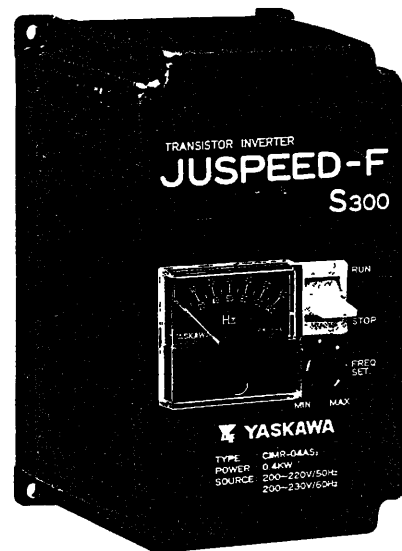
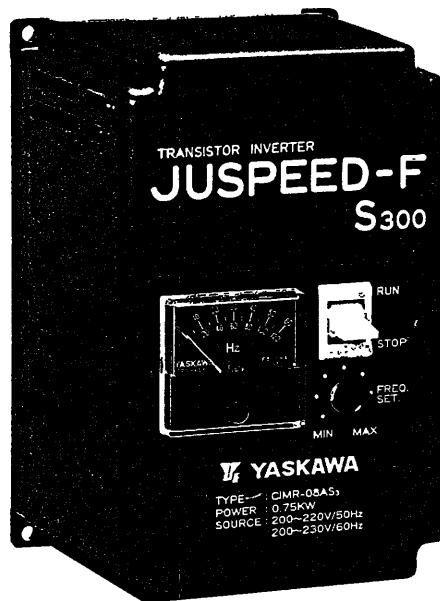


# SMALL-CAPACITY ANALOG TRANSISTOR INVERTER

# JUSPEED-F

## S300 SERIES

200V CLASS, UP TO 10HP (7.5kW)  
MODEL CIMR-04AS<sub>3</sub> TO -75AS<sub>3</sub>



When properly installed, operated and maintained, this equipment will provide a lifetime of optimum operation. It is mandatory that the person who operates, inspects, and maintains this equipment thoroughly read and understand this manual.



YASKAWA

## **DANGER**

- When using single-phase power supply, be sure to connect terminals to L1 (R) and L2 (S). Failure to observe this caution may result in rapid failure of the unit.
- Do not touch circuit components until CHARGE lamp extinguishes after turning off AC main circuit power. The capacitors are still charged and can be quite dangerous. Wait approximately five minutes after AC main circuit power is OFF.
- Do not connect or disconnect wires and connectors while AC power is applied.
- Do not check signals during operation.
- If JUSPEED-F inverter protective circuit activates, inverter output is stopped and, motor is coasting. Take positive action to protect personnel and machines from damage caused by motor coasting. If used with brake motor, be sure that motor power supply is separate from braking power supply.

## **IMPORTANT**

- Be sure to ground JUSPEED-F using mounting bolts.
- Do not provide capacitor between JUSPEED-F and motor.
- JUSPEED-F have been adjusted and paint-locked at the factory. Do not change their settings unnecessarily.
- Do not perform the following tests in the field:
  - Withstand voltage test on any part of the JUSPEED-F unit. It is an electronic device using semi-conductors and vulnerable to high-voltage.
  - Insulation resistance test with a megger. This test has been made at the factory and need not be conducted at test run. Exception: If megger-testing is required for inspection and maintenance purposes, it should be applied only to main circuit and the ground and never to the control circuit.
  - Conduction test on control circuits.
  - When a single-phase power supply is used, connect it to terminals L1 (R) and L2 (S) and use it at 1/2 or less of rated current.

## **1. RECEIVING**

This JUSPEED-F has been put through stringent tests at the factory before shipped. After unpacking, however, check and see the following.

- Nameplate ratings meet your requirements.
- Leads and connectors are not disengaged.
- No damage while in transit.
- Bolts and screws are not loose.
- Attachment: Pressure terminals, insulation caps.

If any part of JUSPEED-F is damaged or lost, immediately notify us giving full details and nameplate data.

## 2. JUSPEED-F MAJOR CONTROL COMPONENT LAYOUT

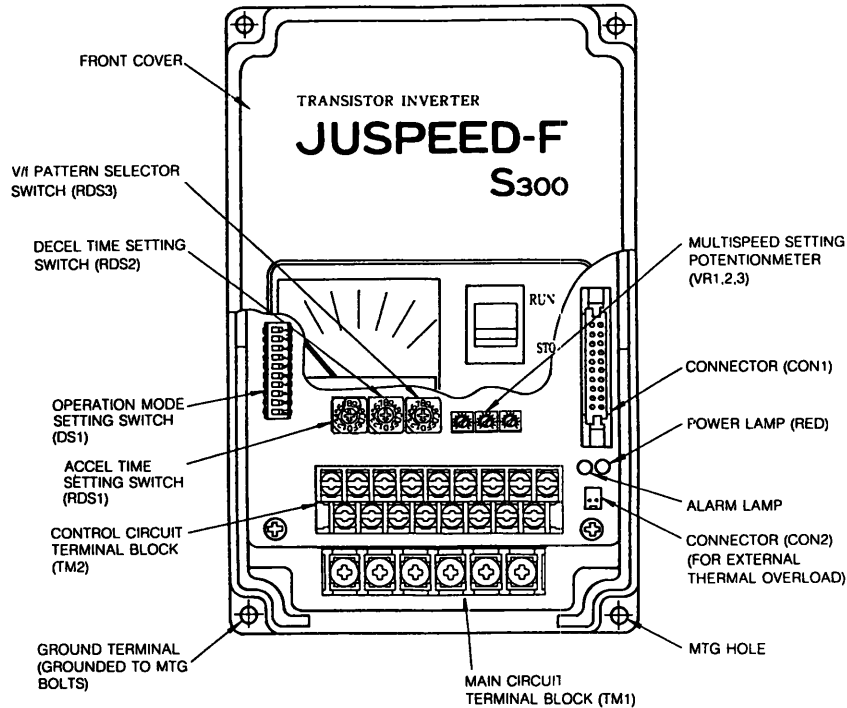


Fig. 1 Major Control Component Layout of JUSPEED-F

## 3. INSTALLATION

### 3.1 LOCATION

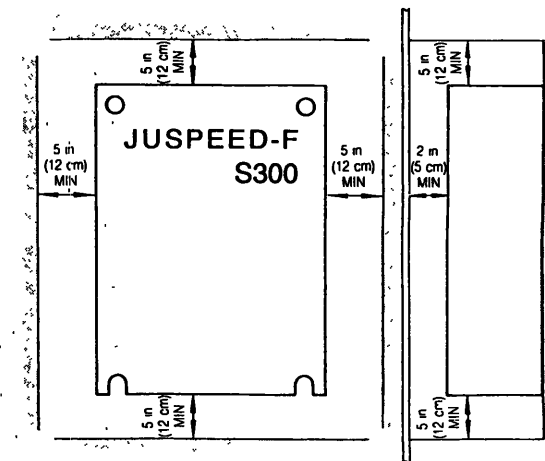
Location of the equipment is important to achieve proper performance and normal operating life. The units should be installed in areas where the following conditions exist.

- Ambient temperature:  $-10$  to  $+40^{\circ}\text{C}$ ;  
 $-10$  to  $+50^{\circ}\text{C}$  with cover removed
- Protected from rain or moisture.
- Protected from direct sunlight.
- Protected from corrosive gases or liquids.
- Free from airborne dust or metallic particles.
- Free from vibration.

### 3.2 POSITIONING

For cooling and maintenance purposes, make sure that there is sufficient clearance around the equipment whether it is enclosed in a cabinet or not, as shown in Fig.2. Keep 5 in. (12 cm) clearance between wiring duct and JUSPEED-F also.

