IMVT130G1460

TOSHIBA

INSTRUCTION

AND

MAINTENANCE

MANUAL

VT130G1 TRANSISTOR INVERTER

1.5 TO 33KVA
(1 to 30 hp)
460 VOLT
3 PHASE

MAY 89
KR

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PREFACE

This instruction manual is concerned with installation, operation, and troubleshooting procedures for the Toshiba VT 130G1 general purpose inverter. The 460V model VT130G1 is a sinusoidal wave, pulse width modulated (P.W.M.), controlled voltage inverter with sizes available from 1 to 30 horsepower.

The 460V VT130G1 may be combined with a general purpose induction motor to constitute a reliable variable speed drive system. A few of the advantages are: easy operation, automatic control capability, reversing, high efficiency, and energy savings. Before using your VT130G1, carefully read this manual and observe all precautions to ensure long trouble free service of your inverter.

The main body of this manual covers the Toshiba power unit only. This is a wall mounted NEMA I unit which will drive an A.C. motor at variable speeds. It does not include recommended peripheral equipment such as, input circuit breaker, input contactor, motor overload relay, etc. For standard built-up package units with peripheral equipment, please refer to Addendum No. 1.

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Section 1
INITIAL INSPECTION

Upon receipt of your VT130G1, a careful inspection for shipping damage should be made. After uncrating, check:

1. Whether there are any parts which might be loose, broken or separated.

2. Whether the rated capacity shown on the nameplate is the same as specified on your order.

Periodically check the operating inverter for cleanliness. Keep the cooling heatsink free of debris. Check connections (with power off) for tightness. Proper maintenance and operation will allow the inverter to give long troublefree service.

Storage

If the inverter is stored, it should be kept in a clean dry location free of temperature extremes. Storage for longer than six months without power requires reconditioning of the filter capacitor:

1. Apply bus voltage for a few seconds and check capacitor temperatures.

WARNING

Be sure charge light is out before touching any component.

2. Repeat Step 1 several times monitoring capacitor temperatures. If a capacitor gets warm, allow it to cool before repeating.

3. Capacitors are reconditioned when a constant bus voltage causes no heating.

Section 2
STANDARD SPECIFICATIONS

The standard specifications are shown in Table 1. If there are any special specifications with your order, they will be described separately.

TABLE 1 – STANDARD SPECIFICATIONS (G1 SERIES)

Applicable Motor Power (HP) MAX.		1	2	3	5	7.5	10	15	20	25	30
Model and Ratings	Model (VT130G1-	4015	4025	4035	4055	4080	4110	4160	4220	4270	4330
	Weight (pounds)	18	18	18	20	33	35.5	42	92	97	106
	Order # (38-3340	01-10	02-10	03-10	05-10	07-10	10-10	15-10	20-10	25-10	30-10
	Capacity (KVA)	1.5	2.5	3.5	5.5	8	11	16	22	27	33
	Rated Current (A)	2.5	3.7	5	8	11	15	22	30	38	45
	Max. Motor KW (4 Pole)	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22
Power Supply	Voltage Frequency	3-phase, 460V, 60 HZ									
	Allowable variation	Voltage ±10% frequency ±2HZ									
Control Specifications	*Control system*	*Sinusoidal wave PWM control*									
	Output voltage	3-phase, 460V *(maximum)*									
	Frequency accuracy	±0.5% of highest frequency (at 25°C ±10°C)									
	Voltage/Frequency ratio	0.5 to 60 HZ: V/F constant 60 to 60 HZ: V constant									
	Overload capacity	150% for 60 seconds; 110% continuous									
	Speed Reference	0 to 12 VDC or 4 to 20mA									
	Acceleration/ Deceleration Time	1 to 20 seconds (acceleration and deceleration individually adjustable)									
Operating Function	Braking	By capacitor charge									
	Starting	By dry contact (hold)									
	Forward, reverse	Reversing can be added using a dry contact or switch									
	Upper and lower speed limits	Upper and lower speed setting limits are adjustable									

Section 2

Protecting Functions	Protection	Stall prevention, overcurrent protection, shortcircuit protection, overvoltage protection, undervoltage protection, momentary power failure protection, and input fuse protection.
	Fault detection	Fault relay form-C contacts (250 VAC 1A resistive). The relay will engage when overcurrent, shortcircuit, overvoltage, or undervoltage is detected. (Reset manually or remote via a 1A contact)
	Display	- CHG. LED to indicate charge on bus. - 3 digit, 7 segment digital display. OC indicates overcurrent OP indicates overvoltage UP indicates undervoltage OH indicates overtemperature
Ambient Conditions	Location	Indoor NEMA 1 Enclosure.
	Ambient Temperature	0 to 40°C
	Relative Humidity	Less than 90%, non condensing
	Vibration	Less than 0.5 G
Construction		NEMA Type 1
Cooling		Forced Air (15 HP and above only)
Instruments installed on cover		Digital frequency meter, speed setting potentiometer (3 K ohms,0.3 W), RUN-STOP switch.

Section 3
PRINCIPLES OF OPERATION/APPLICATIONS

Most A.C. induction motors in the past have been limited to fixed speeds. The Toshiba motor drive provides a simulated (P.W.M.) A.C. that varies the speed of the motor. Toshiba's giant transistor (G-TR) is used with a microprocessor controlled regulator to accomplish the conversion.

Motor speed ratings usually show the motor base speed at 60 HZ operation. Slower speeds (below base speed) are produced by reducing both the voltage and the frequency of the output.

Figure 3-1 shows the voltage varying with the frequency until base speed (60 HZ) is reached. Above base speed, the voltage remains constant.

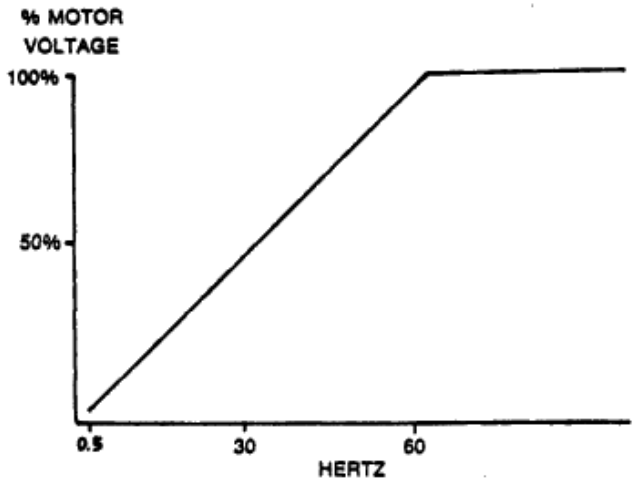


FIGURE 3-1

P.W.M. (Pulse Width Modulated) inverters change the incoming power to D.C. and then pulse the D.C. into the motor leads to simulate A.C. Figure 3-2 shows a representation of the Toshiba output voltage waveform.

An A.C. waveform is superimposed on the pulse wave for illustration.

FIGURE 3-2

Section 3

Figure 3-3 is divided into three parts; the MAIN CIRCUIT which handles the input and output power, the REGULATOR BOARD which senses input information to direct the power transistors (GTR), and the optional REGENERATIVE POWER DISCHARGE UNIT (D.B. unit).

Figure 3-3 shows a block diagram of the VT130G1 schematic.

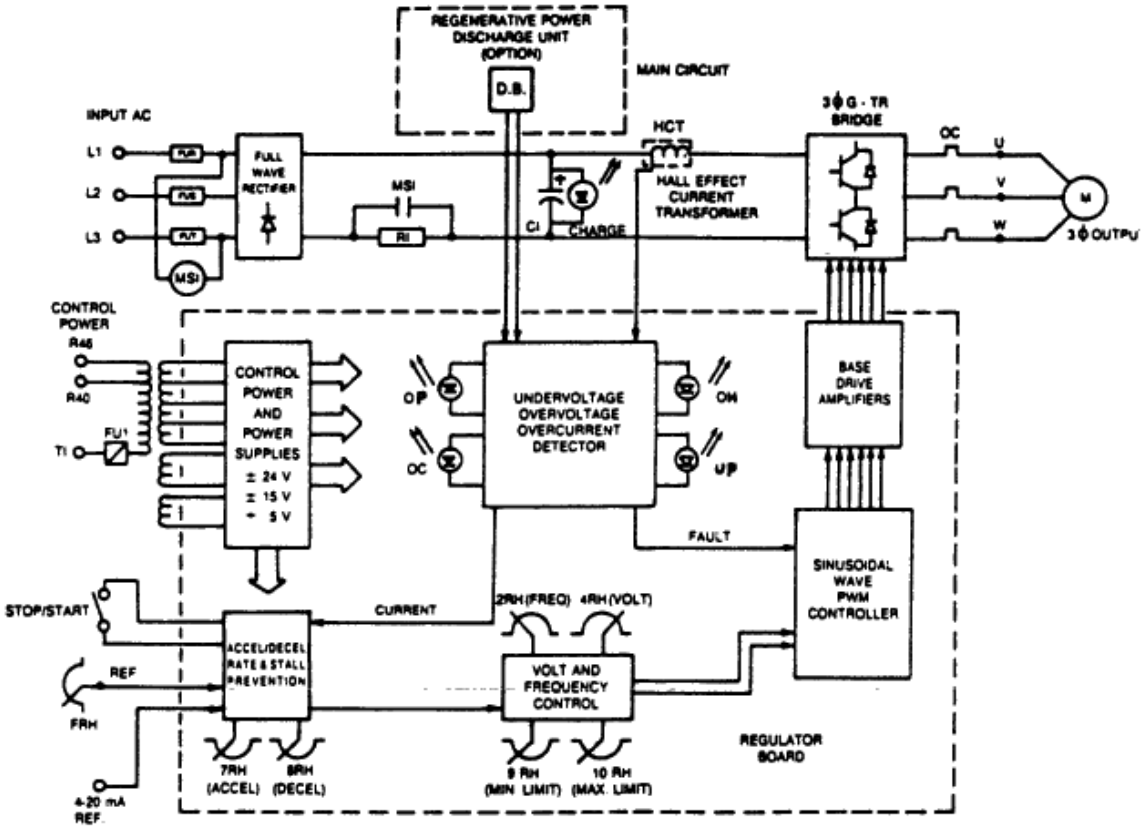


FIGURE 3-3

A. Main Circuit

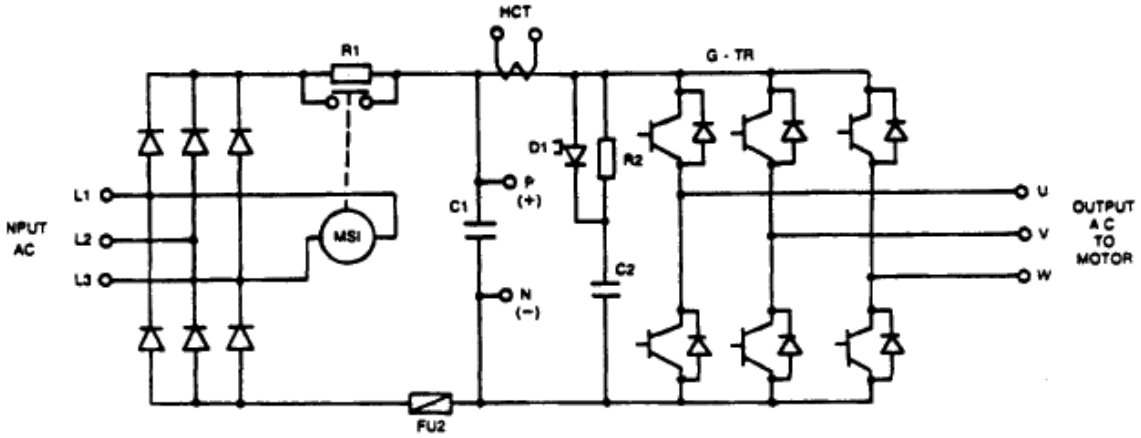


FIGURE 3-4

Incoming 3 phase A.C. line voltage is rectified to a 650V D.C. bus by the diodes in the full wave rectifier.

Input line fuses protect the main circuit from fault currents. (7.5 HP and above)

When the input is first energized, contactors MS1 working with resistor R1, provide a slow charge to filtering capacitors C1. A red LED (light emitting diode) on the base drive board turns on to indicate voltage on the bus.

A Hall-Effect D.C. current transformer (HCT) monitors bus current for the regulator board.

Output to the motor is obtained by switching the D.C. bus with the transistor (GTR) inverter. G-TR control comes from the regulator board through the base amplifiers.

Pulse width is decreased for lower RMS voltage and increased for higher voltage. Lower frequencies have a greater number of pulses in one cycle. As the frequency increases, the microprocessor selects the optimum number of pulses per waveform.

Switching of the transistors is controlled by the regulator board.

Output waveforms are illustrated in Figure 3-5.

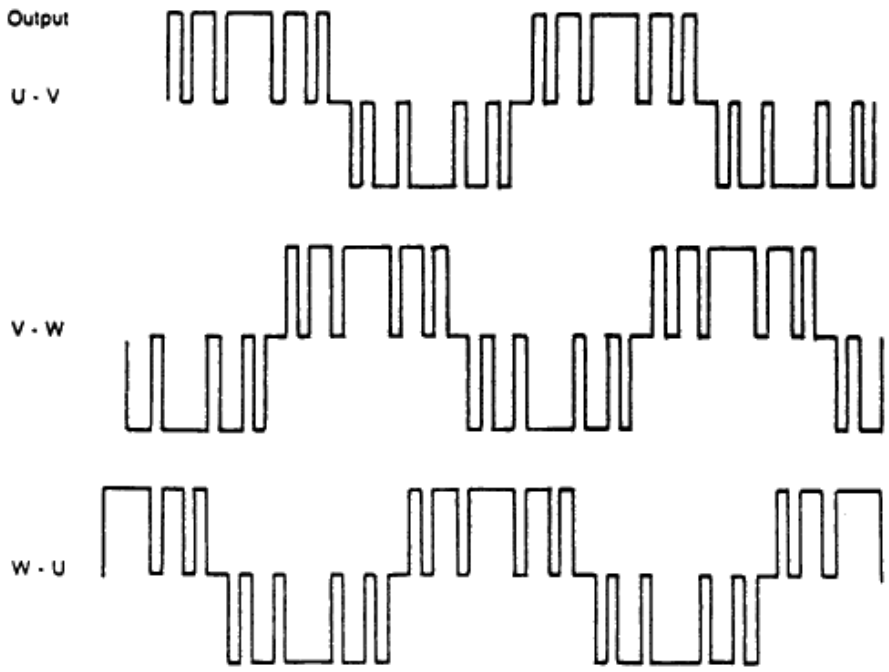


FIGURE 3-5

Proper 120° phase shift between output leads stays constant over the entire frequency range. Typical motor voltage and current at 60 hertz (full load) is shown on Figure 3-6. Note that although the voltage is in pulses, the current waveform is near sinusoidal. Voltage is leading current, typical in induction motors.

OUTPUT VOLTAGE AND CURRENT

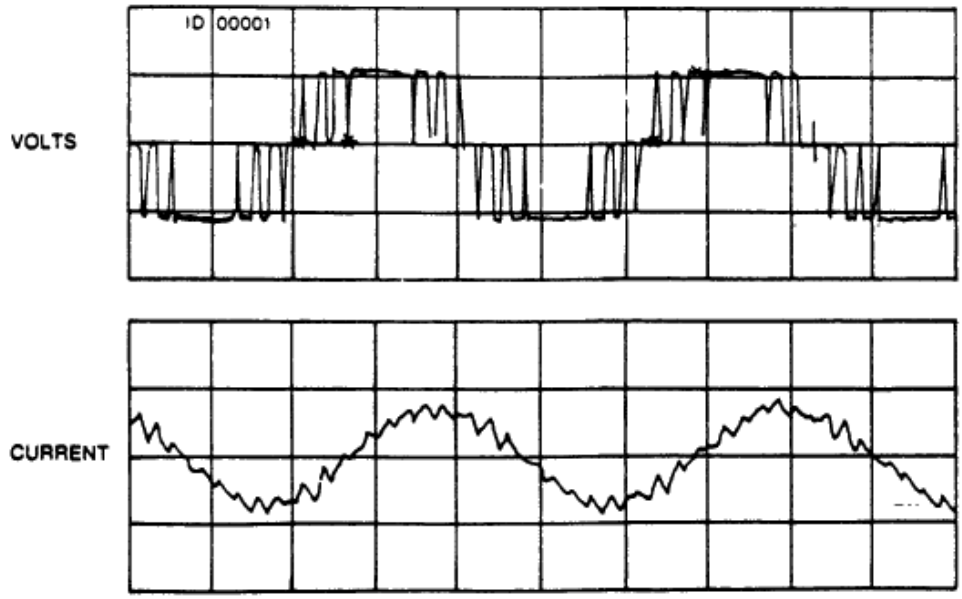


FIGURE 3-6

B. Regulator Board

Wiring diagrams at the end of this manual show a block diagram of regulator board functions and adjustments.

The regulator board accepts operator information and outputs base signals to control the G-TR's. Refer to the wiring diagrams pages 14 and 15 for the following descriptions.

The operator speed pot. (frequency setting signal) is connected to CRF, REF, and OV. 0 to 12V DC at REF controls full range output of the inverter.

A 4 to 20mA signal can be connected at IRF and OV. A contact opening the CRF wire of the speed pot. will automatically switch to this current reference. The cover mounted speed pot. comes standard with this switch.

ST (start), F (forward), and R (reverse) connected to COM controls the start/stop function and direction of inverter output.

Fault relay (contacts at FLA, FLB, and FLC) latches on if a fault occurs. Pressing the reset button or remotely resetting will reset the relay. (Remote reset use term. RST to COM)

A low speed relay may be used to detect inverter speed below 0.5 HZ. (option)

Factory adjustment provides 0.5 to 80 HZ operation. Moving jumper J3 from the 60 HZ to the 50 HZ position automatically changes maximum output to 67 HZ. Frequency range is adjustable from 0.5 HZ to 80 HZ with 1F jumpered at J2. Jumping 2F at J2 raises output frequency to 160 HZ and 4F at J2 raises output frequency to 320 HZ. Note that adjustments or changes in output frequency may require readjustment of remote frequency meter and V/HZ.

The current detector monitors bus current from the HCT. If bus current rises to 163%, stall prevention circuitry phases back both voltage and frequency until the current decreases. 190% current shuts the G-TR base drive off until current decreases. 240% current turns base drive off and latches the fault relay and OC overcurrent display.

Bus voltage is monitored on the base drive board. Fast deceleration rates can cause the bus voltage to rise when absorbing energy from the motor. If the bus voltage rises to 750V (650V normal), deceleration time is lengthened regardless of setting. At 800V, the inverter shuts down to protect filter capacitors C1 and G-TRs from damage and latches fault relay and OV display.

The microprocessor (CPU) develops base signals which are isolated and amplified by the base driver circuit. Transformer T1 provides isolated low voltage A.C. which is rectified and filtered for the base driver amplifiers.

Section 3

Applications

VT130G1 provides a high quality output voltage and current, but it is not a perfect sine wave. Therefore some increase in motor temperature, noise, and vibration may be noticed.

Special considerations must be taken when applying an inverter to an existing motor. At slower speeds, cooling is not effective due to reduced fan RPM. FULL LOAD torque at slow speeds may damage the motor due to overheating. In situations where the load requires high torque at slow speeds, the motor may require replacement with a large frame size for heat dissipation.

Figure 3-7 shows a curve plotting acceptable torque vs. speed.

Note that for a safety margin, the curve shows no more than 90% motor rated torque at any speed. If torque requirements at slow speeds continuously exceed levels shown in Figure 3-7, a larger motor can be substituted.

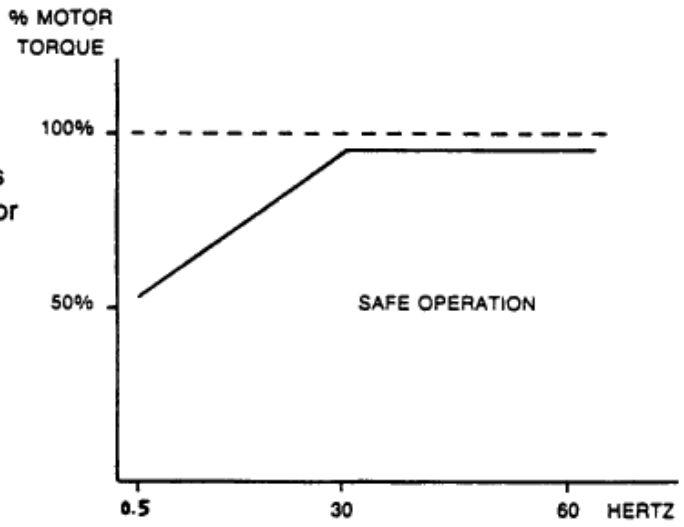


FIGURE 3-7

Fixed speed machinery may not run properly at available speed ranges. Operation above 60 HZ may damage bearings or rotating parts. Slow speeds may provide insufficient lubrication on oil filled gear boxes or speed reducers. Manufacturer specifications may need to be consulted.

The above precautions should be looked at carefully to prevent any problems. It is most often the case, however, that the motor or motors on a variable speed application can be directly applied to the VT130G1.

Section 4
INSTALLATION

(INVERTER MUST BE INSTALLED IN VERTICAL POSITION)

1. The ambient temperature must be between −10°C and 40°C (18 to 104 degrees Farenheit). If the inverter is installed inside a self-contained panel or a large control panel, there must be proper ventilation to keep the temperature between −10°C and 40°C.

2. If the ambient temperature exceeds 40°C, it is necessary to remove the upper and lower covers and the front cover. (When the inverter is installed inside an independent panel or a control panel, remove the covers for adequate ventilation.) This will improve ventilation and allow the ambient temperature rise up to 50°C, (122°F). However, this reduces the strength of the side panel and therefore, the operation panel should be left in place. (In lieu of the standard operation panel a reinforcement bar can be used.)

   Refer to page 70 for cover removal and reinforcement bar installation.

3. It is necessary for proper inverter operation to avoid high temperatures, humidity, dust, or metal particles.

4. Corrosive gas and/or liquids must be avoided.

5. Install in an area where there is no vibration or noise from other electrical equipment and where maintenance can be performed easily.

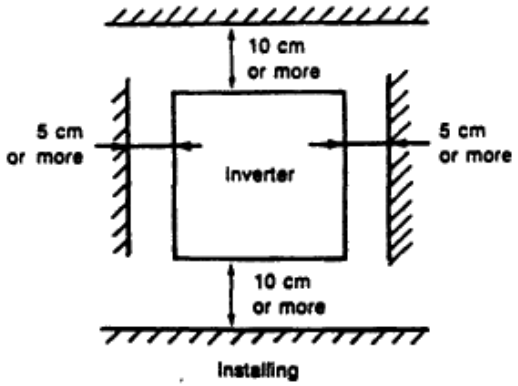


FIGURE 4-1

Section 5
WIRING

Refer to Figures 5-1 and 5-2, Standard Connection Diagram, Table 2, Standard Wire Size, and Table 3, Inverter Rating Chart and use the following instructions. When wiring the unit, the front cover of the inverter must be removed. The method of front cover removal is shown on page 68.

