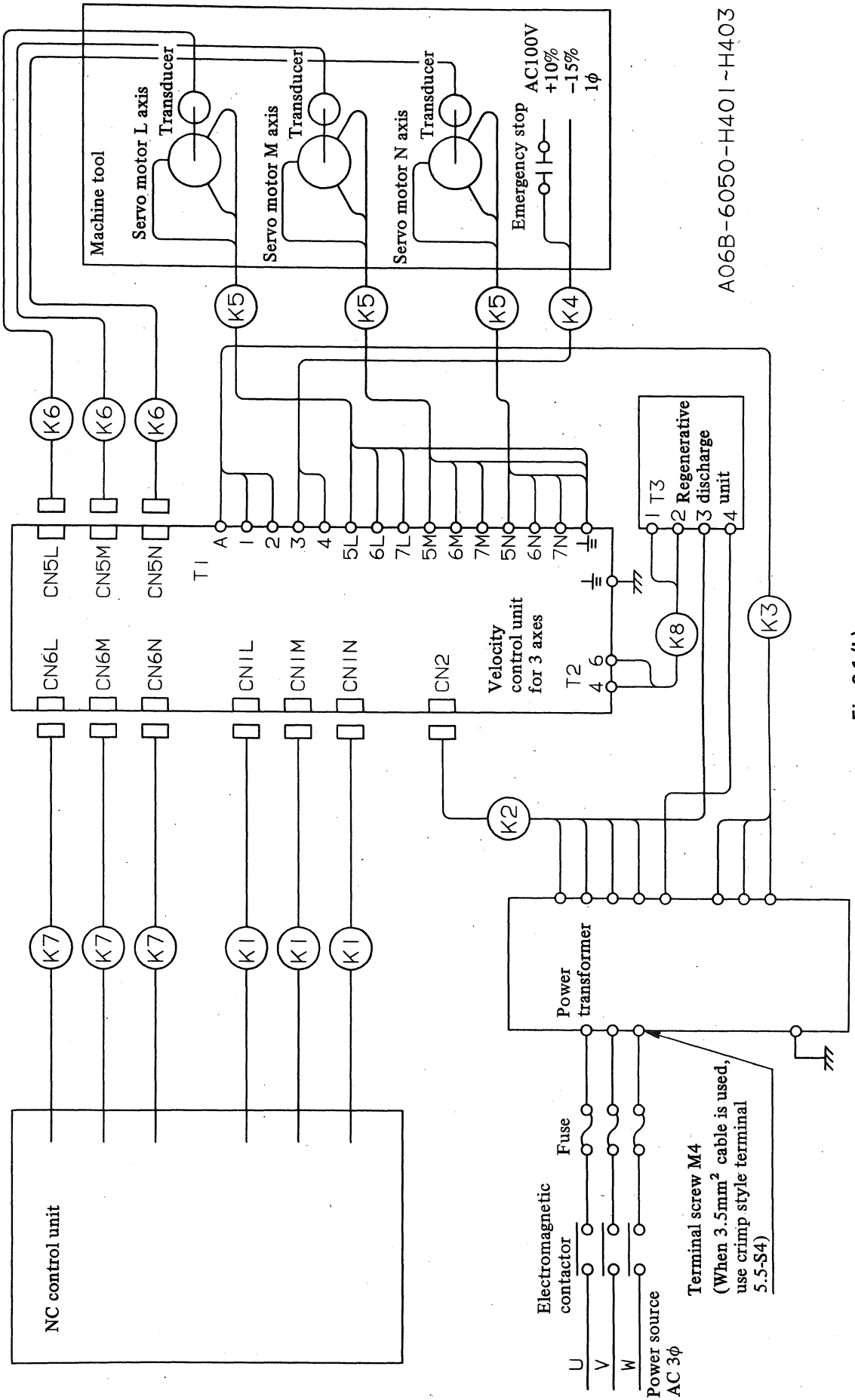


Fig. 2.1 (a)

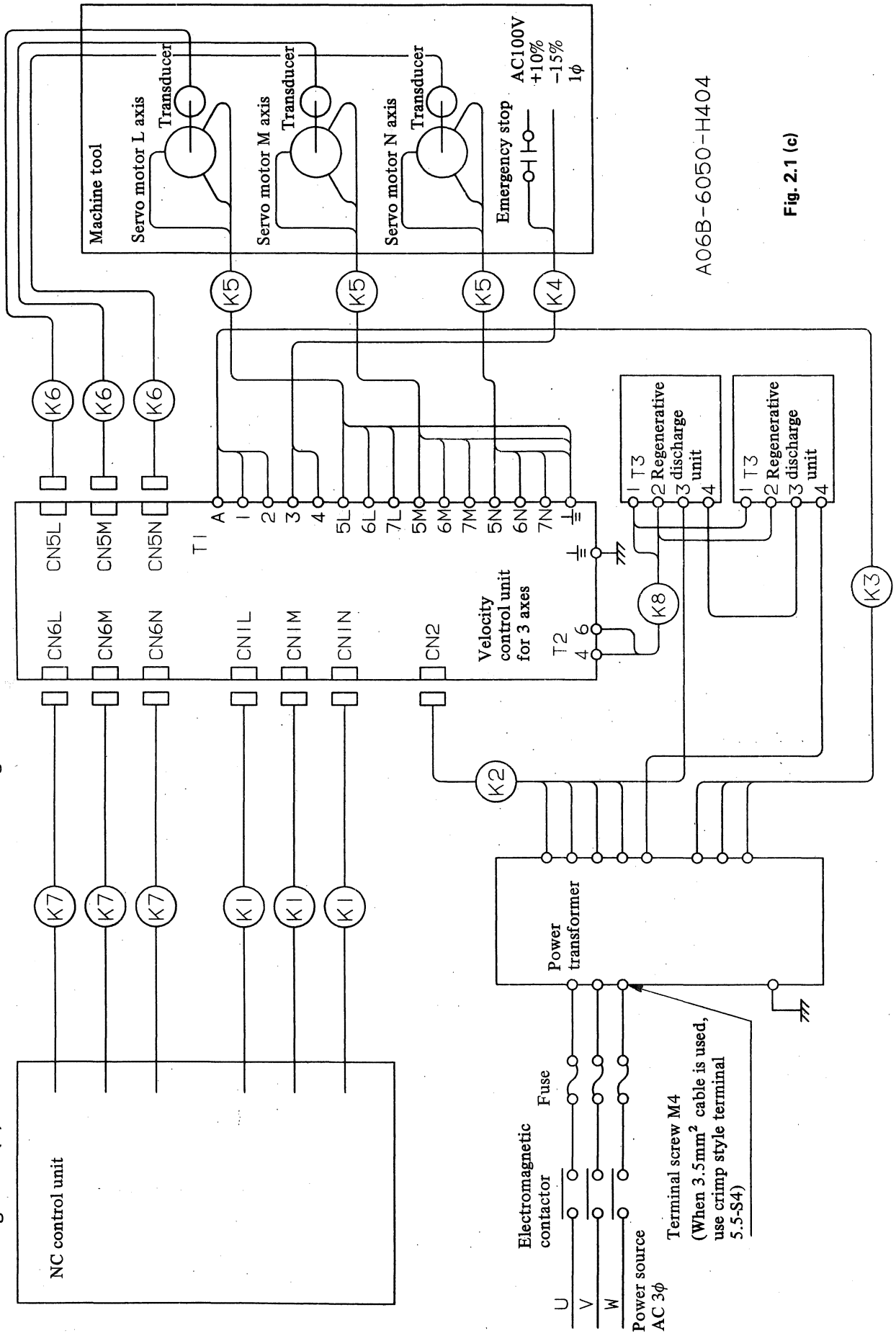
Fig. 2.1(b) shows connection diagram of A06B-6050-H401 - H403 with regenerative discharge unit.



A06B-6050-H401 ~ H403

Fig. 2.1 (b)

Fig. 2.1(c) shows standard connection diagram of A06B-6050-H404.



A06B-6050-H404

Fig. 2.1 (c)

2.2 Detailed Servo System Connection Diagram

2.2.1 Details of connections of cable K1

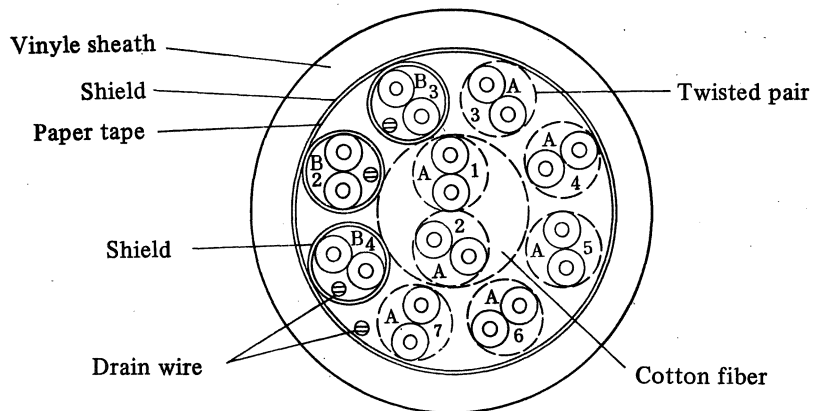
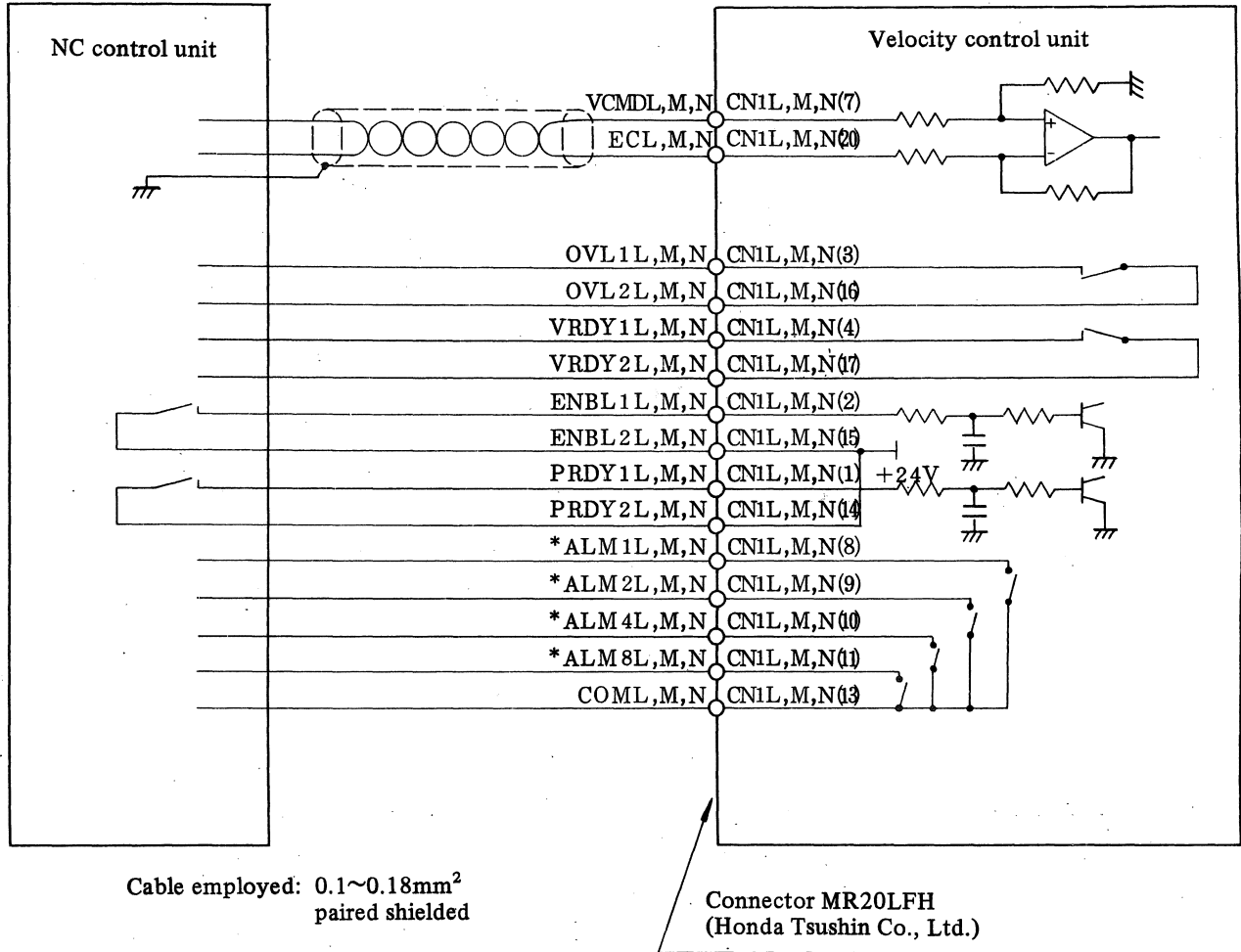


Fig. 2.2.1

2.2.2 Details of connections of cable K2

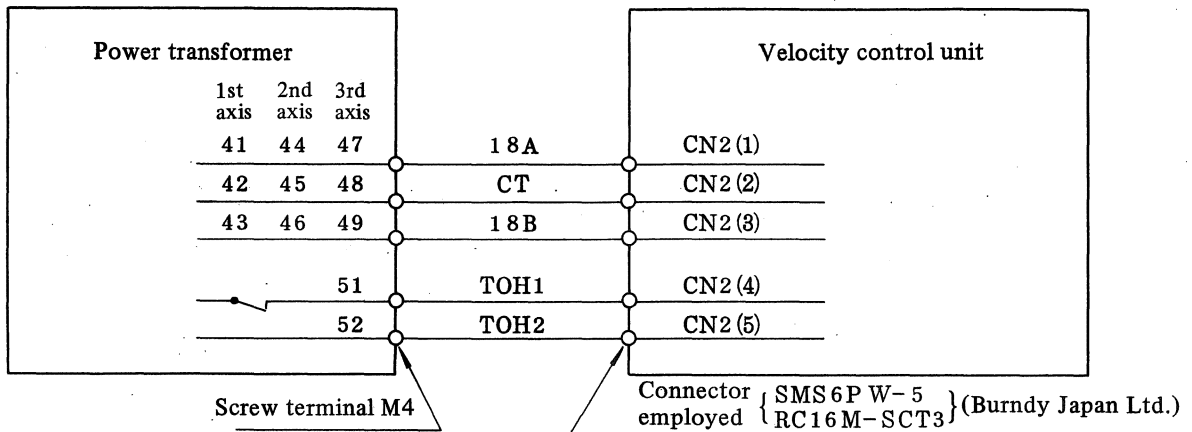
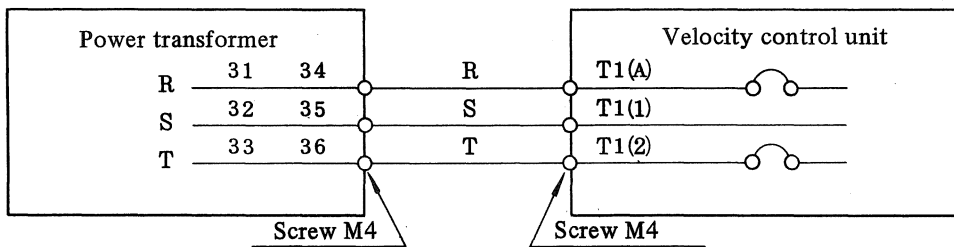


