

FUJI INVERTERS
INSTRUCTION MANUAL

Operating Instructions of AC Spindle System,

FRENIC[®] 5000V2 MARK II

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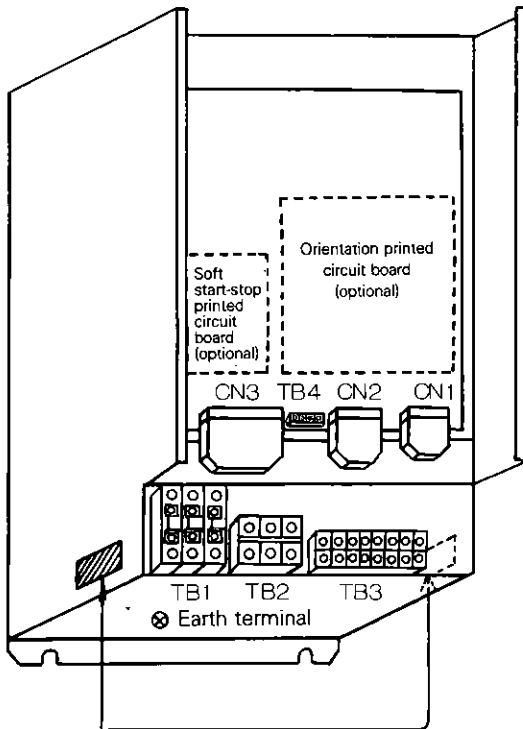
Thank you very much for your purchasing our AC Spindle Drive System FRENIC 5000V2 MK II for Machine Tool this time. Please read through this Operating Instructions by all means before you use the Drive System.

1. Points of Caution

- (1) After you have cut off power, charged voltage remains in the capacitor. Never touch your hand to terminals or check interior before the Charge Lamp light (LED 6 yellow) goes off.
- (2) Never carry out dielectric strength test.
- (3) Volumes and switches, that do not require adjustment, have been set already at delivery of the factory. Therefore, do not adjust them.

2. Fitting Positions of Connector, Terminal Blocks and Name Plate

The connector, terminal Blocks and name plate are fitted at the following positions.



Name plate (example of model 15AR)

FUJI ELECTRIC	TYPE FSD-15AR-23
SOURCE	200 / 220-230V 50 / 60 HZ
OUTPUT	11 / 15 KW CONT / 30 MIN
SERIAL	HC 66666 R 001
Fuji Electric Co.,Ltd. JAPAN	

Particulars of description

- ⇐ Model of the Drive Unit
- ⇐ Specification of input AC power source
- ⇐ Rated capacity of the motor
- ⇐ Manufacture No. of the Drive Unit

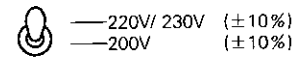
***When inquiring to our Service Centers, please inform them also description on the name plate.**

3. Test Run

3-1 Points of Confirmation

Please make sure of the following before you supply power to the unit (for operation).

Items	Points of confirmation
1	Make sure if voltage level, voltage fluctuation and power source capacity of the input power is as prescribed. (confirmation of the toggle switch for power voltage change-over.)
2	Check that phase rotation of power source connecting to power input terminals (R, S and T) is set in the order of R, S and T phases. (If operated with adverse phase rotation, the power transistor will be damaged.)
3	Make sure that the power input terminals (R, S and T) of the Drive Unit and the output terminals (U, V and W) for the motor are not adversely connected by error.
4	Check that connection to external circuits (by connectors and at terminal blocks) has been made surely. (Clamp CN 1-3 surely with lock screws.)
5	Make sure that wirings of power circuit and control circuit are not earthed nor shortcircuited.
6	Check that no metal chip or other foreign matter is mixed into the Drive Unit.
7	Make sure that setting terminals (shortcircuit pins) on the printed circuit board are pre-set as specified.
8	Check that connectors and screws on the printed circuit board are not loosed.



Checking of the setting terminal (shortcircuit pin): While they have been set to specification at delivery from the factory, check them according to the following procedures if movement of the unit is found improper.