To maintain effective cooling conditions, it must be installed vertically to the ground so that product name can be read correctly using the four mounting screws.



(a) Front View

(b) Side View

Fig. 2 JUSPEED-F Clearance Requirements for Proper Cooling and Maintenance

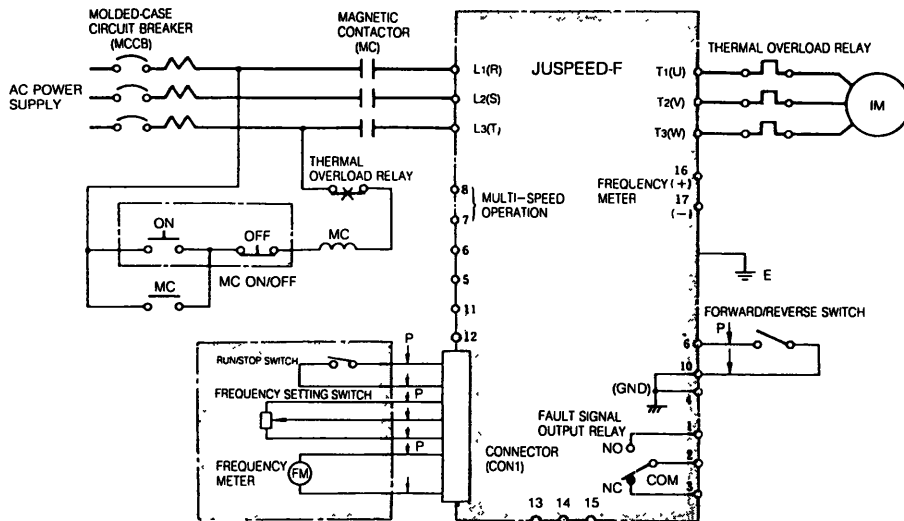
## 4. WIRING

### INTERCONNECTIONS

Fig.3 shows the connection diagram for JUSPEED-F drive. Connections should be made correctly, referring to Fig.3. Before wiring, remove terminal block cover, run the leads through the lead entrance at the JUSPEED-F bottom and connect them at the terminal block.

Wire size must be:

- 14 AWG (2 mm<sup>2</sup>) with M4 terminal screw for main circuit terminals (L1) (R), (L2) (S), (L3) (T), (T1) (U), (T2) (V), (T3) (W), and (E) .
- 18 AWG (0.75 mm<sup>2</sup>) with M3 terminal screw for signal circuit terminals ① to ⑰

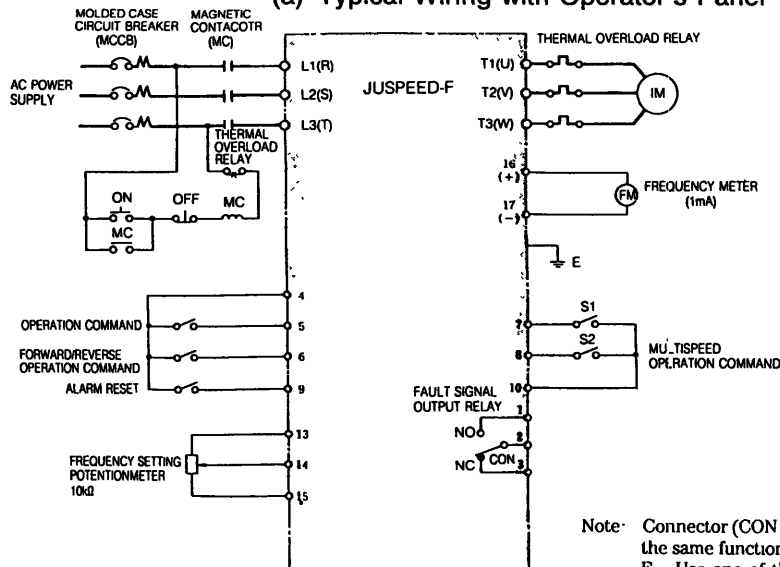


This dashed line indicates only for with operator. For the command from external terminal, remove the connector (CON1)

\*For model CIMR-08ASs

- Notes
- 1 Terminals ① and ② are used as the same, for they are connected in common to GND side of control power
  - 2 For Single phase input, use connectors (L1) (R) and (L2) (S)

(a) Typical Wiring with Operator's Panel



Note: Connector (CON1) and control circuit terminal (TM2) have the same functions and are connected directly in JUSPEED-F. Use one of them

(b) Typical Wiring without Operator's Panel

Fig. 3 Example of JUSPEED-F Interconnections

- (1) Be sure to connect MCCBs rated 30AF, 10A between power supply and JUSPEED-F input terminals  $\text{L1}$  ( $\text{R}$ ),  $\text{L2}$  ( $\text{S}$ ),  $\text{L3}$  ( $\text{T}$ ).
- (2) It is recommended to provide a magnetic contactor (MC) with a self-holding circuit at the power supply side, for safe operation.
- (3) For JUSPEED-F with a front cover, remove the cover and connect lead wire to the terminal stand.
- (4) For JUSPEED-F with an operator's panel, a frequency meter, frequency setting switch and run/stop switch are provided.
- (5) The order of power supply phases to be connected to input terminals  $\text{L1}$  ( $\text{R}$ ),  $\text{L2}$  ( $\text{S}$ ) and  $\text{L3}$  ( $\text{T}$ ) is not important.
- (6) Never connect the power supply to  $\text{T1}$  ( $\text{U}$ ),  $\text{T2}$  ( $\text{V}$ ) or  $\text{T3}$  ( $\text{W}$ ). Otherwise JUSPEED-F will be damaged.
- (7) Connect a single-phase power supply to terminals  $\text{L1}$  ( $\text{R}$ ) and  $\text{L2}$  ( $\text{S}$ ) when it is used.
- (8) Use the twisted lead for connections to control circuit terminals ④ to ⑰. The line must be separated from main circuit and high voltage circuit (200V, relay sequence circuit). See Fig.4. Lead length should be 66 feet (20 meters) or less.

Frequency setting switch is plugged-in by using JAE manual pressure tool CT150-1-PSSF. It employs JAE terminals 030-51304-001.

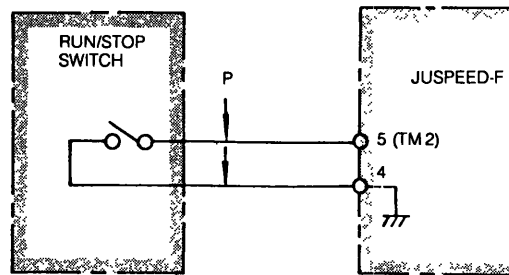


Fig. 4 Connections of RUN/STOP Switch

- (9) When JUSPEED-F output terminals  $\text{T1}$  ( $\text{U}$ ),  $\text{T2}$  ( $\text{V}$ ) and  $\text{T3}$  ( $\text{W}$ ) are connected to motor terminals  $\text{L1}$  ( $\text{R}$ ),  $\text{L2}$  ( $\text{S}$ ) and  $\text{L3}$  ( $\text{T}$ ), respectively, upon forward run command, the motor rotates in the CCW direction viewed from the load side. (When the CW direction rotation from the load side has been specified, it rotates in CW.)
- (10) When a magnetic contactor is provided between JUSPEED-F output terminals  $\text{T1}$  ( $\text{U}$ ),  $\text{T2}$  ( $\text{V}$ ) and  $\text{T3}$  ( $\text{W}$ ) and the motor, large starting current is applied by switching ON/OFF using the magnetic contactor during operation. Then large starting current flows and overcurrent protection functions to stop JUSPEED-F.
- (11) Do not connect an advance-phase capacitor between JUSPEED-F output terminals  $\text{T1}$  ( $\text{U}$ ),  $\text{T2}$  ( $\text{V}$ ),  $\text{T3}$  ( $\text{W}$ ) and the motor. If it is connected and the operation is performed, JUSPEED-F will be damaged.