Fig. 2.2.2

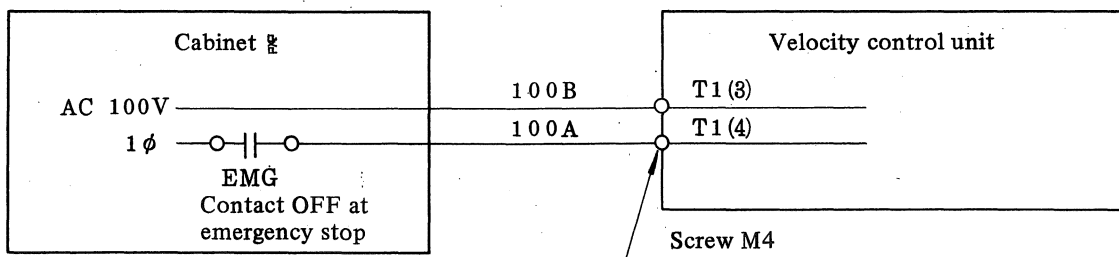
2.2.3 Details of connections of cable K3



(Cable employed: 3.5mm², 600V heat-resistive vinyl wire)

Fig. 2.2.3

2.2.4 Details of connections of cable K4



(Cable employed: 0.75mm², 200V vinyl wire)

Fig. 2.2.4

2.2.5 Details of connections of cable K5

(1) Model 5, 0

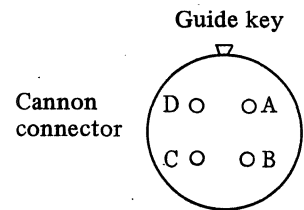
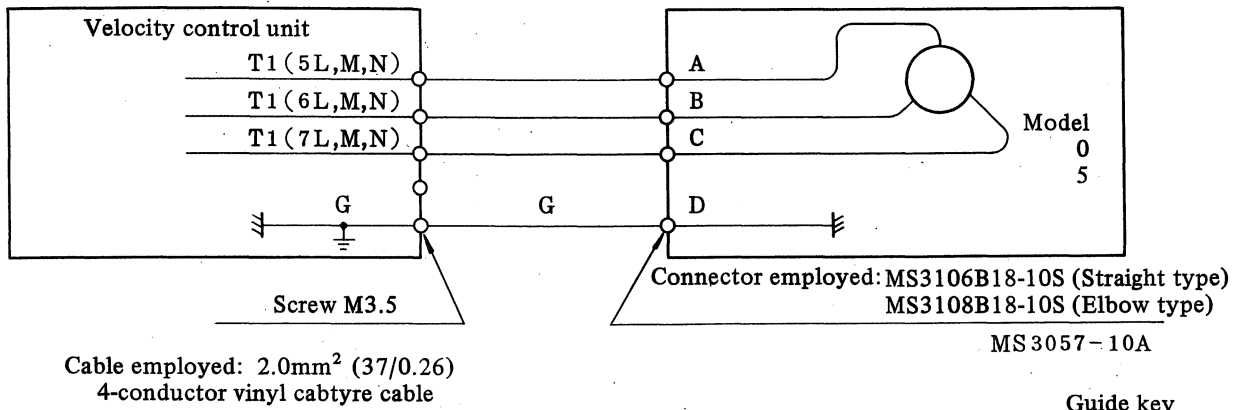


Fig. 2.2.5 (a)

(2) Model 10

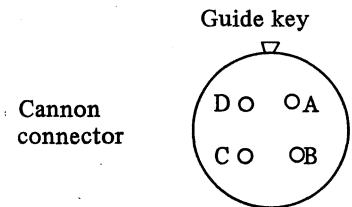
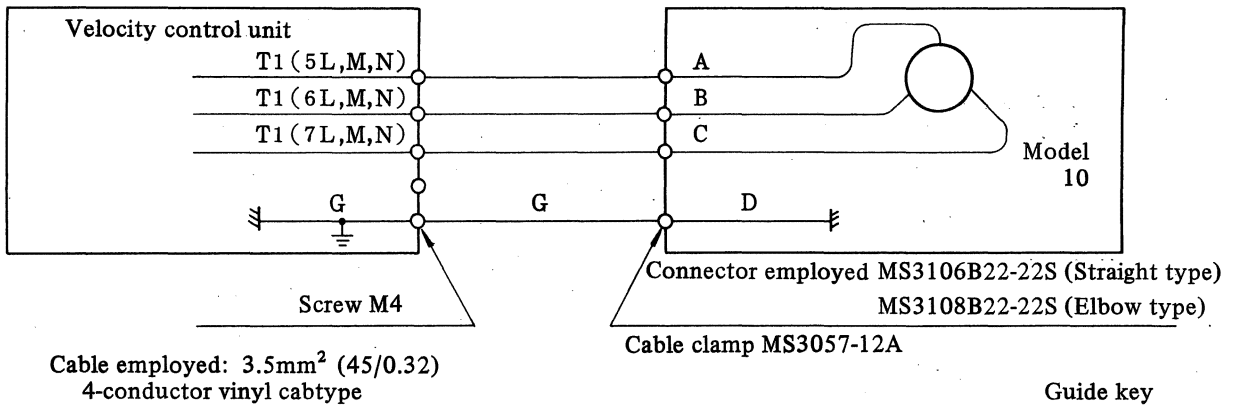


Fig. 2.2.5 (b)

2.2.6 Details of connections of cable K6

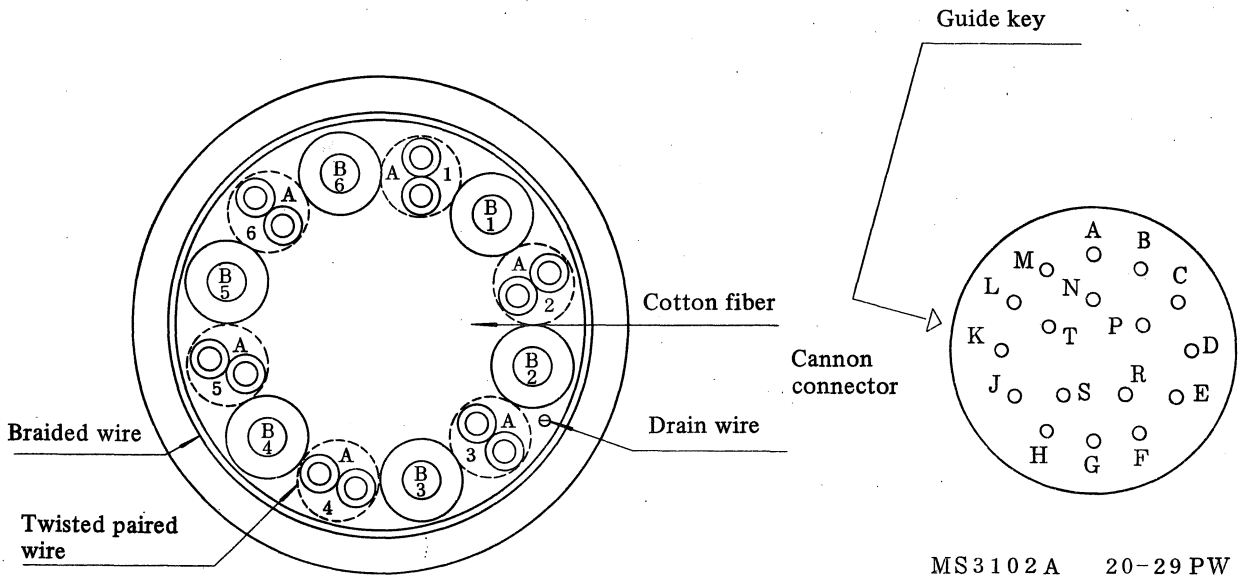
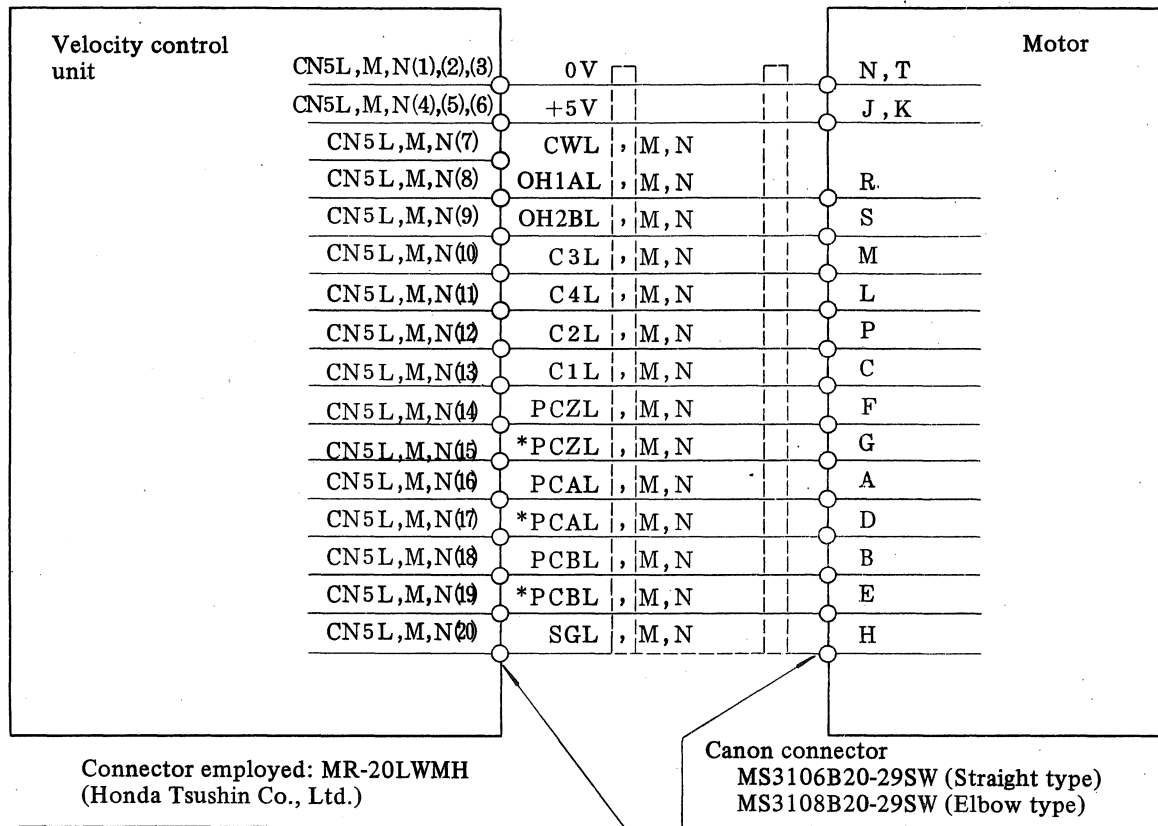


Fig. 2.2.6

2.2.7 Details of connections of cable K7

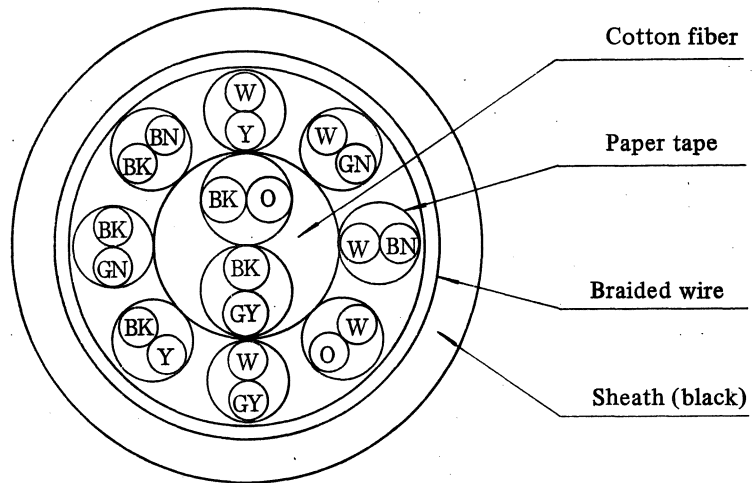
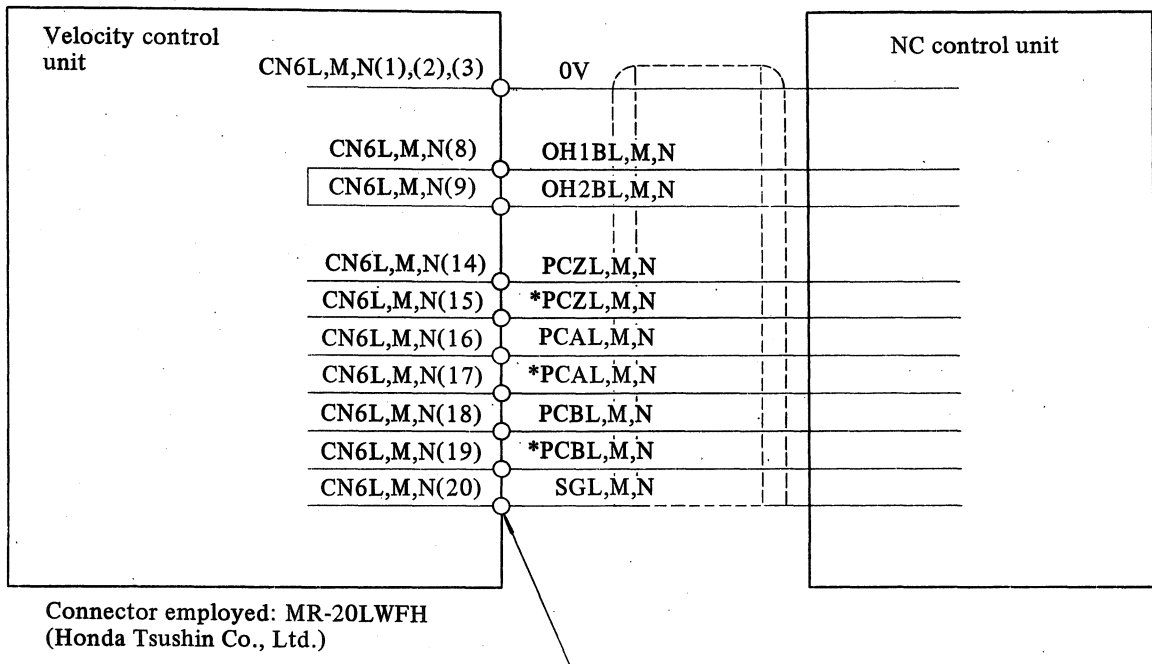


Fig. 2.2.7

2.2.8 Connections of separate discharge unit

(1) In case of A06B-6050-H401 - H403 (option)

(i) Details of connection of regenerative discharge unit

Disconnect the jumper wire from terminals T2 (4) - T2 (5) when the separate regenerative discharge unit is employed.