1. Be careful not to apply commercial voltage to output terminals (U, V, or W). This will damage the unit.

2. A surge suppressor must be connected across the excitation coil of the electro-magnetic contactor (MC) when used. Recommended surge suppressor: MARCON Electronics DCR-10A25 (or RC type, .1uf, 400V, 500Ω, ¼W).

3. Grounding wire size at terminal E must be 3.5 mm2 or greater (#10 gauge).

4. Match the power supply voltage to the control power input terminals.

5. Use shielded, twisted wires for external connections of speed reference signals (CRF, REF, IRF, OV) and also remote meter signals (FM, CM, OV).

6. Use a DC 1 mA meter for frequency and current meter. A 20 K ohms variable resistor is needed for the ammeter scale calibration.

7. Connect either F (forward) or R (reverse) terminal to ST terminal through the RUN/STOP switch. If there are two input signals from both F and R, F (forward) command will override the reverse. The DRIVE-SW (RUN-STOP) on the operation panel is connected to F (forward), therefore to perform reverse operation without switching, two of the output terminal connections (U, V, and W) must be inter-changed. If F (forward) or R (reverse) is to be controlled externally, switch the DRIVE-SW lead on the operation panel between F (forward) and R (reverse).

8. When the standard integral operation panel is included and also a remote operators station is to be used, the frequency reference signals from the integral operation panel and the remote operation panel cannot be used at the same time. In such case, disconnect the operation panel controls, or install a local/remote switch.

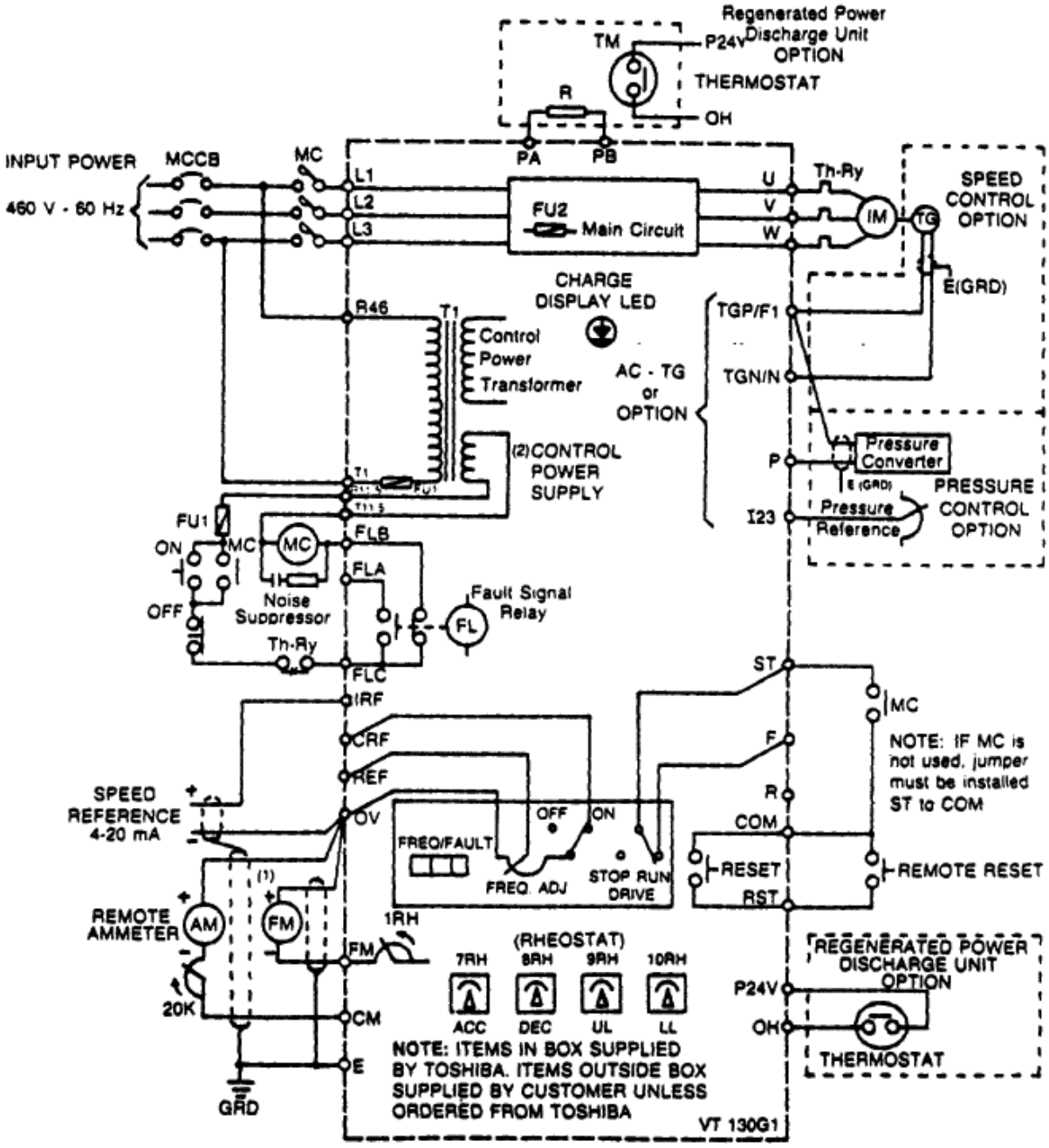
9. The 4 to 20 mA current input signal is not isolated in the inverter control circuit. Toshiba recommends that signal common not be grounded since noise problems may result.

10. CAUTION:

    If auziliary contacts of the Main Contactor are not used, an external jumper must be installed between EC1 and EC2, connect control power to the secondary of the input contactor MC. Lost of input power will cause the FREQ/Fault display to go blank. Do Not install a jumper between ST and COM on power units 7.5HP and above. This will permanently damage soft charge circuitry if EC1 and EC2 have not been wired in accordance with the Instruction Manual.

Section 5

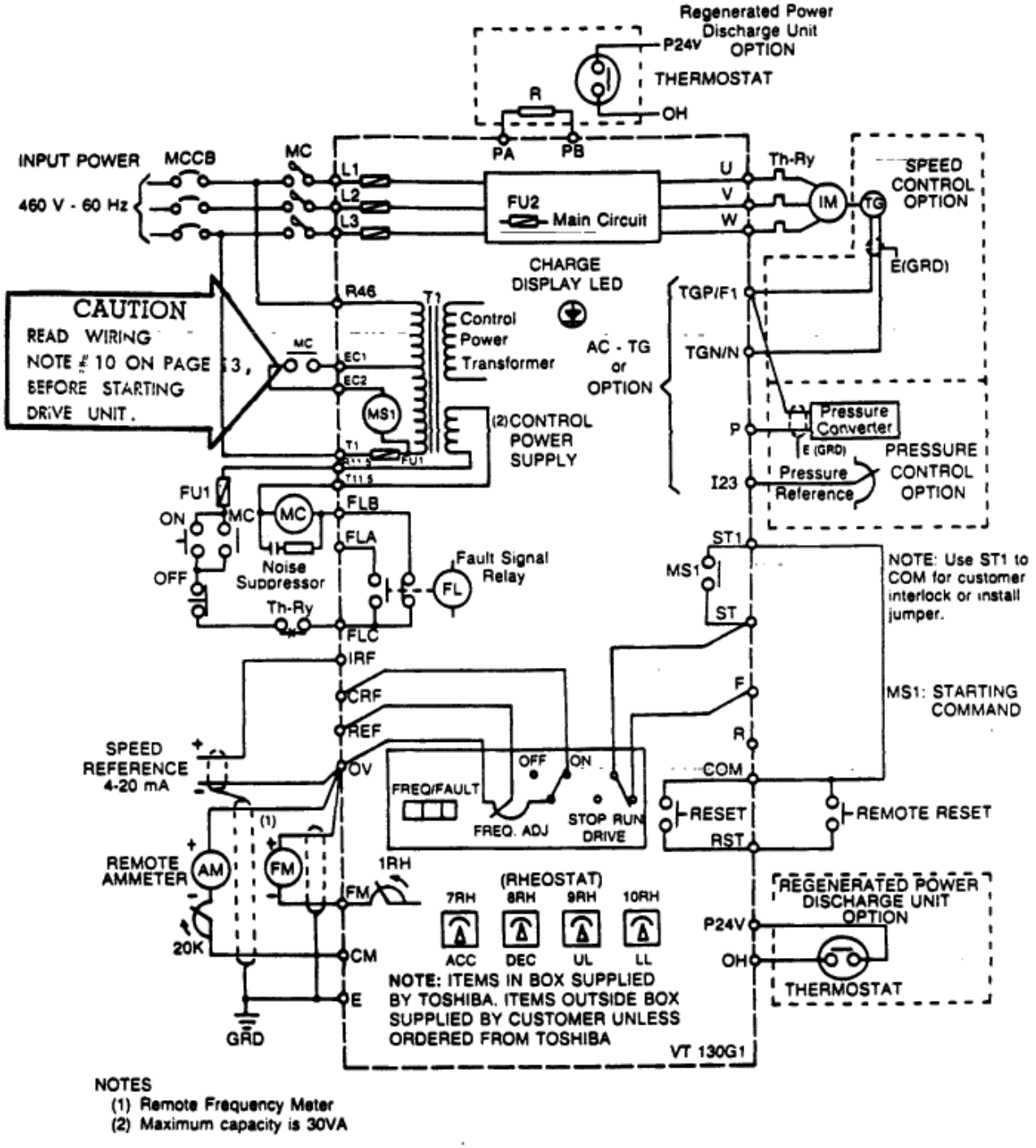
G1 SERIES



NOTES
(1) Remote Frequency Meter
(2) Maximum capacity is 30VA. Only one contactor for 5.5 KVA load can be connected to terminal R11.5 and T11.5

FIGURE 5-1 1.5~5.5KVA Standard Connection Diagram

G1 SERIES



NOTES
(1) Remote Frequency Meter
(2) Maximum capacity is 30VA

FIGURE 5-2 8~33KVA Standard Connection Diagram

Section 5

TABLE 2 – STANDARD WIRE SIZE (mm²)

Model	Main Power Input and Output to Motor	Control Power Supply AC440/460V	Speed Reference, Frequency Meter, Ammeter	Other Signal Circuits
VT130G1-4015	(2.0) #14	(2.0)#14	Three core shielding wire (speed reference) Two core shielding wire (meters) 0.3mm² or more #20	#18 (0.75)
-4025				
-4035				
-4055				
-4080	(3.5) #10			
-4110	(5.5) #8			
-4160	(8) #8			
-4220				
-4270	(14) #6			
-4330				

TABLE 3 – INVERTER RATING AND SWITCH GEAR CHART

Inverter		Applicable Motor	Molded Circuit Breaker (MCCB)	Electro-Magnetic Contactor (MC)	Overload Relay Th-Ry	AUX. Relay (Run)
Model	Capacity KVA/HP	Output (KW)	Model No.	Model No.	Model No.	Model No.
VT130G1-4015	1.5/1	0.75	MCP 0358R	C-20E	R-20E-1.8	
-4025	2.5/2	1.5			R-20E-3.6	
-4035	3.5/3	2.2	MCP 03150R		R-20E-4.2	
-4055	5.5/5	3.7			R-20E-6.6	
-4080	8/7.5	5.5			R-20E-11	
-4110	11/10	7.5	MCP 13300R	C-25E	R-35E-15	
-4160	16/15	11		C-35E	R-35E-22	
-4220	22/20	15	MCP 23480R		R-35E-28	
-4270	27/25	18.5			R-35E-35	
-4330	33/30	22	MCP331000R	C-50E	R-65E-43	

Section 5

Section 5
REQUIREMENTS/START-UP/ADJUSTMENTS

Requirements

Unless supplied in a special optional enclosure, the ESP130G1 should be installed in a area where:

1. Cabinet mounting is upright, leaving room for door clearance.
2. Ambient atmosphere is free of dust, corrosive gases, high moisture content and temperature extremes.
3. Vibration is kept to a minimum.
4. Unit should be easily accessible for maintenance and troubleshooting.

Procedures

Each ESP130G1 is shipped with wiring diagrams that show necessary interconnections. standard unit with operator controls in the door, simply requires connecting input power and output to the motor. A remote operator station and other options require more interconnections.

Terminal numbers in the standard units are shown clearly in wiring diagrams. Terminal strips are mounted at a convenient angle for easy access.

Read the following precautions before installing the inverter:

1. Signal wires, (speed pots, meters, 4 to 20 mA) should be twisted conductors and ru in separate conduit.
2. The inverter enclosure should be grounded to conform with electrical codes.
3. Noise suppressors should be attached to the coils of all relays and contactors that are added to the enclosure. RC type, Electro Cube #RG 1983-8-12 or varistor type #GE-V250PA40C (230V coil), #GE-V150PA20A (115V coil).

Prepower Checks

Before energizing power, check the following:

1. For any wiring errors or grounds.
2. Source voltage to ensure rated input voltage.

Section 5

Initial Operation

1. Initial conditions before power up:

   a) Frequency pot. (speed adjustment) should be at minimum setting.
   b) Forward/Reverse switch (if used) in forward position.

2. Energizing the input terminals will charge the DC bus in the power unit and the charge LED will come on.

3. Run the inverter without connecting motor. Make sure frequency is going up. Stop inverter and turn off the breaker.

4. Connect the motor.

5. Adjusting the speed pot. slightly CW should start the motor turning. If motor runs backwards: stop inverter, turn off power, and reverse any two output leads U, V, W to correct direction.

6. Forward/Reverse (if used) should be checked while motor is running. Engage switch to reverse, motor should stop, and reverse direction to the same speed it was running in forward.

7. Increase speed to full speed slowly, watch motor operation. Leave setting at full speed. Switch to STOP. Motor should decelerate or coast without tripping off inverter. Switch to RUN, motor should accelerate smoothly to full speed without tripping inverter.

Variable Resistors (On Power Unit Control Board)

The variable resistors are adjusted to specification at the factory and should not be touched unless necessary.

(Caution when adjusting)

1. Small-scale precision type variable resistors are used. Use a well insulated thin type minus screwdriver.

2. When the power is on, a high voltage is applied to the parts on the printed circuit board. Also, after the power is turned off, the large capacitor is charged for about five (5) minutes.

> **WARNING**
>
> **Do not touch any circuit while the CHARGE lamp is on.**

3. A digital counter and an oscilloscope are necessary for readjustment. Do not ground the instruments when connecting and keep the input impedance of the instruments over 10 K ohms.

4. When monitoring the waveform with an oscilloscope, turn off the power before connecting or disconnecting the probe.

TABLE 3-1. Description of Variable Resistor (RH)

RH No.	Symbol	Adjustment Function	When the RH Is Turned Clockwise	Adjustment At Shipment	Remarks
1RH	FM	Remote frequency meter calibration	Sweep of the frequency meter increases		
2RH	FRQ	Output frequency adjustment	Output frequency decreases	60 Hz	
3RH	V-BS	Output voltage bias (Voltage boost)	Minimum output voltage increases	—	
4RH	V-GN	Output voltage gain	V/F ratio decreases	100%	
5RH	I-BS	Current input bias	Output V and F increase	0%	4 mA input
6RH	I-GN	Current input gain	Output gain decreases	100%	20 mA input
7RH	ACC	Acceleration time adjustment	Acceleration time decreases	about 20 sec	1 ~ about 120 s
8RH	DEC	Deceleration time adjustment	Deceleration time decreases	about 20 sec	1 ~ about 120 s
9RH	UL	REF input upper limit	Limit value increases	60 Hz	
10RH	LL	REF input lower limit	Limit value increases	0 Hz	
J5 Jumper		Deceleration time control	When connected, increases decel. time to avoid O.P. trip	connected	Cut jumper when using dynamic bra-

Note: Do not touch variable resistors which are not described above.

Adjustment Procedures

The ESP-G1 Built-up Assembly is adjusted for standard 3 to 60 Hz operation. Before readjusting, determine if factory adjustment is not satisfactory. If the speed range is not correct for the motor or machine, recalibration is necessary. If inverter stalling or shut-down occurs during normal machine operation, adjustment is necessary. Table 3-2, page shows a list of adjustments and ranges.

WARNING!

Adjusting the inverter with power on requires special precautions:

All test equipment should be connected and disconnected with POWER OFF.

High voltage exists on the base driver board, all potentiometers should be adjusted with insulated handle screwdrivers.

Grounded test equipment, such as oscilloscopes, may damage the inverter.

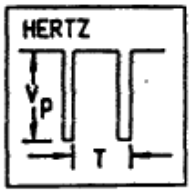
Isolate all instruments from ground before using. The D.C. bus remains charged for several minutes after power is removed.

Section 5

Table 3-2 shows a test sheet that gives test points and voltages at different speeds to aid readjustment. The following describes each test point:

TABLE 3-2

DESCRIPTION OF TEST	TEST POINT TO		0 Hz	30 Hz	60 Hz NO LOAD	60 Hz FULL LOAD	RPM 60 Hz MAX	TYPE
SPEED REFERENCE	REF	OV	0 V	6 V	12 V	—	12 V	+VDC
4-20 mA INPUT	IRF		2.04 V	5.1 V	8.16 V	8.16 V	10.2 V	+VDC
V	V		0 V	2.5 V	5 V	5 V	6.67 V	+VDC
HERTZ	OF	⊥	0 ms	.029 ms	.014 ms	—	.0109 ms	PULSE



SPEED REFERENCE — is measured at the wiper of the speed pot. at the power unit, REF to OV. 12 VDC means maximum output of the inverter.

4 to 20 mA REFERENCE is measured at terminal IRF to OV. Potentiometer 5RH adjusts for zero speed at 4 mA.

Voltage, Frequency REF is measured at test point REF to common. Factory set at the voltages shown in Table 4, potentiometer 9RH can be used to adjust desired maximum output frequency. The V/Hz ratio stays the same for proper motor operation. Potentiometer 10RH adjusts the minimum speed.

V is used to determine the V/Hz ratio. Measured at V test point to common, 5V means maximum output voltage has been reached.

HERTZ – is measured at OF test point. Hertz is a strobe pulse with a frequency 1152 times inverter output frequency. 69, 120Hz means the inverter is running 60 Hz. (This testpoint is an open collector and requires a pullup 20K ohms resistor for readouts.)

VOLTAGE BOOST – is a V/Hz adjustment at 3 RH. Output voltage at low frequencies is raised for more starting torque.

A procedure is described below for recalibrating the power unit assuming all potentiometers are misadjusted. When using an oscilloscope or frequency counter, the motor does not have to be connected.

1. **Initial Conditions** 3RH - full counter clockwise (C.C.W.), 9RH - full C.W., 10RH - full C.C.W.

2. **Set Maximum Frequency.** Run inverter. Adjust pot. 2RH for *desired* maximum speed with manual speed pot. fully clockwise. Digital frequency meter will show true output hertz.

3. **Calibrate Remote Meter.** Use 1RH pot. to set scale on optional remote meter.

4. **Adjust Volts Per Hertz.** Turn manual speed pot. to 60 Hz. Adjust 4RH pot. for 5 VDC @ test point "V" to Com.

5. **4 to 20 mA Input.** Enable auto mode. Minimum speed at 4 mA can be adjusted with pot. 5RH. Maximum speed at 20 mA can be adjusted with pot. 6RH. Pots. 5RH and 6RH interact.

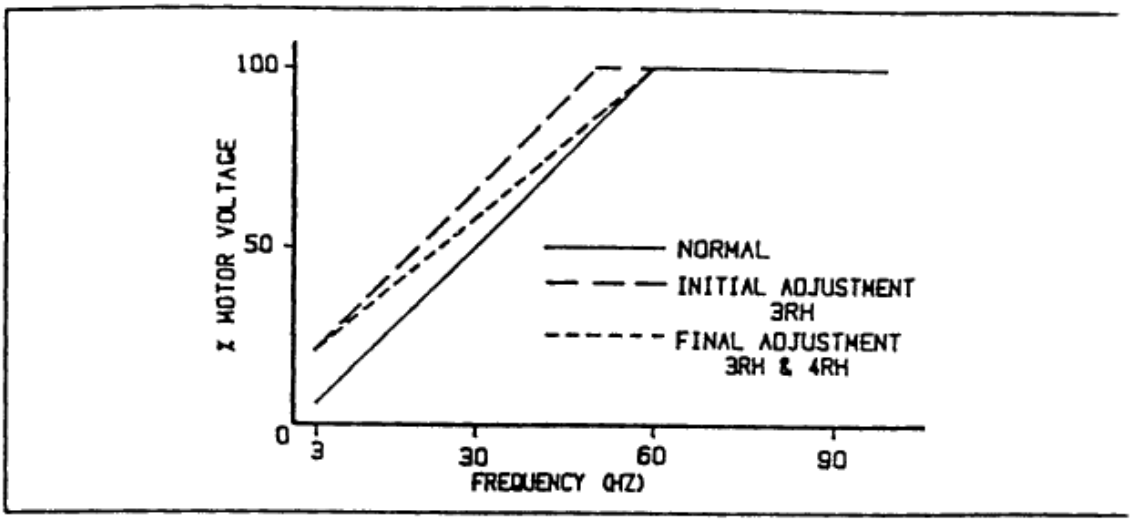


FIGURE 3-1

6. **Upper and Lower Limits** Pot. 10RH adjusts lower limit and will override minimum speed set in step 5. Pot. 9RH adjusts upper limit and will override maximum speeds set in 2 and 5.

7. **Voltage Boost** Pot. 3RH increases low speed breakaway torque. **Note:** High voltages at low frequency may burn up the motor.

8. **Overvoltage Level** factory set for safe operation. It should never be adjusted.

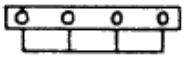
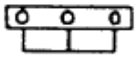
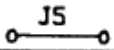
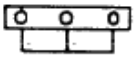
9. **Check Motor Current** at several different operating speeds after completion of adjustments. Continuous currents above the motor nameplate (rated) current may damage the motor.

Section 5

Jumper Connections

Jumpers are connected to specification at the factory and should not be changed unless necessary. The locations of jumpers are shown on **Figure 5-2, page 24.**

The function of each jumper is as follows.

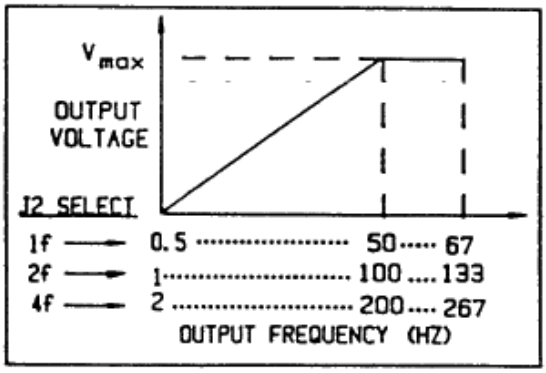
No.	Symbol on Circuit Board	Function	Connection at Shipment
J2		Ratio of output frequency can be changed. 2f...Output frequency is doubled. 4f...Output frequency is quadrupled.	1f
J3		Output frequency can be switched between 50 Hz and 60 Hz according to jumper selection.	60 Hz
J5		Disconnect when adding regenerative discharge resistor unit (option).	Connected
J13		Acceleration/Deceleration time can be changed X1 — 1 ~ about 20 sec X6 — 6 ~ about 120 sec Available in some models	X1

Note 1: Do not touch jumpers that are not described above.