Setting terminals	Particulars	Setting	Remarks	
SW 1	Selection of speed command input	Analog speed command	1 <input checked="" type="checkbox"/> 3	Carry out change-over with the sequence other than the unit.
		Digital speed command	1 <input type="checkbox"/> 3	
		Joint speed command of analog and digital	1 <input checked="" type="checkbox"/> 3	
SW 2	Analog overriding	Used	1 <input checked="" type="checkbox"/> 3	
		Not used (invalid)	1 <input type="checkbox"/> 3	
SW 3 SW 4	Selection of D/A convertor	BCD 2 digits	SW 3 1 <input checked="" type="checkbox"/> 3	Check that the D/A converter element has been fitted on P.C.B.
			SW 4 1 <input type="checkbox"/> 3	
		12-bit binary	SW 3 1 <input type="checkbox"/> 3	
			SW 4 1 <input checked="" type="checkbox"/> 3	
SW 5	Soft start-stop optional printed circuit board	Used	1 <input type="checkbox"/> 3	Cancellable by external signal
		Not used	1 <input checked="" type="checkbox"/> 3	
SW 6	Selection of ASR integral action time	Long integral action time	1 <input checked="" type="checkbox"/> 3	Normally set at 2-3, however at 1-2 for conventional series
		Short integral action time	1 <input type="checkbox"/> 3	
SW 7	Operating preparation command	Used	OFF <input type="checkbox"/> ON	
		Not used	OFF <input checked="" type="checkbox"/> ON	
SW 8	Starting delay detection	Used	OFF <input type="checkbox"/> ON	Turn ON when the torque limiter is used.
		Not used (invalid)	OFF <input checked="" type="checkbox"/> ON	
SW 9	Free run	Used	OFF <input type="checkbox"/> ON	Normally turn OFF as this is the special switch for test.
		Not used	OFF <input checked="" type="checkbox"/> ON	
SW 11	Selection of temperature sensor (spindle motor)	Normal circuit is used	OFF <input type="checkbox"/> ON	Change over to the spare circuit when the thermistor is disconnection.
		Spare circuit is used	OFF <input checked="" type="checkbox"/> ON	
SW 13	Changeover of ASR actuation	To actuates at 5% speed deviation	1 <input checked="" type="checkbox"/> 3	Set at 1-2 normally
		To actuates at 10% speed deviation	1 <input type="checkbox"/> 3	
SW 14	Selection of speed setting polarity	+10V / Maximum speed	1 <input checked="" type="checkbox"/> 3	
		-10V / Maximum speed	1 <input type="checkbox"/> 3	
SW 15	Selection of internal HLR circuit	Internal HLR circuit is used	1 <input checked="" type="checkbox"/> 3	
		Internal HLR circuit is not used	1 <input type="checkbox"/> 3	

mark: Dip switch

mark: Shortcircuit pin

Note) The setting terminal SW10 is not provided.