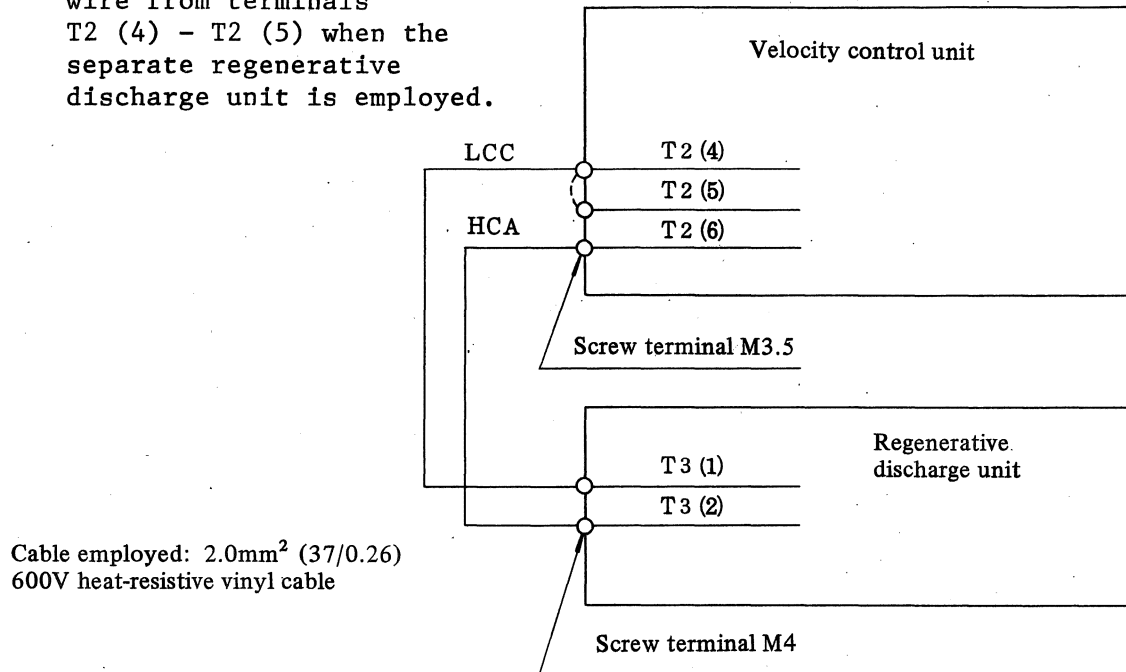


Fig. 2.2.8 (a)

(ii) Details of connection of cable K2

For connections of cable K2 in 9.1.2, change the connection of TOH1 and TOH2 as follows.

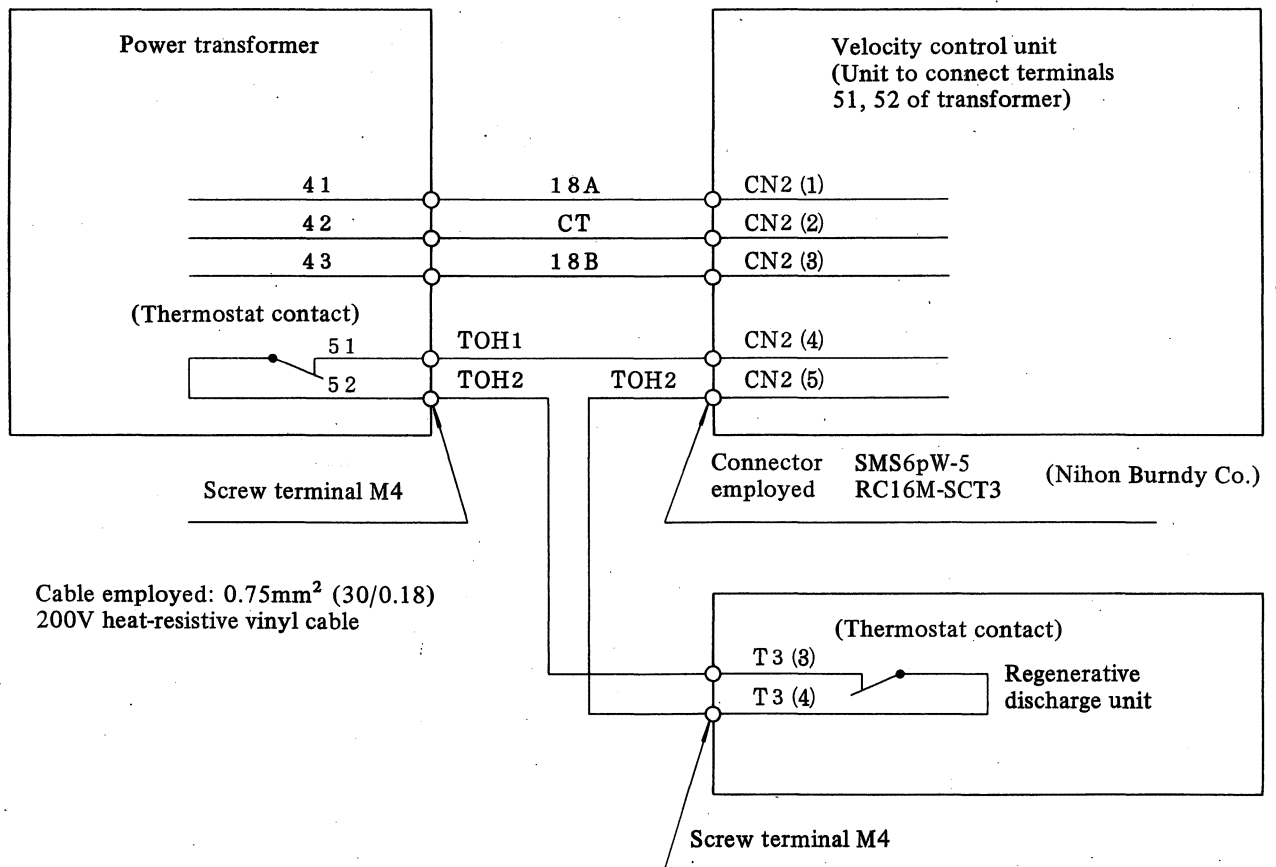


Fig. 2.2.8 (b)

- (2) In case of A06B-6050-H404 (standard)
 (i) Details of connection of regenerative discharge unit

Disconnect the jumper wire from terminals T2 (4) - T2 (5) when the separate regenerative discharge unit is employed.

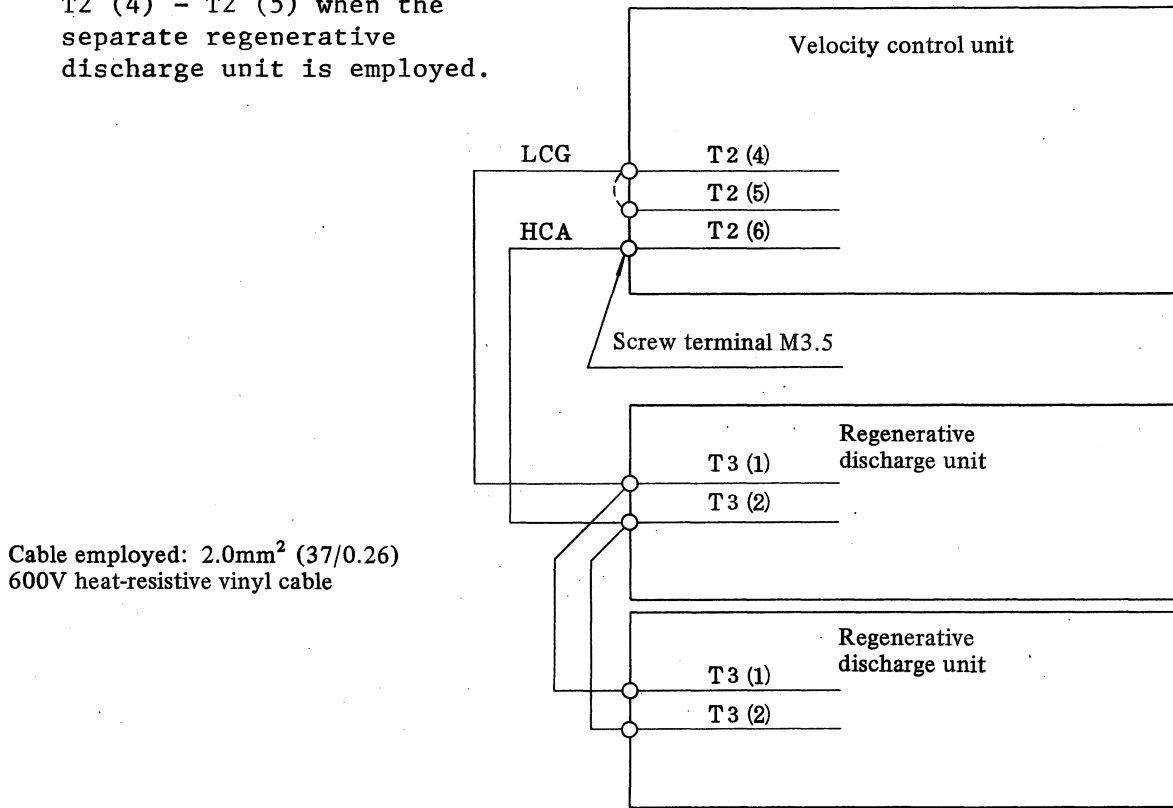


Fig. 2.2.8 (c)

- (ii) Details of connection of cable K2
 For connections of cable K2 in 2.2.2, change the connection of TOH1 and TOH2 as follows.

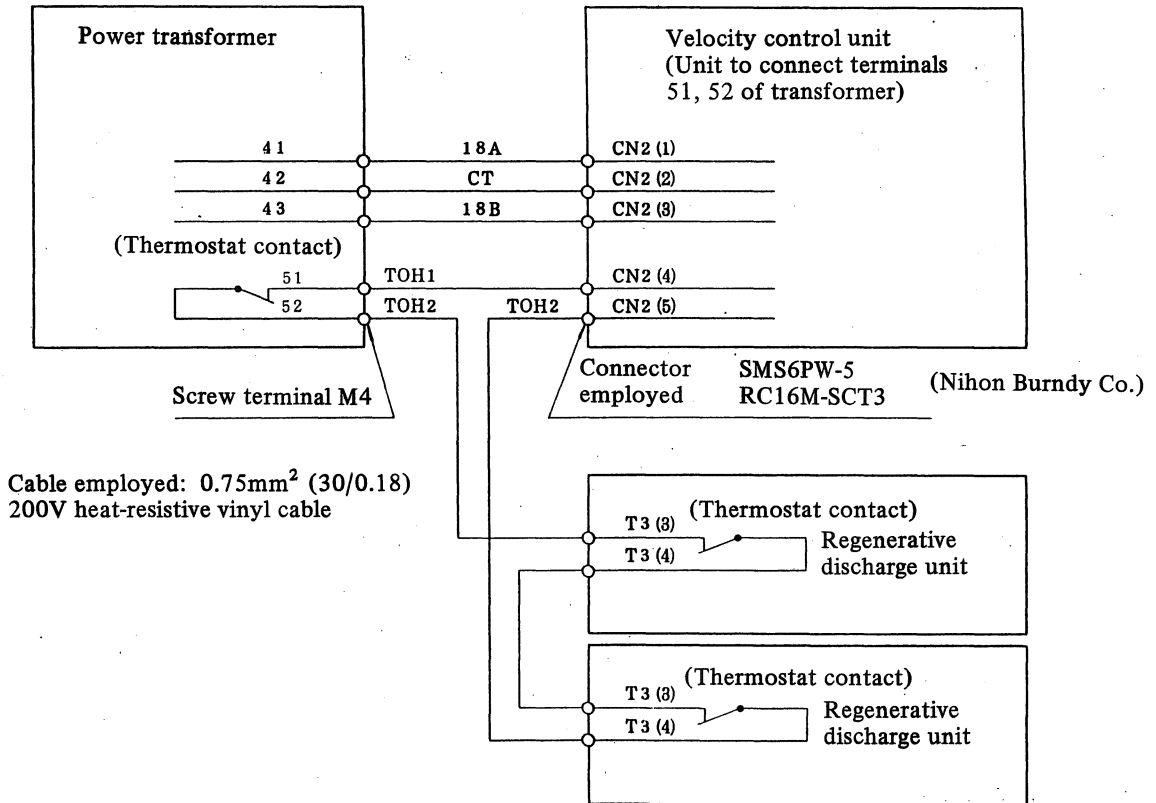


Fig. 2.2.8 (d)

2.3 Connection of Power Transformer

Refer to the same subsections in Chapter I in this manual.