Note 2: J2 and J3 jumpers —

The V/F characteristic is as follows when J2 and J3 jumpers are switched.

a) When J3 is set to 50 Hz



b) When J3 is set to 60 Hz

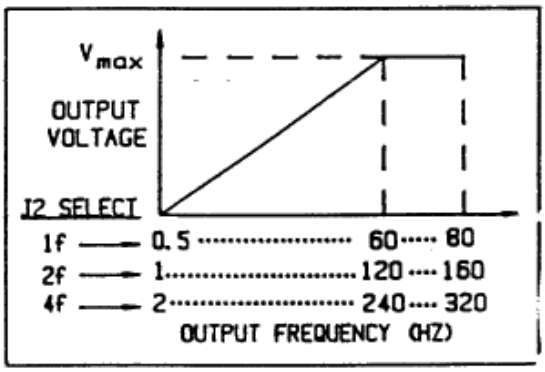
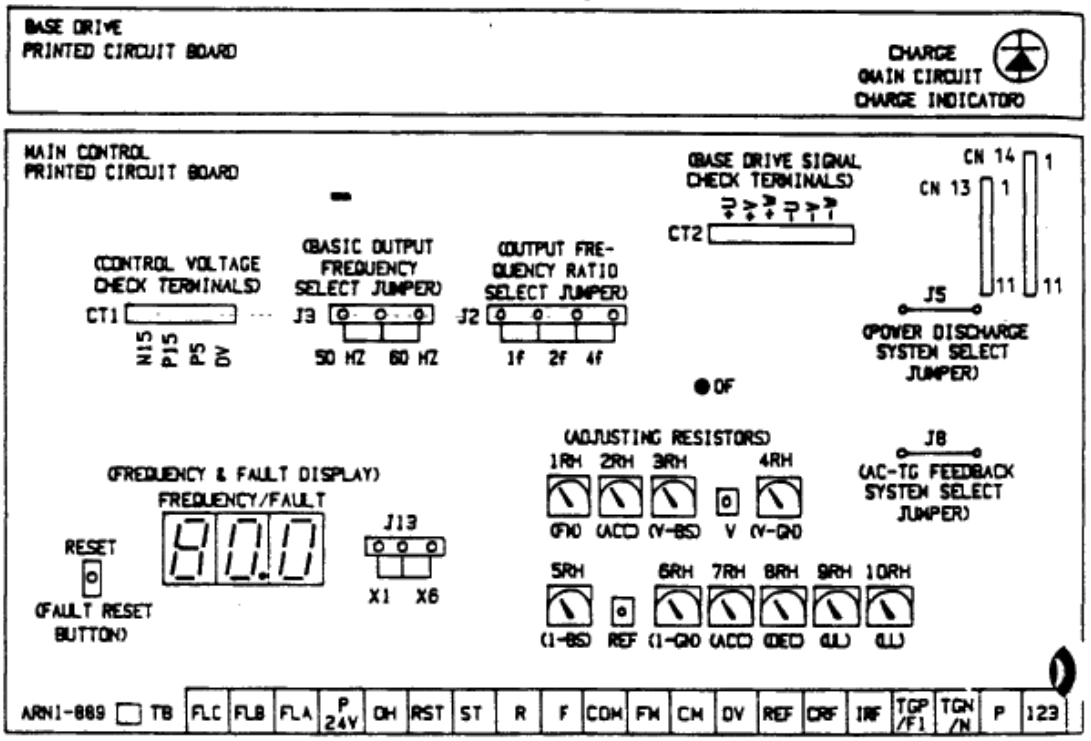


Figure 3-2 shows location of terminals, adjusting resistors, and FREQUENCY/FAULT display on the Printed Circuit Board.

FIGURE 5-2



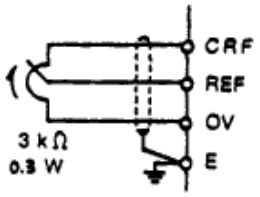
Terminal Symbol	Terminal Function
FLC	Signal Common
FLB	"Open" Output is obtained between FLB and FLC during inverter fault
FLA	"Closed" Output is obtained between FLA and FLC during inverter fault
P24V	+ 24 Volts out
OH	Overtemperature contact input. OH indication when connected to +24 V (normally "Open" contact)
RST	Fault reset input. Reset when connected to COM (Normally "open" contact)
ST	Start preparation/command input: start preparation complete when ST connected to COM, then start command complete when F or R is selected
R	Reverse operation input. Reverse operation when connected to ST
F	Forward operation input. Forward operation when connected to ST
COM	Signal common
FM	Remote frequency meter (1 mA meter between FM and OV)
CM	Remote ammeter (1 mA meter between CM and OV with 20 K calibration rheostat in series)
OV	Signal common
REF	External frequency reference input (0 - 12 VDC)
CRF	Power supply output to external frequency setting device
IRF	Current loop input (4 - 20 mA between IRF and OV)
TGP/FI	TG feedback signal (TGP - TGN) (option)
TGN/N	Pressure converter output (F1 - N) (option)
P	Pressure converter power supply (option)
123	Pressure converter set point input (option)

Section 6
OPERATION AND CONNECTION EXAMPLES

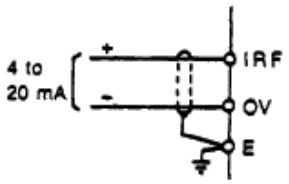
1. Connection of remote speed reference signals.

   a) With variable resistor (3 KΩ pot.)

   NOTE: Disconnect the cover mounted speed pot. from terminals CRF, REF, and OV.

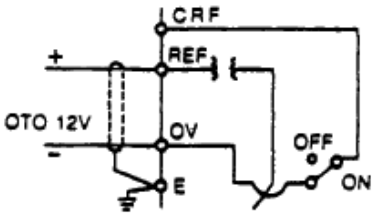


   b) With current input.



   c) With voltage input.

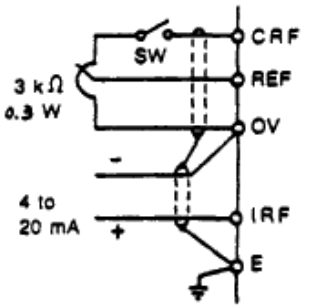
   NOTE: Disconnect REF lead from cover mounted pot and turn pot on. Motor speed will follow your 0 to 12 V input signal.



   d) Switching between variable resistor and current input.

   SW-ON: Variable resistor is selected.

   SW-OFF: 4 to 20 mA current is selected.

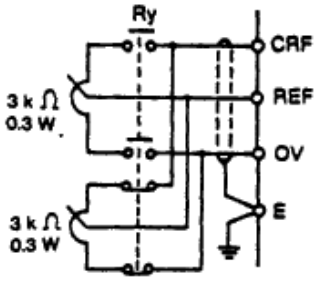


   NOTE: The variable resistor is to be mounted with a switch (SW). 4 to 20 mA current input is selected when the switch is turned off. Use a 20 mA current rated switch. For local/remote operation, the standard cover mounted speed pot has an integral switch which will allow the 4-20mA signal to control the motor SPEED when the pot is in the OFF position.

Section 6

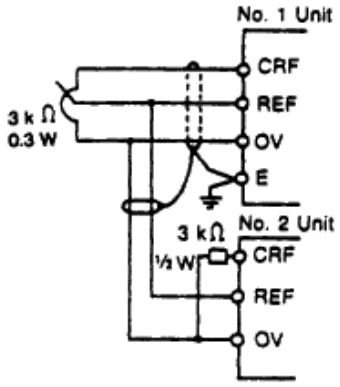
e) Switching between two or more variable resistors:

Two or more pots are set at different frequencies and selected. Use small current rated relay for selection.. Disconnect the door mounted pot from terminals CRF, REF, and OV



f) Multiple inverter cascading with one setting device:

Connect 3 K ohm ½ w resistor between CRF and OV terminal of each slave unit. Disconnect the door mounted pots on all units.

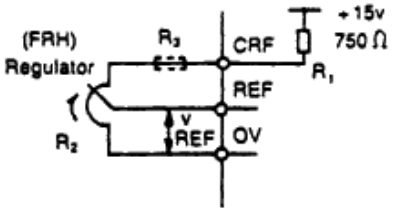


g) Multiple inverter cascading from one process signal:

4 to 20 mA input signal cannot be used. Use voltage (0 to 12v) signal only into all inverters. Turn door mounted speed pots into OFF position.

h) Selection of a variable resistor other than 3 kΩ for speed setting.

(3 kΩ variable resistor is furnished on inverter door)



A 750Ω fixed resistor is to be used as R1 in the inverter unit so that the REF value (V_{REF}) is between 0 and 12V when regulator R2 is 3 kΩ and the voltage (V_{REF}) is divided by R1 and R2.

If the resistance value of the regulator is to be changed, a compensation resistor R3 is required.

Obtain the compensation resistance R3 by substituting the value of the generator (R2) in the following equation.

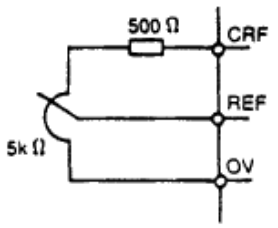
$$V_{REF} = \frac{15\ V \times R_2}{750\,\Omega + R_2 + R3} = 12\ V$$

$$R_3 = \frac{3 \times R_2 - 9000}{12}\ (\Omega) \qquad \text{where } \underline{5\ k\Omega > R_2 > 3\ k\Omega}$$

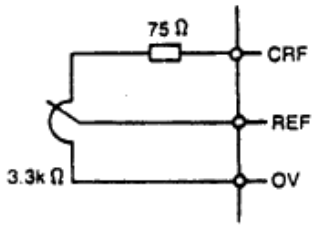
If a fixed resistor cannot be selected because R3 is not a round number, change R2 or use a variable resistor for R3.

Selection examples:

<f – 1> When using a 5 k ohms variable resistor



<f – 2> When using a 3.3 k ohms variable resistor

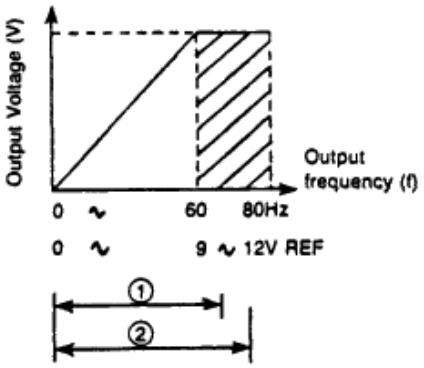


Note: If the regulator is less than 3 k ohms, REF voltage becomes less than 0 to 12 V and the maximum inverter output frequency decreases. Therefore R3 must be greater than 3 k ohms. However, if V/F characteristic between 9 and 12 V (shaded area) is not required, a regulator between 1.2 and 3 k ohms can be used.

Examples:

1) When 1.5 k ohms
   V_{REF}: 0 to 10 V variable
   Output frequency: 0 to 66.7 Hz

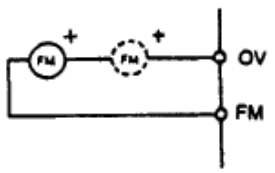
2) When 2.5 k ohms
   V_{REF}: 0 to 11.5 variable
   Output frequency: 0 to 76.7 Hz



2. Connection of remote frequency meter and ammeter.

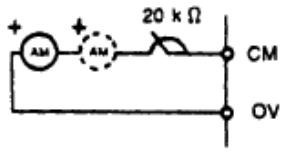
   a) Connection of remote frequency meter (FM)

- When the operating frequency is to be displayed externally in addition to the digital display on the unit, use DC1 mA meter.
- When using multiple meters, connect meters with the same rating in series.



b) Connection of remote ammeter (AM)

- Use DC 1 mA meter
- Use a 20 K ohms variable resistor for the scale calibration.
- When using multiple meters, connect meters with the same rating in series.



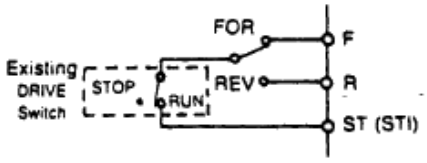
3. Connection of run signals (forward, reverse)

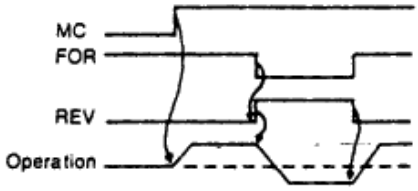
a) When operating in one direction only

- Connect ST terminal directly to either F (forward) or R (reverse) terminal with jumper.
- Connection must be made by customer between COM and ST on all 1.5 to 5.5KVA units and between STI and COM on all 8 to 33KVA units. Solid jumper gives programmed STOP. MC interlock gives choice of coast or programmed STOP.

b) When operating in both directions

- Use FOR - REV switch as below. (1)



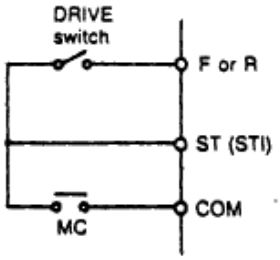


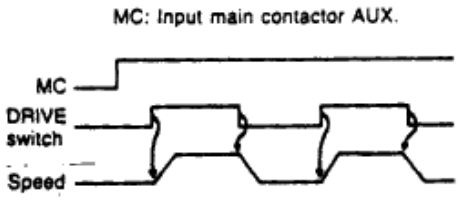
Note: If both F (forward) and R (reverse) operating signals are connected at the same time, F (forward) command will override.

(1) Use single pole, double throw, toggle switch rated for 24V DC.

c) Acceleration and deceleration

- Connect DRIVE switch and MC AUX as below.



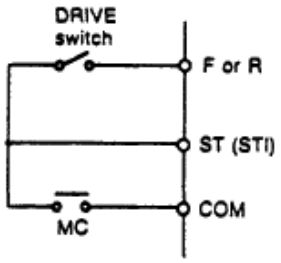


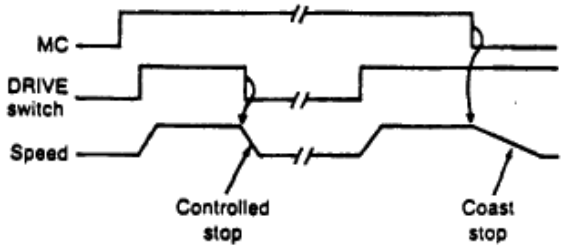
Inverter output frequency changes according to the preset acceleration and deceleration rates when unit is started or stopped.

Note: If acceleration/deceleration is performed with a short preset rate and high inertia, OC (over current), or over voltage/potential (OP) protection circuit may be activated. If the fault signal relay is activated, check the cause and take necessary action such as increasing the accel/decel rates.

d) Motor coast stop and controlled stop

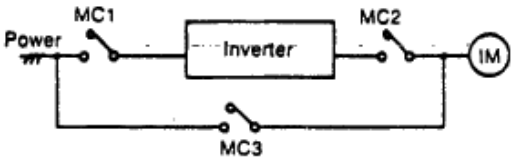
Coast stop or controlled stop is determined by the input signal to ST or STI terminal. Opening MC AUX. gives coast stop, otherwise unit will go through controlled (programmed) stop.



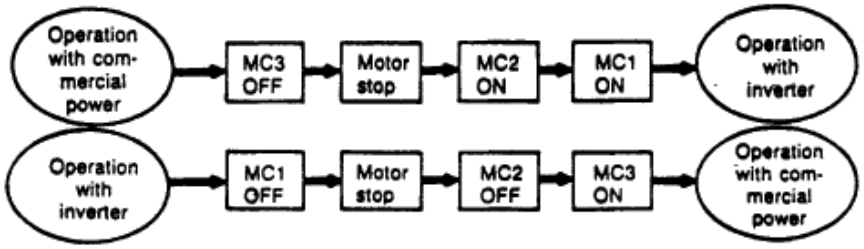


4. Switching between commercial power source and inverter output. (Bypass)

- MC2 must be provided in order to protect the transistors in the inverter unit from damage.
- MC2 and MC3 must be equipped with mechanical interlock (reversing contactors).
- Protection circuit may be activated when switching from commercial power to inverter while the motor is spinning.

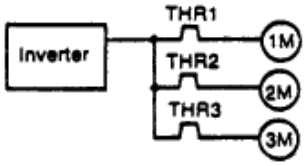


Switching sequence



5. Parallel motor operation

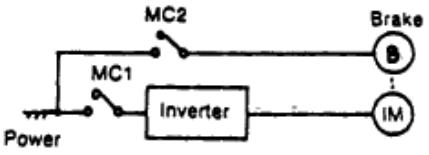
- The total current of the motors must not exceed the rated current of the inverter.
- Add a thermal relay for each motor for overload protection.



Section 6

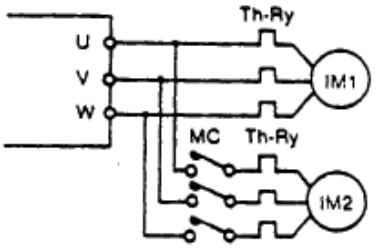
6. Using brake with motor

   - Connect brake power from the inverter input line.
   - Use brake with mechanical interlock so that operation sequence is: MC1 OFF first then MC2 ON.



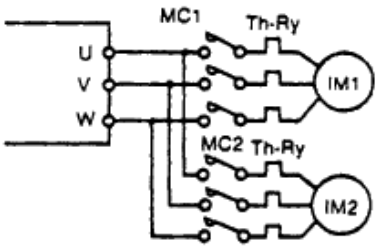
7. Additional motor operation

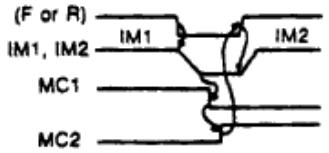
   - This is the method for starting one or more additional motors during inverter operation.
   - Both the curent of running motor and the initial starting current in-rush of the additional motor flow through the inverter. Inverter rating must be greater than this total current. The overcurrent protection circuit may be activated if the capacity of the inverter is not sufficient.
   - Please contact your dealer when you want this operation.



8. Method of switching inverter output between motors.

   - This is the method for switching from an operating motor to a non-operating motor.
   - Switching procedure:
     Turn off the run signal (F or R) and after the motor stops, turn off MC1, turn on MC2, and then turn on the run signal.
   - If the switching is made before the motor stops, the overcurrent protection circuit may be activated.





9. Replacing VF PACK-S or TOSVERT-130G with TOSVERT-130G1:
   Except for differences in overall dimensions, the basic functions are compatible with previous models of VF PACK-S and TOSVERT-130G.

   However, if the "LOW" terminal on the previous model was used, it can be compensated for by adding the low speed indicator option.

   Please contact your dealer.

Section 7
OPERATION

1. Pre-operation checkoff:

   Check the following before starting unit.

   - Check that all wiring is correct.
   - Check power supply voltage.
   - Check that control power transformer terminals are connected to the correct voltages.
   - Check that there is no short-circuit.
   - Check that terminal screws and connectors are tight.

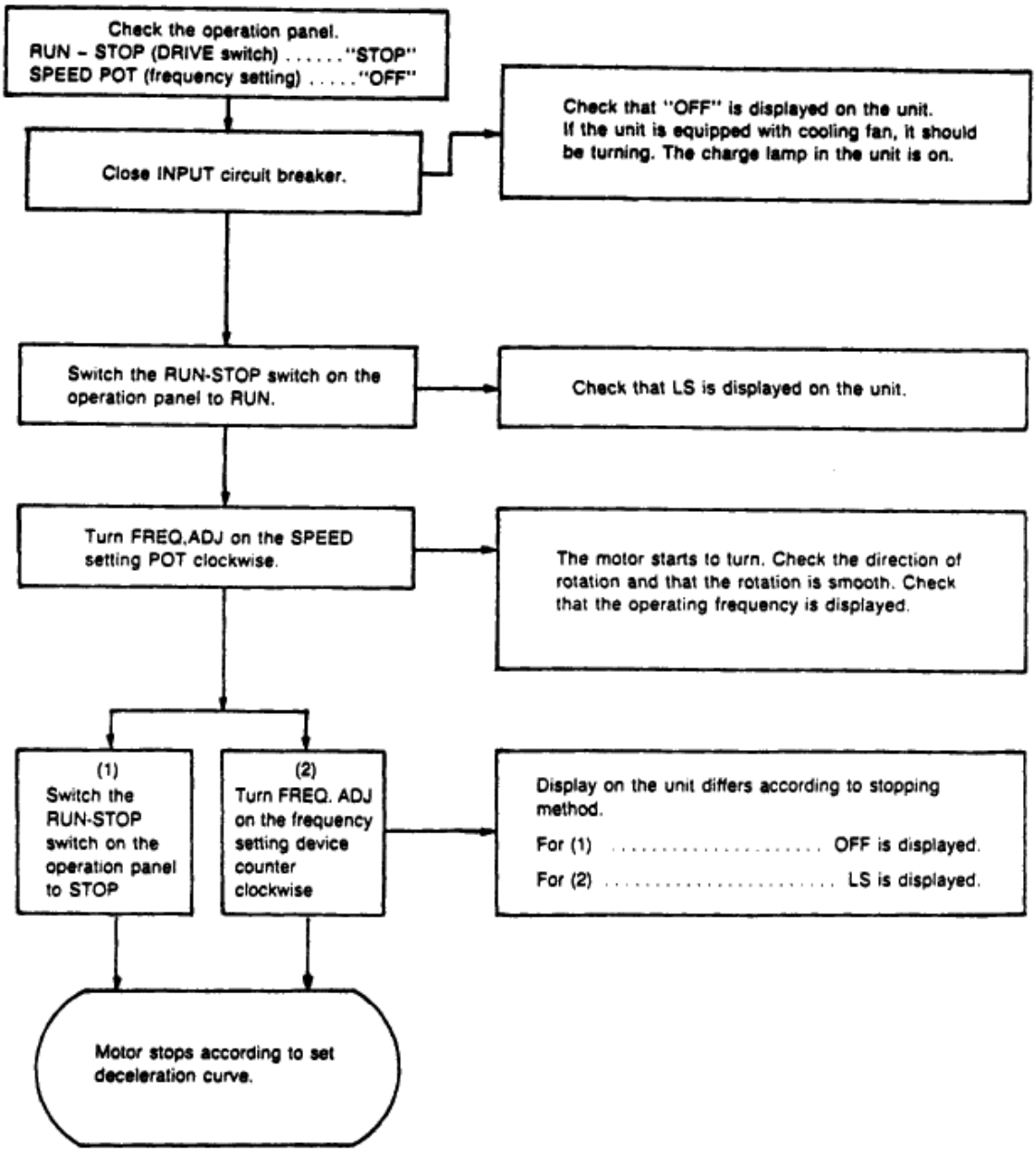
2. Pre-operation adjustments:

   This inverter can be adjusted according to usage and load. Refer to section 5 (Adjustments) and make the proper adjustments.

3. Operation procedure:

   Refer to the standard connection diagram (Pages 14 and 15) and perform the following:

Section 7



NOTE: Check the F or R command when performing reversible (forward - reverse) operation.

- The motor should be accelerated and decelerated slowly to determine that the motor and the mounting base do not vibrate abnormally.

4. Frequency and fault indicator:

Operating status and fault status are displayed by the three-digit seven-segment LCD on the printed circuit board.