3-2 Test Run Procedures

Items	Particulars	Procedures and items to be confirmed
1	Power supply	① Alarm lamp LED 1-4 (ALARM): To go off ② Control power source display LED 5 (PS): To be lit ③ Main circuit charging display LED 6 (CHARGE): To be lit ④ CPU running display LED 9 (RUN): To flicker *The alarm lamp may be lit instantaneously when power is supplied or cut.
2	Operating preparation signal ON	The fan motor of the spindle motor and unit cooling fan revolves. Check revolving direction of the fan motor. Note: Must be in reset condition of emergency stop input.
3	Operating command ON (Forward/reverse operation command)	Check revolving direction by giving the minimum speed command. When Forward revolution command is given: Anti-clockwise revolution. When reverse revolution command is given: Clockwise revolution. Note: Determine the revolution direction seeing from output shaft of the motor.
4	Optimum adjustment of speed feedback (Adjusting resistor: VR29*)	Adjust VR29 so that it revolves at forward revolution rate of 100-120rpm (speed of the motor) and LED 7 (ADJ) is lit. Note: (1) Adjust VR29 desirably at 7-9 notches in normal cases. (2) Turn VR6 or VR7 anticlockwise by 0.5 notch when revolution of the motor is not smooth.
5	Adjustment of speed feedback (Adjusting resistor: VR30*)	① Check after the main shaft maximum speed revolution command is given that voltage of CH8 is 9.95-10.05V. ② Check under condition of the above ① that the main shaft is running at the maximum speed. If not, adjust it by means of VR30 (Speed drops when turned clockwise).
6	Optimum adjustment of speed controlling amplifier (Adjusting resistors: VR6* and VR7)	Increase P gain of the speed controlling amplifier (ASR) by means of VR6 or VR7 (increasing when turning clockwise) while increasing speed command gradually to the maximum speed. Note:(1) VR6: Valid when L gear and M gear signals are input. VR7: Valid when H gear signal is input. (2) ASR: When P gain is increased too much, hunting is apt to occur and when decreased too much, response is made poor, leading to possible overshooting.
7	Final confirmation	Check through operation by giving various speed commands such as forward and reverse revolution that there is no abnormality at main shaft revolution.

*For adjusting method of VR6, VR7, VR29 and VR30, refer also to next page.

3-3 Adjustment

(1) Adjustment of Speed Control System

Adjust VR6, VR7, VR8 and VR9 (VR29) among adjusting resistors to their optimum conditions according to loads at combined operation with the machine. VR5 and VR30 have been already adjusted at their delivery from the factory. Therefore, they need not to be adjusted as a principle.

Items	Particulars	Adjusting methods
1	Adjustment of analog speed setting voltage (Adjusting resistor: VR5)	Check, after having adjusted by means of VR5 so that voltage of CH8 is +10.00V when forward maximum revolution speed command was given, that the voltage of CH8 is in a range of -9.95 ~ -10.05V when reverse revolution command is given. (voltage increases when turned clockwise)
2	Adjustment of P gain of speed controlling amplifier (Adjusting resistors: VR6 and VR7)	Adjust by means of VR6 VR7 depending on load conditions so that hunting or overshoot does not take place. (gain increases when turned clockwise) VR6: Valid when L gear and M gear signals are input. VR7: Valid when H gear signal is input (And no gear signal). (Correspondence of notch and gain is different in model MK II)
3	Adjustment of P gain of speed controlling amplifier increasing holding strength after termination of orientation (Adjusting resistors: VR8 and VR9)	Adjust by means of VR8 and VR9 so that hunting does not occur after orientation termination. (gain increases when turned clockwise) VR8: Valid when L gear and M gear signals are input VR9: Valid when H gear signal is input. (And no gear signal) When no orientation function is required. (Correspondence of notch and gain is different in model MK II)
4	Optimum adjustment of speed feedback (Adjusting resistor: VR29)	Adjust by means of VR27 so that LED 7 (ADJ) is lit for regular revolving operation. (100-120rpm at V2 of motor revolution)
5	Adjustment of speed feedback volume (Adjusting resistor: VR30)	When the maximum speed is to be changed, adjust by means of VR30 so that the prescribed number of main shaft revolution is obtained when the maximum speed command (10V) is given. (Speed decreases when turned clockwise)

(2) Adjustment applicable at abnormal phenomenon

Basically, adjustment can be made by the procedure mentioned under Item (1).

However, when phenomena such as described below are observed, volumes (VR) may be required to be readjusted according to respective adjusting standard. Treat these volumes carefully and do not change their notches largely as they have already been adjusted at delivery from the factory.

[Examples of Abnormal Phenomenon]: Please refer to the Item 5-2(2) Failure Diagnosis.

- Slow revolution is kept and does not stop even when stopping action is taken.
- The motor does not revolve at the prescribed speed.