2.4 Connection Diagram of Velocity Control Unit

2.4.1 Model 0/5, Model 0/5 and Model 0/5 (A06B-6050-H401)

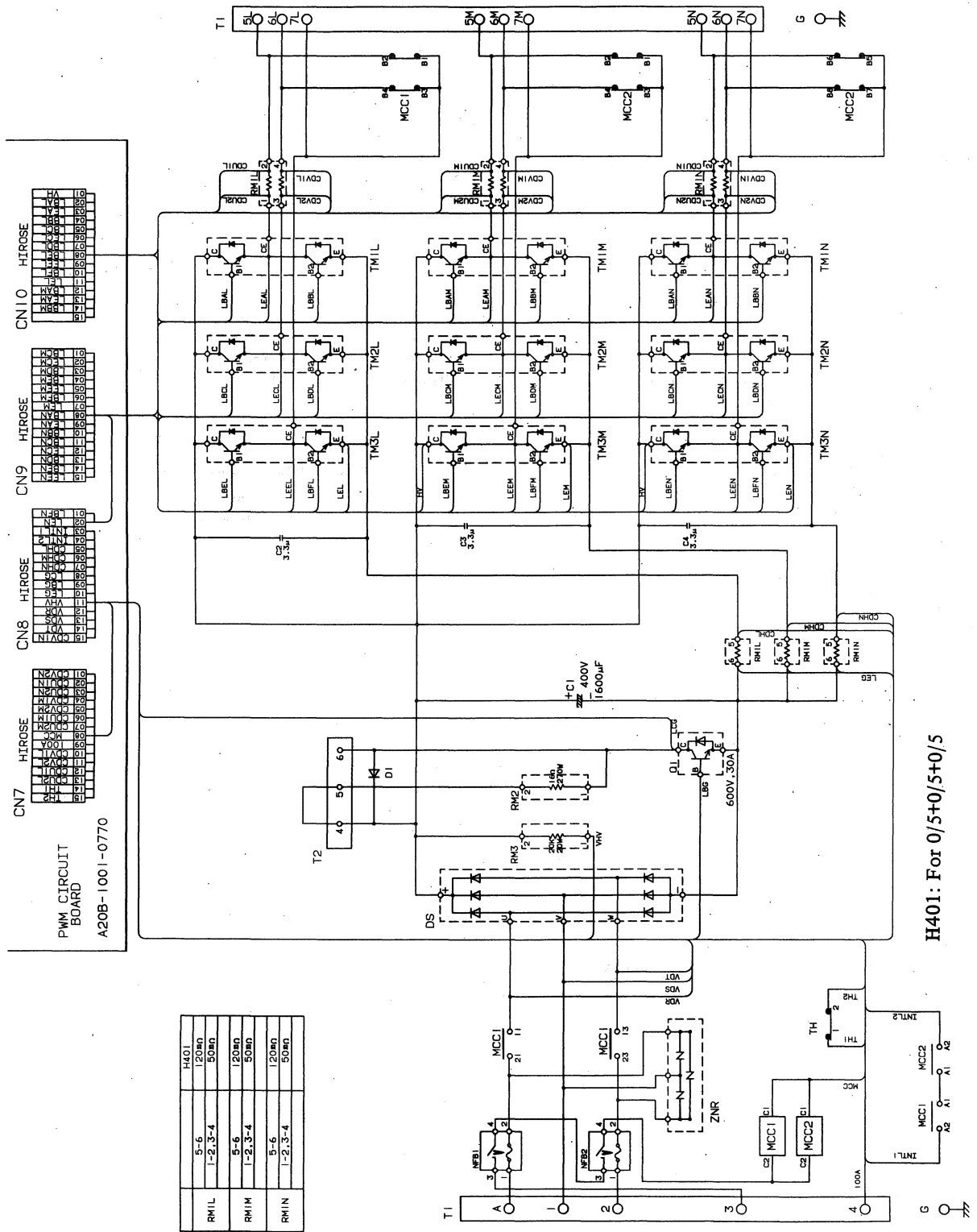


Fig. 2.4.1 Connection Diagram of Velocity Control Unit

2.4.2 Model 0/5, Model 0/5 and Model 10 (A06B-6050-H402)

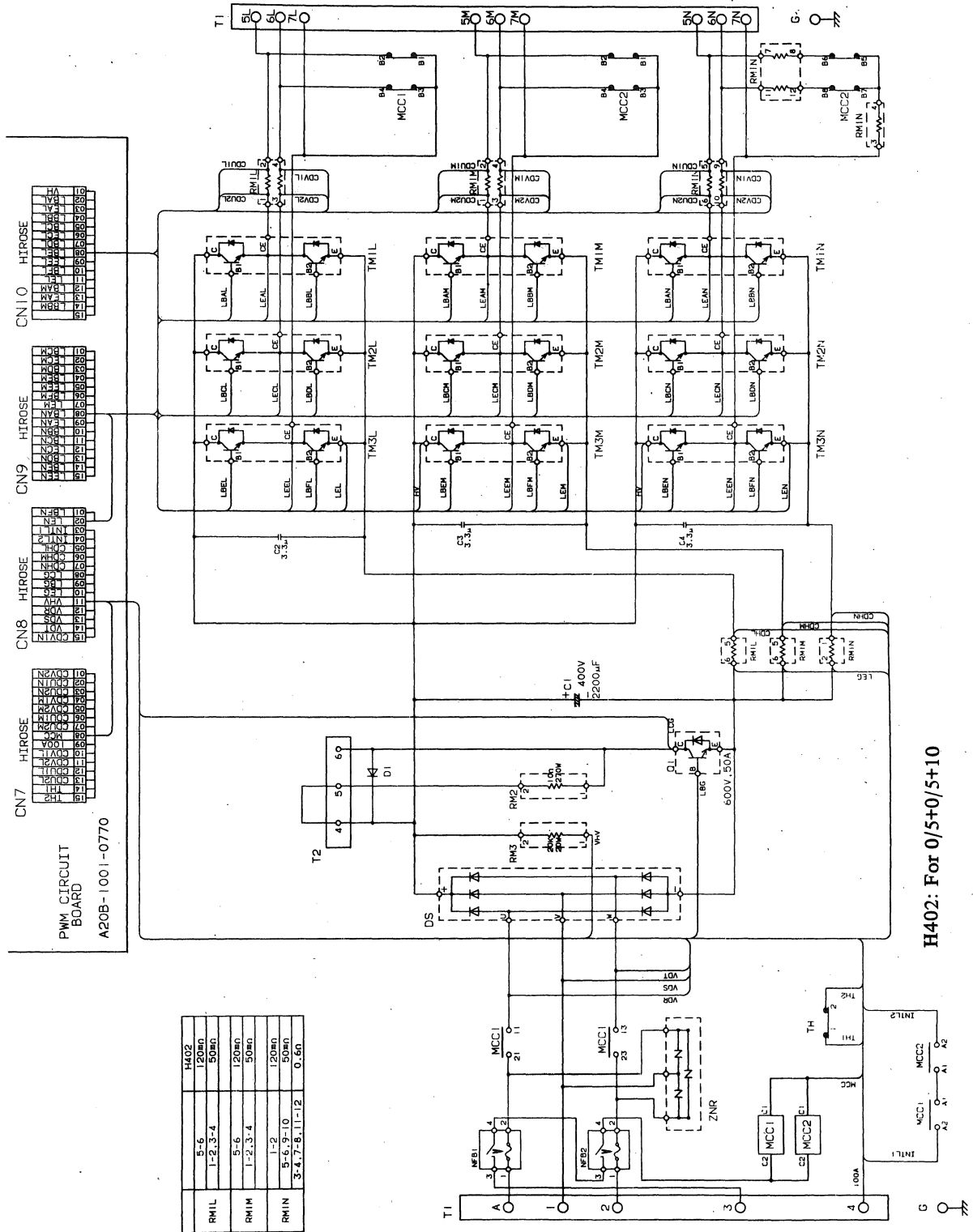


Fig. 2.4.2 Connection Diagram of Velocity Control Unit

2.4.3 Model 0/5, Model 10 and Model 10 (A06B-6050-H403)

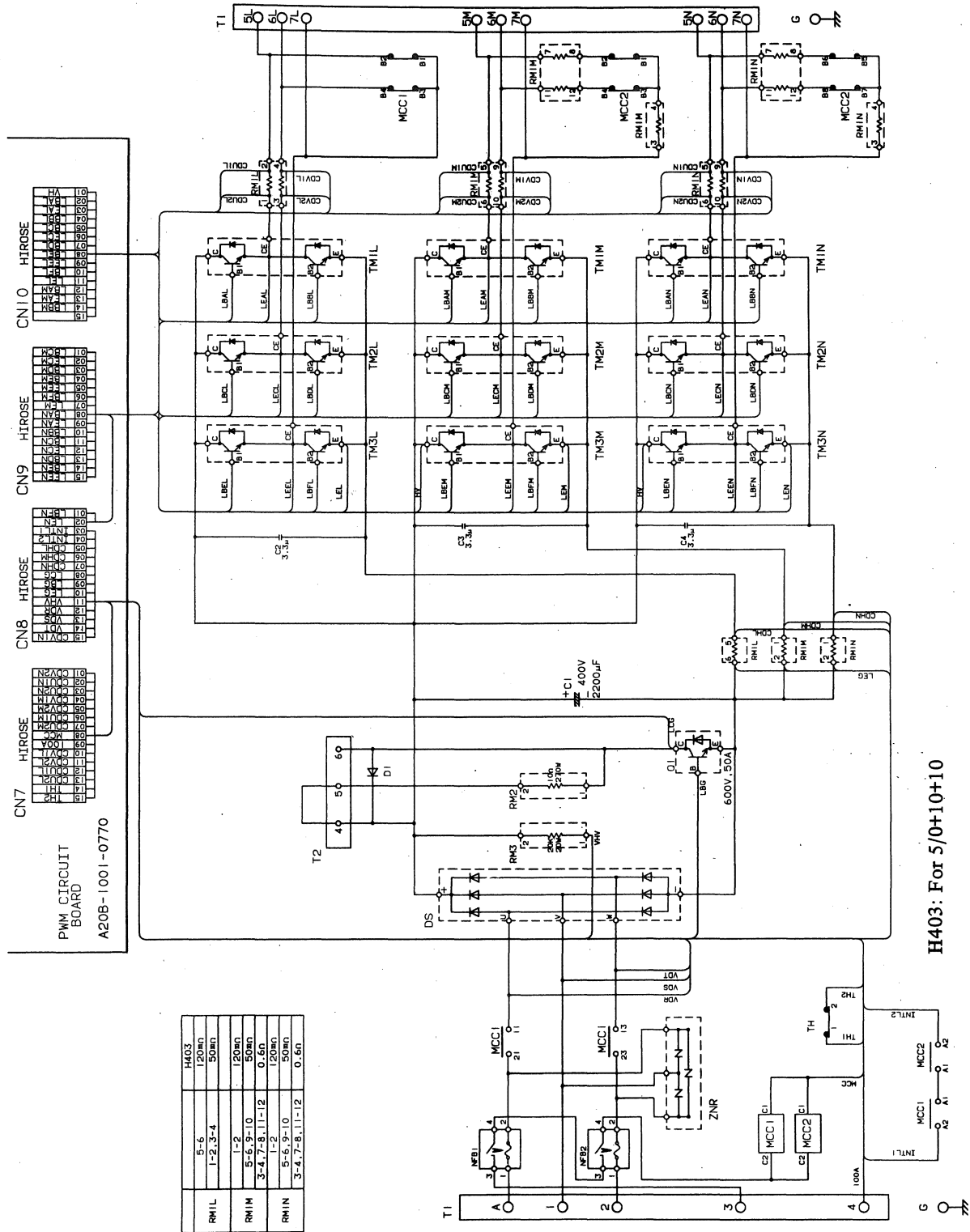


Fig. 2.4.3 Connection Diagram of Velocity Control Unit

2.4.4 Model 10, Model 10 and Model 10 (A06B-6050-H404)

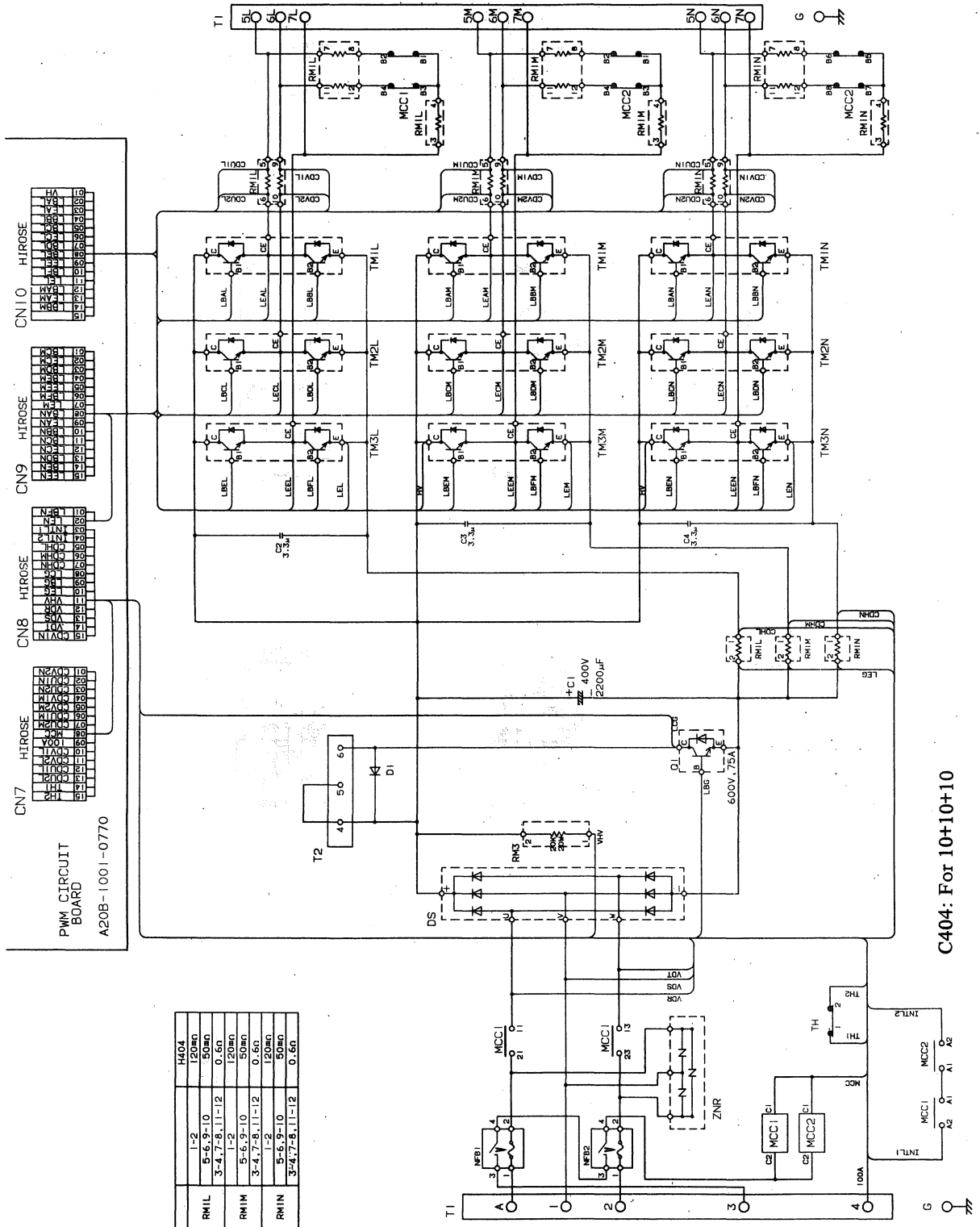


Fig. 2.4.4 Connection Diagram of Velocity Control Unit

CN2	
BURNDY	
1	18A
2	CT
3	18B
4	TOH1
5	TOH2
6	

CN11 (TO NC.VCMD)	
14	PRDY2M
15	ENBL2M
16	OV12M
17	VRDY2M
18	CLMTM
19	COMM
20	EL
MR 20P07 VCMDL	

CN5L (TO PULCO)	
01	OV
02	OV
03	OV
04	+SV
05	+SV
06	+SV
07	CML
MR 20S20 SGL	

CN6L (TO NC.PULCO FEEDBACK)	
14	PCZL
15	*PCZL
16	PCAL
17	*PCAL
18	PCBL
19	*PCBL
20	SGL
MR 20P07 CLMT2L	

CN7	
HIROSE	
01	CDV2N
02	CDUIN
03	CDU2N
04	CDVIM
05	CDV2M
06	CDUIM
07	CDU2M
08	MCC
09	LOA
10	CDV1L
11	CDV2L
12	CDU1L
13	CDU2L
14	TH1
15	TH2

CN9	
HIROSE	
01	LBM
02	LECM
03	LBM
04	LBM
05	LECM
06	LBM
07	LEM
08	LBA
09	LEA
10	LBBN
11	LBCN
12	LECN
13	LBDN
14	LBBN
15	LEEN