TABLE 6

Display Item	Display Condition and Content	Display Example
Output Frequency	When J2 Jumper is 1f. Displayed with one decimal digit. 0.5 to 80.0.	80.0
	When J2 Jumper is 2f. No decimal display. 1 to 160.	160
	When J2 Jumper is 4f. No decimal display. 2 to 320.	320
STOP Display	When operation signal F (forward) or R (reverse) is not input or when DRIVE-SW on the operation panel is STOP, OFF is displayed.	OFF
	When operation signal is complete and SPEED input signal is less than minimum frequency or when DRIVE-SW on the operation panel is in RUN and SPEED input is 0, LS is displayed.	LS
Fault Display	UP will flicker when insufficient input voltage is sensed.	UP
	OP will flicker when over voltage is sensed.	OP
	OC will flicker when over current is sensed.	OC
	OH will flicker when overtemperature is sensed. (15 HP and Larger.)	OH

When a protection circuit is activated and there is a flicker display, turn off the power and eliminate the cause of the fault and restart.

For details, refer to section "FAULT DETECTION AND REPAIR."

SECTION 8
ADJUSTMENTS

Pages 35 - 38 deleted 4-21-88.
See pages 18 - 24 for ADJUSTMENT DETAILS.

SECTION 9
OPTIONS

Pages 39 - 50 deleted 4-21-88.
Consult factory for OPTION DETAILS.

Section 10
MAINTENANCE

Check the following items monthly.

Before performing inspection, be sure to open the input circuit breaker (MCCB). Wait for at least 5 minutes, and check that the "CHARGE" lamp is "OFF" and then start inspection. The "CHARGE" lamp being "ON" indicates that the inverter unit is still energized by the main capacitor.

1. Check for loose wiring at terminals and damaged wires.

2. Check that the vents are not clogged by dust or debris.

3. Check that there is no dust on the printed wiring board and inside the unit.

4. If the inverter unit has been unused for a long period, turn on the power at least once every six months to check its operation. The protection against dust, corrosive gas, high temperature, and excessive humidity must be continued during any unused period. Periodic inspection is required.

5. Do not allow excessive vibration of the unit since damage may occur.

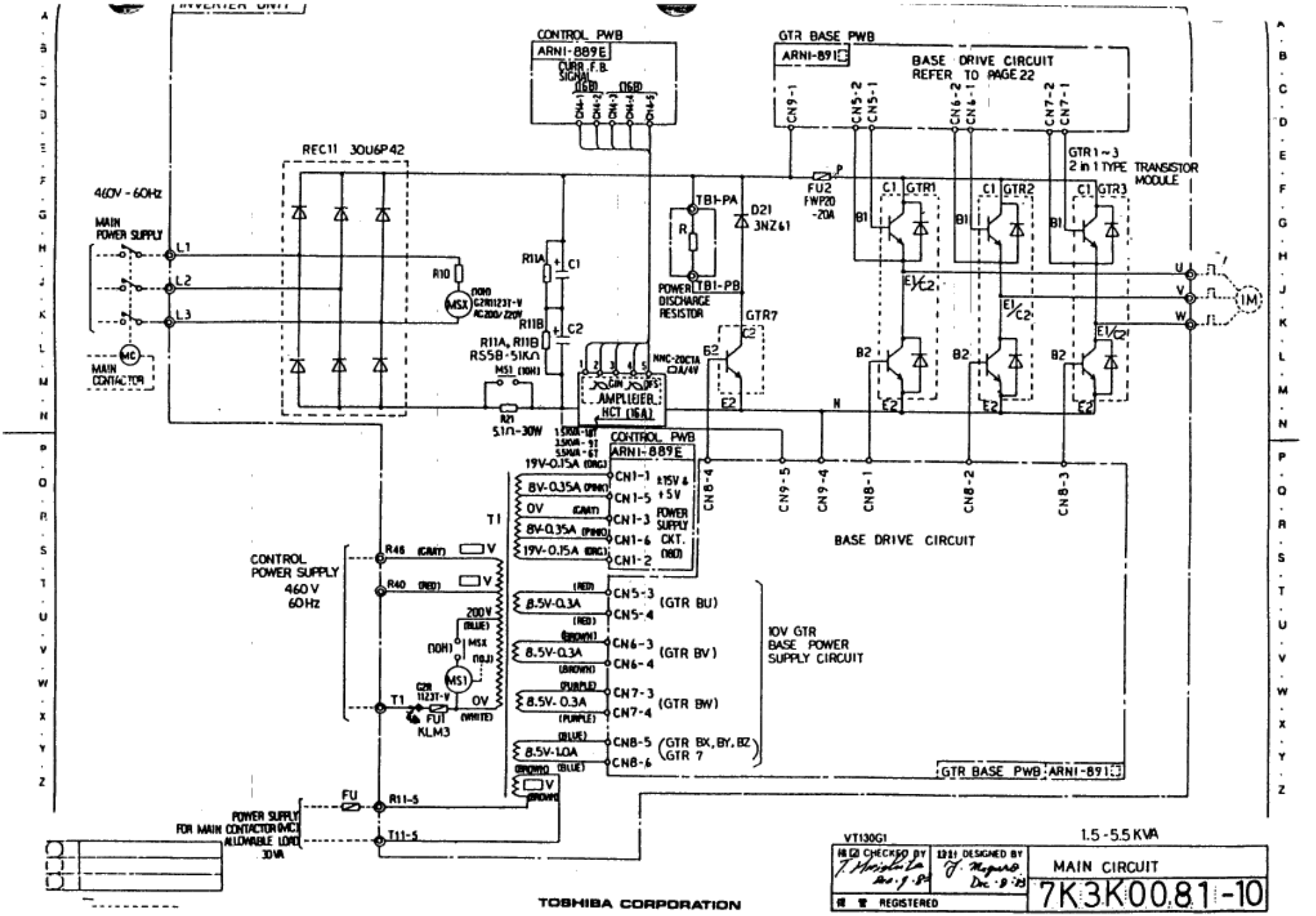
6. If necessary, perform megger test only for main circuit terminals with a DC 500 V megger.

   Note: Perform megger test with the terminals shorted. Do not test the terminals on the printed circuit board with a megger.

7. Measuring instruments

   Measuring instruments may not show the correct measurements because of the PWM output wave forms. Use the following instruments at the specified locations.

Measurement	Instrument type	Location
Output voltage	Rectifier type analog voltmeter	Output terminals U, V, W
Current	Moving-iron type + CT	Each phase of motor and inverter
Power	Electrodynamometer type	Input to inverter

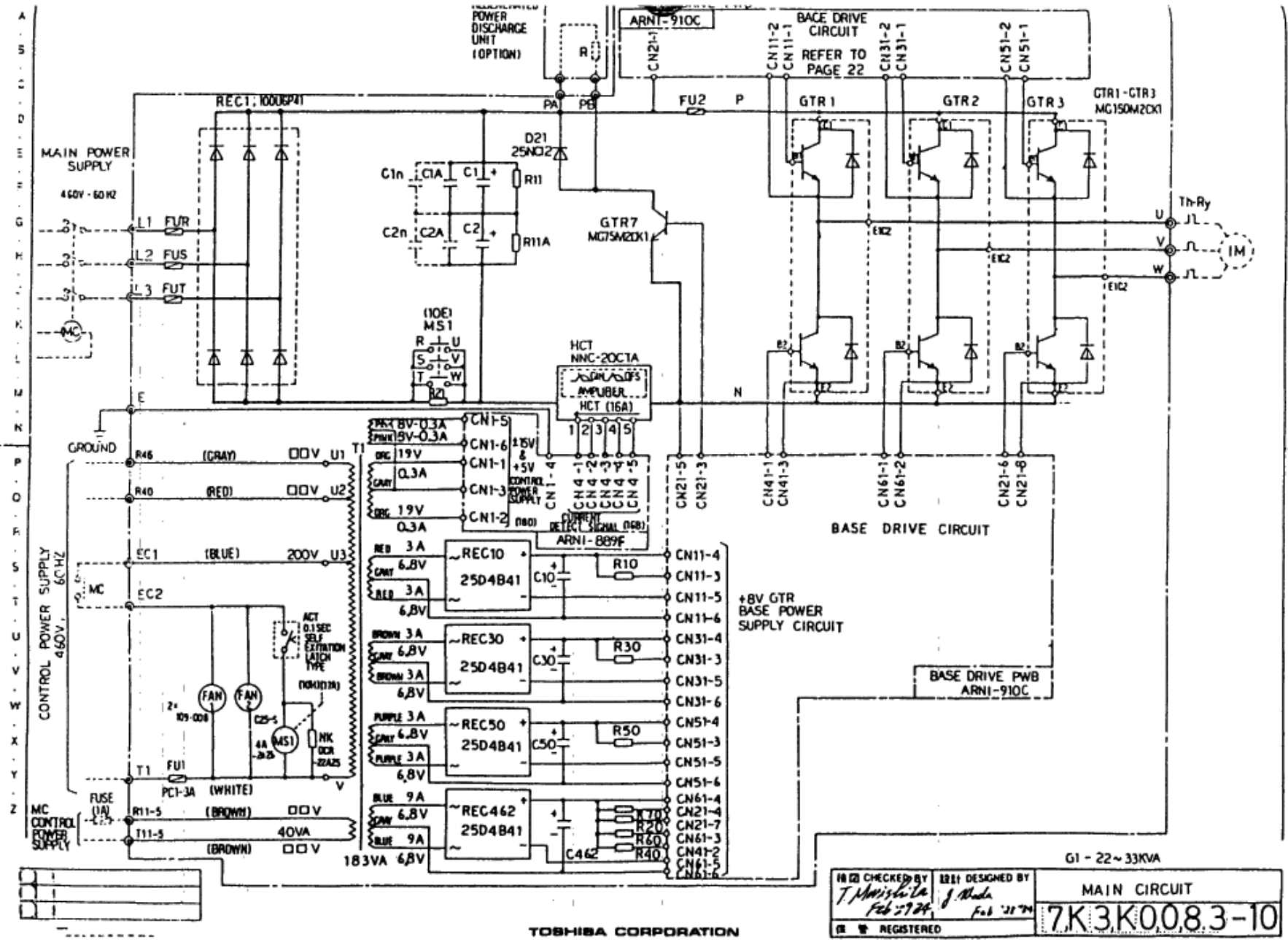


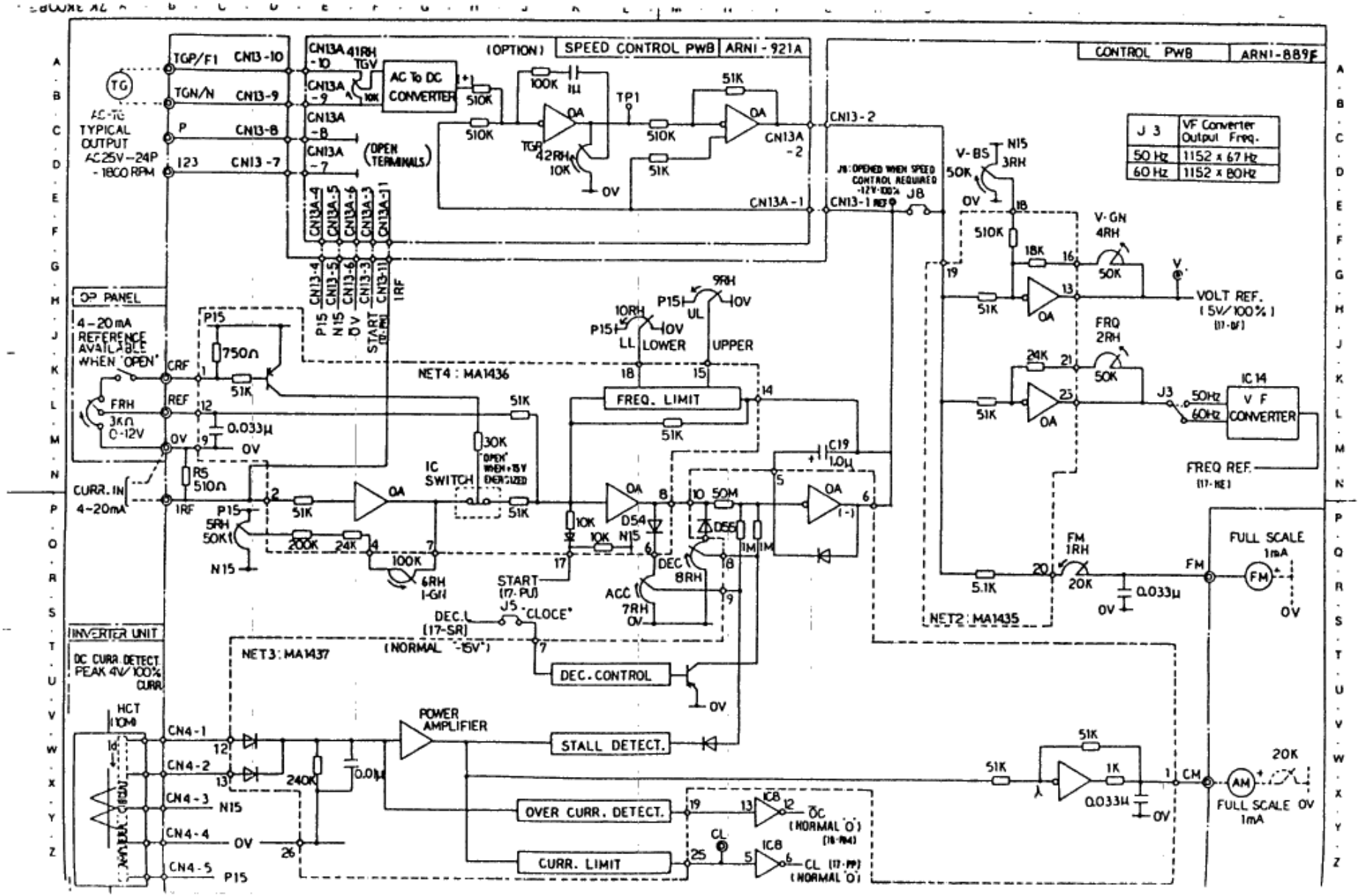
TOSHIBA CORPORATION

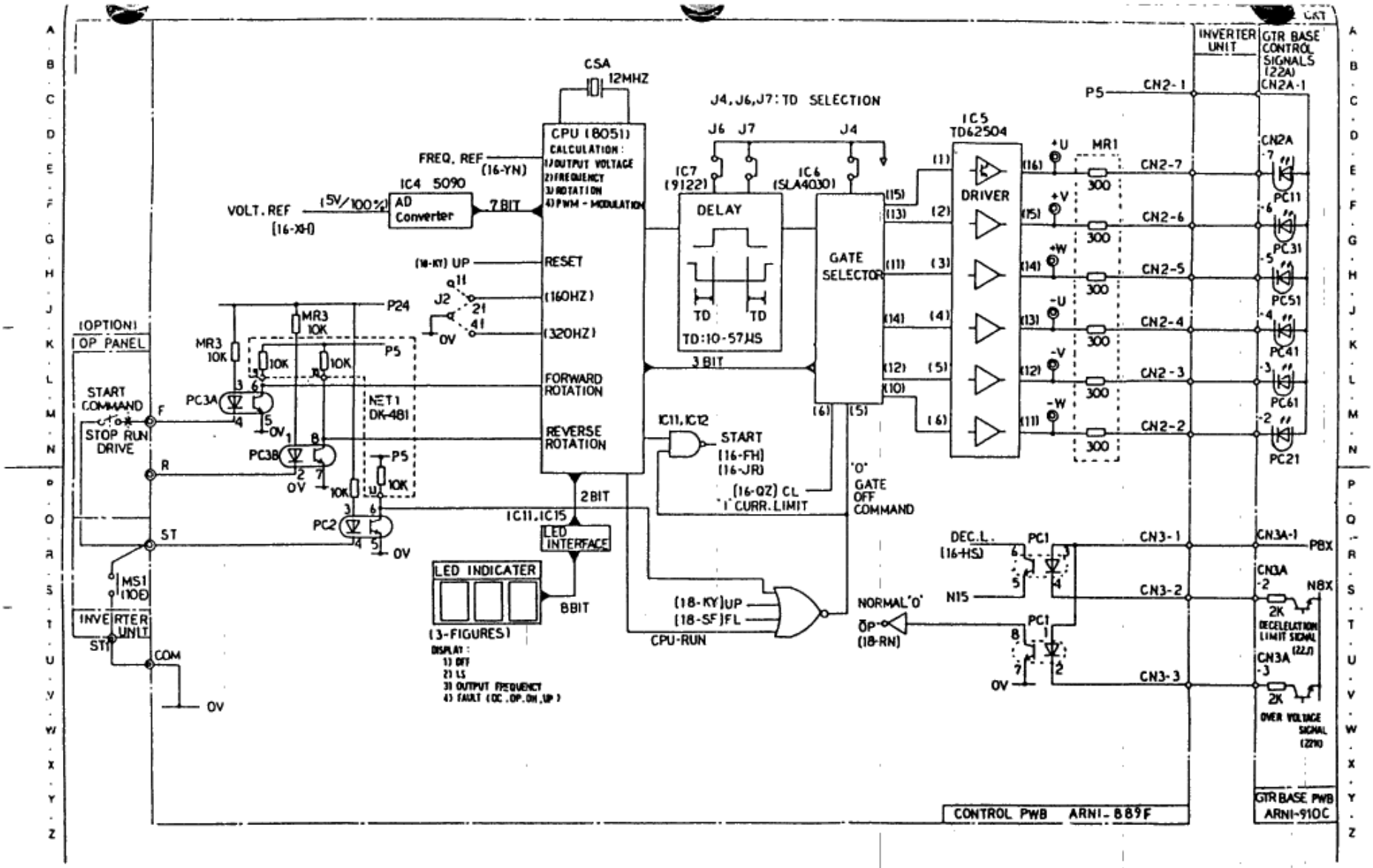
VT130G1

1.5 - 5.5 KVA

CHECKED BY	DESIGNED BY	MAIN CIRCUIT
REGISTERED		7K3K0081-10

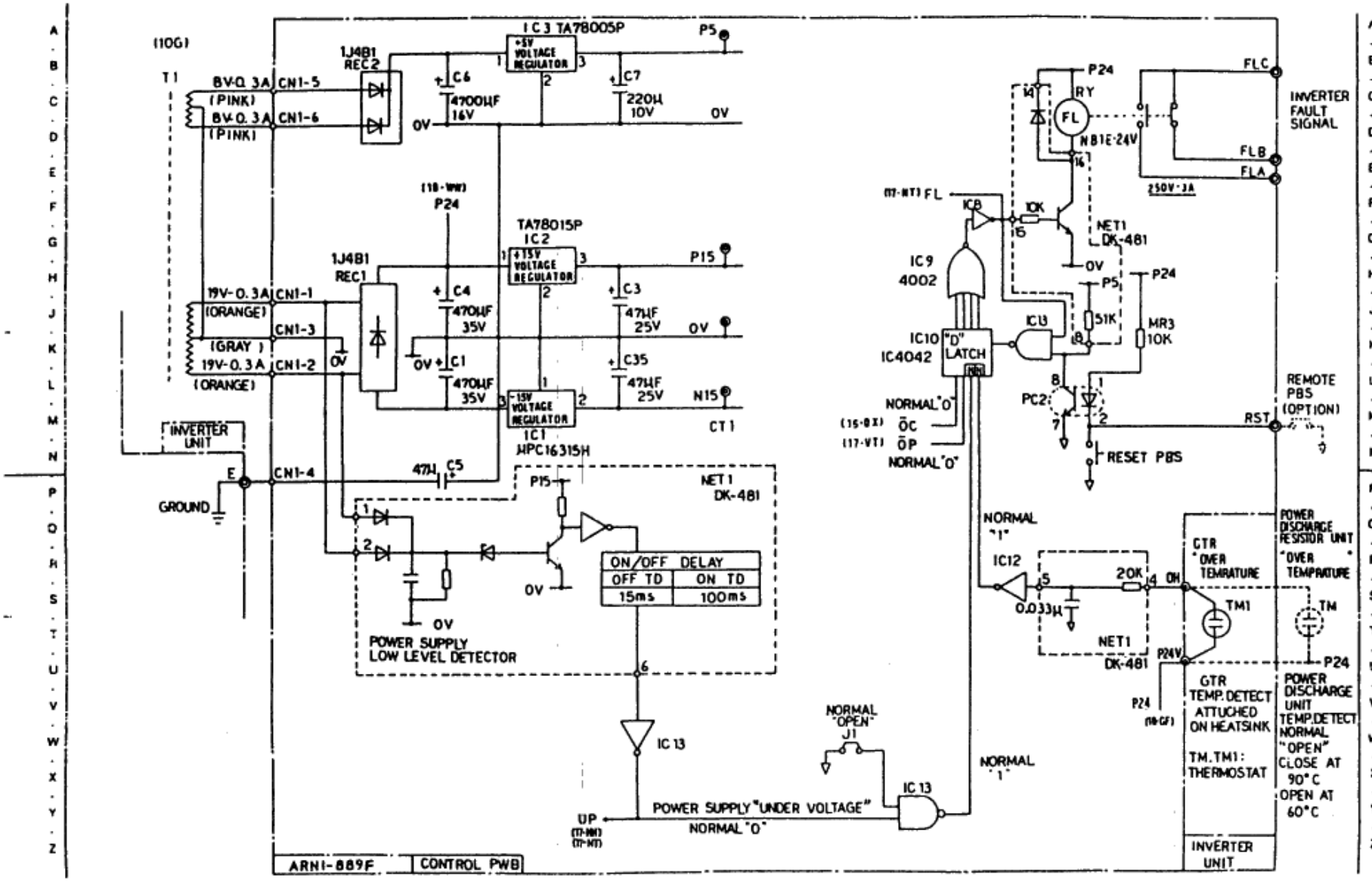

POWER DISCHARGE UNIT (OPTION)
ARNI-910C
BASE DRIVE CIRCUIT
REFER TO PAGE 22
REC1: 100D6P41
MAIN POWER SUPPLY
460V - 60HZ
L1 FUR
L2 FUS
L3 FUT
MC
D21 2SN02
C1n C1A C1
C2n C2A C2
R11
R11A
GTR7 MG75M2DK1
GTR1
GTR2
GTR3
GTR1-GTR3 MG150M2CK1
FU2
P
PA
PB
R
U
V
W
Th-Ry
IM
(10E) MS1
HCT NNC-20C1A
HCT (16A)
AMPERE
N
E
GROUND
R46 (GRAY) 0V U1
R40 (RED) 0V U2
EC1 (BLUE) 200V U3
EC2
T1
FU1 PC1-3A (WHITE)
CONTROL POWER SUPPLY 60HZ 460V
FAN
MS1
ACT 0.1SEC SELF EXTINTION LATCH TYPE
MC CONTROL POWER SUPPLY
FUSE (1A)
R11-5 (BROWN) 0V
T11-5 40VA (BROWN) 0V
183VA
CN1-5
CN1-6
CN1-1
CN1-3
CN1-2
15V & +5V CONTROL POWER SUPPLY
CURRENT DETECT SIGNAL (DSB)
ARNI-889F
REC10 25D4B41
REC30 25D4B41
REC50 25D4B41
REC462 25D4B41
C10
C30
C50
C462
R10
R30
R50
R70
R20
R60
R40
CN11-4
CN11-3
CN11-5
CN11-6
CN31-4
CN31-3
CN31-5
CN31-6
CN51-4
CN51-3
CN51-5
CN51-6
CN61-4
CN21-4
CN21-7
CN61-3
CN41-2
CN61-5
CN61-6
+8V GTR BASE POWER SUPPLY CIRCUIT
BASE DRIVE CIRCUIT
BASE DRIVE PWB ARNI-910C
G1 - 22~33KVA
CHECKED BY T. Mishida Feb '74
DESIGNED BY J. Maeda Feb '74
REGISTERED
MAIN CIRCUIT
7K3K008.3-10
TOSHIBA CORPORATION