Adjusting VR	Functions	Checking pins and positions	Adjusting methods
VR1* VR2*	Offset adjustment of current detection circuit (Powering side)	CH2↔M CH6↔M	Adjust by means of VR1 so that voltage of CH2 will be less than $\pm 10\text{mV}$ when operating preparation and operating commands are OFF. Similarly, adjust by means of VR2 so that voltage of CH6 will be less than $\pm 10\text{mV}$.
VR15*	Offset adjustment of current detection (Regeneration side)	CH13↔M	Adjust by means of VR15 so that voltage of CH13 will be $\pm 10\text{mV}$ when operating preparation and operating commands are OFF.
VR23	Fine gain adjustment of speed setting circuit *Always carry out offset adjustment of the speed setting circuit before fine gain adjustment is performed.	CH8↔M	Adjust by means of VR23 so that voltage of CH8 will be $10 \pm 0.05\text{V}$ at input of regular revolution command when speed setting is made at the maximum level (CH7 = $10 \pm 0.05\text{V}$). Similarly, adjust motor revolution at this time by means of VR30, inputting forward motor revolution command. Then, check motor revolution also at reverse motion and fine-adjust if deviated.
VR41	Offset adjustment of speed setting circuit *Always carry out offset adjustment at each time when accelerating/decelerating time is changed for those using external HLR.	CH101↔M	Check CH7 = 0V. Then, adjust by means of VR41 so that voltage of CH101 will be $\pm 1\text{mV}$ when operating and regular revolution commands are ON. Further check that voltage of CH8 is $\pm 2\text{mV}$ when both forward and reverse revolution commands are OFF. Readjust VR45 if the motor does not stop completely.

*Always readjust VR1, VR2 and VR15 every time when the printed circuit boards are replaced.

(3) Adjustment of Auxiliary Function

Following variable resistors need not be readjusted in principle as they have been already adjusted at their delivery from our factory.

Carry out following readjustments only when change is required in their actual use.

Adjusting VR	Functions	Particulars
VR 10	Setting of "Low" torque limiting value	0~50% of continuous torque rating can be set. Limiting value increases when turned clockwise.
VR 11	Setting "High" torque limiting value	0~100% of continuous torque rating can be set. Limiting value increases when turned clockwise.
VR 20	Setting of speed attainment detection level	Detection level of $\pm 1 \sim \pm 10\%$ range can be set when speed attained to the set level. Detection range increases when turned clockwise.
VR 21	Setting of arbitrary speed detection level	Detection level of 10~90% of the maximum speed can be set. Detection level increases when turned clockwise.
VR 22	Output voltage adjustment for speedmeter	Adjustment can be made for 7~10.5V (at the maximum speed) at 10K Ω load. Output voltage increases when turned clockwise.
VR 37	Output voltage adjustment for load meter	Gain of the amplifier for 10V setting increases by 1~1.2 times. (at time of the maximum output)

4. Maintenance and Check

Daily Maintenance

Proper maintenance and check are required in order to have performance of the unit displayed fully and to maintain highly dependable operation for a long time eliminating any failure in advance.

Perform check every 3~6 months observing following items

- (1) Always cut power supply
- (2) The smoothing capacitor (large capacity electrolytic capacitor) does not discharge immediately after cutting of power supply.
Therefore, carry out checking work after waiting several minutes from the power cut when the CHARGE lamp light (LED 6 yellow) went off.
- (3) When attach or detach the connector, do always holding housing of the connector.
- (4) Never conduct megger test nor insulation withstand voltage test.
- (5) Check items.

No.	Check items	Particulars	Dispositions
1	Electromagnetic contactor	<ul style="list-style-type: none">• If contact is abraded.• Whether action is smooth and sure.	Replacement
2	Transistor, diode, smoothing capacitor and printed circuit board	<ul style="list-style-type: none">• If any abnormality is involved such as discoloring or abnormal smell.• If any metallic chip or piece of wire is mixed in.• If any part of the printed circuit board is discolored or deformed.• If dust is blocking.	After check, replace defective parts. Replace printed circuit board.
3	Unit cooling fan	<ul style="list-style-type: none">• If it revolves powerfully when power is supplied.• If any foreign noise is heard from the bearing position.• If dust accumulates at air suction position.	Replacement of fans
4	Terminals and connectors	<ul style="list-style-type: none">• If these are not in a loosed condition.	re-clamping

Remarks: If a large quantity of dust is found deposited, remove it by blowing compressed air taking care not to shock any part.
However, if electroconductive dust or fine powder dust possible to cause insufficient contact of the relay etc deposits, suck it up by a vacuum cleaner.