CN1M (TO NC.VCMD)	
14	PRDY2M
15	ENBL2M
16	OV12M
17	VRDY2M
18	CLMTM
19	COMM
20	EM
MR 20P07 VCMDL	

CN5M (TO PULCO)	
01	OV
02	OV
03	OV
04	+SV
05	+SV
06	+SV
07	CMM
MR 20S20 SGN	

CN6M (TO NC.PULCO FEEDBACK)	
14	PCZM
15	*PCZM
16	PCAM
17	*PCAM
18	PCBM
19	*PCBM
20	SGM
MR 20P07 CLMT2M	

CN10	
HIROSE	
01	VH
02	LEAL
03	LEAL
04	LBL
05	LBL
06	LECL
07	LBDL
08	LBDL
09	LEEL
10	LBDL
11	LEIL
12	VR
13	LEAM
14	LBDL

CN1N (TO NC.VCMD)	
14	PRDY2N
15	ENBL2N
16	OV12N
17	VRDY2N
18	CLMTN
19	COMN
20	EN
MR 20P07 VCMDN	

CN5N (TO PULCO)	
01	OV
02	OV
03	OV
04	+SV
05	+SV
06	+SV
07	CNN
MR 20S20 SGN	

CN6N (TO NC.PULCO FEEDBACK)	
14	PCZN
15	*PCZN
16	PCAN
17	*PCAN
18	PCBN
19	*PCBN
20	SGN
MR 20P07 CLMT2N	

CN8	
HIROSE	
01	LBN
02	LEN
03	ENL1
04	ENL2
05	CDL
06	CDL
07	CDN
08	LEL
09	LEL
10	VW
11	VW
12	VR
13	VOS
14	VOT
15	CDVIN

3. SETTING AND ADJUSTMENT OF VELOCITY CONTROL UNIT

3.1 Setting and Adjustment of Velocity Control Unit PCB

3.1.1 Parts location

PCB A20B-1001-0770

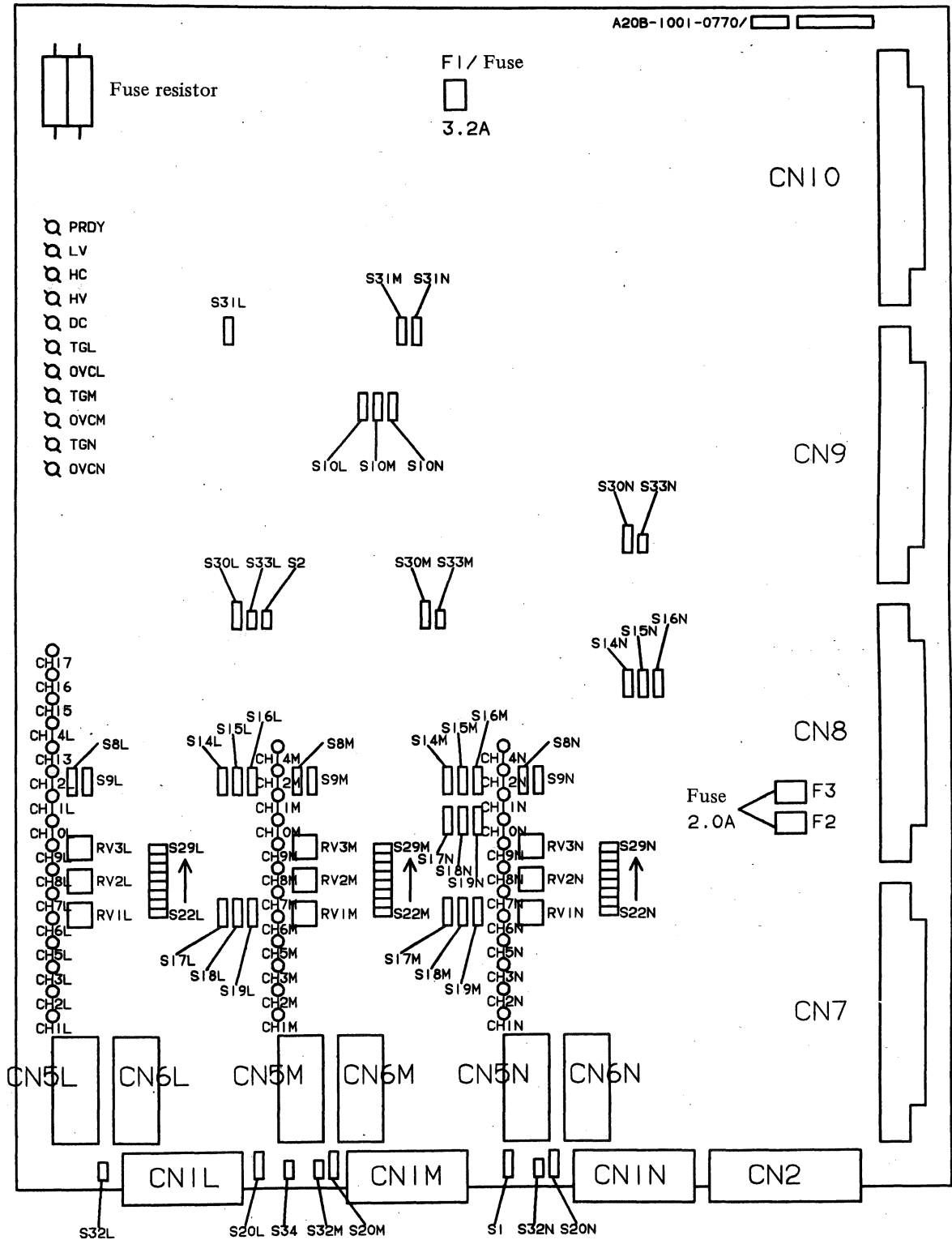


Fig. 3.1.1

3.1.2 Setting terminal

PCB A20B-1001-0770

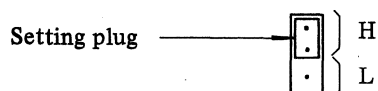
Table 3.1.2

Terminal setting	Standard setting		Remarks
	0/5	10	
S1	L	L	TOH setting (Note 1)
S2	x	x	DC alarm setting (Note 2)
S10L,M,N	H	H	TG alarm enable (Note 3)
S17L,M,N	H	H	Current limit setting
S18L,M,N	L	L	
S19L,M,N	H	H	
S20L,M,N	H	H	Absolute code output enable (Note 4)
S22L,M,N	o	x	Compensation circuit setting
S23L,M,N	o	x	VCMD gain setting (Note 5)
S24L,M,N	o	o	F/V circuit filter setting
S25L,M,N	x	x	Compensation circuit
S26L,M,N	x	x	
S27L,M,N	x	x	
S28L,M,N	x	x	
S29L,M,N	x	x	F/V input pulse width setting (Note 6)
S30L,M,N	L	L	Current loop gain setting
S31L,M,N	H	H	TG alarm enable
S32L,M,N	o	o	Setting for absolute pulse coder (Note 7)
S33L,M,N	x	x	OVC alarm level setting

Terminal setting	Pulse coder			Remarks
	2000P	2500P	3000P	
S8L,M,N	L	L	H	Pulse coder F/V gain setting
S9L,M,N	H	L	L	
S14L,M,N	L	H	H	Pulse coder pole number and pulse number setting
S15L,M,N	H	L	L	
S16L,M,N	H	L	H	

Terminal setting	NC system		Remarks
	FS0,FS1,FS2,FS3,FS6,FS9	FS10,FS11,FS12	
S34	x	o	VRDY signal setting

- Note 1. If the power transformer is connected to terminals CN2(4) and (5), set S1 at L side.
- Note 2. If the regenerative discharge unit is mounted, set S2 in the short-circuit state. If it is not mounted, set S2 in the open state.
- Note 3. If check is required without connection of the motor power cable, set S10 at L side.
- Note 4. If S20 is set at L side, absolute codes from the pulse coder is output to NC while VRDY is on. If VRDY is turned OFF, the alarm code is output. If S20 is set at H, the alarm code is always output.
- Note 5. If S23 is short-circuited, 7V/2000 rpm is set, and if it is open, 7V/1000 rpm is set.
- Note 6. If S29 is short-circuited, the velocity feedback voltage is changed from 3V/1000 rpm to 1.5V/1000 rpm. Normally, set it in the open state.
- Note 7. If ABS pulse coder is used, set S32 in the open state.
- Note 8. Setting operations are shown in the Fig. below.



(a) Set at H side



(b) Set at L side

3.1.3 Variable resistor

Table 3.1.3

Volume	Standard setting	Remarks
RV1L,RV1M,RV1N	50%	Gain setting
RV2L,RV2M,RV2N	-	Adjustment of offset voltage
RV3L,RV3M,RV3N	-	Adjustment of velocity feedback voltage

- Note 1. RV2L,M,N and RV3L,M,N are adjusted before shipping from the factory.

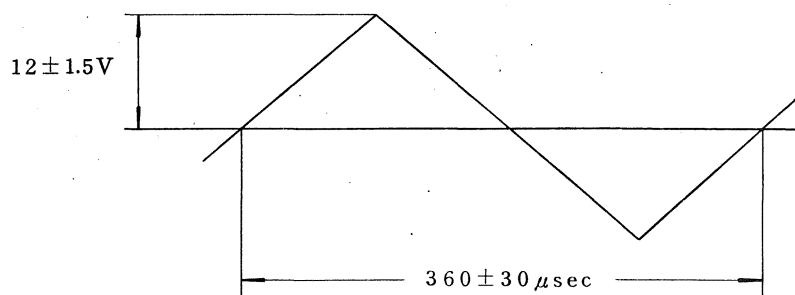
3.1.4 Check terminals

Table 3.1.4

Check terminal	Symbol	Contents	
CH1L,M,N	VCMD	a x velocity command voltage	(Note 1)
CH2L,M,N	TSA	0.8 x velocity feedback voltage	
CH3L,M,N	0V	0V	
CH5L,M,N		Compensation circuit	
CH6L,M,N			
CH7L,M,N	R	R-phase current command	
CH8L,M,N	S	S-phase current command	
CH9L,M,N	T	T-phase current command	
CH10L,M,N	IR	R-phase current feedback	5.45A/V (Motor 0,5,10)
CH11L,M,N	IS	S-phase current feedback	
CH12L,M,N	IT	T-phase current feedback	
CH13	TRW	Triangle wave	(Note 2)
CH14L,M,N	ER	Error voltage (Torquecommand)	
CH15	+5V	+5V	
CH16	+15V	+15V	
CH17	-15V	-15V	

Note 1. a = 0.344 when VCMD is 7V/1000 rpm
a = 0.687 when VCMD is 7V/2000 rpm

Note 2. Wave form of triangle wave is as follows.



Note 3. Motor load currents (peak values) can be monitored using the same conversion as CH10-12. The effective values can be obtained by multiplying $1/\sqrt{2}$.

3.2 Block Diagram of Velocity Control Unit

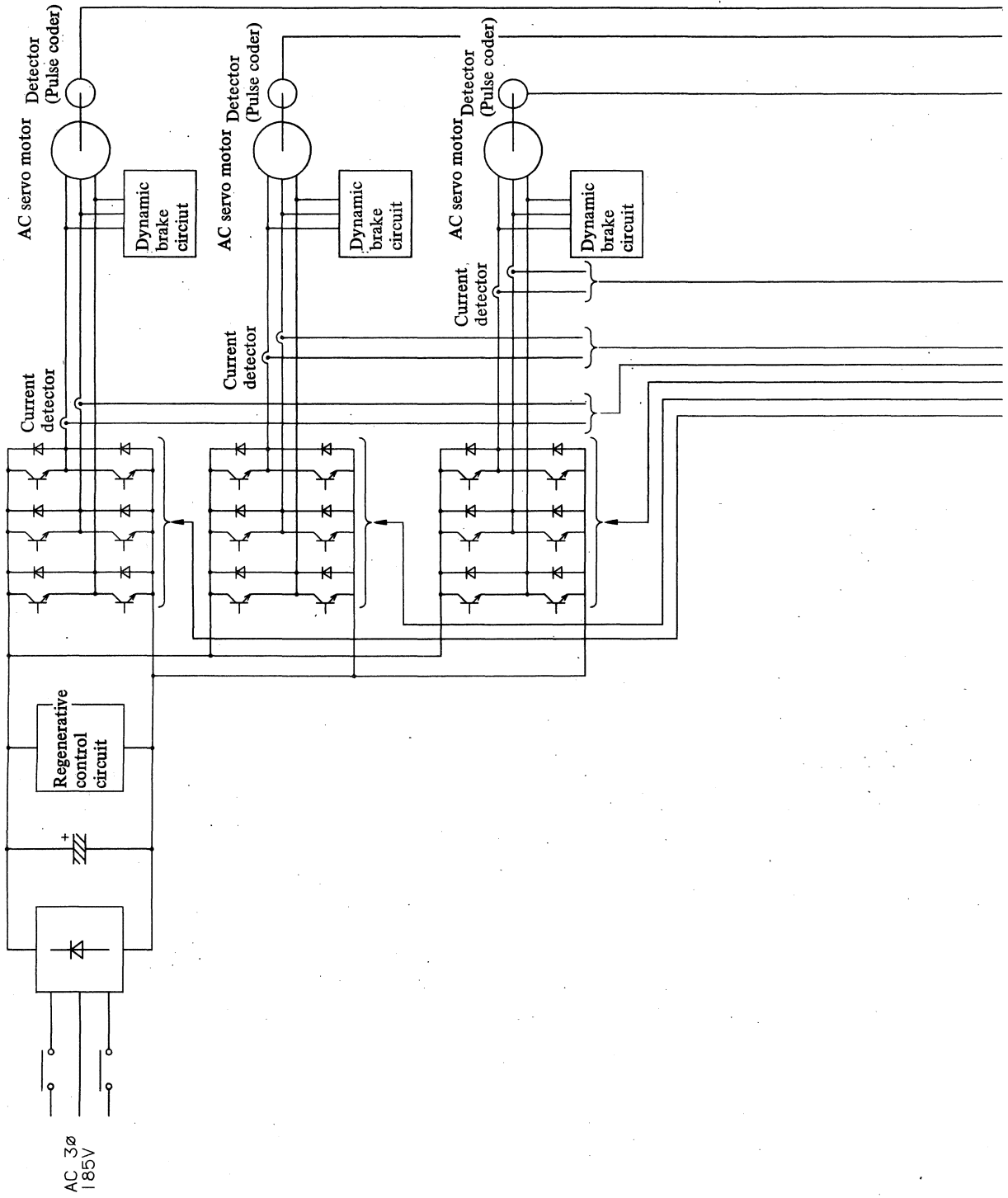
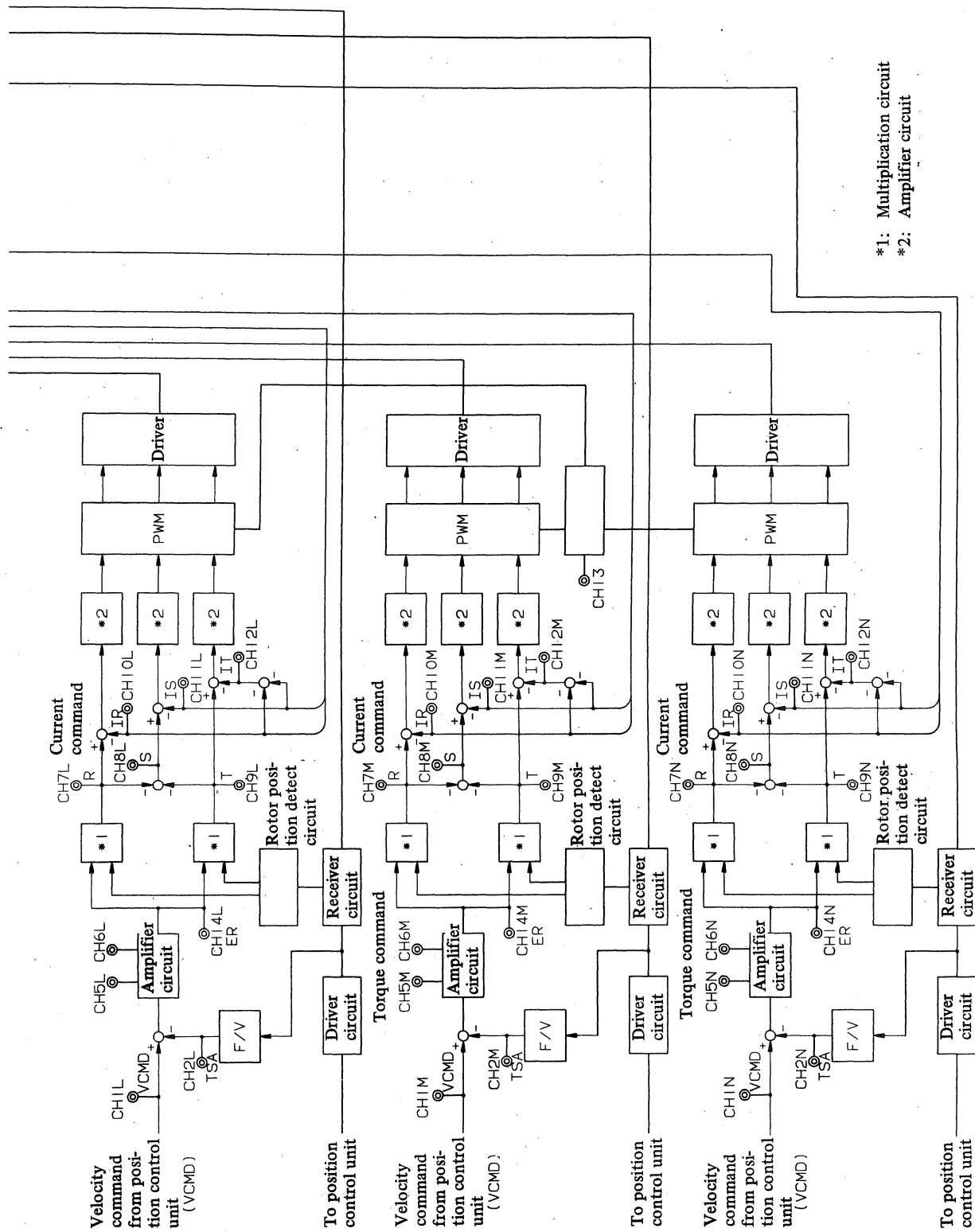