(12) For peripheral devices and the applicable cables, refer to Table 1.

Table 1 Peripheral Devices and Applicable Cables

JUSPEED-F Model CIMR-		-04AS <sub>3</sub>	-08AS <sub>3</sub>	-15AS <sub>3</sub>	-22AS <sub>3</sub>	-37AS <sub>3</sub>	-55AS <sub>3</sub>	-75AS <sub>3</sub>
Molded-case Circuit Breaker (MCCB)		NF-30, 5A	NF-30, 10A	NF-30, 20A		NF-30, 30A	NF-50, 50A	NF-100, 60A
Magnetic Contactor (MC)		HI-7E		HI-10-2E		HI-20E	HI-30E	HI-50E
Main Circuit Terminals Ⓘ (Ⓘ), Ⓛ (Ⓛ), Ⓜ (Ⓜ), Ⓝ (Ⓝ), Ⓙ (Ⓙ), Ⓚ (Ⓚ), Ⓛ (Ⓛ), Ⓜ (Ⓜ)	Lead Size	2 mm <sup>2</sup>		3.5 mm <sup>2</sup>			5.5 mm <sup>2</sup>	
	Terminal Screw	M4						
Control Circuit Terminals ① to ⑩		Lead size: 0.75 mm <sup>2</sup> or more Terminal screw diameter M3						

- (13) When used with brake motors, power supply of brake must be separated from that of motor. Operate JUSPEED-F after the brake has been released.
- (14) Connect a surge absorber to the coils of magnetic contactor, control relay, magnetic valve or magnetic brake which is used around JUSPEED-F.
- (15) Use JUSPEED-F mounting bolt for grounding (Class 3, 100Ω or less.)

## 5. TEST RUN

### 5.1 CHECKS BEFORE TEST RUN

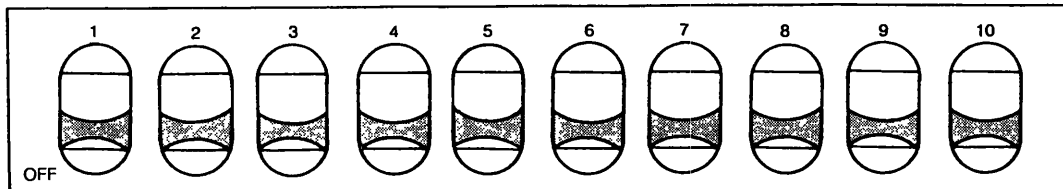
After completing mounting and connection of units, check for:

- Correct connections
- No short-circuit conditions
- No loose screws (Check especially for loose wire clippings)
- Proper load conditions
- Correct input power (No voltage drop or voltage unbalance, etc.)

### 5.2 PRESETTING AND ADJUSTMENT

#### 5.2.1 Operation Mode Setting Switch

Operation mode setting switch (DS1) consists of 10 ON/OFF slide switches printed on a base board. Select the operation modes from Table 2 according to the application. All the ON/OFF slide switches have been preset at factory to OFF as shown in Fig.5.



Note: Switches must be treated delicately.

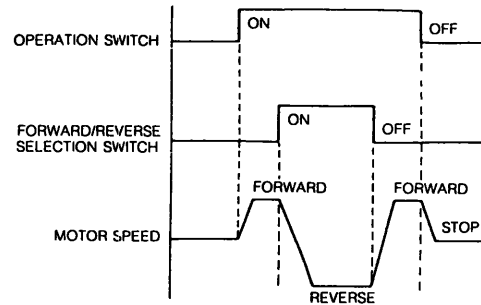
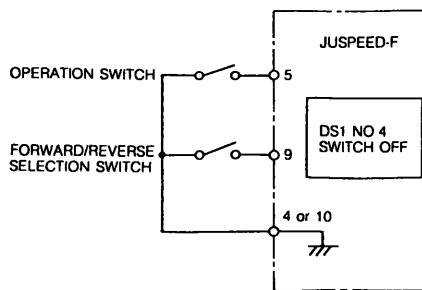
Fig. 5 Operation Mode Setting Switch (DS1)  
(ON/OFF Slide Switches)

Table 2 Selection of Operation Modes Slide

Switch No.	Mode	ON/OFF	Operation Mode	
DS1	1	Stopping Mode	OFF	Brakes to a stop
		ON	Coasts to a stop	
	2	DB selection	OFF	Provided at braking 2Hz or less
			ON	Not provided at braking 2Hz or less
	3	_____	OFF	No function provided
			ON	No function provided (For future expansion.)
	4	Forward/reverse Mode	OFF	Mode A (control by operation command and FWD/REV run command)
			ON	Mode B (control by FWD run and REV run commands)
	5	Thermal overload selection	OFF	External thermal overload not used
			ON	External thermal overload used
6 • 7	Max frequency	6 OFF 7 OFF	60 Hz	
		ON OFF	50 Hz	
		OFF ON	90 Hz	
		ON ON	120 Hz	
8	Offset selection	OFF	Not provided.	
		ON	Provided (Under 1 to 5V, 4 to 20mA reference, frequency up from 1V or 4mA)	
9 • 10	Frequency reference	9 OFF 10 OFF	0 to 10V, 10kΩ variable potentiometer	
		OFF ON	1 to 5V	
		ON OFF	Do not use	
		ON ON	4-20 mA	

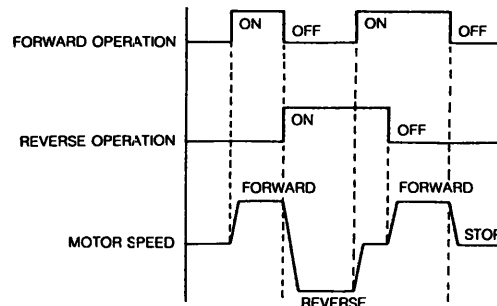
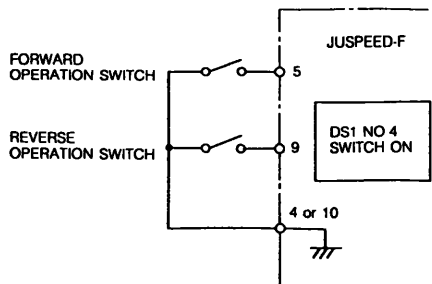
### Forward/Reverse Command Selection Switch

The forward or reverse command mode can be selected by setting Mode A or B as shown below.



Mode A. Selection of forward and reverse operation can be controlled by combining the operation signal and forward/reverse signal.

Fig. 6 Mode A



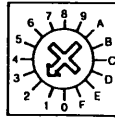
Mode B. Selection of forward and reverse operation can be controlled by the forward and reverse signals.

Fig. 7 Mode B

Inverter stops outputting if forward and reverse run signals are input simultaneously. Also input can be possible by open collector signals. Each switch "closed" is equivalent to open collector "L".

## 5.2.2 V/f Pattern Selector Switch

V/f pattern selector switch (RDS3) sets the voltage corresponding to the output frequency. For smooth motor running, select the optimum V/f pattern from 10 types listed in Table 3. The V/f pattern selector switch has been preset at the factory at notch ①. Setting V/f pattern excessively high voltage at low frequency such as notch ④ or ⑧ may cause overcurrent and result in activating overcurrent protective function to shut off the transistor power.