5. Trouble shooting

If any abnormal phenomenon should take place while or at operation, grasp correct condition of the phenomenon while observing the below mentioned points of caution and treat it according to the List of Trouble shooting.

Failing to resume to the normal condition, or finding breakage of any part, please advise to us.

Points of Caution

- (1) Repair and adjustment of the unit are not to be made by anyone other than the responsible person.
 - (2) For checking of circuits, appropriate equipments such as tester, digital voltmeter and synchroscope are to be used. (Measuring instruments of more than $1M\Omega$ input impedance are to be used, but the electromagnetic oscillograph is not to be used.)
 - (3) Never connect disconnect wiring while power is supplied as such handling causes shortcircuiting.
 - (4) Already adjusted SW and VR are not to be re-adjusted arbitrarily.
- If they are re-adjusted unavoidably, positions before the re-adjustment (number of notches) should be recorded so that they can be return to their original conditions.

5-1 Confirmation of Power Source Voltage

When a trouble took place, out confirmation of the following power source voltages in the first place.

Checking of AC power source voltage	Check whether it is as prescribed by "specification of connecting power source"																				
Confirmation of control power source voltage	Check whether control power source voltage on the main printed circuit board is at the following prescribed values																				
	<table border="1"> <thead> <tr> <th>Voltage</th> <th>Use</th> <th>Checking pins</th> <th>Prescribed values</th> </tr> </thead> <tbody> <tr> <td>+24V</td> <td>Relay circuit</td> <td>P 1 - M</td> <td>+24V \pm 15% (27.6V ~ 20.4V)</td> </tr> <tr> <td>+15V</td> <td>Analog circuit</td> <td>P - M</td> <td>+15V \pm 5% (15.75V ~ 14.25V)</td> </tr> <tr> <td>-15V</td> <td>Analog circuit</td> <td>N - M</td> <td>-15V \pm 5% (-14.25V ~ -15.75V)</td> </tr> <tr> <td>+5V</td> <td>Digital circuit</td> <td>P_D - M</td> <td>+5V \pm 1% (4.95V ~ 5.05V)</td> </tr> </tbody> </table>	Voltage	Use	Checking pins	Prescribed values	+24V	Relay circuit	P 1 - M	+24V \pm 15% (27.6V ~ 20.4V)	+15V	Analog circuit	P - M	+15V \pm 5% (15.75V ~ 14.25V)	-15V	Analog circuit	N - M	-15V \pm 5% (-14.25V ~ -15.75V)	+5V	Digital circuit	P _D - M	+5V \pm 1% (4.95V ~ 5.05V)
Voltage	Use	Checking pins	Prescribed values																		
+24V	Relay circuit	P 1 - M	+24V \pm 15% (27.6V ~ 20.4V)																		
+15V	Analog circuit	P - M	+15V \pm 5% (15.75V ~ 14.25V)																		
-15V	Analog circuit	N - M	-15V \pm 5% (-14.25V ~ -15.75V)																		
+5V	Digital circuit	P _D - M	+5V \pm 1% (4.95V ~ 5.05V)																		

5-2 List of Trouble Shooting

When the Failure Display LED is lit

Particulars of of an alarm are displayed by 4 LEDs (red) provided on the printed circuit board.