Fig. 3.2



4. TROUBLESHOOTING

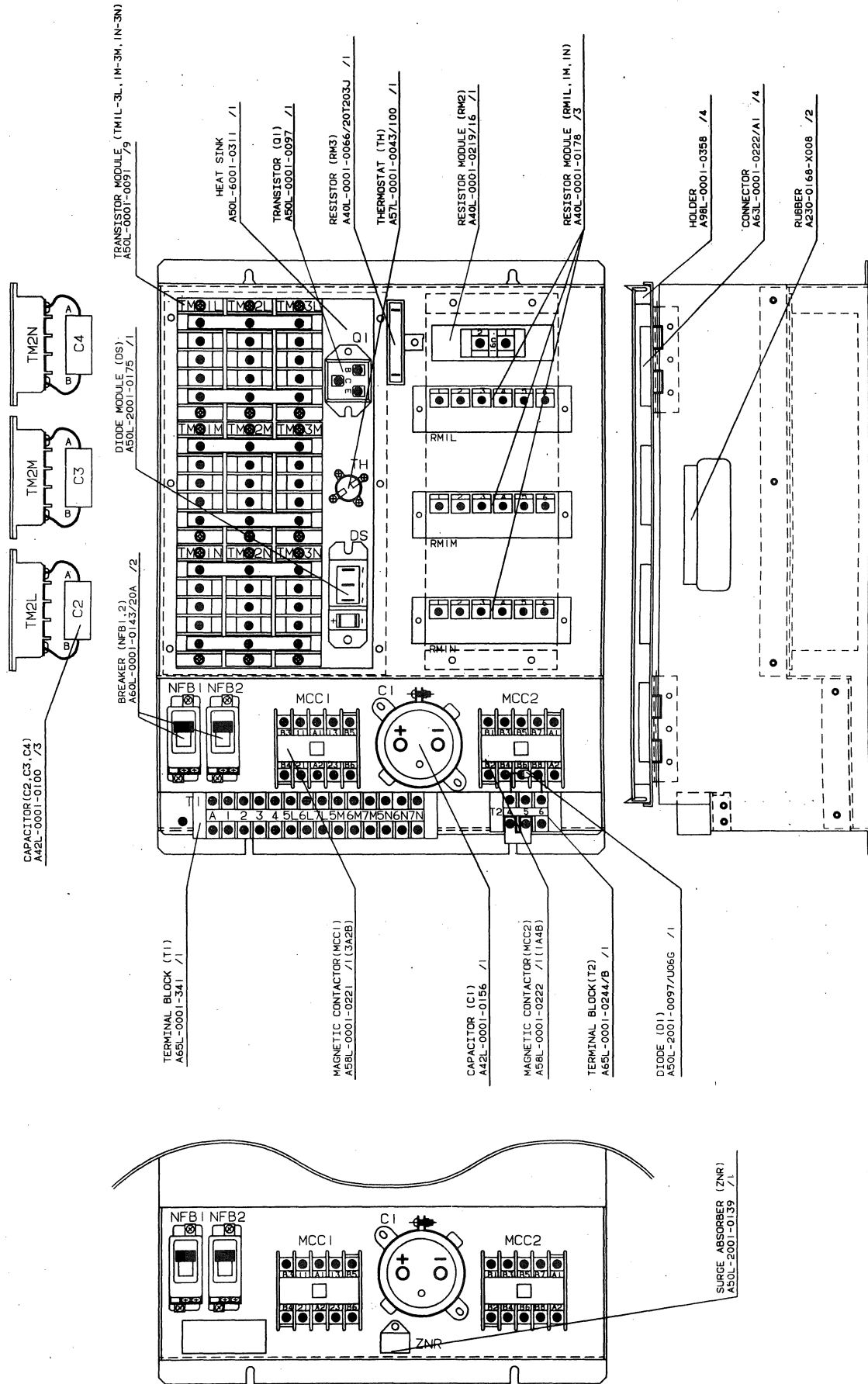
4.1 Protection and Fault Detecting Function

4.2 Troubleshooting

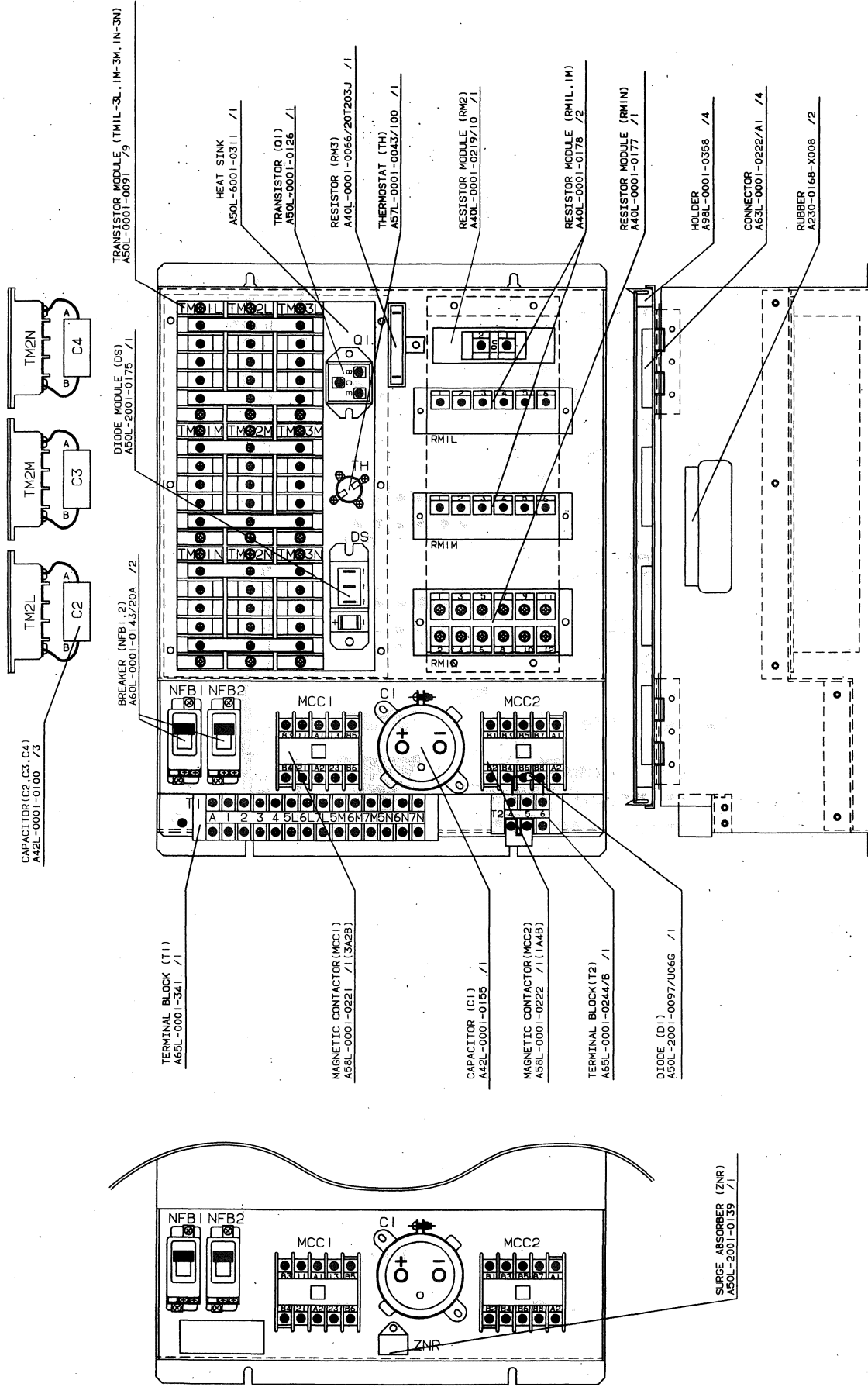
For subsection 4 - 4.2 refer to the same subsection in Chapter I in this manual.

5. PARTS SPECIFICATION AND LOCATIONS ON VELOCITY UNIT

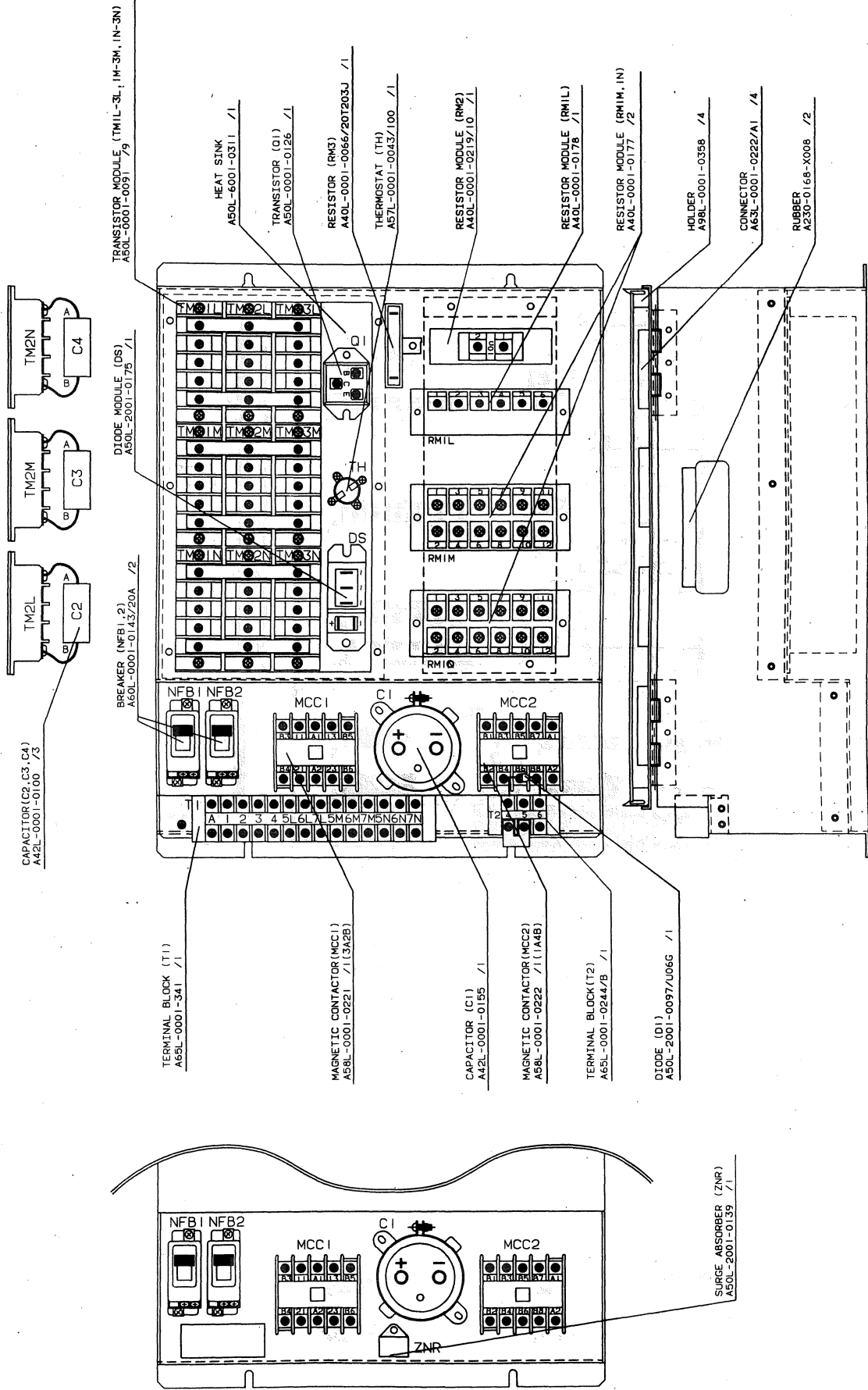
5.1 Model 0/5, Model 0/5 and Model 0/5 (A06B-6050-H401)