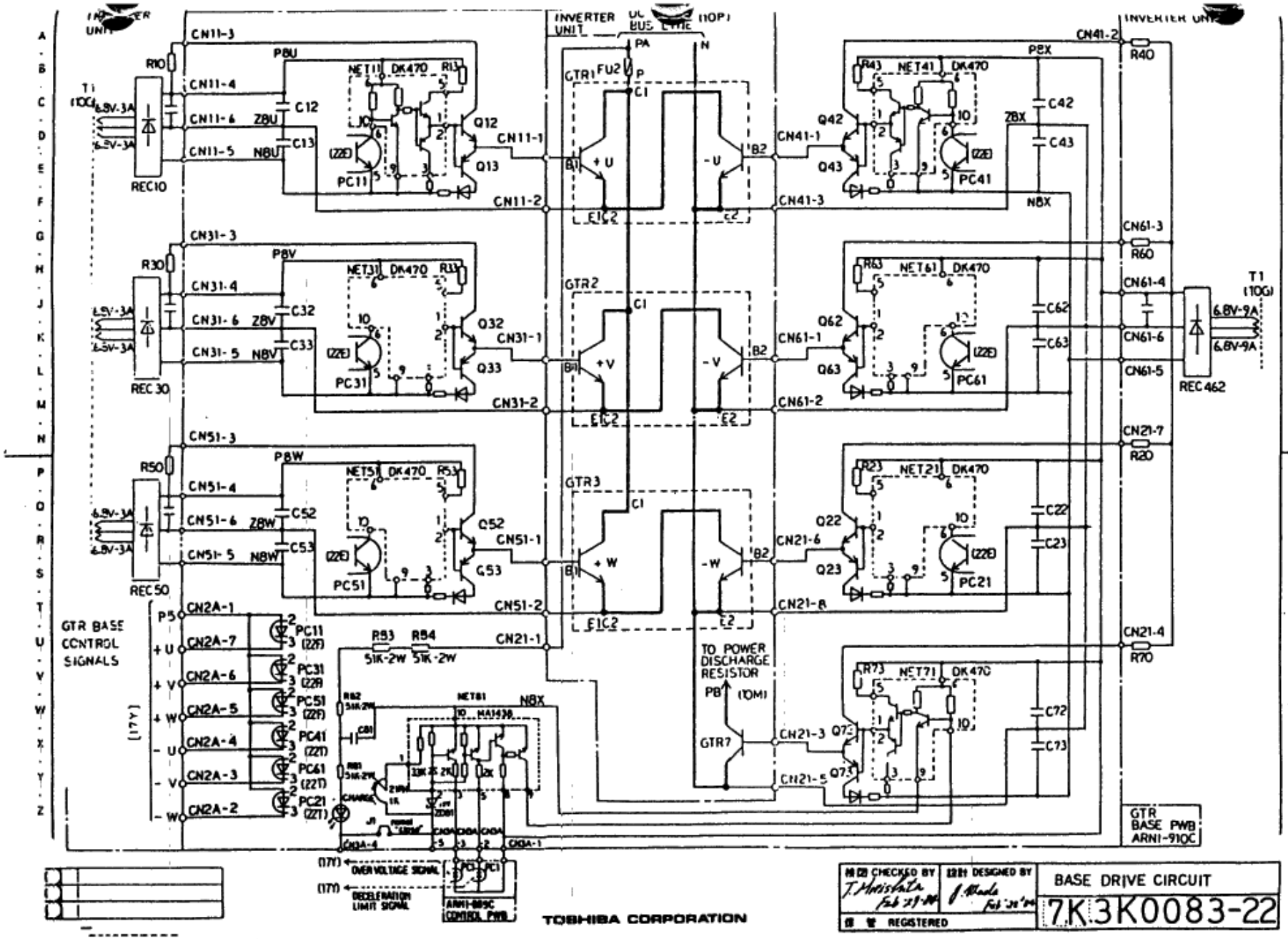

(OPTION) SPEED CONTROL PWB ARN1-921A
CONTROL PWB ARN1-889F
TG
AC-TG TYPICAL OUTPUT AC25V-24P -1800 RPM
TGP/F1 CN13-10
TGN/N CN13-9
P CN13-8
123 CN13-7
(OPEN TERMINALS)
AC To DC CONVERTER
TP1
TGP 42RH 10K
CN13-2
CN13A-1
J8: OPENED WHEN SPEED CONTROL REQUIRED -12V-100% J8
V-BS N15 3RH 50K
V-GN 4RH 50K
VOLT REF. (5V/100%)
FRQ 2RH 50K
IC 14 V F CONVERTER
J3 50Hz 60Hz
FREQ REF.
J 3 | VF Converter Output Freq.
50 Hz | 1152 x 67 Hz
60 Hz | 1152 x 80Hz
OP PANEL
4-20mA REFERENCE AVAILABLE WHEN "OPEN"
CRF
FRH 3KΩ 0-12V
REF
0V
CURR. IN 4-20mA
R5 510Ω
P15 750Ω
0.033μ
NET4 : MA1436
FREQ. LIMIT
9RH P15H UL 0V
10RH P15H LL 0V
LOWER UPPER
C19 1.0μ
IC SWITCH
30K "OPEN" WHEN +15V ENERGIZED
D54 D55
50M 1M 1M
5RH 50K
200K 24K 100K 6RH 1-GH
N15
START (17-PU)
DEC. (17-SR)
J5 "CLOCE" (NORMAL "-15V")
ACC 7RH 0V
DEC. CONTROL
NET3 : MA1437
INVERTER UNIT
DC CURR. DETECT. PEAK 4V/100% CURR.
HCT 10KΦ
CN4-1
CN4-2
CN4-3 N15
CN4-4 0V
CN4-5 P15
POWER AMPLIFIER
STALL DETECT.
OVER CURR. DETECT.
CURR. LIMIT
IC8
OC (NORMAL "0") (18-P04)
CL (17-PP) (NORMAL "0")
240K 0.01μ
NET2 : MA1435
FM 1RH 20K
5.1K 0.033μ
FULL SCALE 1mA
AM
FULL SCALE 0V 1mA
CM



TOSHIBA CORPORATION

CHECKED BY	DESIGNED BY	CONTROL CIRCUIT (2)
T. Moriishi Feb 27 '84	J. Maeda Feb '28 '84	7K3K0083-17
REGISTERED		


(10G)
T1
8V-0.3A (PINK) CN1-5
8V-0.3A (PINK) CN1-6
1J4B1 REC2
IC3 TA78005P
+5V VOLTAGE REGULATOR
P5
C6 4700μF 16V
C7 220μ 10V
0V
(18-WW) P24
TA78015P IC2
+15V VOLTAGE REGULATOR
P15
1J4B1 REC1
19V-0.3A (ORANGE) CN1-1
CN1-3
(GRAY)
19V-0.3A (ORANGE) CN1-2
C4 470μF 35V
C3 47μF 25V
C1 470μF 35V
C35 47μF 25V
-15V VOLTAGE REGULATOR
N15
CT1
IC1 μPC16315H
INVERTER UNIT
E
GROUND
CN1-4
47μ C5
NET1 DK-481
P15
ON/OFF DELAY
OFF TD 15ms
ON TD 100ms
POWER SUPPLY LOW LEVEL DETECTOR
IC13
NORMAL "OPEN" J1
POWER SUPPLY "UNDER VOLTAGE"
NORMAL "0"
UP (17-WW) (17-WT)
ARN1-889F CONTROL PWB
P24
RY
FL
NB1E-24V
FLC
FLB
FLA
250V-3A
INVERTER FAULT SIGNAL
(17-WT) FL
IC8
10K
NET1 DK-481
IC9 4002
IC10 IC4042 "D" LATCH
IC11
51K
MR3 10K
PC2
REMOTE PBS (OPTION)
RST
RESET PBS
NORMAL "0"
(15-BX) ŌC
(17-VT) ŌP
NORMAL "1"
IC12
20K
0.033μ
NET1 DK-481
GTR "OVER TEMPRATURE
TM1
POWER DISCHARGE RESISTOR UNIT "OVER TEMPRATURE"
TM
P24V
P24
GTR TEMP. DETECT ATTUCHED ON HEATSINK
TM, TM1: THERMOSTAT
POWER DISCHARGE UNIT TEMP. DETECT NORMAL "OPEN" CLOSE AT 90°C OPEN AT 60°C
INVERTER UNIT


INVERTER UNIT
INVERTER UNIT
GTR BASE CONTROL SIGNALS
TO POWER DISCHARGE RESISTOR
OVER VOLTAGE SIGNAL
DECELERATION LIMIT SIGNAL
GTR BASE PWB ARNI-910C
ARNI-889C CONTROL PWB
TOSHIBA CORPORATION
CHECKED BY
DESIGNED BY
REGISTERED
BASE DRIVE CIRCUIT
7K3K0083-22

DEVICE	NAME	TYPE FORM & RATING		
		VT130Gi-4220U	VT130Gi-4270U	VT130Gi-4330U
R21	RESISTOR	SCH40G 9.64 3.9 3.9Ω−35W−2S	SCH40G 9.64 3.9 3.9Ω−35W−2S	SCH40G 9.64 3.9 3.9Ω−35W−2S
C1, C1A - C1$_n$, C2, C2A - C2$_n$	CONDENSOR	(50W) C1, C1A, C2, C2A 2200μ−400V	(50W) C1, C1A, C1B, C2, C2A, C2B 2200μ−400V	(50W) C1, C1A, C1B, C2, C2A, C2B 2200μ−400V
GTR1 - GTR3	TRANSISTOR	MG150N2CK1 150A−1000V	MG150N2CK1 150A−1000V	MG150N2CK1 150A−1000V
REC 1	RECTIFIER	100U6P41 100A−1600V	100U6P41 100A−1600V	100U6P41 100A−1600V
FUR, FUS, FUT	FUSE	FWH80 or A050F080 A050F080	FWH80 or A050F080 A050F080	FWH100 or A050F100 A050F100
FU1	#1 FUSE	PC1 6JX3 3A−500V	PC1 6JX3 3A−500V	PC1 6JX3 3A−500V
FAN1, FAN2	COOLING FAN	109−008 125XR0281 200/220V	109−008 125XR0281 200/220V	109−008 125XR0281 200/220V
		C-20E-F 208V COIL	C-20E-F 208V COIL	C-20E-F 208V COIL
MS1	MAGNET SWITCH	C−20−S 200/220V−3A•2a2b	C−20−S 200/220V−3A•2a2b	C−20−S 200/220V−3A•2a2b
ACT	AC TIMER	ACT−1A 220V−0.1SEC	ACT−1A 220V−0.1SEC	ACT−1A 220V−0.1SEC
HCT1	CUURENT TRANSFORMER	NNC−20CTA 100A−4V−2T	NNC−20CTA 65A−4V−1T	NNC−20CTA 75A−4V−1T
TM1	THERMOSTAT	US-602AYTFL or OHD3-90MU 90°C ON · 60°C OFF	US-602AYTFL or OHD3-90MU 90°C ON · 60°C OFF	US-602AYTFL or OHD3-90MU 90°C ON · 60°C OFF
FU2	#1 FUSE	FWP80 A070F080	FWP80 A070F080	FWP100 A070F100
R11, R11A	RESISTOR	51K 5W 3 PARALLEL (33K 20W 2 PARA)	51K 5W 5 PARALLEL (33K 20W 3 PARA)	51K 5W 5 PARALLEL (33K 20W 3 PARA)
BASE DRIVE PWB	PWB	ARNI-910C	ARNI-910C	ARNI-910C
CONTROL CIRCUIT PWB	PWB	ARNI-889F	ARNI-889F	ARNI-889F
GTR7	TRANSISTOR	MG75M1BK1 75A−1000V	MG75M1BK1 75A−1000V	MG75M1BK1 75A−1000V
D21	RECTIFIER	25NC12 25A-1000V	25NC12 25A-1000V	25NC12 25A-1000V
C462	CONDENSOR	68000μF-10V	68000μF-10V	100000μF-10V
R10 - R70	RESISTOR	SCRW22 16 50Ω 3.3Ω−37W 3.3Ω 55W	SCRW22 16 50Ω 3.3Ω−37W 3.3Ω 55W	SCRW22 16 50Ω 1.8Ω−37W 1.8Ω 55W
C10, C30, C50	CONDENSOR	22000μF-10V	22000μF-10V	33000μF-10V
FRH (OPTION)	VARIABLE RESISTOR	RV24YN-ME 5KΩ−S-20L	RV24YN-ME 5KΩ−S-20L	RV24YN-ME 5KΩ−S-20L
SW (OPTION)	SWITCH	PW−2012−W2W	PW−2012−W2W	PW−2012−W2W
R (OPTION)	RESISTOR	(20+30)Ω-180W-3P 16.7Ω-1080W	(20+30)Ω-180W-3P 16.7Ω-1080W	(20+30)Ω-180W-3P 16.7Ω-1080W

NOTE) #1; FWH, FWP TYPE FUSES ARE USED FOR 460V UNIT OF INPUT VOLTAGE

INVERTER UNIT TYPE FORM : VT130G1-4□□□

VR : VARIABLE RESISTOR (RHEOSTAT)

	VR-NO.	USE	STANDARD ADJUST
CONTROL PWB (ARNI-889F)	1RH	FREQUENCY METER ADJUST.	0-NOTCH
	2RH	OUTPUT FREQUENCY ADJUST.	REFER TO FIG 11.
	3RH	OUTPUT VOLTAGE ADJUST. (LOW LEVEL BIAS ADJUST)	〃
	4RH	OUTPUT VOLTAGE GAIN ADJUST.	〃
	5RH	I-IN : 4-20mA REF ADJUST. (BIAS)	〃
	6RH	I-IN : 4 20mA REF ADJUST. (GAIN)	〃
	7RH	ACCELERATION TIME (1~20 SEC)	20 SEC
	8RH	DECELERATION TIME (1~20 SEC)	20 SEC
	9RH	UPPER LIMIT (MAX. OUTPUT FREQUENCY LIMIT)	REFER TO FIG 12.
	10RH	LOWER LIMIT (MIN. OUTPUT FREQUENCY LIMIT)	〃
	12RH	OVER VOLTAGE ADJUST	REFER TO "OP" LEVEL
MAIN CIRCUIT/BASE DRIVE PWB (ARNI 910□)			
	HCT-GIN	HALL EFFECT CT CIRCUIT OUTPUT GAIN ADJUST.	PEAK 4V At Rating Curr.
	HCT-OFS	HALL EFFECT CT CIRCUIT OUTPUT NULL ADJUST.	0V At 0 AMPARE

STANDARD PROTECTION LEVEL

OC : OVER CURRENT	*1 225 %
OP : OVER POTENTIAL (OVER VOLTAGE)	DC760V
UP : UNDER POTENTIAL (UNDER VOLTAGE)	*2 85 %
OH : GTR AND/OR POWER Discharge Unit OVER HEAT	90 ℃
STALL CURR. LEVEL	*1 150 %
CURR. LIMIT LEVEL	*1 185 %

*1 : PERCENTAGE OF RATED OUTPUT CURRENT
*2 : PERCENTAGE OF RATED SUPPLY VOLTAGE

UNIT TYPE FORM VT-130G1	Rating Curr.	Rating Curr. At 110% cont. - 150% 30 sec	
-4220	22 KVA	30 A	
-4270	27 KVA	38 A	
-4330	33 KVA	45 A	

STANDARD JUMPER SELECTION

ARNI-889F

J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12
OPEN	"11"	"60Hz"	OPEN	CLOSE	CLOSE	CLOSE	CLOSE	CLOSE (A-D)	CLOSE	OPEN	OPEN

ARNI-910□

J1
CLOSE

STANDARD V/F ADJUST JUMPER SELECTION (J2) : 11

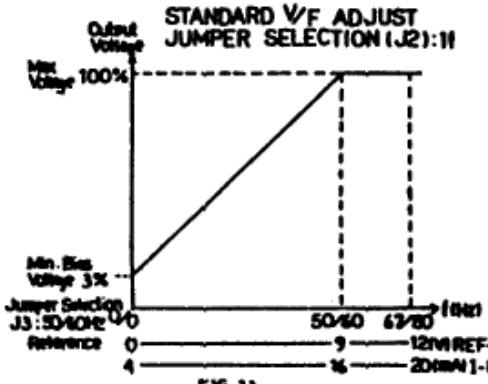


FIG 11.

UPPER LIMIT LOWER LIMIT

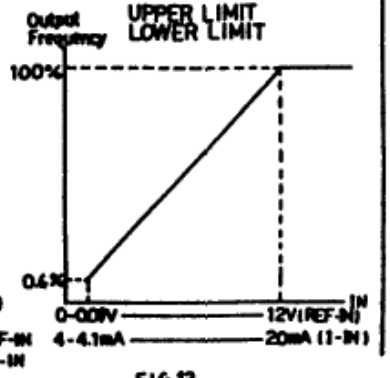
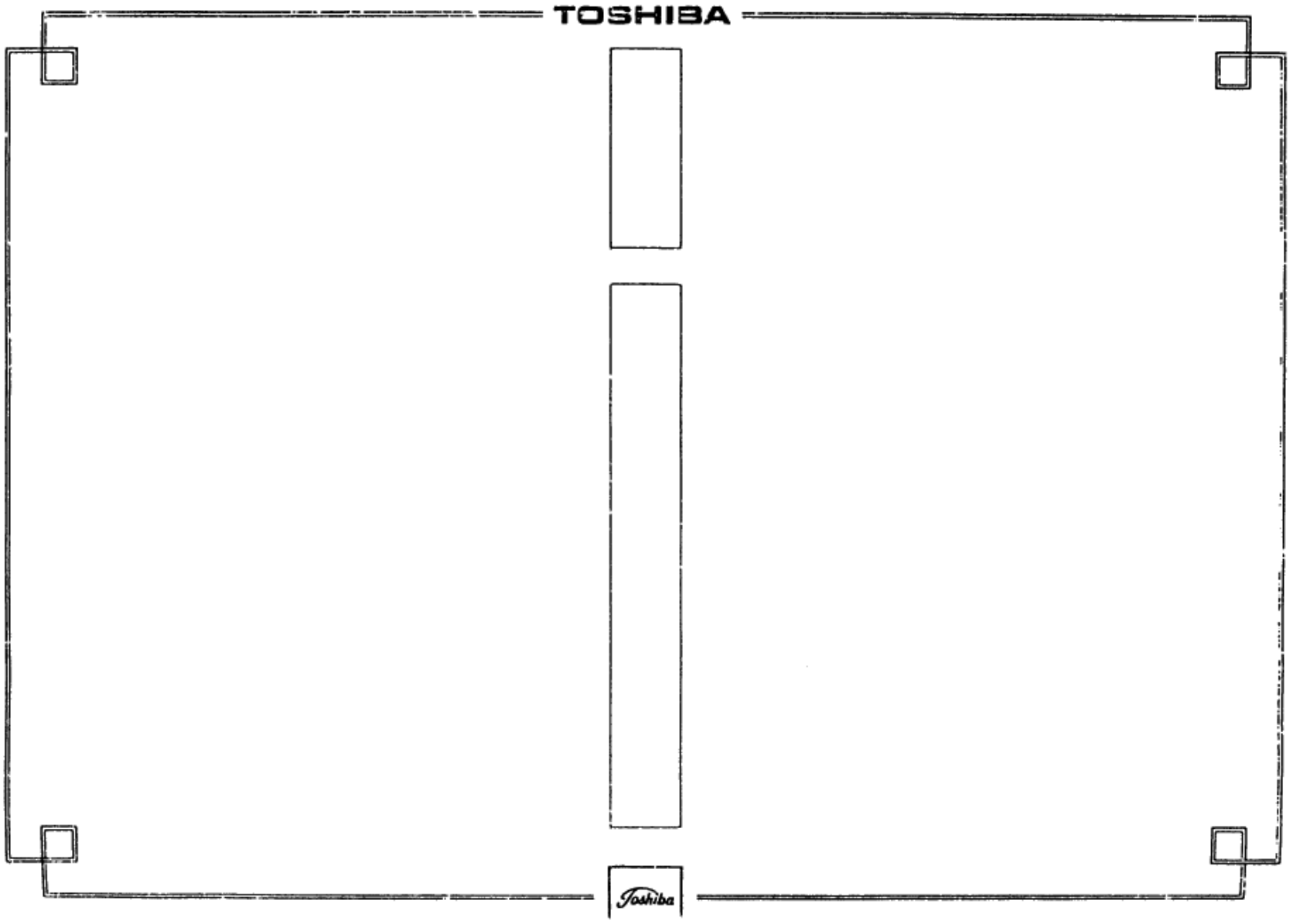


FIG 12.