V/f Pattern Selector Switch (RDS3)

Table 3 Ten Types of V/f Patterns

Application	Hz	V/f Pattern	Application	Hz	V/f Pattern
General Purpose (Start at 50% torque of the rating)	50 Hz		High-start Torque (Start more than 100% torque of the rating)	50 Hz	
	60 Hz			60 Hz	
	90 Hz or 120 Hz		Fans and Pumps (At variable torque)	50/60 Hz	

Note: Circled numbers in the table above indicate the notch to be set by the V/f pattern selector switch and their respective pattern curve

### V/f Pattern Selection

Pattern Notch No.	Selection
0 (at 60 Hz)	4 (at 50 Hz)
1 (at 60 Hz)	5 (at 50 Hz)
2 (at 60 Hz)	6 (at 50 Hz)
3 (at 60 Hz)	7 (at 50 Hz)
8 (at 90 Hz)	9 (at 120 Hz)

For high starting at 150% of the rated torque.  
Apply to next upper inverter capacity, combination with motor output for inverters may activate over-voltage protective circuit Use a special motor Continuous operation of standard motors at low frequency cannot be made

For starting at 100% of the rated torque  
Optimum for constant torque such as conveyors. Continuous operation of standard motors at low frequency cannot be made Use a special motor.

For starting at 50 % of the rated torque.  
For the application requiring 50% starting torque or less, noise and vibration at low frequency will be reduced as compared with 100% rated starting torque mode of pattern ① and ⑤.

For variable torque loads specially for fans and pumps.

For high-frequency motor at 90 Hz or 120 Hz

Note. Operation of standard motor at 60 Hz or more may cause motor vibration or cooling fan noise.



### 5.2.3 Acceleration/Deceleration Time Setting Switch

Acceleration and deceleration times can be set independently.

Set the acceleration and deceleration times using accel/decel time setting switches (RDS1, RDS2) according to applications and load condition. Table 4 shows the settings of RDS1 and RDS2 notches, acceleration and deceleration time and DC injection braking time. The switches have been preset at the factory to notch ⑥. High-speed frequency limit of 90 Hz or 120 Hz is selected, the time ranges in Table 4 are 0 to 120 Hz or 120 to 0 Hz.

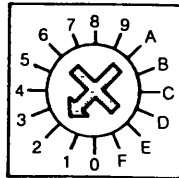
Acceleration time and deceleration time RDS1 and RDS2. Acceleration and deceleration times represent the range of time of output frequency from 0 Hz to 60 Hz (or 120 Hz) and 60 Z (or 120Hz) to DC injection braking, respectively. Calculate the corresponding time from the formula:

#### Example

At output frequency of 50Hz or 90Hz, the following calculation will apply.

$$\text{At 50 Hz, accel/decel time to be set} = \text{Accel/decel time in Tables 3} \times \frac{50}{60}$$

$$\text{At 90 Hz, accel/decel time to be set} = \text{Accel/decel time in Table 3} \times \frac{90}{120}$$



RDS1: Accel Time Setting Switch  
RDS2: Decel Time Setting Switch

Table 4 Accel/Decel Times and DC Injection Braking Time at Switch Notches (Output Frequency Setting 0 to 60 Hz, 0 to 120 Hz)

Notch	①	②	③	④	⑤	⑥	⑦	⑧	⑨	A	B	C	D	E	F
Accel/Decel Time (s)	0.1	0.15	0.2	0.3	0.5	0.75	1.0	1.5	2.0	3.0	5.0	7.5	10.0	15.0	30.0
DC Injection Braking Time (s)	0.20	0.22	0.25	0.27	0.3	0.33	0.36	0.40	0.45	0.50	0.60	0.80	1.0	1.5	3.0

### 5.2.4 Multispeed Setting Potentiometer

This is a variable potentiometer to set frequency by 3-step speed setting.

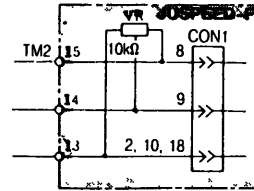
VR1 to VR3 can be selected by combination with input signals S1 and S2. (Refer to "Multispeed Operation Terminals" on page 12.) Set frequency according to the frequency meter mounted on the front cover. Frequency can be set in the range of 2 to 120Hz.

## 5.2.5 Signal Connections

Signals can be connected through terminal block (TM2) or connector receptacle (CON1). Do not use both TM2 and CON1 simultaneously. Tables 5 and 6 list the functions of terminal block (TM2) and connector receptacle (CON1), respectively.

### Internal wiring of TM2 and CON1

Both terminals TM2 and CON1 with same function are directly connected internally, therefore use either one of them. For standard models with operation panel, the connection is applied to CON1, so TM2 terminal with same function is not available.

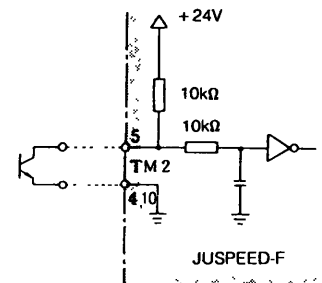


Interconnection of TM2 and CON1

Table 5 Terminal Block TM2 Function

Terminal No.	Terminal Name	Terminal Function
1	Fault Signal	Contact signal output indicating that inverter protective circuit activates and operation stops
2		
3		
4, 10	I/O Common	Common terminals for I/O terminals ⑤ to ⑫ (0 V terminal of control circuit GND)
5	Operation or Forward Run	Contact signal for operation/stop or for forward run Connected to terminal ④ or ⑩ (Closed Operation or forward operation, Open stop)
6	Forward/Reverse Changing or Reverse Run	For contact signal of forward/reverse run Connected to terminal ④ or ⑩. (Closed Reverse, Open Forward)
7	Multispeed Operation Input	Input signal for multispeed operation Connected to terminal ④ or ⑩
8		
9	Reset Input	Resetting input during inverter tripping and connected to terminal ④ or ⑩ (Closed Reset)
11	Frequency Synchronization Output	Open collector output terminal which indicates that output frequency reaches the set frequency ("L" - when synchronized, "H" - in other cases) V <sub>cc</sub> = 35V max, I <sub>c</sub> = 50 mA max
12	Output During Run	Open collector output terminal which indicates that the inverter is running ("L" - during running, "H" - in other cases) V <sub>cc</sub> = 35V max, I <sub>c</sub> = 50 mA max
13	Frequency Setting (Common)	0 V of control circuit. Connected to minus (-) signals of 0 to 10 V, 1 to 5V, and 4 to 20 mA
14	Frequency Setting (Input)	Inputs plus (+) signals of 0 to 10 V, 1 to 5 V, and 4 to 20 mA For frequency setting potentiometer, connect to terminal ② (center pin).
15	Frequency Setting (Output)	Used as power supply for setting by use of frequency setting potentiometer (10 kΩ)
16	Frequency Meter Driving (Output)	Connects to frequency meter (1 mA DC at 60, 120Hz) (Plus of terminal ⑬, minus of terminal ⑰) Use moving coil type DC ammeter for frequency meter.
17		

Note: Input contact signal or input open collector signal with terminals ④ and ⑩ as common (GND common) for each input terminal. To input contact signal, input no-voltage contact signal between terminals ④ and ⑩. To input open collector signal, input "L" (active) for terminals ④ and ⑩