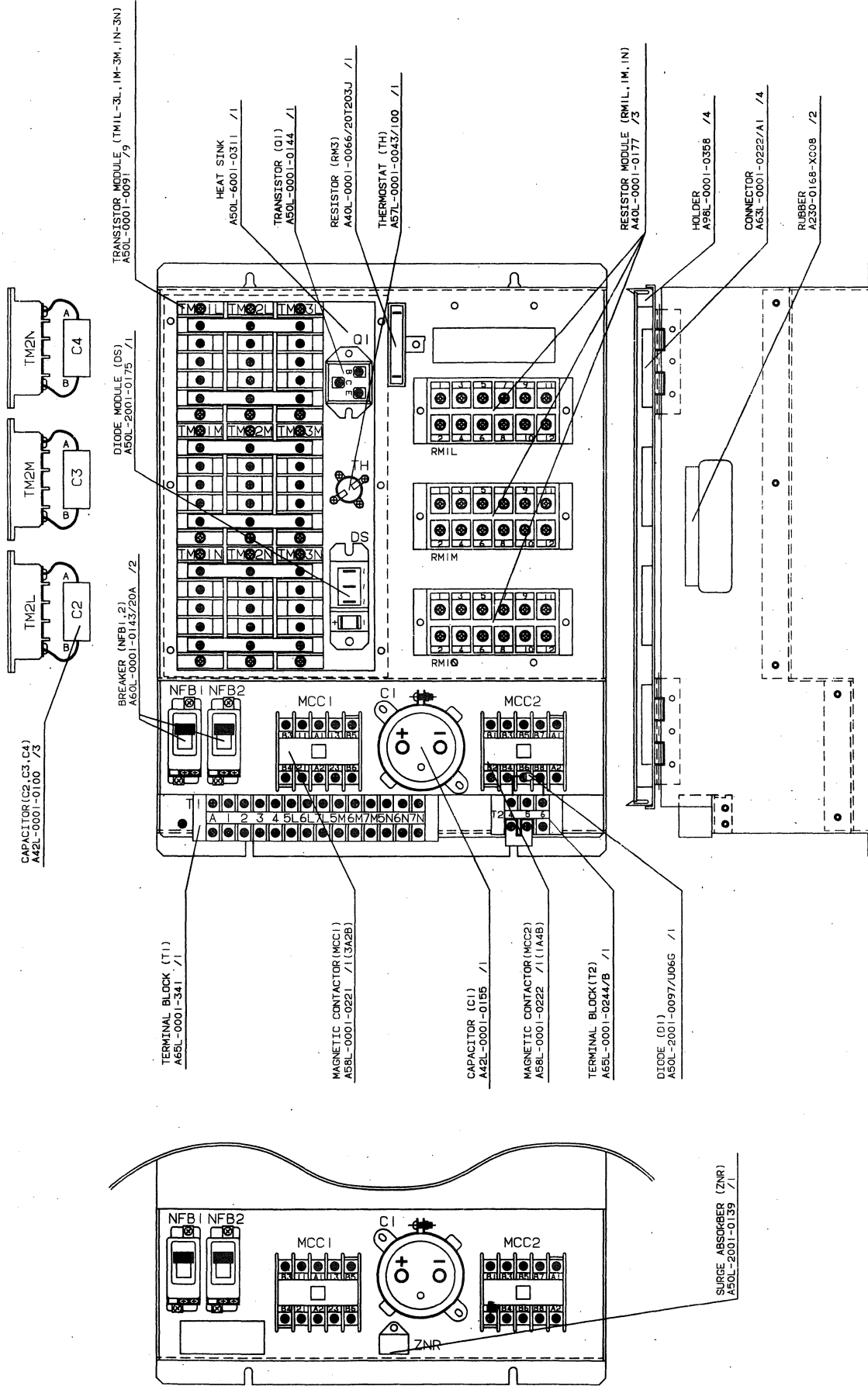
5.2 Model 0/5, Model 0/5 and Model 10 (A06B-6050-H402)



5.3 Model 0/5, Model 10 and Model 10 (A06B-6050-H403)



5.4 Model 10, Model 10 and Model 10 (A06B-6050-H404)





APPENDIX

APPENDIX 1

1. REVERSE CONNECTION

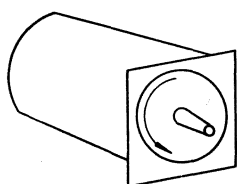
1.1 Connection and Rotational Direction

For AC servo unit there are connection cables of power supply, feedback signals and motor power.

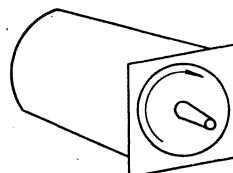
There are standard connection and reverse connection for the feedback signal cable and motor power cable according to the rotational direction which follows the feed command from the control unit.

The rotational direction corresponding to the (+) feed command

Standard connection
(+) Command



Reverse connection
(+) Command



To make reverse connection, next procedure should be taken.

1.2 Method

(1) For Model 2-0 - 30R

Change the connection of connector mounted on velocity control unit side of feedback signal cable K6 (between motor and CN5).

- | |
|---|
| <ul style="list-style-type: none">① Signals PCA and PCB should be replaced each other in cable K6.② Signals *PCA and *PCB should be replaced each other in cable K6.③ Signals CW and OV (terminal 1 or 2 or 3) should be connected. |
|---|

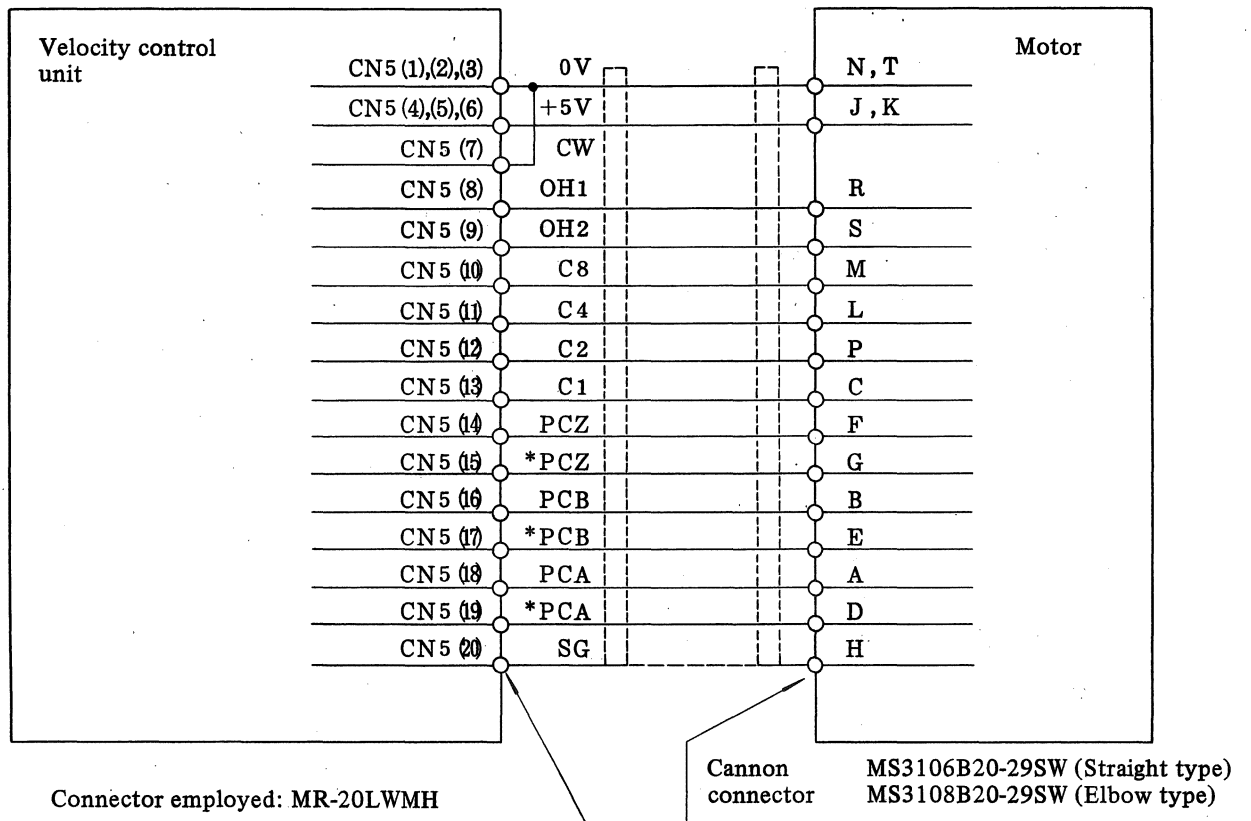
Note 1. Connection of motor power line is not changed.

Note 2. This method can apply to velocity edition C or after of velocity control unit PCB (A20B-1000-0560).

The method in item (2) apply to the edition A and B of PCB.

Note 3. This method can apply to AC SERVO UNIT for 2 axes control and AC SERVO UNIT for 3 axes control. Reconstruct cable K6 for axis to be reverse connection according to above changing.

Detail of connection of cable K6 in reverse connection.



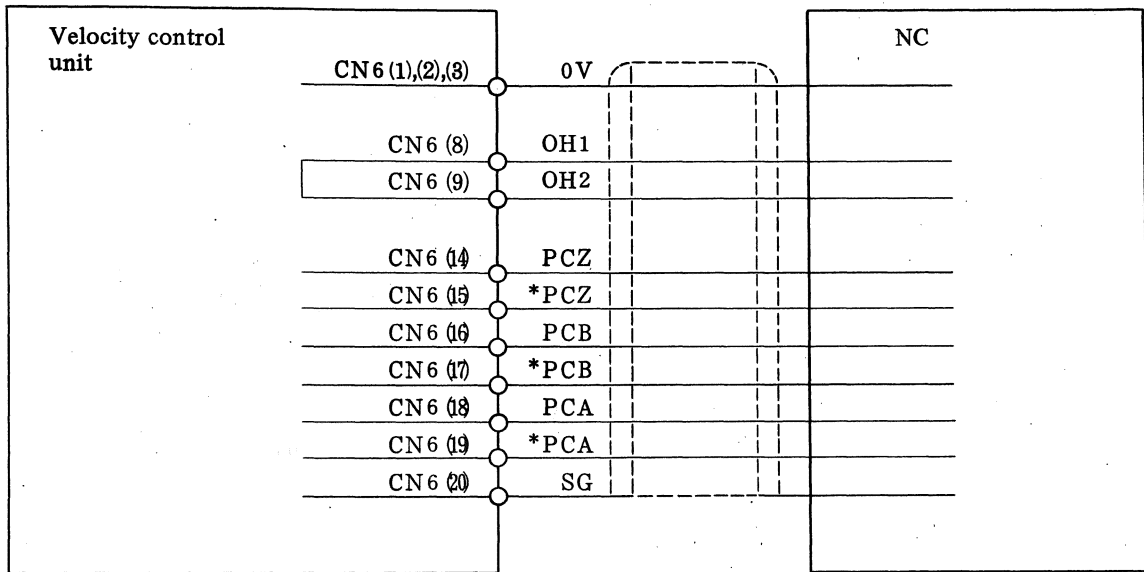
(2) For Model 4-0, 3-0

Change the connection of connector mounted on velocity control unit side of cable K1 and K7 between NC and velocity control unit.

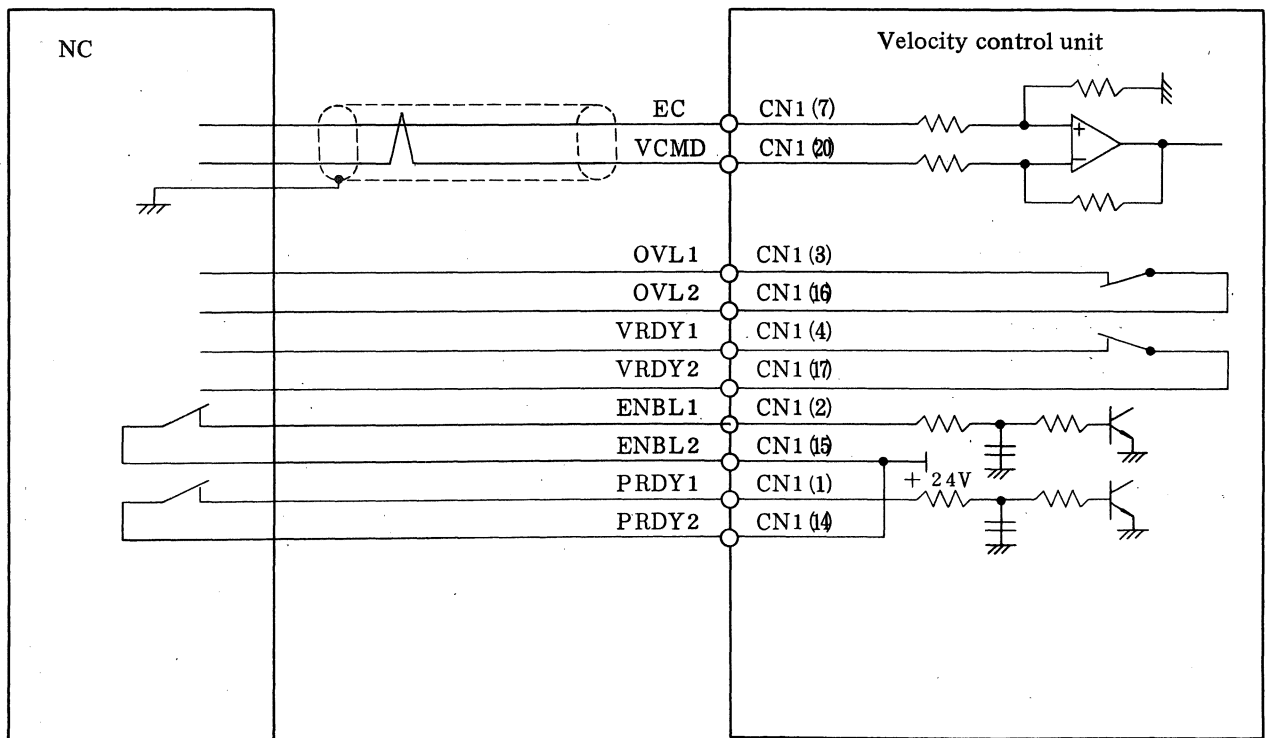
- ① Signal PCA and PCB should be replaced each other in cable K7.
- ② Signal *PCA and *PCB should be replaced each other in cable K7.
- ③ Signal VCMD and EC should be replaced each other in cable K1.

Note 1. Connection of motor power line is not changed.

Detail of connection of cable K7 in reverse connection.



Detail of connection of cable K7 in reverse connection.