DRAWN CHECKED BY T. Hamada Feb 27 '91	DESIGNED BY J. Wada Feb 28 '91	STANDARD ADJUSTMENT LIST
® ℗ REGISTERED		7K3K0083-50


TOSHIBA
Toshiba

TOSHIBA

JOB NO. [ ]

CUSTOMER [ ]

TOSVERT-130G1 380-460V 40~100KVA

SCHEMATIC DIAGRAMS

PAGE	TITLE	PAGE	TITLE	PAGE	TITLE	PAGE	TITLE
1	INDEX	16	CONTROL CIRCUIT (1)	31	OUTLINE (1)	46	
2		17	CONTROL CIRCUIT (2)	32	OUTLINE (2)	47	
3	ABBRIVIATION LIST	18	CONTROL CIRCUIT (3)	33		48	
4		19		34		49	
5	INTERFACE	20		35	PARTS LIST	50	STANDARD ADJUSTMENT LIST
6		21		36		51	
7		22	BASE DRIVE CIRCUIT	37		52	
8		23		38		53	
9		24		39		54	
10	MAIN CIRCUIT (1)	25		40		55	
11	MAIN CIRCUIT (2)	26		41		56	
12		27		42		57	
13		28		43		58	
14		29		44		59	
15		30		45		60	BACK COVER

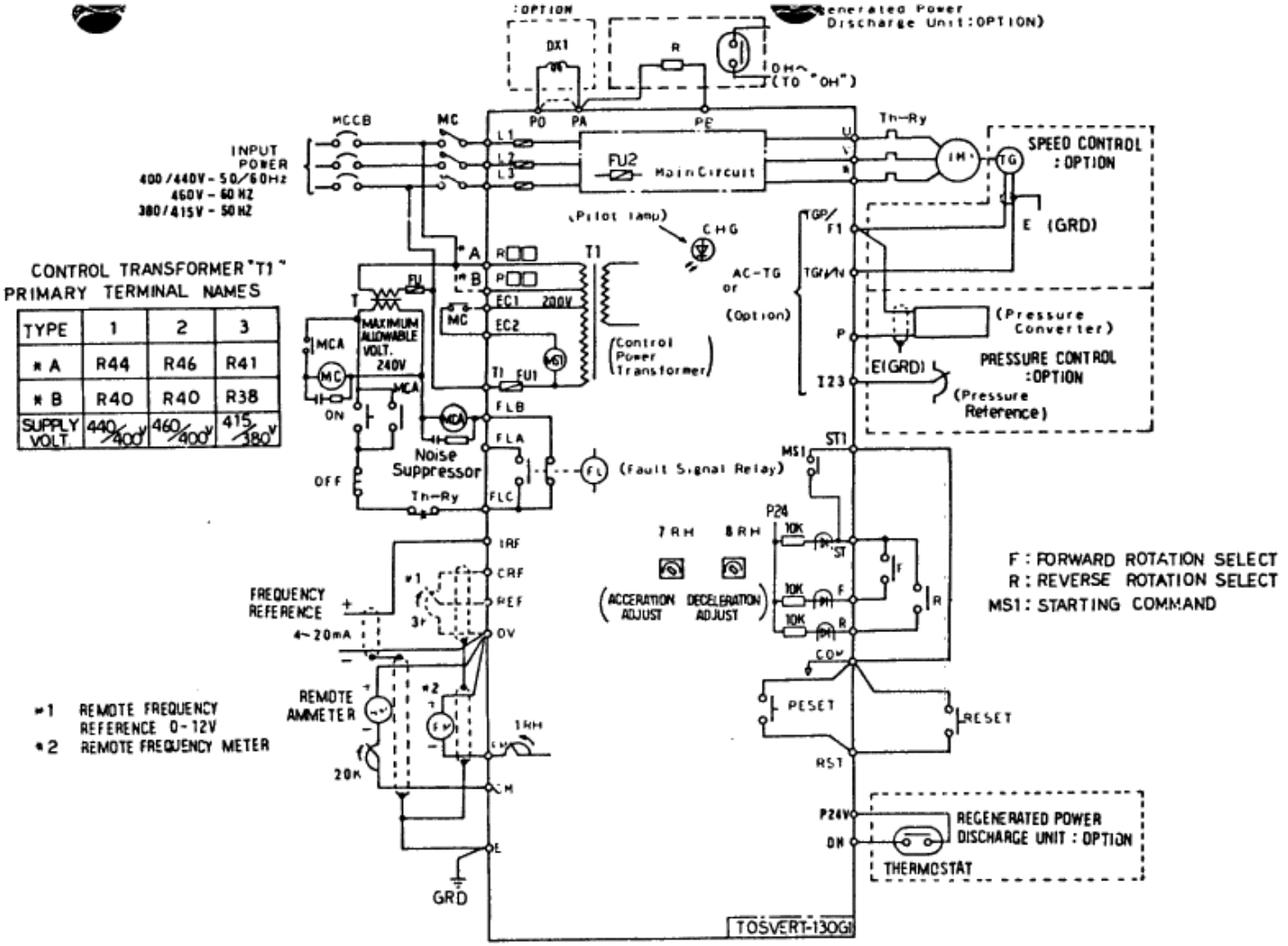
2	MAR. 3 '86 CHG "B" S. Miyazaki N. Tsukasa
1	Jan-18-85 CHG "A" J. Maeda

TOSHIBA CORPORATION
TOKYO JAPAN

APPROVED BY	CHECKED BY	DESIGNED BY	DRAWN BY
T. Morishita Dec 4-84	N. Tsukasa Dec. 18. '84	J. Maeda Dec-15-84	A. Ashii Dec-14-84
REGISTERED			

TOSVERT-130G1
CODE V.T.1.3.0.G.1.
7K3K0084-1

ABBR.	DESCRIPTION	ABBR.	DESCRIPTION	ABBR.	DESCRIPTION
ACC.	ACCELERATION	NET	HINET····HYBRID IC	ACT	AC TIMER RELAY
AM	AMMETER	OA	OPERATIONAL AMPLIFIER	ZNR	SURGE ABSORBER
C	CONDENSOR	OC	OVER CURRENT		
CN	CONNECTOR	OH	OVER HEAT		
CPU	CENTRAL PROCESSING UNIT	OP	OVER POTENTIAL/OVER VOLTAGE		
D	DIODE	PC	PHOTO COUPLER		
DEC.	DECELERATION	PBS	PUSH BUTTON SWITCH		
E	EARTH GROUND	PWB	PRINTED WIRING BOARD		
F	FORWARD	R	1) REVERSE 2) RESISTOR		
FL	FAULT	REC	RECTIFIER		
FM	FREQUENCY METER	REF.	REFERENCE		
FU	FUSE	RH	RHEOSTAT		
GTR	GIANT TRANSISTOR B: BASE E: EMITTER C: COLLECTOR	T	TRANSFORMER		
		TB	TERMINAL BLOCK		
		TG	TACHO GENERATOR		
HCT	HALL EFFECT CURRENT TRANSFORMER	TM	THERMOSTAT		
IC	INTEGRATED CIRCUIT	Th-Ry	THERMAL RELAY		
IM	INDUCTION MOTOR	UP	UNDER POTENTIAL UNDER VOLTAGE		
J	JUMPER	VFC	VOLTAGE TO FREQUENCY CONVERTER		
LED	LIGHT EMITTING DIODE	ADC	ANALOG TO DIGITAL CONVERTER		
MC	MAGNETIC CONTACTOR	CSA	CRYSTAL (OR CERAMIC) OSCILLATOR		
MCCB	MOLDED CASE CIRCUIT BREAKER	MR	MOLDED RESISTOR		
MS	MAGNETIC CONTACTOR FOR SHORTING	LS	LOW SPEED		



CONTROL TRANSFORMER "T1" PRIMARY TERMINAL NAMES

TYPE	1	2	3
* A	R44	R46	R41
* B	R40	R40	R38
SUPPLY VOLT	440/400V	460/400V	415/380V

F : FORWARD ROTATION SELECT
R : REVERSE ROTATION SELECT
MS1 : STARTING COMMAND

*1 REMOTE FREQUENCY REFERENCE 0-12V
*2 REMOTE FREQUENCY METER

TOSVERT-130G1

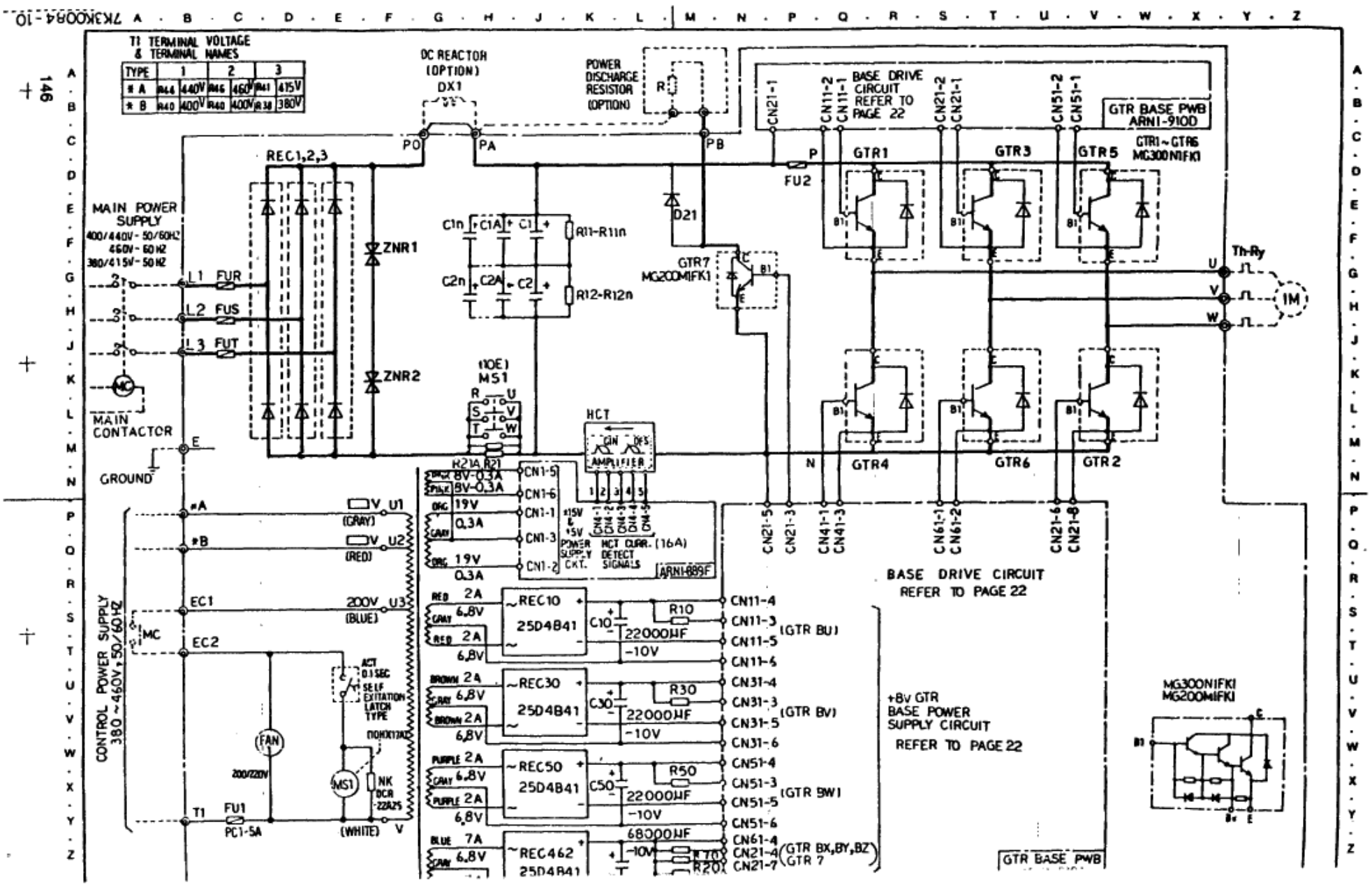
STANDARD CONNECTION DIAGRAM

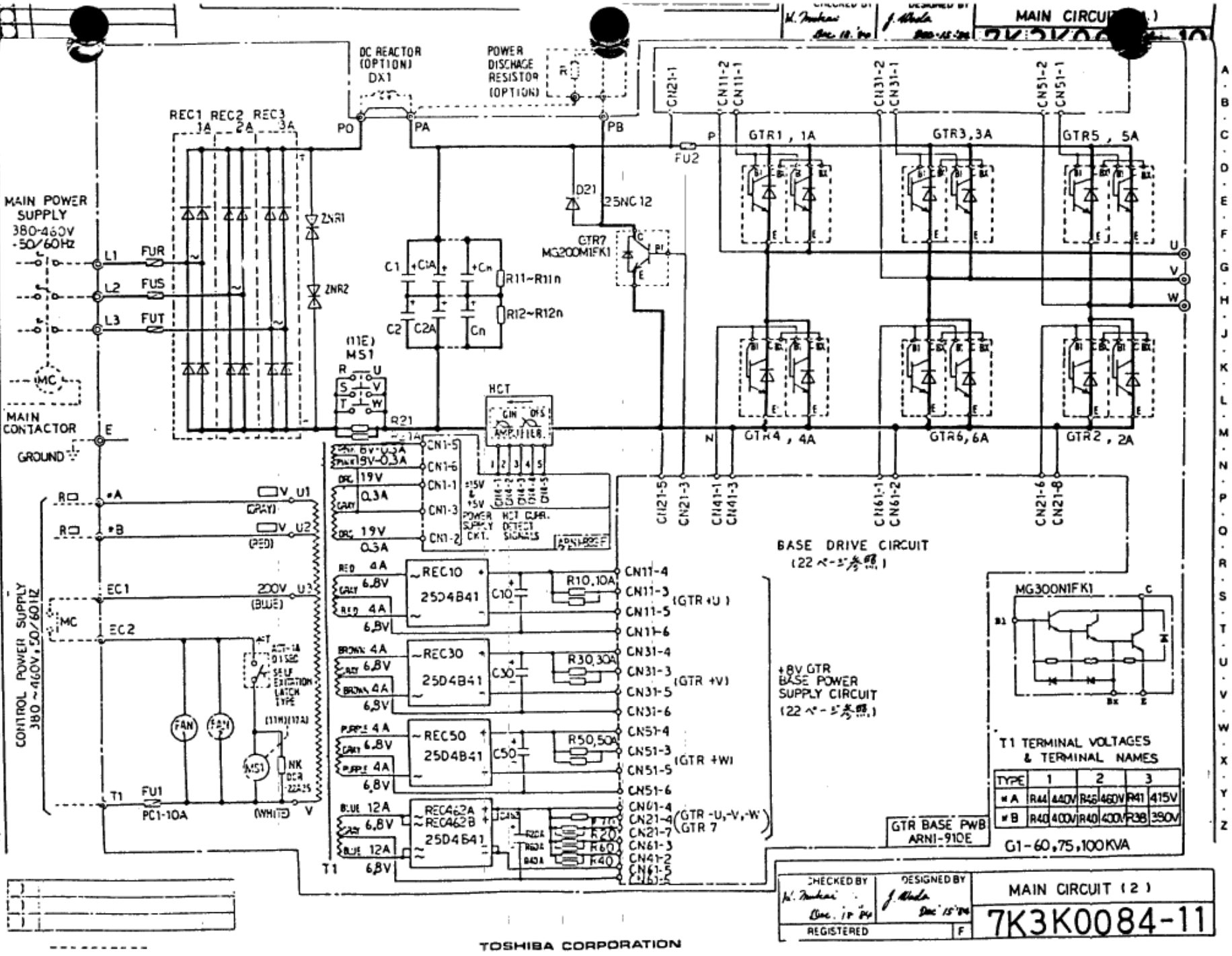
Fig.-1

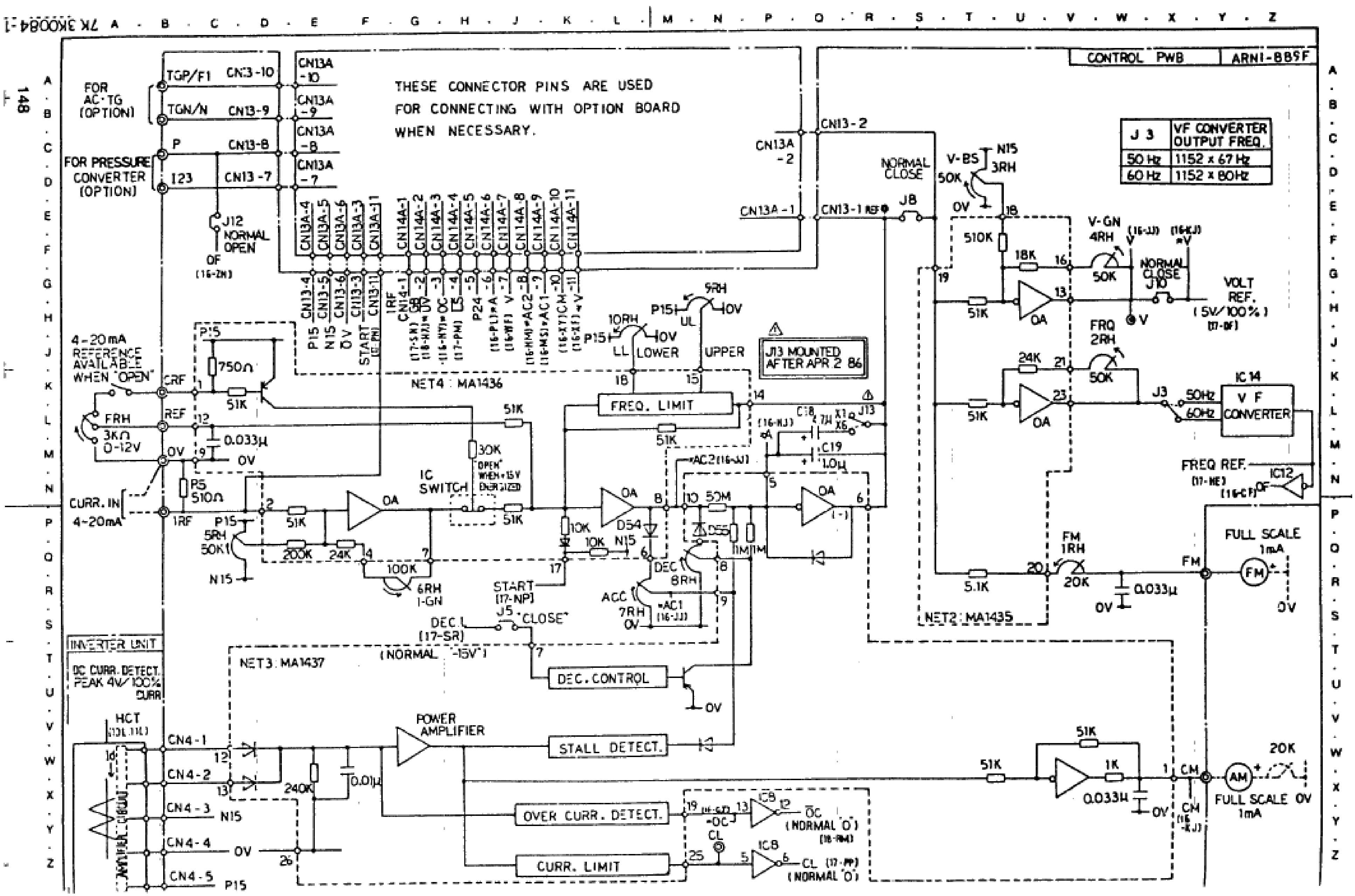
1	Jan 18 '95 Add MCA

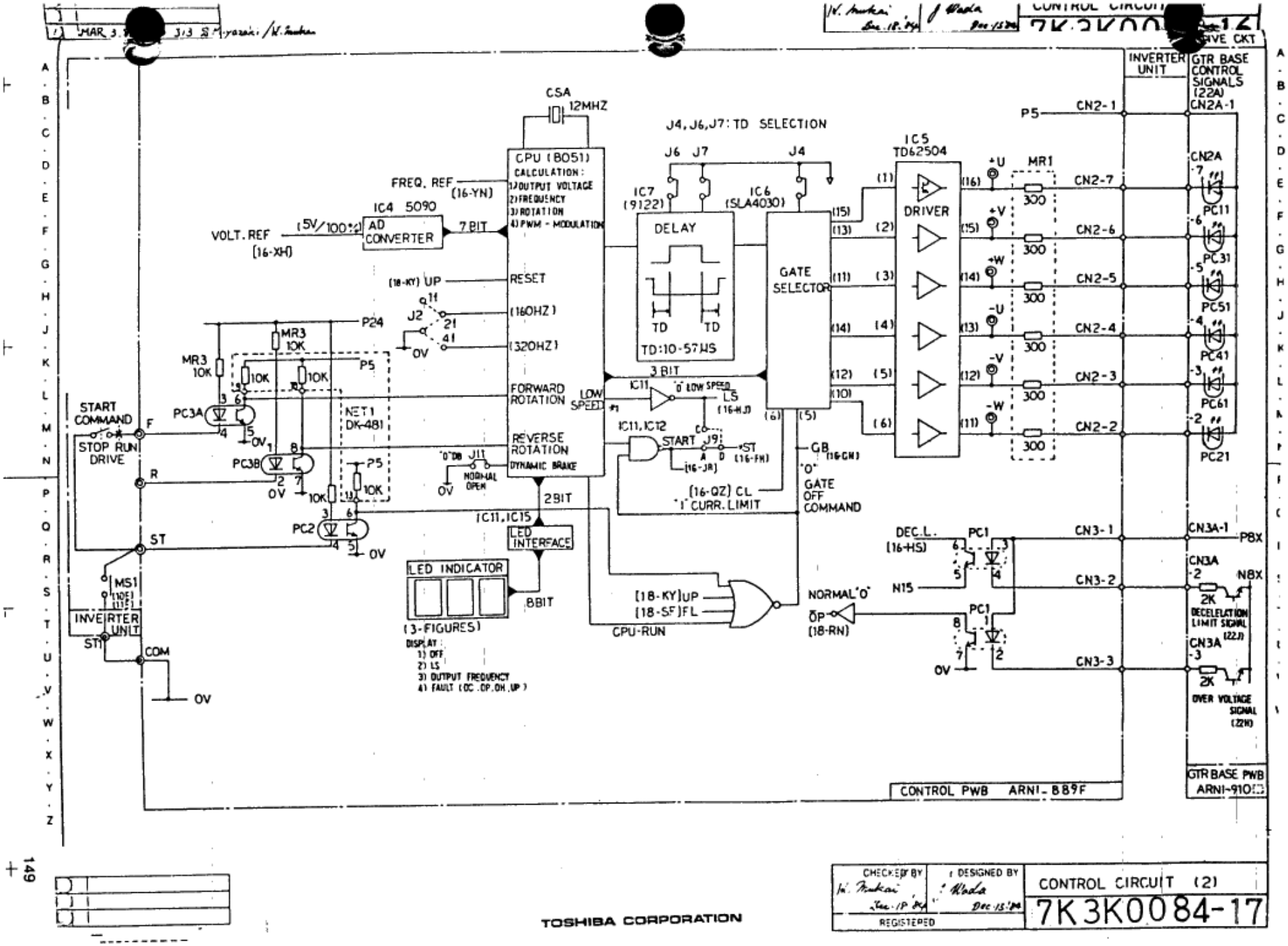
TOSHIBA CORPORATION

CHECKED BY	DESIGNED BY	
K. Tsukai Dec 19 '94	J. Wada Dec 15 '94	INTERFACE
REGISTERED		7K3K0084-5


T1 TERMINAL VOLTAGE & TERMINAL NAMES
TYPE 1 2 3
* A R46 440V R45 460V R41 415V
* B R40 400V R40 400V R38 380V
DC REACTOR (OPTION) DX1
POWER DISCHARGE RESISTOR (OPTION) R
BASE DRIVE CIRCUIT REFER TO PAGE 22
GTR BASE PWB ARN1-9100
GTR1~GTR6 MG300N1FK1
GTR1
GTR3
GTR5
GTR4
GTR6
GTR2
GTR7 MG200M1FK1
D21
FU2
REC1,2,3
MAIN POWER SUPPLY
400/440V-50/60HZ
460V-60HZ
380/415V-50HZ
L1 FUR
L2 FUS
L3 FUT
MC
MAIN CONTACTOR
GROUND
ZNR1
ZNR2
C1n C1A C1
C2n C2A C2
R11-R11n
R12-R12n
(10E) MS1
HCT
AMPLIFIER
Th-Ry
U
V
W
IM
N
P
PO
PA
PB
CONTROL POWER SUPPLY 380~460V±50/60HZ
#A
#B
EC1
EC2
T1
FU1
PC1-5A
V U1 (GRAY)
V U2 (RED)
200V U3 (BLUE)
(WHITE) V
FAN
200/220V
MS1
NK OCR-22A2S
ACT 0.1SEC SELF EXITATION LATCH TYPE
8V-0.3A
19V 0.3A
CN1-5
CN1-6
CN1-1
CN1-3
CN1-2
POWER SUPPLY CKT.
MCT CURR. (16A) DETECT SIGNALS
ARN1-889F
REC10 25D4B41
REC30 25D4B41
REC50 25D4B41
REC462 25D4B41
C10 C30 C50
22000μF -10V
68000μF -10V
R10 R30 R50 R70 R20
CN11-4
CN11-3
CN11-5
CN11-6
CN31-4
CN31-3
CN31-5
CN31-6
CN51-4
CN51-3
CN51-5
CN51-6
CN61-4
CN21-4
CN21-7
(GTR BU)
(GTR BV)
(GTR BW)
(GTR BX,BY,BZ GTR 7)
+8V GTR BASE POWER SUPPLY CIRCUIT REFER TO PAGE 22
BASE DRIVE CIRCUIT REFER TO PAGE 22
GTR BASE PWB
MG300N1FK1
MG200M1FK1