Open Collector Input Terminal Interconnection

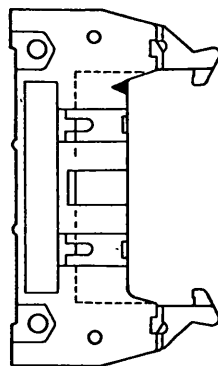
Table 6 CON1 Connector Function

Pin No.	Pin Name	Connector Function
1	NC	Spare Pin
2, 10, 18	I/O Common	0 V of control circuit (GND)
3	Reset Input	Resetting input at inverter tripping Connected to terminal ②, ⑩ or ⑱ (Closed Reset)
4	Operation or Forward Run Input	For input of run/stop or forward run command Connected to terminal ②, ⑩ or ⑱ (Closed Operation or Forward run, Open Stop)
5	Forward/Reverse Changing or Reverse Run Input	For input of forward/reverse or reverse run command Connected to terminal ②, ⑩ or ⑱ (Closed Reverse, Open:Forward)
6	Multispeed Operation	Input for multispeed operation. Activates at "L"
7		
8	Frequency setting (Power Supply Output)	Used as a power supply for setting by use of frequency setting potentiometer.
9	Frequency Setting (Input)	Inputs plus (+) signals of 0 to 10V, 1 to 5V, and 4 to 20mA For frequency setting potentiometer, connect to terminal ② (center pin)
11 to 14	NC	
15	Frequency synchronizaion Signal Output	Open collector output terminal which indicates that output frequency reaches the set frequency ("L" - when synchronized, "H" - in other cases) Vcc = 35V max, Ic = 50mA max
16	Output During Run	Open collector output terminal which indicates that the inverter is running ("L" - during running, "H" - in other cases) Vcc = 35V max, Ic = 50mA max
17	Fault Signal Output	Open collector signal output indicating that inverter protective circuit activates and operation stops ("L" - at stop by fault, "H" - in other cases) Vcc = 35V max, Ic = 50mA max
19	Frequency Meter	Connect a frequency meter, 1 mA DC at 60 or 120 Hz (pin 19 at "+" and pin 20 at "-") Use a moving coil type DC ammeter as a frequency meter. (e.g Model TRM-45Y made by KUWANO Electric)
20		

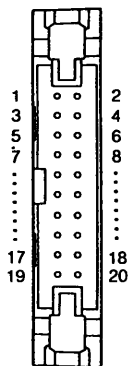
Note. Input open collector signal with input pins ②, ⑩ and ⑱ as common (GND common) for each input pin "L" is active To input contact signal, input non-voltage contact signal between pins ②, ⑩ and ⑱ "Closed" means open collector "L"

### Location of CON1 Connector Pins

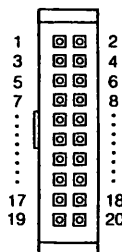
Pin header (receptacle) is mounted on the PC board. Mount terminals according to connector pin numbers. Plug the connector firmly into the pin header.



Pin Header (Receptacle)



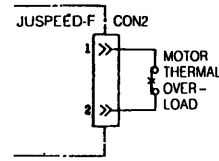
Connector



		Model (Made by JAE)
Leads Pressure-Type	Connector	PS-D4C20 (With key)
	Pressure welding type connector	PS-20SM-D4P1-1C
Pressure Welding-Type	Strain relief (Type M)	PS-SR20M
	Pin Header	PS-20PE-D4T2-M1

### CON2 (for thermal overload)

Input for motor thermal overload. Connect NC contact of thermal protector between CON2 ① and ② pins. Turn ON the 5th pole of operation mode selector switch (DS1). When the motor is overheated, thermal protector in the motor operates to stop JUSPEED-F and send an alarm. (Refer to page 18.) Connector (CON2) water is mounted on the board. The table indicates the applicable connectors.



Name	Type (made by Molex)
Connector	5251-2, 5051-2
Terminals Manual Pressure Tool	5659 JHTR5972

Note When CON2 is not used, turn OFF the 5th pole of operation mode selector switch (DS1)

### Fault Signal Terminals ①, ②, ③

Give the contact output if the inverter is tripped.

CONTACT RATING.  
250VAC, 1A RESISTANCE LOAD  
30VDC, 1A RESISTANCE LOAD

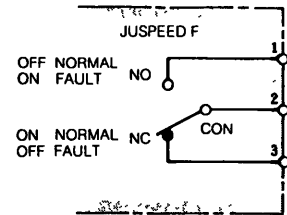
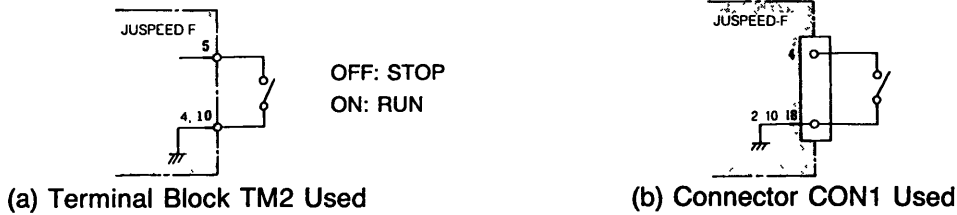


Fig. 8 Connections of Fault Signal Output Relay

### RUN/STOP or Forward Operation Terminals (⑤ and ④ or ⑤ and ⑩)

Terminals for run/stop or forward operation switch. For JUSPEED-F with operation panel, the terminals are connected as shown in Fig. 9. For remote running or stopping of motor, use a toggle switch (30VDC, 3A, contact resistance: 0.010Ω or less) and connect with twisted lead to prevent erroneous operation due to noise. Terminals ④ and ⑩ are connected within the circuit. RUN/STOP (mode A) or forward operation (mode B) can be selected by selector switch position at switch No.4 of DS1.



#### NOTE

TM2 and CON1 cannot be used at the same time.

Fig. 9 Connections of RUN/STOP or Forward Run Switch

### Multispeed Operation Terminals (⑦, ⑧ or ⑩)

Terminals for contact input for multispeed. See Fig.10. Set ON or OFF of contacts corresponding to three variable potentiometers (VR1 to VR3) in Table 7. For external switches S1 and S2, use the relay for small signals or containing contacts at micro level, with high reliable contact for micro current.

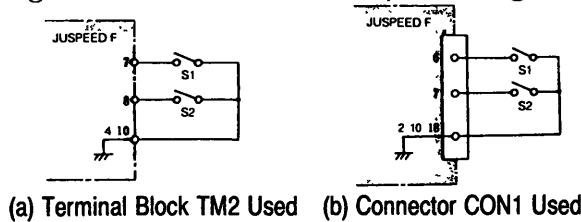


Fig. 10 Connections of External ON/OFF Switches for Multispeed Operation

Table 7 Setting of External Switches

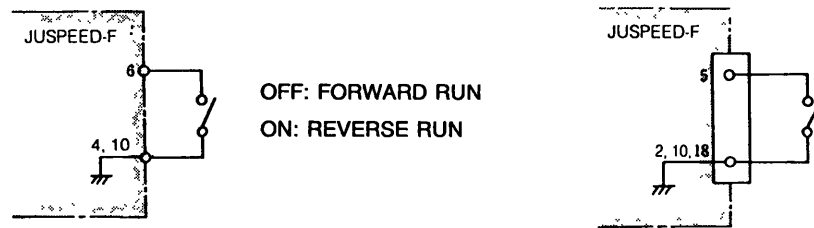
External ON/OFF Switch		Output Frequency
S1	S2	
OFF	OFF	Frequency set by frequency selector
ON	OFF	Frequency set by VR1
OFF	ON	Frequency set by VR2
ON	ON	Frequency set by VR3

Note: Setting range of VR1 to VR3:  $F_{MIN}$  to  $F_{MAX}$

## Forward/Reverse or Reverse Operation Terminals (⑥ and ⑩ or ⑥ and ④)

Terminals for forward/reverse or reverse operation switch. See Fig.11. When DS1 switch No.4 is OFF, forward run is performed when open between ⑥ and ⑩, and reverse run when closed. When DS1 switch No.4 is ON, reverse run command is input. For selector switch, use high reliable contact for micro current.