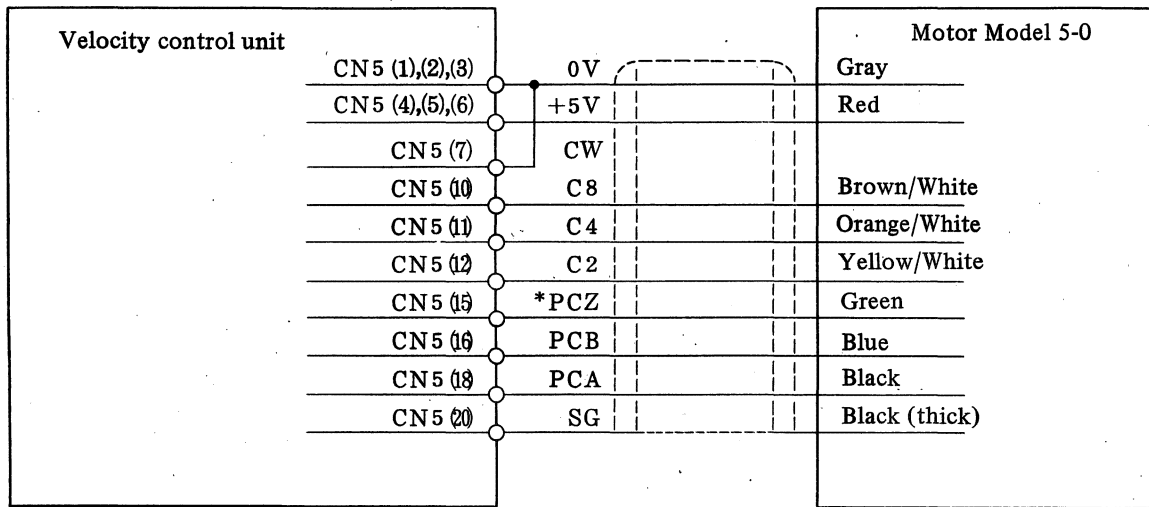
(3) For Model 5-0

Change the connection of connector mounted on velocity control unit side of feedback signal cable K6 (between motor and CN5).

- ① Signal PCA and PCB should be replaced each other in cable K6.
- ② Signal CW and OV (terminal 1 or 2 or 3) should be connected.

Note 1: Connection of motor power line is not changed.

Detail of connection of cable K6 in reverse connection.



APPENDIX 2

1. AC SERVO MOTOR MAINTENANCE

1.1 Outline

As a rule, AC servo motor is free from periodic maintenance because wearing parts are not included. But AC servo motor contains precise detector, so false operation or damage in transit might cause failure or trouble. It is recommended to check the motor referring to this manual at every chance.

1.2 Acceptance and Storage

Immediately upon receipt of servo motor, check the following items.

- o Whether servo motor is exactly the specified one (check the type, detector type).
- o Whether there is any mechanical damage sustained in transit or not.
- o Whether the rotating part can be normally turned by hand.
- o In the case of the motor with brake, whether the brake is normal.
- o Whether there is any loosened screw or play.

Every servo motor undergoes strict inspection before shipment, therefore any special receipt inspection may not be required as a rule. If the receipt inspection is particularly needed, however, it is advisable to refer to the specifications regarding the wiring of servo motor and detector, current, and voltage so as to make the inspection without any mistake. Don't leave the received servo motor outdoors, but preserve it indoors. Avoid storing it in the place with an extremely high or low humidity, a radical change of temperature, and dust.

1.3 Mounting

Note the following points when mounting the servo motor.

- (1) The water-proof structure of servo motor is not so strict. If cutting oil, lubricating oil, etc. penetrate into the inside of the motor, these may cause poor insulation, short-circuit of the coil. Therefore, due care should be taken so that the motor body will be kept away from such liquids as cutting oil and so on.
- (2) When mounting the servo motor on the gear box where liquid lubrication is performed, if the lip of the oil seal is always exposed to oil, there is a possibility that the oil may penetrate little by little into the inside of the motor in the course of a long time. Therefore the height of the oil level must be lower than the oil seal lip. When the servo motor is mounted with the output shaft upward, mount another oil seal at machine side so as to make the structure where the oil which passed through the first oil seal can directly flow outside.

The oil seal used for the respective servo motors are listed in the following.

Motor model	Oil seal specification
1-0, 2-0	AB0598E0 (SB type)
0, 5	AB1314F0 (")
10, 20M, 20, 30, 30R	AB2057G0 (")

The oil seals used for the servo motors are the products of JAPAN OIL SEAL INDUSTRY Co., Ltd.

- (3) The servo motor is coupled with the load through the direct coupling, gears, timing belt or such. In any case the force exerted on the motor shaft must not exceed the values shown in the following table, therefore due care should be taken for the operating condition, mounting method, and mounting accuracy.

Motor model	Permissible radial load
1-0, 2-0	25 kg
0, 5	75 kg
10, 20M, 20, 30, 30R	450 kg

- o The values of permissible radial loads are the ones when the load is imposed on the end of the shaft.

The values in this table indicate the maximum permissible loads which are the sum of the constant force always exerted on the shaft owing to the mounting method (e.g., the force given by the tension of the belt when the belt coupling is used) and the force generated by the load torque (e.g., the force transmitted from the gear face).

- o As a rule, axial load to the shaft should be avoided. Servo motor contains precise detectors, so excess axial shock may give damage to detectors.

- (4) Make the wiring between the servo motor and the control circuit without any mistake, just as specified in the specifications. (See the connection diagram of the machine.) A mistake made in the wiring may cause runaway or abnormal oscillation and may give damage to the motor or the machine. When the wiring is completed, measure the insulation between the power line and the motor frame before turning on the power. The measurement should be made with a 500V megger. Further, check the insulation between the signal lines and the motor frame with a multi-tester. Be sure not to use a megger especially for measuring the insulation of the signal lines for the pulse coder.

1.4 Replacement of Pulse Coder

(1) Abstract

This section is described about the way of replacing pulse coders assuming the case of urgent field troubles due to pulse coders defect, and the way of checking the phase-relationship between AC servo motor and pulse coder. So, if possible, please re-check the phase-relationship.

(2) The way of replacing pulse coder

The method written here is applicable to AC servo motor model 0, 5, 10, 20M, 20, 30 and 30R. It is impossible to remove pulse coder from other motor models (2-0, 1-0, 3-0, 4-0), because pulse coder itself is directly assembled on to the motor shaft for those type.

a. Remove defective pulse coder. (see Fig. 1)

- ① remove rubber cap.
- ② unfasten bolt 1.
- ③ unfasten bolt 2.
- ④ remove pulse coder (+attachments) from the motor shaft.

b. Mount new (good) pulse coder.

- ① mount pulse coder (+attachments) on the motor shaft. Notice that both a tooth (of coupling) and a groove (of pulse coder) are just fitted together. Care should be taken, for fitting length is short.
- ② connect both shaft by bolt 1.
- ③ adjust marking-off line between attachments of pulse coder and motor housing.
- ④ fasten bolt 2.

(3) The way of checking the phase-relationship

The method written here is applicable to all models of FANUC AC servo motors.

- ① connect V & W of motor power line. (see Fig. 2)
- ② excite motor at rated DC current from U to V & W. (U: +, V & W: -)
- ③ supply DC 5V to the pulse coder, and check signals of C1 - C8. Correct pattern is as follows.

	C1	C2	C4	C8	
	1	1	1	1	
or	1	1	1	0	(1: HI, 0: LOW)

* change position of C8 is accurate.

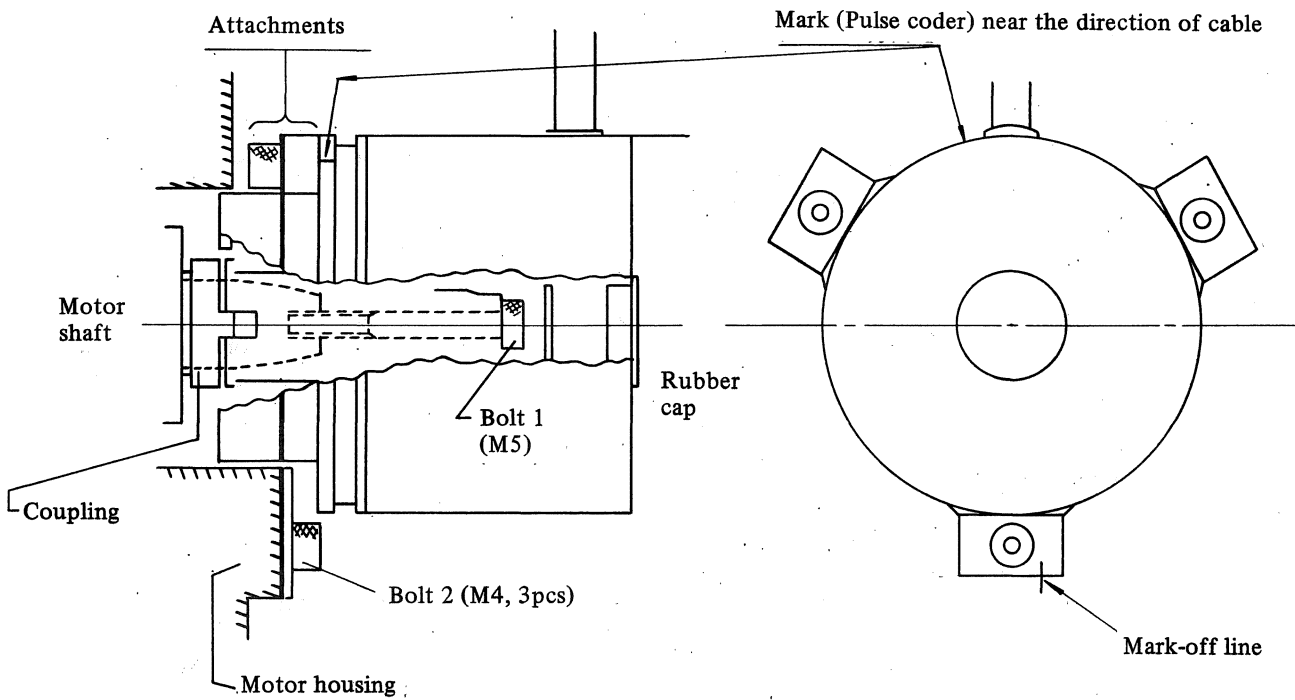


Fig. 1

* RATED DC CURRENT AT THE CHECK OF PHASE-RELATIONSHIP IS AS FOLLOWS.

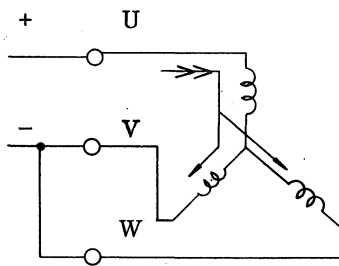


Fig. 2

MOTOR MODEL	3-0, 4-0	1.2A
	1-0, 2-0	4A
	0, 5	9A
	10	15A
	20, 30	30A
	30R	40A

2. COMPENSATING CIRCUIT SETTING FOR AC SERVO UNIT

1) AC servo unit (for one axes) 2 - 0 to 30R

Setting pin	Standard setting					Description
		0 5	10	20 30	30 R	
S21	×	×	×	×	×	High-frequency gain
S22	×	×	×	×	×	High-frequency gain
S23	o	o	×	×	×	VCMD gain setting (7V/1000 rpm, 7V/2000 rpm)
S24	o	o	o	o	o	F/V circuit filter setting
S25	o	o	o	o	o	High-frequency gain
S26	×	×	×	×	×	Low-band gain
S27	×	×	×	×	×	High-frequency gain
S28	×	×	×	×	×	Low-band gain

Short-circuit is marked with a circle.

Expanation S21: Should it be short-circuited, the high-band gain decreases. Effective when oscillation is generated in the high band (200 to 400 Hz)
 S22: Be sure it is in the open state.
 S23: 7V/1000 rpm is set in the open state.
 7V/2000 rpm is set in the short-circuit.
 S24: Be sure it is short-circuited.
 S25: Should it be open, high-band gain increases.
 S26: Should it be short-circuited, the low-band gain decreases. Effective in a full-close circuit, or when inertia is large.
 S27: Should it be open, the high-band gain increases.
 S28: Should it be short-circuited, the low-band gain decreases. Effective when inertia is large.

* Whenever the setting of a compensating circuit is changed according to this table, please make contact with our service office.

2) AC servo unit (for two axes)

Setting pin	Standard setting		Description
	1-0 2-0	0 5	
S22L,M	o	o	Gain switching
S23L,M	o	o	VCMD gain setting (7V/1000 rpm, 7V/2000 rpm)
S24L,M	o	o	F/V circuit filter setting
S25L,M	x	x	High-frequency gain
S26L,M	x	x	Low-band gain
S27L,M	o	o	High-frequency gain (Note 1)
S28L,M	x	x	Low-band gain

Short-circuit is marked with a circle.

Note) The open state for S27L,M is standard setting since A20B-1001-0470/05B edition.

Explanation	S22L,M:	The open state double the total gain.
	S23L,M:	7V/1000 rpm is set in the open state. 7V/2000 rpm is set in the short-circuit.
	S24L,M:	Be sure it is short-circuited.
	S25L,M:	Should it be short-circuited, the gain decreases. Effective when oscillation is generated in the high-band (200 to 400 Hz).
	S26L,M:	Should it be short-circuited, the low-band gain decreases. Effective in a full-closed circuit, or when inertia is large.
	S27L,M:	Should it be open, the high-band gain increases.
	S28L,M:	Should it be short-circuited, the low-band gain decreases. Effective when inertia is large.

* Whenever the setting of a compensating circuit is changed according to this table, please make contact with our service offices.

3) AC servo unit (for three axes)

Setting pin	Standard setting		Description
	0/5	10	
S22L,M,N	o	×	Gain switching
S23L,M,N	o	×	VCMD gain setting (7V/1000 rpm, 7V/2000 rpm)
S24L,M,N	o	o	F/V circuit filter setting
S25L,M,N	×	×	High-frequency gain
S26L,M,N	×	×	Low-band gain
S27L,M,N	×	×	High-frequency gain
S28L,M,N	×	×	Low-band gain

Short-circuit is marked with a circle

Explanation

S22L,M,N: The open state double the total gain.
S23L,M,N: 7V/1000 rpm is set in the open state.
7V/2000 rpm is set in the short-circuit.
S24L,M,N: Be sure it is short-circuited.
S25L,M,N: Should it be short-circuited, the high-band gain decreases. Effective when oscillation is generated in the high band (200 to 400 Hz)
S26L,M,N: Should it be short-circuited, the low-band gain decreases. Effective in a full-closed circuit, or when inertia is large.
S27L,M,N: Should it be open, the high-band gain increases.
S28L,M,N: Should it be short-circuited, the low-band gain decreases. Effective when inertia is large.

* Whenever the setting of a compensating circuit is changed according to this table, please make contact with our service offices.

Revision Record
FANUC AC SERVO UNIT MAINTENANCE MANUAL (B-54765E)

Edition	Date	Contents	Edition	Date	Contents
02	Jun., '86	<ul style="list-style-type: none"> • Adding of description for 2 axes control servo unit. • Adding of description for 3 axes control servo unit. 			
01	Dec., '83	_____			

B-54765E/02



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