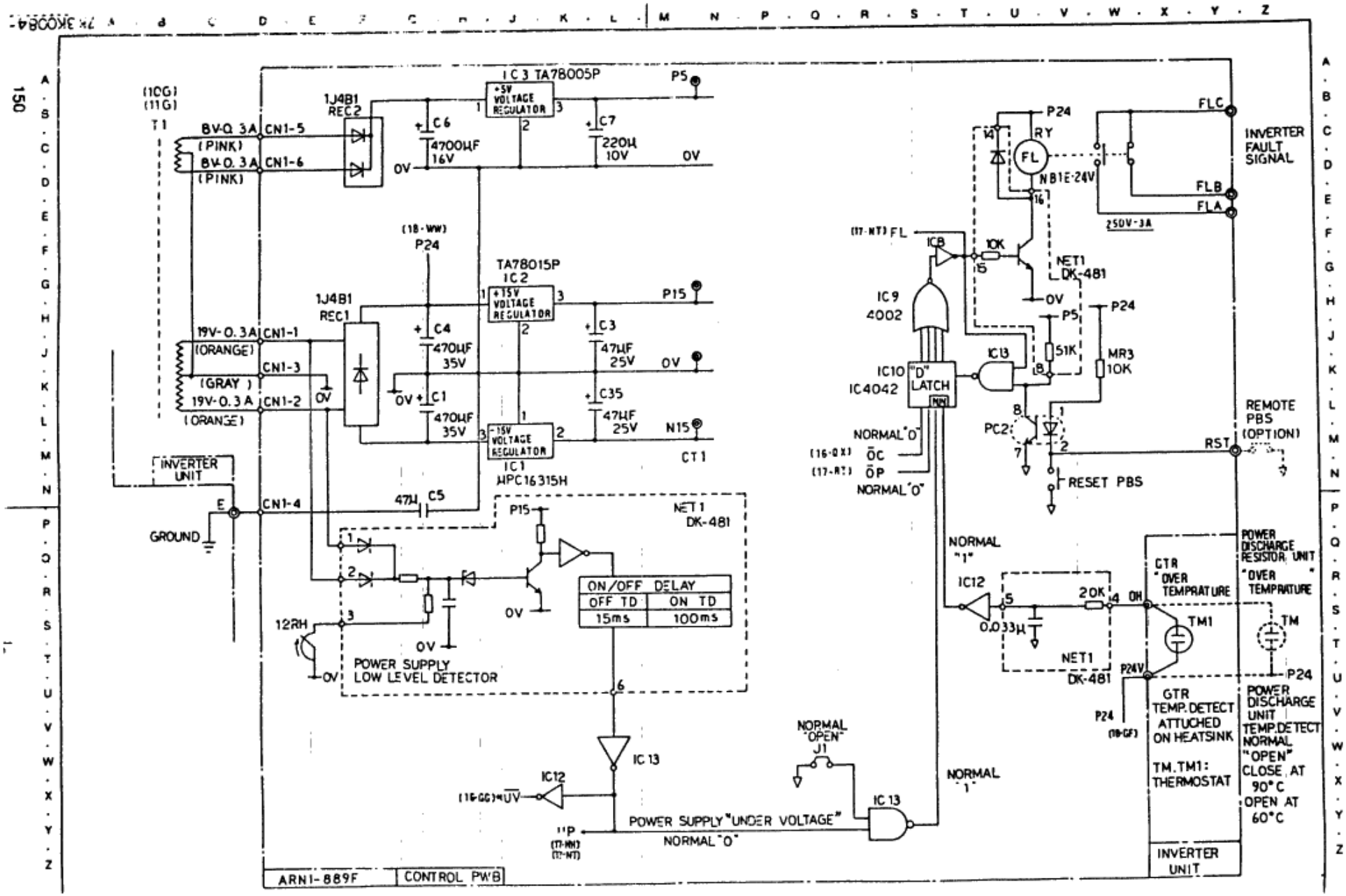

MAIN CIRCUIT (2)
DC REACTOR (OPTION) DX1
POWER DISCHAGE RESISTOR (OPTION)
REC1 REC2 REC3
1A 2A 3A
PO PA PB
MAIN POWER SUPPLY 380-460V -50/60Hz
L1 FUR
L2 FUS
L3 FUT
MC
MAIN CONTACTOR
GROUND
ZNR1
ZNR2
C1 +C1A +Cn R11~R11n
C2 C2A Cn R12~R12n
D21 2SNC12
GTR7 MG200M1FK1
(11E) MS1
R21
HCT
GTR1 , 1A
GTR3 , 3A
GTR5 , 5A
GTR4 , 4A
GTR6, 6A
GTR2 , 2A
FU2
CN21-1
CN11-2
CN11-1
CN31-2
CN31-1
CN51-2
CN51-1
CN21-5
CN21-3
CN41-1
CN41-3
CN61-1
CN61-2
CN21-6
CN21-8
U
V
W
P
N
CONTROL POWER SUPPLY 380~460V, 50/60HZ
*A
*B
EC1
EC2
T1
FU1 PC1-10A
V U1 (GRAY)
V U2 (RED)
200V U3 (BLUE)
(WHITE) V
FAN
FAN
MS1
NK DCR-22A25
ACT-1A DISC SELF EXTINCTION LATCH TYPE
6V-0.3A
9V-0.3A
19V 0.3A
19V 0.3A
CN1-5
CN1-6
CN1-1
CN1-3
CN1-2
±15V & +5V POWER SUPPLY CKT.
HCT CURR. DETECT SIGNALS
REC10 25D4B41 C10 R10,10A
REC30 25D4B41 C30 R30,30A
REC50 25D4B41 C50 R50,50A
REC462A REC462B 25D4B41 R20A R20B R20 R60 R40
CN11-4
CN11-3
CN11-5
CN11-6
CN31-4
CN31-3
CN31-5
CN31-6
CN51-4
CN51-3
CN51-5
CN51-6
CN01-4
CN21-4
CN21-7
CN61-3
CN41-2
CN61-5
(GTR +U)
(GTR +V)
(GTR +W)
(GTR -U,-V,-W GTR 7)
BASE DRIVE CIRCUIT
(22ページ参照)
+8V GTR BASE POWER SUPPLY CIRCUIT
(22ページ参照)
MG300N1FK1
T1 TERMINAL VOLTAGES & TERMINAL NAMES
TYPE 1 2 3
*A R44 440V R45 460V R41 415V
*B R40 400V R40 400V R38 380V
GTR BASE PWB ARN1-910E
G1-60,75,100KVA
CHECKED BY
DESIGNED BY
REGISTERED
MAIN CIRCUIT (2)
7K3K0084-11
TOSHIBA CORPORATION
147

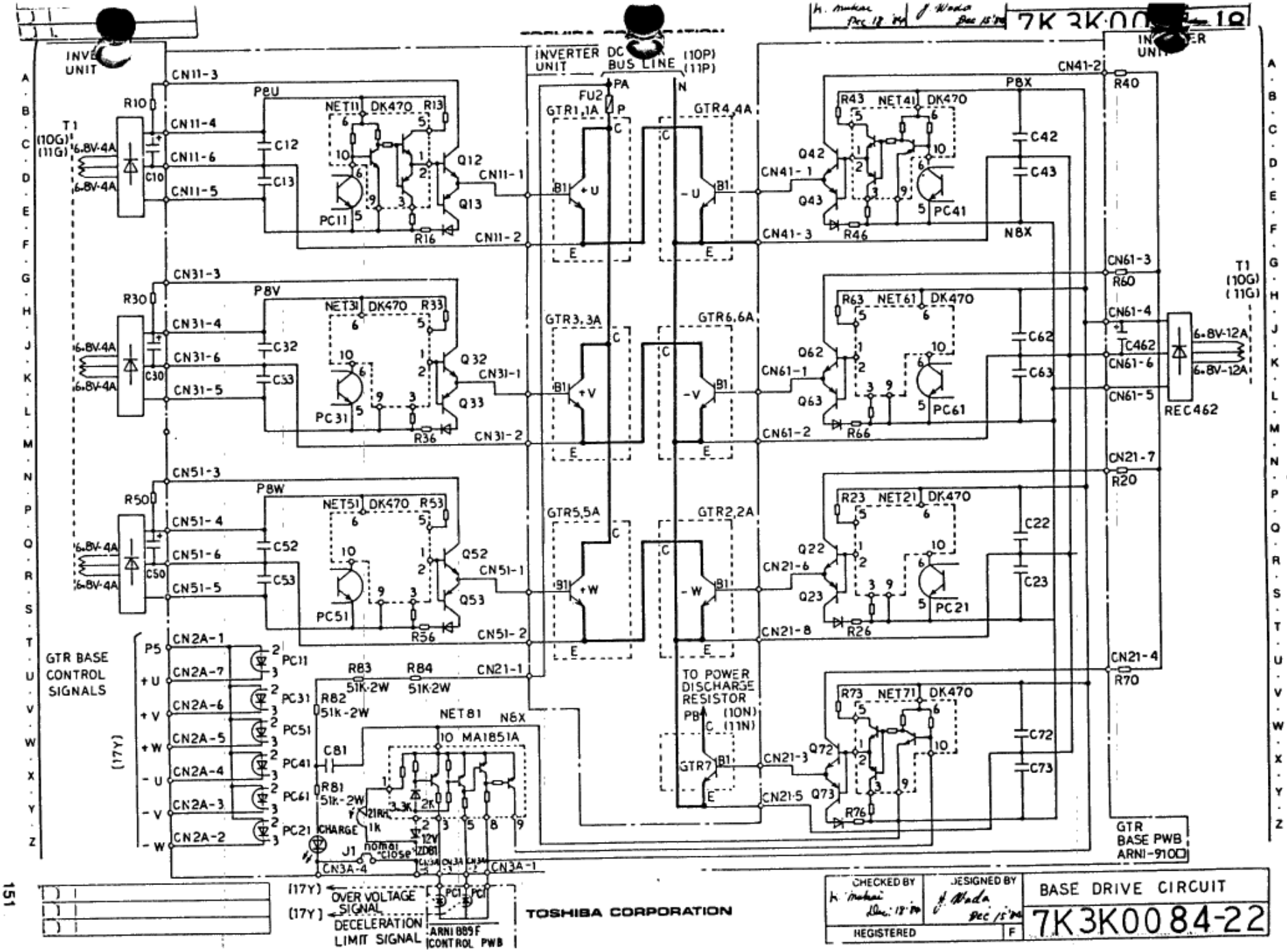

7K 3K0084-1
CONTROL PWB
ARN1-BB9F
THESE CONNECTOR PINS ARE USED
FOR CONNECTING WITH OPTION BOARD
WHEN NECESSARY.
J 3 | VF CONVERTER OUTPUT FREQ.
50 Hz | 1152 x 67 Hz
60 Hz | 1152 x 80Hz
FOR AC·TG (OPTION)
FOR PRESSURE CONVERTER (OPTION)
TGP/F1
TGN/N
CN13-10
CN13-9
CN13-8
CN13-7
J12 NORMAL OPEN
4-20mA REFERENCE AVAILABLE WHEN "OPEN"
FRH
3KΩ 0-12V
CURR. IN 4-20mA
NET4 : MA1436
NET3 : MA1437
NET2 : MA1435
J13 MOUNTED AFTER APR 2 86
FREQ. LIMIT
IC SWITCH
DEC. CONTROL
POWER AMPLIFIER
STALL DETECT.
OVER CURR. DETECT.
CURR. LIMIT
INVERTER UNIT
DC CURR. DETECT. PEAK 4V/100% CURR
HCT
VOLT REF. (5V/100%)
FREQ REF.
IC14
V F CONVERTER
IC12
FULL SCALE 1mA
FM
AM
CM
NORMAL CLOSE
JB
V-BS
V-GN
FRQ
START
DEC.L
J5 "CLOSE"
(NORMAL "-15V")

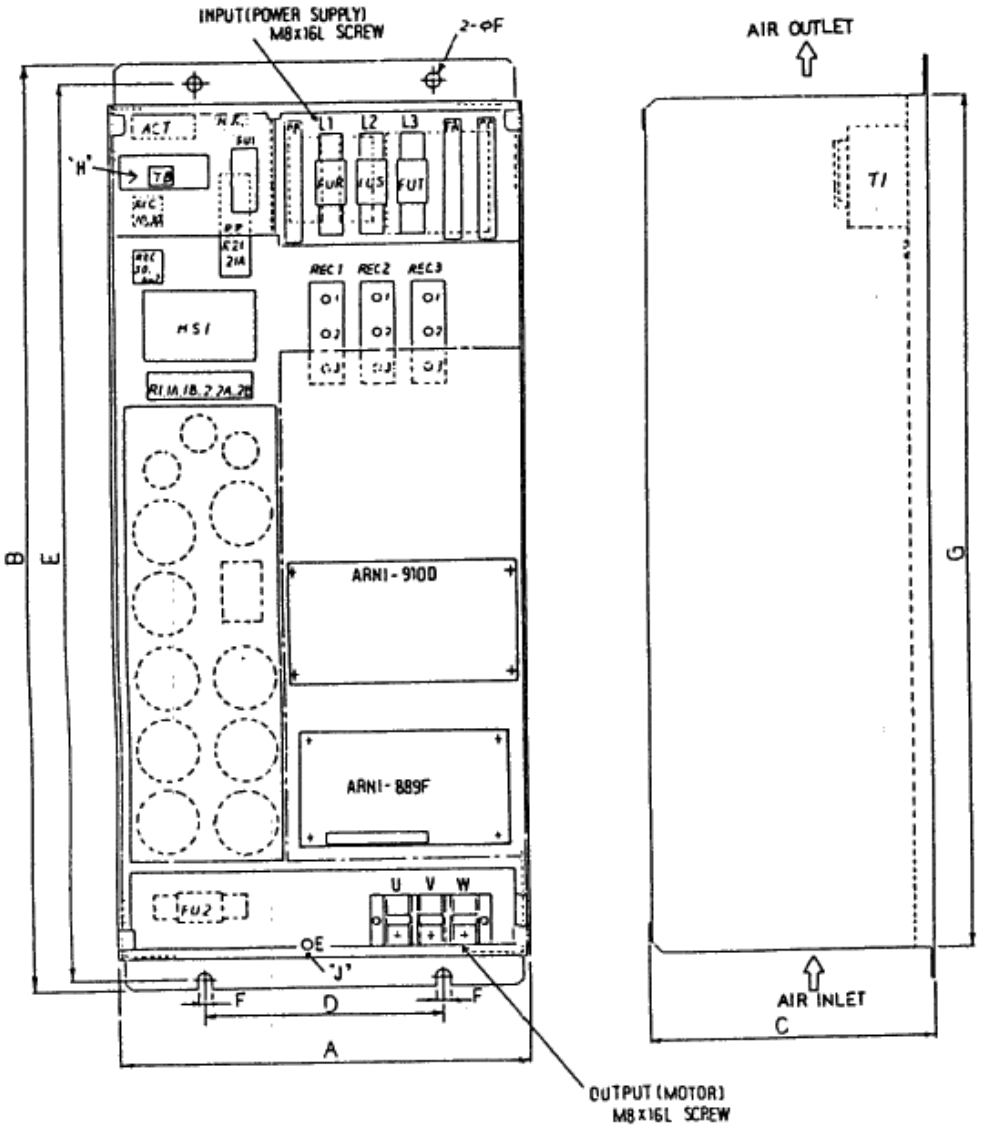


TOSHIBA CORPORATION

CHECKED BY	DESIGNED BY	CONTROL CIRCUIT (2)
REGISTERED		7K3K0084-17


IC3 TA78005P
+5V VOLTAGE REGULATOR
P5
(10G) (11G)
T1
8V-0.3A (PINK) CN1-5
8V-0.3A (PINK) CN1-6
1J4B1 REC2
C6 4700μF 16V
C7 220μ 10V
0V
(18-WW) P24
TA78015P IC2
+15V VOLTAGE REGULATOR
P15
1J4B1 REC1
19V-0.3A (ORANGE) CN1-1
(GRAY) CN1-3
19V-0.3A (ORANGE) CN1-2
C4 470μF 35V
C3 47μF 25V
C1 470μF 35V
C35 47μF 25V
-15V VOLTAGE REGULATOR
N15
CT1
IC1 μPC16315H
INVERTER UNIT
E
CN1-4
GROUND
47μ C5
NET1 DK-481
P15
ON/OFF DELAY
OFF TD 15ms
ON TD 100ms
12RH
POWER SUPPLY LOW LEVEL DETECTOR
IC 13
IC12
(16-GG) UV
"P" (17-HN) (17-NT)
POWER SUPPLY "UNDER VOLTAGE"
NORMAL "0"
NORMAL "OPEN" J1
NORMAL "1"
IC 13
P24
RY
FL
NB1E-24V
FLC
FLB
FLA
250V-3A
INVERTER FAULT SIGNAL
(17-NT) FL
IC8
10K
NET1 DK-481
IC 9 4002
IC10 IC4042 "D" LATCH
IC13
51K
MR3 10K
P5
P24
PC2
REMOTE PBS (OPTION)
RST
RESET PBS
NORMAL "0"
(16-QX) $\overline{OC}$
(17-RT) $\overline{OP}$
NORMAL "0"
NORMAL "1"
IC12
20K
0.033μ
NET1 DK-481
GTR "OVER TEMPRATURE
TM1
POWER DISCHARGE RESISTOR UNIT "OVER TEMPRATURE"
TM
P24V
P24
(18-GF)
GTR TEMP. DETECT ATTUCHED ON HEATSINK
TM, TM1: THERMOSTAT
POWER DISCHARGE UNIT TEMP. DETECT NORMAL "OPEN" CLOSE AT 90°C OPEN AT 60°C
INVERTER UNIT
ARN1-889F
CONTROL PWB


INVERTER UNIT
INVERTER DC BUS LINE (10P) (11P)
T1 (10G) (11G) 6.8V-4A
CN11-3
CN11-4
CN11-6
CN11-5
R10
C10
C12
C13
P8U
NET11 DK470 R13
Q12
Q13
PC11
R16
CN11-1
CN11-2
FU2
GTR1.1A
GTR4.4A
+U
-U
CN41-2
R40
P8X
R43 NET41 DK470
Q42
Q43
PC41
R46
C42
C43
N8X
CN41-1
CN41-3
CN31-3
CN31-4
CN31-6
CN31-5
R30
C30
C32
C33
P8V
NET31 DK470 R33
Q32
Q33
PC31
R36
CN31-1
CN31-2
GTR3.3A
GTR6.6A
+V
-V
CN61-3
R60
CN61-4
CN61-6
CN61-5
C462
REC462
6.8V-12A
R63 NET61 DK470
Q62
Q63
PC61
R66
C62
C63
CN61-1
CN61-2
CN51-3
CN51-4
CN51-6
CN51-5
R50
C50
C52
C53
P8W
NET51 DK470 R53
Q52
Q53
PC51
R56
CN51-1
CN51-2
GTR5.5A
GTR2.2A
+W
-W
CN21-7
R20
CN21-4
R70
R23 NET21 DK470
Q22
Q23
PC21
R26
C22
C23
CN21-6
CN21-8
GTR BASE CONTROL SIGNALS
(17Y)
P5
+U
+V
+W
-U
-V
-W
CN2A-1
CN2A-7
CN2A-6
CN2A-5
CN2A-4
CN2A-3
CN2A-2
PC11
PC31
PC51
PC41
PC61
PC21
R83 51K-2W
R84 51K-2W
R82 51k-2W
R81 51k-2W
C81
NET81 N6X
10 MA1851A
3.3K
2K
1K
12V
ZD81
CHARGE
J1 normal close
CN3A-4
CN3A-1
CN21-1
TO POWER DISCHARGE RESISTOR
PB (10N) C (11N)
GTR7
CN21-3
CN21-5
R73 NET71 DK470
Q72
Q73
R76
C72
C73
GTR BASE PWB ARNI-910
(17Y) OVER VOLTAGE SIGNAL
(17Y) DECELERATION LIMIT SIGNAL
PC1
ARNI 889 F CONTROL PWB
TOSHIBA CORPORATION
CHECKED BY
DESIGNED BY
REGISTERED
F
BASE DRIVE CIRCUIT
7K3K0084-22



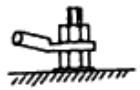
OUTPUT (MOTOR)
M8x16L SCREW

TYPE FORM	(kVA)	SIZE (mm) A	B	C	D	E	F	G	WEIGHT (Kg)
VT130G1-4400U	40	410	905	292	245	875	15	835	55
VT130G1-4500U	50	410	905	292	245	875	15	835	57

DETAIL 'H'

TYPE	1	2	3
A	R44	R46	R41
B	R40	R40	R38

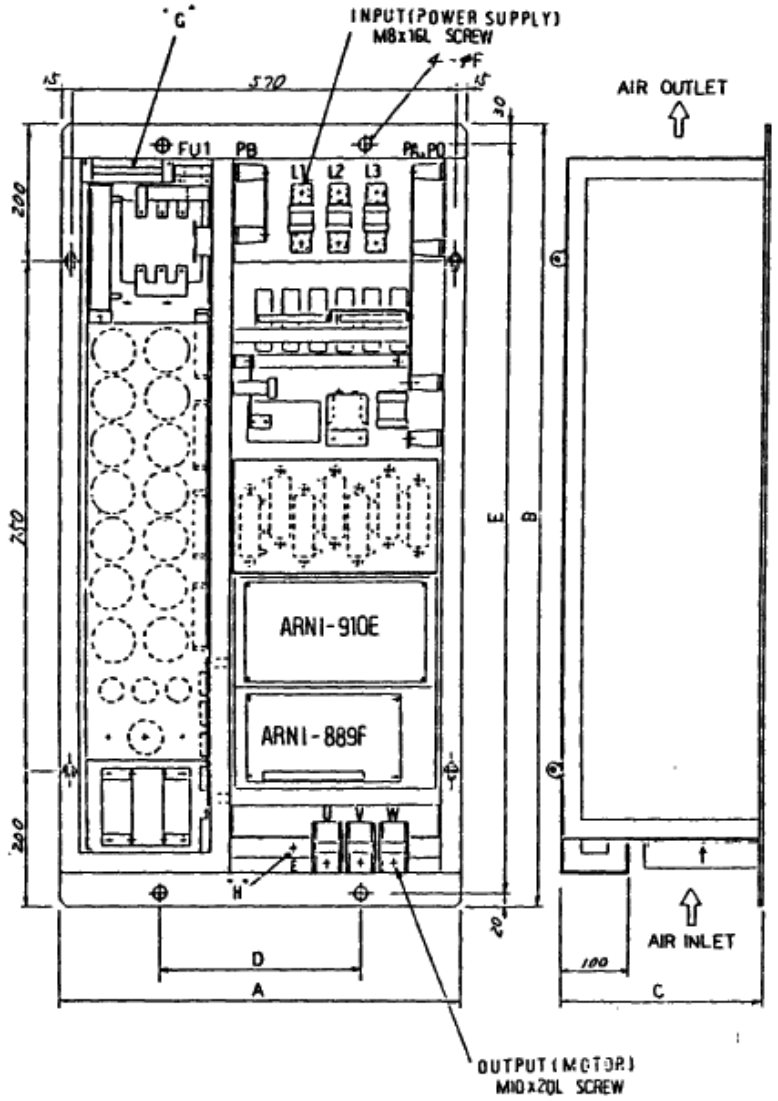
DETAIL 'J'