Forward/reverse running can be changed during running. For forward operation only, forward/reverse switch need not be connected.



(a) Terminal Block TM2 Used

(b) Connector CON1 Used

Note: At the selection of forward/reverse individual operation command mode (DS1 No.4 at ON), if forward and reverse commands are simultaneously executed, inverter output becomes "0" zero.

Fig. 11 Connections of Forward/Reverse or Reverse Operation Switch

## 5.3 TEST RUN

Uncouple the motor from the driven machine to insure safety. Start the operation following the procedures below.

1. Move RUN/STOP switch to STOP. Turn off the external sequence switches, if used.
2. Set the frequency setting switch to scale 0 (Min.).
3. Turn on JUSPEED-F molded case circuit breaker (MCCB) and then the magnetic contactor (MC). At this time, motor still does not start unless the operation circuit malfunctions. Check the motor for any noise or vibration (by hand) to make sure no malfunction has occurred.
4. When any fault has not been found, set the operation switch to the RUN side. In this status, rotate the frequency setting device in CW and check the motor rotating direction.
5. JUSPEED-F output frequency increases or decreases according to the preset accel/decel time. Motor accelerates or decelerates according to the frequency as well. If the motor does not run smoothly during acceleration or deceleration, or JUSPEED-F stops due to malfunction, the accel/decel time is assumed to have been set too short for the load level.
6. Accel/decel time and V/f pattern can not be changed during motor operation. The change must be carried out at operation command off.

### 5.3 TEST RUN (Cont'd)

7. If any of the protective functions activates, JUSPEED-F is stopped. Turn off the AC main circuit power by turning off the molded case circuit breaker (MCCB) or magnetic contactor (MC) and turn on the power again.

Faults can be located by the blinking fault lamp (milk-white) in JUSPEED-F (under the front cover). If JUSPEED-F stops, remove the front cover and identify the trouble with the blinking lamp, referring to Table 8.

8. If load inertia ( $WK^2$ ) is excessively large and rapid acceleration or deceleration frequently occurs, braking discharge resistor may be needed.

## 6. OPERATION

After the test run is over, start the operation keeping the following in mind.

- (1) For general purpose motors combined with JUSPEED-F controller, motor temperature rises and noise and vibration increase as compared with commercial power.
- (2) At low speed operation, operate the motor at the temperature below the allowable temperature rise level, for motor cooling effects decrease.
- (3) Motor ratings
  - When two or more motors are controlled by a single JUSPEED-F, check to be sure that the total motor current is not larger than the inverter rating.
  - When multipole motors of more than 8 poles or special purpose motors are used, make sure that motor current is within the inverter rating.
  - Even with small load, never use a motor whose current exceeds the inverter rating.
- (4) Never connect a capacitor at the inverter output, for it may damage JUSPEED-F.
- (5) To start and stop the motor, use RUN/STOP switch on the front of JUSPEED-F, not the magnetic contactor (MC) or molded case circuit breaker (MCCB) which are used only for emergency stop.
- (6) If supply voltage changes at momentary power failure, protective functions may operate and stop JUSPEED-F, resulting in motor coasting to a stop. Turning on the AC power supply within one second after the activation of protective functions will not restart the motor. Power input after approximately 10 seconds will restart the motor. For the application requiring positive motor stop in an emergency, provide magnetic contactor (MC) including self-holding circuit at power input as shown in Fig.3.
- (7) Restart the motor after making sure that the motor has come to a full stop. If the operation is started during motor coasting, overcurrent protective function may be activated.

## 7. MAINTENANCE

JUSPEED-F requires almost no routine checks. It will function efficiently and longer if it is kept clean, cool and dry, observing precautions listed under "Location." Especially check for tightness of electrical connections, discoloration or other signs of overheating. When servicing inspection, turn off AC main circuit power and wait ten minutes before removing the front cover. The capacitors are still charged and can be quite dangerous.

### Insulation Resistance Test

- For megger-testing the external circuit, remove all the JUSPEED-F terminals and do not apply the test voltage to the inverter.
- For megger-testing the inverter, measure the insulation resistance of the main circuit only with a 500 VDC megger.

Connect the AC main circuit terminals (L1 (R)), (L2 (S)), (L3 (T)), (T1 (U)), (T2 (V)), and (T3 (W)) by a common wire as shown in Fig.12. After that, measure the insulation resistance between the common wire and ground with a megger. If reading is above  $1M\Omega$ , it is considered satisfactory. Never measure the insulation resistance of the control circuit.

- Never make a conduction test of the control circuit.

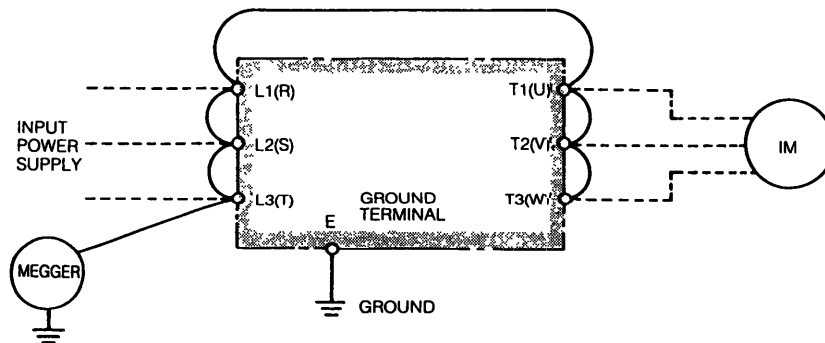
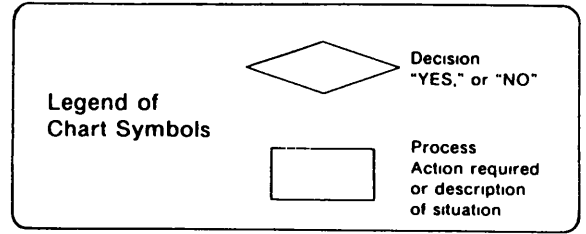