Displays \ Particulars of trouble	Particulars of trouble													
	Starting failuar	Motor over-heat	AC line fuse trip	DC line fuse trip	Input overvoltage	Overspeed(analog)	Overspeed(digital)	Overload regeneration	Overload	Tault of thermistor	Under voltage for instantaneous stop	Over-voltage	Over-current	Thermal trip
LED4								●	●	●	●	●	●	●
LED3				●	●	●	●				●	●	●	●
LED2		●	●			●	●			●	●			●
LED1	●		●		●	●		●			●		●	

Items	Failure names	Cause of failure	Methods of checking	Dispositions
1	Stating failuar	Voltage level for speed setting is too low or not supplied at all	Is voltage of CH7 more than 75mV?	Confirm setting of the check SW1 for external circuit (N/C etc.) and raise setting of the minimum speed
			Is load GD ² not too large?	Re-check machine side
		Speed detection PG failure	Confirmation of PG signal	Replace of PG or motor
		Overload or mechanical lock	Is scale of load meter not insufficient to indicate?	Examination of cutting conditions and machine
2	Motor over-heat	Overload	Is scale of load meter not insufficient to indicate?	Load decreasement, examination of cutting conditions and review of tools
		Defective motor cooling system	Is fan motor revolving?	Replacement of fan motors
			Blocking in motor draft path	Cleaning of motor
Defective thermistor element in the motor	Is the motor not actually overheated?	Change over to the spare thermistor circuit and reverse setting of SW11		
3	AC line fuse trip	Defective power transistor	Checking of the power transistor	Replacement of power transistors
		Defective surge absorber and capacitor	Checking of the surge absorber and capacitor	Replacement of surge absorbers and capacitors
		Defective main printed circuit board	Checking of base signal	Replacement of main printed circuit board
		Breakage of charging resistor	Checking of the charging resistor	Replacement of charging resistors
			Checking of contactor input circuit	Repair of the input circuit
		Loosed connection of fuse	Is clamping not insufficient?	Clamping of fuse
		Adverse phase of power source (Overvoltage and Overcurrent while in deceleration)	Checking of phase rotation	Repair the phase rotation to be correct
Failure or earthing of fan motor for cooling spindle motor	Checking of motor coil resistance and insulation resistance	Replacement of fan motors		
4	DC line fuse trip	Defective power transistor on the motoring side	Checking of the power transistor on the motoring side	Replacement of power transistor fuses on the motoring side
			Defective base drive circuit boards	Replacement of base drive printed circuit boards and power transistors
		Defective current feedback system	Is there any coming off of hall CT cable or loose connector?	Repair or replacement of cables and power transistors
			Defective hall CT	Replacement of hall CT and power transistors
Shortcircuiting and grounding of output wiring	Checking of connection	Repair of connection and replacement of power transistors		
5	Input overvoltage	Excessive input voltage level	Is input power voltage not exceeding 253V? Missetting of voltage change-over tap Low side setting which has to be set at high side	Re-check power source and surge absorber (if broken) Reset the tap correctly
6	Overspeed (analog) Main shaft protection	Defective speed detection circuit	Is CH56 not saturated at $\pm 10V$?	Replacement of control printed circuit boards
		Excessively set speed level	Is CH8 not exceeding 10V?	Replacement of control printed circuit boards
7	Overspeed (digital) motor protection	Defective speed detection circuit	Check by CH56	Replacement of control printed circuit boards
		Improper adjustment	Is actual motor revolution not too high?	Re-adjustment by means of VR30
		Mistake in ROM specification	Checking of ROM seal	Replacement of ROM
		Improper ROM insertion	Checking of inserted condition of ROM	Re-insertion