Fig. 12 Connections for Megger-testing

## 8. TROUBLESHOOTING

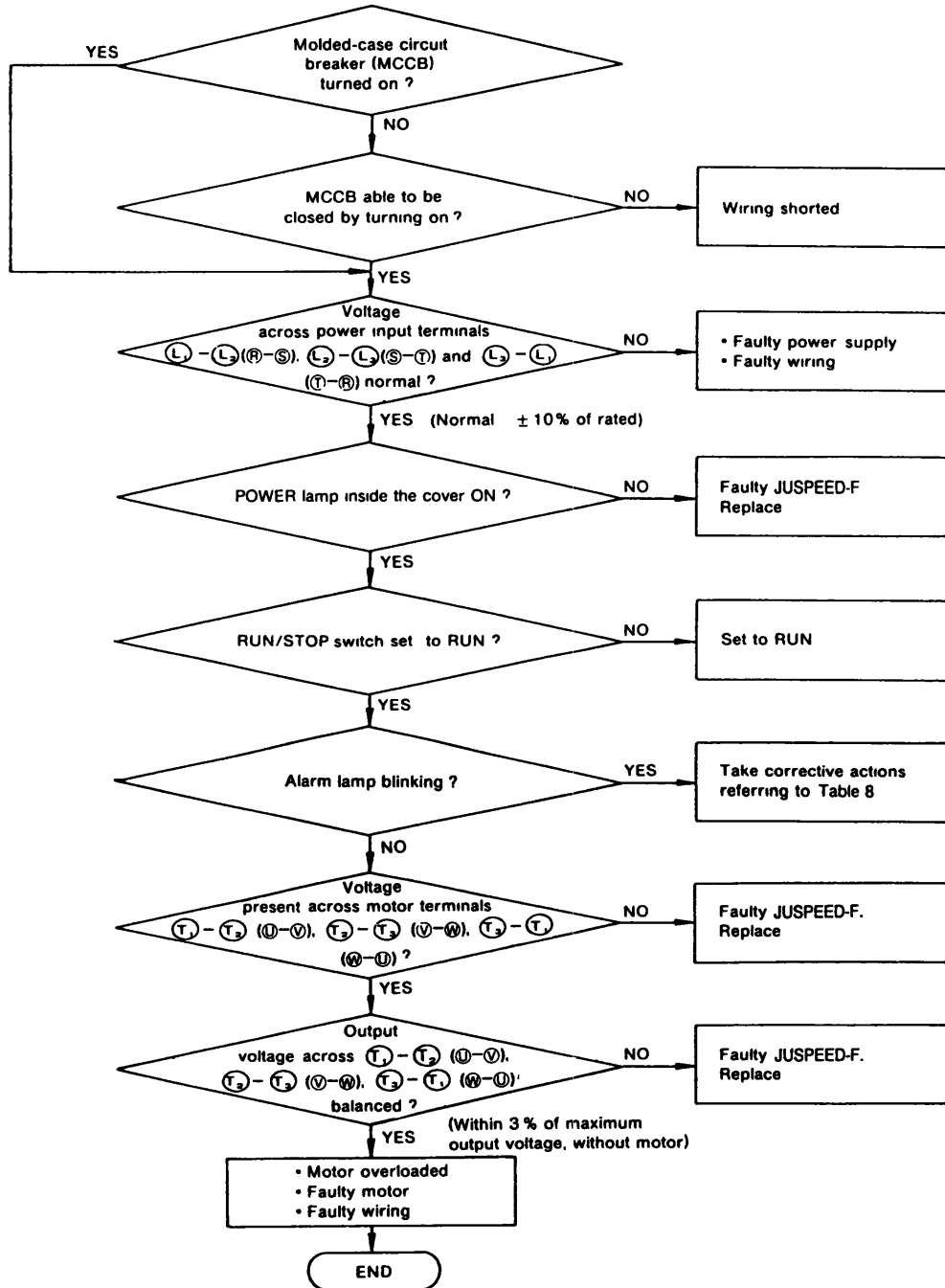
If JUSPEED-F malfunctions, find the cause and take the corrective actions by following the flowcharts.

If the causes cannot still be located by the flowcharts, the inverter or some parts are damaged, or any other problem occurs, contact Yaskawa representative.



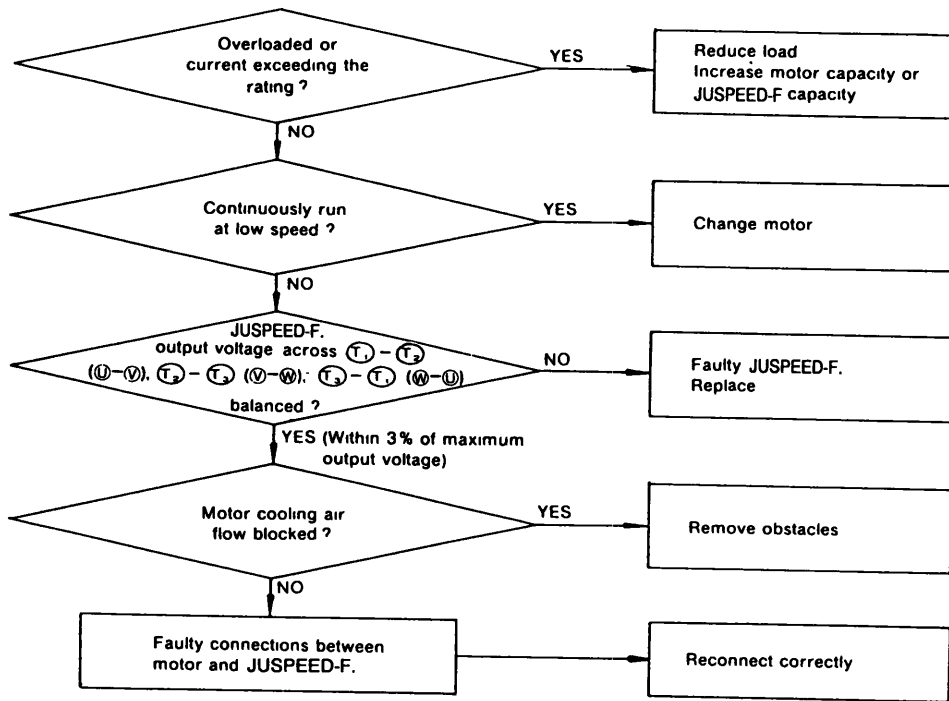
### 8.1 TROUBLESHOOTING CHART

#### (1) Motor will not run

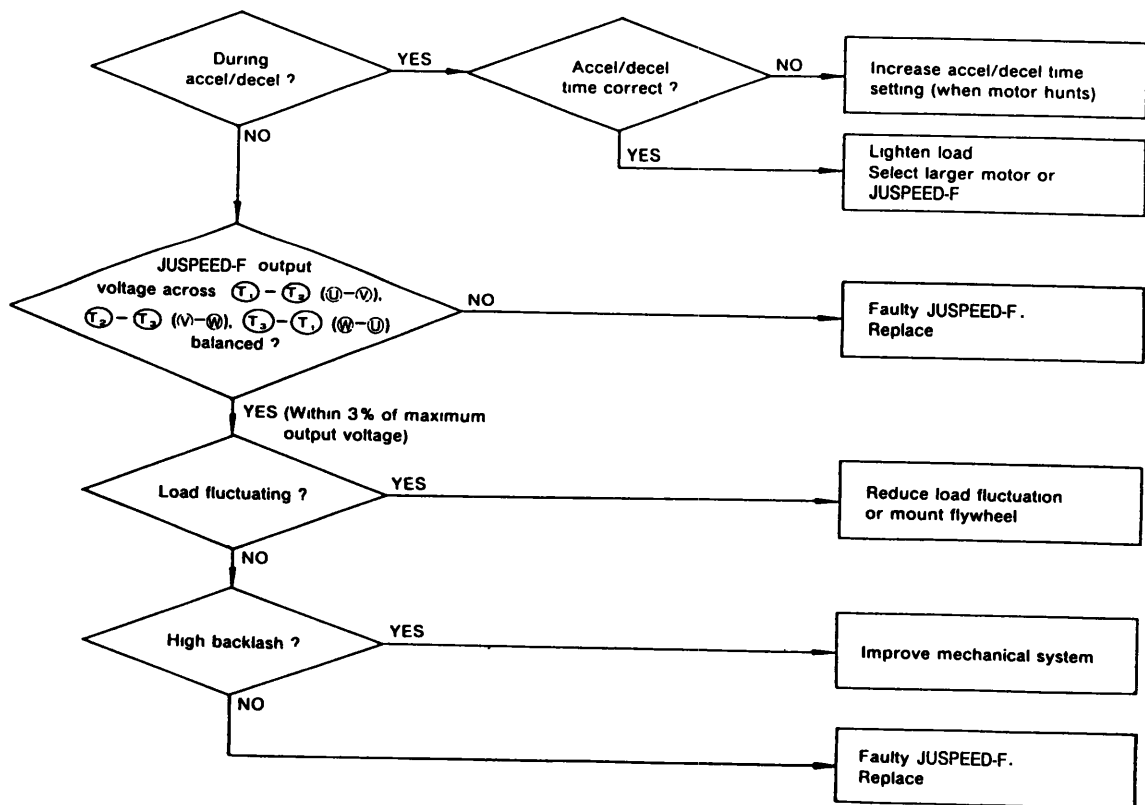




## (2) Motor overheat








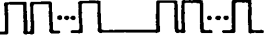
## (3) Motor hunting



## 8.2 CAUSES FOR FAULT LAMP (MILK-WHITE) ACTIVATION AND REMEDIAL ACTIONS

If JUSPEED-F malfunctions, fault lamp (milk-white) lights. Depending on the type of malfunction, the lamp will blink. When the lamp blinks, check for continuous or intermittent blink and whether the operation switch is ON or OFF.

Table 8 Failure Indication of JUSPEED-F

Operation of Fault Lamp	Cause	How to Check	What to Do	
<p>n = number of blinking times n = 1 time</p> 	External thermal overload functions (Motor)	Check the motor load status	<ul style="list-style-type: none"> <li>Improve motor cooling capability</li> <li>Reduce motor load</li> </ul>	
<p>n = 2 times</p> 	Instantaneous overcurrent protection	<ul style="list-style-type: none"> <li>JUSPEED-F output circuit shorted or ground fault</li> </ul>	<ul style="list-style-type: none"> <li>Remove JUSPEED-F output terminals and measure the resistance across motor leads or motor leads and ground. Use an ohmmeter across motor leads, and a megger across any one of motor lead and ground.</li> </ul>	If less than 1MΩ, correct the short-circuit conditions
		<ul style="list-style-type: none"> <li>Accel/decel time set too short</li> </ul>	<ul style="list-style-type: none"> <li>Extend the accel/decel time and operate the motor.</li> </ul>	<ul style="list-style-type: none"> <li>Extend the accel/decel time until overcurrent protective function stops</li> </ul>
		<ul style="list-style-type: none"> <li>Load too heavy</li> </ul>	<ul style="list-style-type: none"> <li>Run motor without load</li> <li>Check load conditions.</li> </ul>	<ul style="list-style-type: none"> <li>Change V/f pattern</li> <li>Reduce load.</li> </ul>
		<ul style="list-style-type: none"> <li>Power factor correction capacitor connected to JUSPEED-F output</li> </ul>	—	Remove
		<ul style="list-style-type: none"> <li>Incorrect V/f pattern selection</li> </ul>	<ul style="list-style-type: none"> <li>Run motor with frequency set at 5Hz, and V/f pattern selector switch at notch ③ or ⑦</li> </ul>	<ul style="list-style-type: none"> <li>Select the optimum V/f pattern</li> </ul>
<p>n = 3 times</p> 	<b>Overvoltage protection</b> <ul style="list-style-type: none"> <li>Decel time set too short.</li> </ul>	<ul style="list-style-type: none"> <li>Extend the decel time and operate the motor.</li> </ul>	<ul style="list-style-type: none"> <li>Extend the decel time until overvoltage protective function stops</li> </ul>	
<p>n = 4 times</p> 	<b>Undervoltage protection</b> <ul style="list-style-type: none"> <li>Supply voltage too low.</li> <li>Momentary power failure (15 ms or more)</li> </ul>	Measure supply voltage with voltmeter	Restart the motor when the measured voltage is correct <ul style="list-style-type: none"> <li>Eliminate the cause of voltage drop.</li> </ul>	
<p>n = 5 times</p> 	<ul style="list-style-type: none"> <li>Ground fault</li> <li>Transistor module damaged</li> </ul>	Remove all JUSPEED-F terminals and check continuity across any one of motor leads and ground with a 500 V megger.	If less than 1MΩ, eliminate the cause of ground fault.	
<p>n = 6 times</p> 	<ul style="list-style-type: none"> <li>Microcomputer malfunction due to noise.</li> </ul>	Check to see if noise source exists at inverter Input/Output.	Prevent noise generation. Insert a noise filter at inverter primary or secondary side.	

### Notes

- If fault lamp blinks, set RUN/STOP switch to STOP, find the cause, and turn off MCCB and MC.
- If the cause cannot be found, disconnect leads from JUSPEED-F and motor

- For any problem which cannot be corrected locally, contact your Yaskawa representative.

# JUSPEED-F S300 Ratings and Specifications

## 200V CLASS

Model CIMR-	Analog	04AS <sub>3</sub>	08AS <sub>3</sub>	15AS <sub>3</sub>	22AS <sub>3</sub> *	37AS <sub>3</sub> *	55AS <sub>3</sub> *	75AS <sub>3</sub> *
Max Motor Output		0.4kW	0.75kW	1.5kW	2.2kW	3.7kW	5.5kW	7.5kW
Rated Capacity		1kVA	1.5kVA	2.5kVA	3.5kVA	6kVA	9kVA	12kVA
Rated Current		3.0A (1.5A)**	4.5A (2.0A)**	7.5A (3.5A)**	10.5A (5.0A)**	17.5A (8.5A)**	24.0A	33.0A
Input Power Supply		3-phase or single-phase 180 to 242V 50Hz (±5%) 180 to 253V 60Hz (±5%)						
Max Output Voltage		3-phase 180 to 253V						
Control Method		Sinusoidal sine wave PWM						
Output Frequency Range		2 to 120Hz (2 to 360Hz available)						
Frequency Resolution		0.01Hz (2 to 60Hz), 0.02Hz (2 to 120Hz)						
Frequency Accuracy		±0.5%(-10 to +40°C, +14 to +104°F)						
Allowable Overload Capacity		200% for 30 seconds, 150% for 2 minutes						
Accel/Decel Time		0.1 to 30 sec (16 selections available independently of accel/decel)						
Braking		Braking by charging capacitor and discharging resistor, or D.C. injection braking for less than 2Hz(100% braking torque)						
Approx. Weight		0.8kg	1.1kg	1.3kg	-	-	-	-
Munsell Notation		7.5R <sup>3</sup> /12, dull finish						
Enclosure		Enclosed type with operator panel, enclosed-type without operator panel, built-in type						
Input Signal	Run and Stop	Command by NO contact or open collector signal Mode A or B selectable (Mode A: RUN/STOP, FWD/REV Mode B: FWD/RUN, REV/RUN)						
	Forward/Reverse Run							
	Frequency Setting	Analog: Frequency setting pot or any of 0 to 10V, 1 to 5V, 4 to 20mA selectable.						
	Multi-speed	3-step speed selected by external input signal. Frequency selectable in the range of 2 to 120Hz by variable potentiometers VR1 to VR3 on the printed board.						
	Reset	Reset command of protective function by NO contact.						
Output Signal	Frequency Synchronization Signal, During Run Signal	Open collector output V <sub>cc</sub> = 35V max, I <sub>c</sub> = 50mA max						
Protective Functions	Instantaneous Power Loss	Protective circuit functions if power loss is detected.						
	Undervoltage	Stopped at 170V or less						
	Overcurrent	Stopped by overcurrent caused by short circuit and/or ground fault before operation.						
	Overvoltage	Stopped by overvoltage when regeneration.						
Environmental Conditions	Location	Indoor (free from corrosive gases and dust)						
	Ambient Temperature	-10 to +40°C (+14 to +104°F) for enclosed type. -10 to +50 °C (+14 to +122°F) for built-in type.						
	Humidity	95% max relative (non-condensing)						
	Elevation	3300 feet max (1000 meters)						
	Vibration	0.5G max						

\*: To be released in the market soon.

\*\* : Parenthesized values are for single-phase power input.

Notes: 1. When a single-phase power supply is used, connect to terminal L1(R) and L2(S).

2. 0.1 sec. or less accel/decel time available as an option.

# JUSPEED-F S<sub>300</sub> SERIES

SMALL-CAPACITY ANALOG TRANSISTOR INVERTER  
200V CLASS, UP TO 10HP (7.5kW)

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