Items	Failure names	Cause of failure	Methods of checking	Dispositions
8	Over load regeneration	Erroneous actuation due to noise	Check if noise is affecting CH13 waveform	Noise prevention and connection check
		Defective hall CT	Confirm if fluctuation of hall CT output voltage (CH13) is too much (see by cooling)	Replacement of hall CT
		Stringent regeneration duty	Checking of operation cycle	Re-examination of operation cycle
		Defective overheat detection sensor for current-limiting resistor	Checking of detection sensor	Replacement of detection sensors
9	Overload (Inverter on the motoring side)	Overload (fin heating)	Checking by means of load meter	Load reduction and examination of cutting conditions
		Defective detection sensor	Checking of detection sensor	
		Defective cooling system of the unit	Examination of cooling fan motor of the unit	Cleaning of the unit and replacement of fan motors
		Temperature rise in strong power panel	Confirmation of temperature in panel	Improvement of cooling conditions panel
10	Fault of thermistor	Improper wiring and loosened connector	Checking of wiring and connector	Replacement of wiring and connectors
		Breakage of thermistor (inside the motor)		Change over to spare thermistor circuit (Reverse setting of SW11)
		Too low ambient temperature (less than -10)	Checking of ambient temperature	Examination of installation environment
11	Undervoltage for instantaneous stop	Too low level of AC input voltage (less than 170V)	Checking of input power voltage	Examination of power source specification (power source capacity, waveform distortion power fluctuation rate etc) and review of electric wire size
		Instantaneous power failure due to lightning etc (more than 20msec)		Resume to normal condition by applying failure resetting
12	Overvoltage (DC line)	Excess level of AC input voltage (at regeneration)	Checking of input power voltage	Examination of power source specification
		Breakage of current-limiting resistor	Checking of current-limiting resistor's resistance value	Replacement of current-limiting resistors
		Loosened connector at regeneration circuit	Checking of loosened or broken connector	Clamping of connector
		Defective control printed circuit board	Checking of overvoltage level	Re-adjustment and replacement of control printed circuit boards
13	Overcurrent (inverter)	Shortcircuiting and grounding of motor circuit	Checking of connection	Repair of defective positions
		Defective hall CT	Is output voltage level (CH2 and 6) fluctuation of hall CT not too much?	
		Improper current command	Are signals of CH1 and 5 forming sine wave?	Replacement of defective parts and control printed circuit boards
		Erroneous actuation due to noise	Checking of CH2 and 6 waveforms	Re-examination of earthing treatment
		Abnormality of motor	Measurement of insulation resistance (To measure 500V megger for the single motor (removing connection wiring to the unit))	Replacement of motors
14	Thermal trip (micro-computer processing)	Too heavy load	Does it not require more than 1 minute for acceleration time at the maximum torque?	Review of the machine side
		Mechanical lock is applied	Are orientation (tool exchange) and cutting lock condition not still kept?	Review of the machine side

(2) When the Failure Display LED lamp does not light up:

Items	Failure names	Cause of failure	Methods of checking	Dispositions
1	Trip of power breaker on input side (ELB)	Shortcircuiting and grounding of main circuit	Checking of main circuit	Repair of defective positions
		Too low level of breaker's rated current	Checking of breaker's current capacity	Replacement of breakers
		ELB is not the type corresponding to inverter	Checking of breaker specification (such as trip value etc)	Replace with the breaker type corresponding to inverter
		Rush current was on as charging resistor was broken	Checking of charging resistor	Replacement of charging resistors
2	Motor does not revolve	Operating preparation and operating signals are not input	Checking of external sequence	Repair of sequence
		Emergency stop and unc lamp signals are input		
		Defective logic inside printed circuit board	Checking of logic at input circuit	Replacement of parts and control printed circuit boards
3	Motor does not reach to the prescribed speed level, or its number of revolution is not uniform	Erroneous speed setting voltage (on N/C SIDE) or improper digital signal	Checking of N/C maximum speed parameter	Change of parameter
			Checking of digital signal (binary or BCD code)	Treatment of N/C side
			Misconnection of digital signal line	Re-adjustment of connection
		Erroneous speed setting voltage (on printed circuit board side)	Are voltages of CH7 and CH8 showing a ratio of 1:1?	Re-adjustment of speed setting
			Is offset of speed setting circuit not dislocated (CH101 and CH8)?	Re-adjustment of offset
		Noise is affecting speed setting circuit	Check shield processing by CH7	Correction of shield processing (depending on the case, 2-point shielding may be better)
		Noise is affecting speed feedback circuit	Checking of PG signal (CH50, 52) and PG shield processing	Re-adjustment of PG shield processing and replacement of hall CT
Improper adjustment of speed feedback circuit	Check CH56 if alarm appears with less than 100rpm motor revolution	Re-adjustment of speed feedback circuit (VR29)		
4	Motor revolves irregularly and number of revolution do not increase	Misconnection and breakage of PG circuit	Checking of PG circuit (load meter scale was insufficient to indicate)	Review of connection (particularly for connector)
		Mistake to connect in phase order for motor's main circuit	Checking of PG circuit (load meter scale was insufficient to indicate)	Review of connection
		Improper PG	Checking of PG waveform	Replacement of PG and motors
		Improper soldering and insufficient contact of PG connector	Checking of PG connector	Replacement of PG connectors
5	Motor does not stop but rotates slowly	Erroneous speed setting voltage	Is offset of speed setting circuit not dislocated (CH101 and CH8)?	Re-adjustment of offset
		Noise is affecting speed setting circuit	Checking of shield processing by CH7	Re-adjustment of shield processing (Depending on the case, 2-point shield may be better)
		Noise is affecting speed feedback circuit	Checking of PG waveform (CH50 and 52) and PG shield processing	Correction of PG shield processing and replacement of hall CT
		Defective control printed circuit board		Replacement of control printed circuit boards
6	Too large overshoot of revolution speed	Improper adjustment of ASR	Is gain not too low?	Raise ASR gain (V6 and V7)
			Load GD ² is large	Is gain not too low?
				Raise ASR gain (V6 and V7)
				Checking of mechanical specification
7	Cutting power is weak	Torque is restricted, or cutting speed fluctuation is large	Is external torque limiter (H or L) not input?	Review of sequence
		Improper adjustment	Checking of normal torque limiter value, current command value, current feedback gain and ASR gain	Re-adjustment
		Insufficiency on machine side	Checking of program	Review of program
8	Gear sound is heard and vibration is observed	Defective PG shield	Checking of PG waveform and PG shield processing	Correction of PG shield processing
		Improper cutting volume and feeding speed	Does it take place even in free run?	Review of machine side

Guide to our Service Centers

[Domestic]

TOKYO SERVICE CENTER (in headoffice)

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TEL (06) 344-1221 (Key No.)

NAGOYA SERVICE CENTER (in Nagoya Branch)

(NAGOYA DAIICHI BLDG) 19-24,NISHIKI 1-CHOME, NAKA WARD,
NAGOYA POSTAL CODE 460,
TEL (052) 231-8171 (Key No.)

KOBE SERVICE CENTER (in Kobe Factory)

1-1, TAKATSUKADAI 4-CHOME, NISHI WARD, KOBE POSTAL CODE
673-02,
TEL (078) 991-2111 (Key No.)

KOBE FACTORY, FUJI ELECTRIC CO.,LTD.,

1-1, TAKATSUKADAI 4-CHOME, NISHI WARD, KOBE POSTAL CODE
673-02,
TEL (078) 991-2111 (Key No.)

[Oversea]

U.S.A N.J. SERVICE CENTER

C/O ELMES & OESS SERVICE INC.
800 HUYLER STREET TETERBORO N.J. 07608 U.S.A.
TEL (201) 288-4422
FAX (201) 288-4496

CHICAGO

C/O ELMES & OESS SERVICE INC.
955-F NORTH PLUM GROVE ROAD SCHAUMBURG, IL 60195 U.S.A.
TEL (312) 605-1633
FAX (312) 605-1635

L.A. SERVICE CENTER

C/O ELMES & OESS SERVICE INC.
CYPRESS COMMERCE CENTER 5550 CERRITOS AVE.
SUITE "H" CYPRESS, CARIFORNIA 90630 U.S.A.
TEL (714) 220-1879
FAX (714) 220-1870

E.C. E.C. SERVICE CENTER

C/O FUJI ELECTRIC CO.,LTD. FRANKFURT REPRESENTATIVE OFFICE.
LYONER STRASSE 11,6000 FRANKFURT AM MAIN 71 F.R. GERMANY.
TEL (069) 666-4089
FAX (49) 69-6661020