E; FRAME EARTH (GROUND)
M5x20L SCREW

COLOR; MUNSELL 5Y 7/1

400V- 40, 50KVA



TYPE FORM	(kVA)	SIZE (mm) A	B	C	D	E	F		WEIGHT (Kg)
VT130G1-4600U	60	600	1150	300	300	1100	20		65
VT130G1-4750U	75	600	1150	300	300	1100	20		67
VT130G1-4100KU	100	600	1150	300	300	1100	20		70

DETAIL "G"

TYPE	1	2	3
A	R44	R46	R41
B	R40	R40	R38

DETAIL "H"

E; FRAME EARTH (GROUND)
M5x20L SCREW

COLOR; MUNSELL 5Y 7/1

400V- 60,75,100KVA

CHECKED BY	DESIGNED BY	OUTLINE (2)
K. Tanaka Dec 18'74	J. Wada Dec 15'74	7K3K0084-32
REGISTERED	F	

TOSHIBA CORPORATION

DEVICE	NAME	TYPE FORM & RATING				
		VT130G-4400U	VT130G-4500U	VT130G-4600U	VT130G1-4750U	VT130G1-4100KU
R21, R21A	RESISTOR	SCH40G 10Ω-35W	SCH40G 10Ω-35W	SCHN110 3.9Ω-80W	SCHN110 6.2Ω-80W	SCHN110 3.9Ω-80W
C1, C1n, C2, C2n	CONDENSOR	C1,C1A,C1B,C2,C2A,C2B 2700μ-400V	C1,C1A,C1C,C2,C2A-C2C 2700μ-400V	C1,C1A-C1D,C2,C2A-C2D 2700μ-400V	C1,C1A-C1E,C2,C2A-C2E 2700μ-400V	C1,C1A-C1F,C2,C2A-C2F 2700μ-400V
GTR1~6 GTR1A~6A	TRANSISTOR	GTR1-6 MG300N1FK1	GTR1-6 MG300N1FK1	GTR1-6 GTR1A-6A MG300N1FK1	GTR1-6, GTR1A-6A MG300N1FK1	GTR1-6 GTR1A-6A MG300N1FK1
REC1~REC3 REC1A~REC3A	RECTIFIER	REC1~REC3 160U2G41 160A-1600V	REC1~REC3 160U2G41 160A-1600V	REC1,1A~3,3A 160U2G41 160A-1600V	REC1,1A~3,3A 160U2G41 160A-1600V	REC1,1A~3,3A 160U2G41 160A-1600V
FUR, FUS, FUT	FUSE	50SHB150 (FWH150) 150A-500V	50SHB150 (FWH150) 150A-500V	50SHB150 (FWH200) 150A-500V	50SHB200 (FWH200) 200A-500V	50SHB300 (FWH300) 300A-500V
FU1	FUSE	PC1 5A-500V	PC1 5A-500V	PC1 10A-500V	PC1 10A-500V	PC1 10A-500V
FAN1, FAN2	COOLING FAN	5915PC-20T-B30 200/220V	5915PC-20T-B30 200/220V	5915PC-20T-B30 200/220V	5915PC-20T-B30 200/220V	5915PC-20T-B30 200/220V
ZNR	SURGE ABSORBER	ERZ-A25EL471	ERZ-A25EL471	ERZ-A25EL471	ERZ-A25EL471	ERZ-A25EL471
MS1	MAGNET SWITCH	C-25-S-3A2a2b 200/220V-45A	C-25-S-3A2a2b 200/220V-45A	C-35-S-3A2a2b 200/220V-60A	C-50-S-3A2a2b 200/220V-80A	C-65-S-3A2a2b 200/220V-100A
ACT	AC TIMER	ACT-1A 220V-0.1SEC	ACT-1A 220V-0.1SEC	ACT-1A 220V-0.1SEC	ACT-1A 220V-0.1 SEC	ACT-1A 220V-0.1 SEC
HCT	CUURENT TRANSFORMER	20AM3A 53A-4V-1T	20AM3A 117A-4V-1T	20AM3A 161A-4V-1T	20AM3A 176A-4V-1T	20AM3A 203A-4V-1T
TM1, TM	THERMOSTAT	US602AYTFL 90°C ON-60°C OFF	US602AYTFL 90°C ON-60°C OFF	US-602AYTFL 90°CON-60°C OFF	US602AYTFL 90°C ON-60°C OFF	US602AYTFL 90°C ON-60°C OFF
FU2	FUSE	70SHB150 (FWP150) 150A-700V	70SHB150 (FWP150) 150A-700V	70SHB200 (FWP200) 200A-700V	70SHB250 (FWP250) 250A-700V	70SHB300 (FWP300) 300A-700V
R11~R11n R12~R12n	RESISTOR	R11-R11B, R12-R12B 33KΩ-10W	R11-R11A, R12-R12A 15KΩ-20W	R11-R11B, R12-R12B 15KΩ-20W	R11-R11B, R12-R12B 15KΩ-20W	R11-R11C, R12-R12C 15KΩ-20W
BASE DRIVE PWB	PWB	ARNI-910D	ARNI-910D	ARNI-910E	ARNI-910E	ARNI-910E
MAIN DRIVE PWB	PWB	ARNI-889F	ARNI-889F	ARNI-889F	ARNI-889F	ARNI-889F
GTR7	TRANSISTOR	MG200M1FK1 200A-900V	MG200M1FK1 200A-900V	MG200M1FK1 200A-900V	MG200M1FK1 200A-900V	MG200M1FK1 200A-900V
R10-R70 R10A-R60A	RESISTOR	SCRW22 2.2Ω-37W	SCRW22 2.2Ω-37W	SCRW22 3.3Ω-37W	SCRW22 1.1Ω-74W (2.2Ω-37W-2P)	SCRW22 1.1Ω-74W (2.2Ω-37W-2P)
R (OPTION)	RESISTOR	(20Ω-180W 4P2S) 10Ω-1440W	(20Ω-180W 4P2S) 10Ω-1440W	(20Ω-180W 5P2S) 8Ω-1800W	(20Ω-180W 6P2S) 6.6Ω-2160W	(20Ω-180W 8P2S) 5Ω-2520W
DX1 (OPTION)	DC REACTOR	530μH-75A	425μH-95A	350μH-110A	280μH-140A	220μH-185A
C10, C30, C50	CONDENSOR	22000μF-10V	22000μF-10V	22000μF-10V	47000μF-10V	47000μF-10V
C462	CONDENSOR	68000μF-10V	68000μF-10V	68000μF-10V	150000μF-10V	150000μF-10V

INVERTER UNIT TYPE FORM : VT130G1-4□□□

VR: VARIABLE RESISTOR (RHEOSTAT)

	VR-NO.	USE	STANDARD ADJUST
CONTROL PWB	1RH	FREQUENCY METER ADJUST.	0-NOTCH
	2RH	OUTPUT FREQUENCY ADJUST.	REFER TO FIG 11.
	3RH	OUTPUT VOLTAGE ADJUST. (LOW LEVEL BIAS ADJUST)	〃
	4RH	OUTPUT VOLTAGE GAIN ADJUST.	〃
	5RH	I-IN: 4~20mA REF ADJUST. (BIAS)	〃
	6RH	I-IN: 4 20mA REF ADJUST. (GAIN)	〃
	⚠ 7RH	ACCELERATION TIME X1-1~20SEC X6-6~120SEC	X1-20 SEC
	⚠ 8RH	DECELERATION TIME X1-1~20SEC X6-6~120SEC	X1-20 SEC
	9RH	UPPER LIMIT (MAX. OUTPUT FREQUENCY LIMIT)	REFER TO FIG 12
	10RH	LOWER LIMIT (MIN. OUTPUT FREQUENCY LIMIT)	〃
	12RH	UNDER VOLTAGE ADJUST	REFER TO "UP" LEVEL
MAIN CIRCUIT/BASE DRIVE PWB	21RH	OVER VOLTAGE ADJUST.	REFER TO "OP" LEVEL
	HCT-GIN	HALL EFFECT CT CIRCUIT OUTPUT GAIN ADJUST.	PEAK 4V At Rating Curr.
	HCT-OFS	HALL EFFECT CT CIRCUIT OUTPUT NULL ADJUST.	0V At 0 AMPARE

STANDARD PROTECTION LEVEL

	40~75KVA	100KVA
OC: OVER CURRENT	*1 225 %	*1 195 %
OP: OVER POTENTIAL (OVER VOLTAGE)	MAX. DC800V	MAX. DC800V
UP: UNDER POTENTIAL (UNDER VOLTAGE)	*2 85 %	*2 85 %
OH: GTR AND/OR POWER Discharge Unit OVER HEAT	90°C	90 °C
STALL CURR. LEVEL	*1 150 %	*1 130 %
CURR. LIMIT LEVEL	*1 185 %	*1 160 %

*1: PERCENTAGE OF RATED OUTPUT CURRENT
*2: PERCENTAGE OF RATED SUPPLY VOLTAGE

UNIT TYPE FORM VT-130G1	Rating KVA	Rating Curr. At 110 % cont. -150% 30sec	Rating Curr At 110% cont. -130% 30sec
-4400	40 KVA	55 A	—
-4500	50 KVA	69 A	—
-4600	60 KVA	83 A	—
-4750	75 KVA	104 A	—
-4100K	100 KVA	—	138 A

⚠ J13 MOUNED AFTER APR. 2.86

STANDARD JUMPER SELECTION

ARNI-889F

J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12	J13
OPEN	"1f"	"60Hz"	OPEN	CLOSE	CLOSE	OPEN	CLOSE	CLOSE (A-D)	CLOSE	OPEN	OPEN	X1

ARNI-910D/E

J1
CLOSE

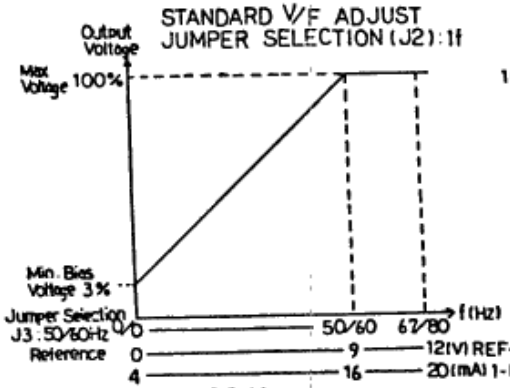


FIG 11.

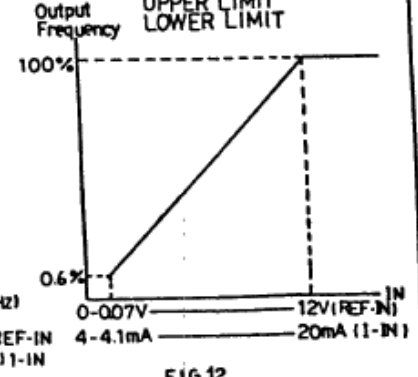


FIG 12.

	CHECKED BY	DESIGNED BY	STANDARD ADJUSTMENT LIST
	H. Tsukui Dec '18 '84	J. Wada Dec 15 '84	7K3K0084-50
	REGISTERED		

1) MAR. 3 86 ADD J13 S.M. H. Tsukui

TOSHIBA CORPORATION

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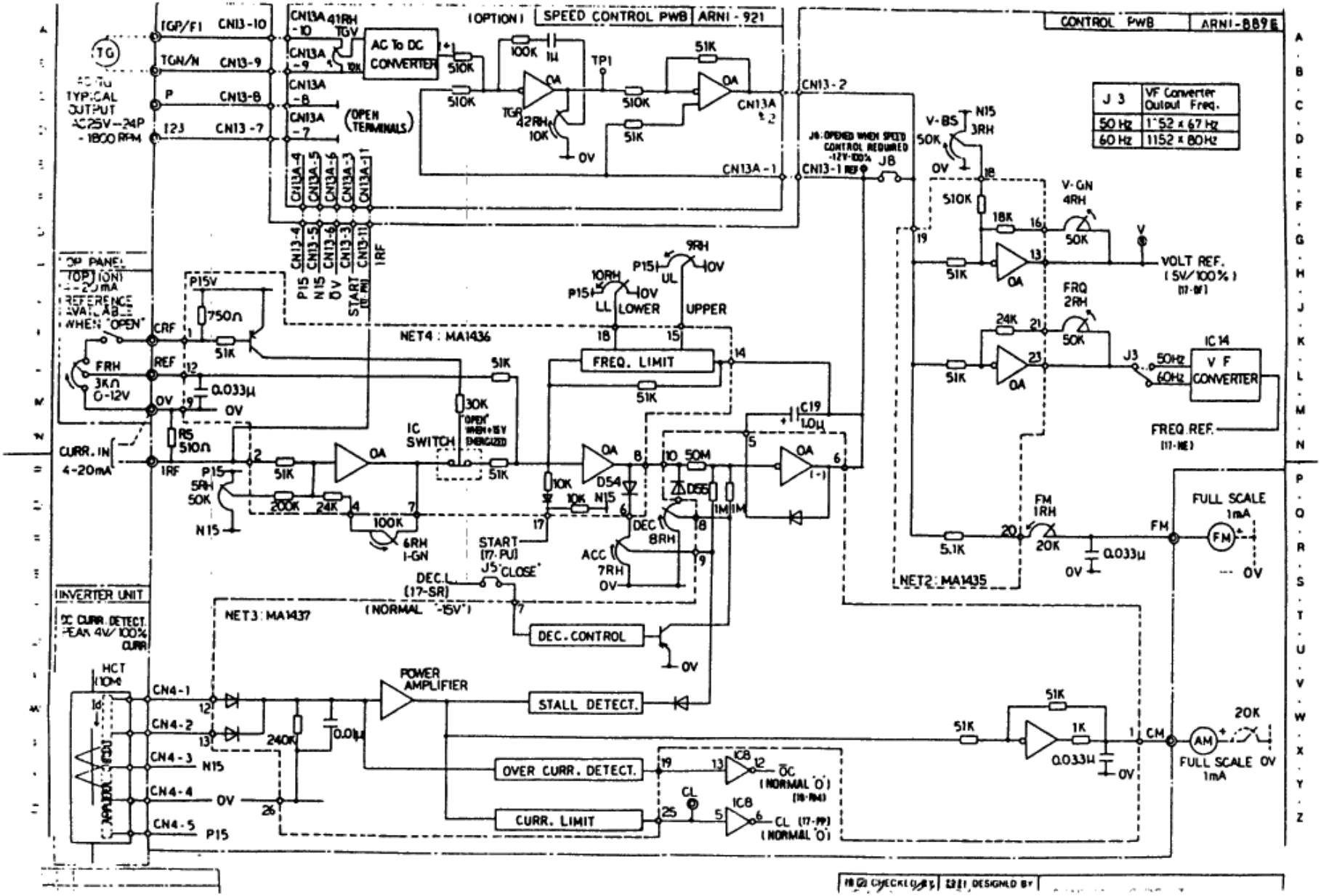
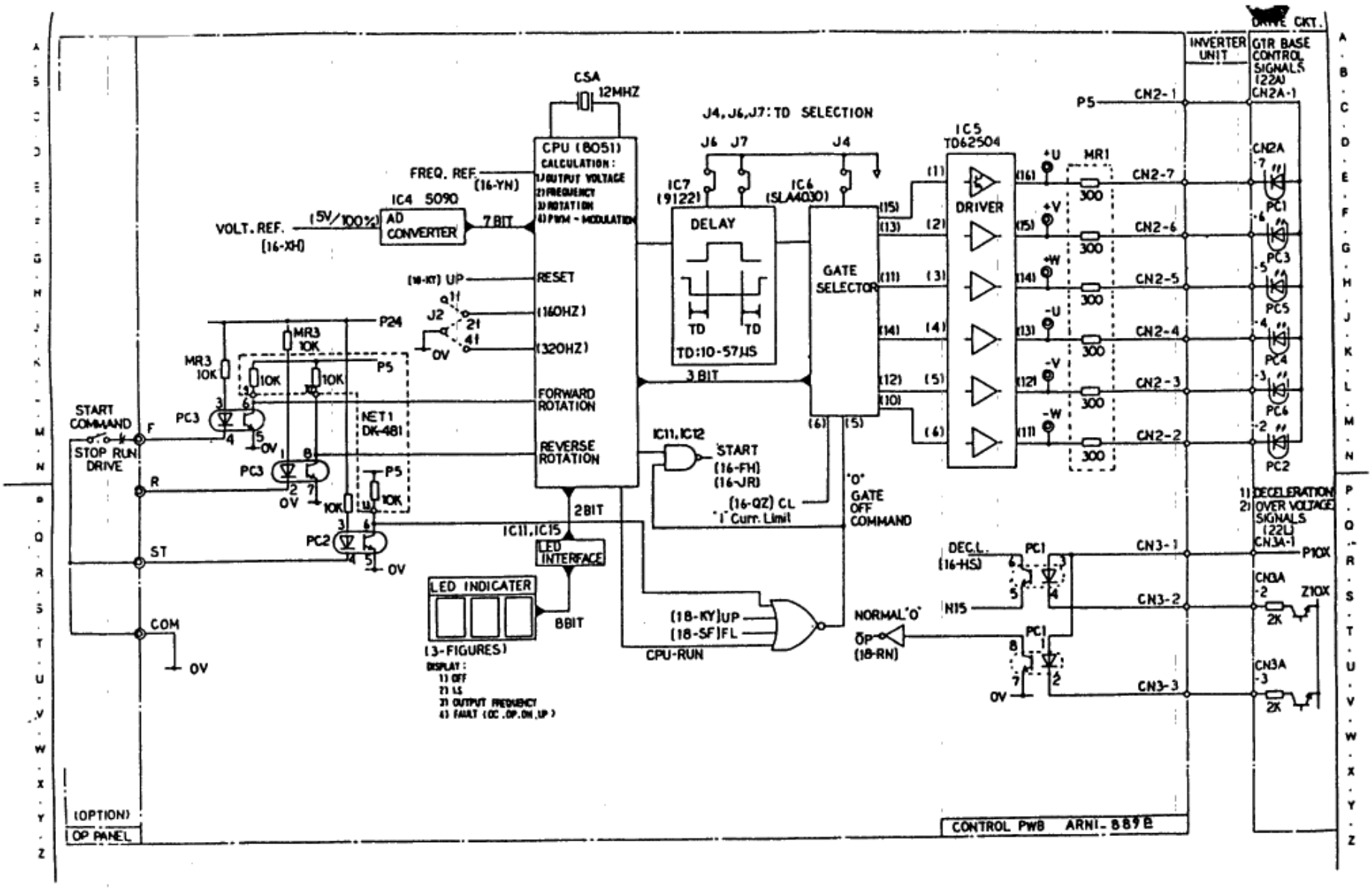
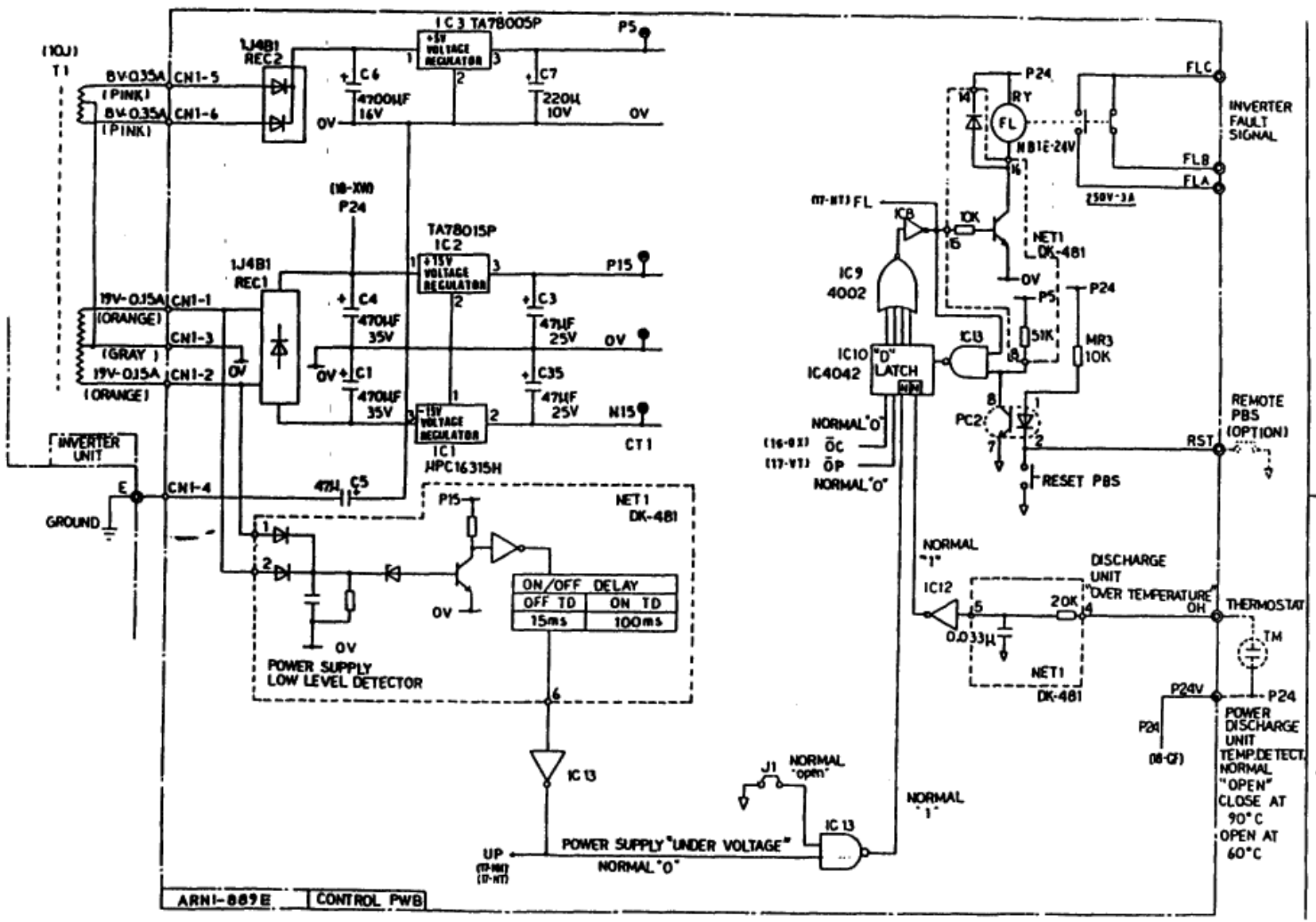
TOSHIBA

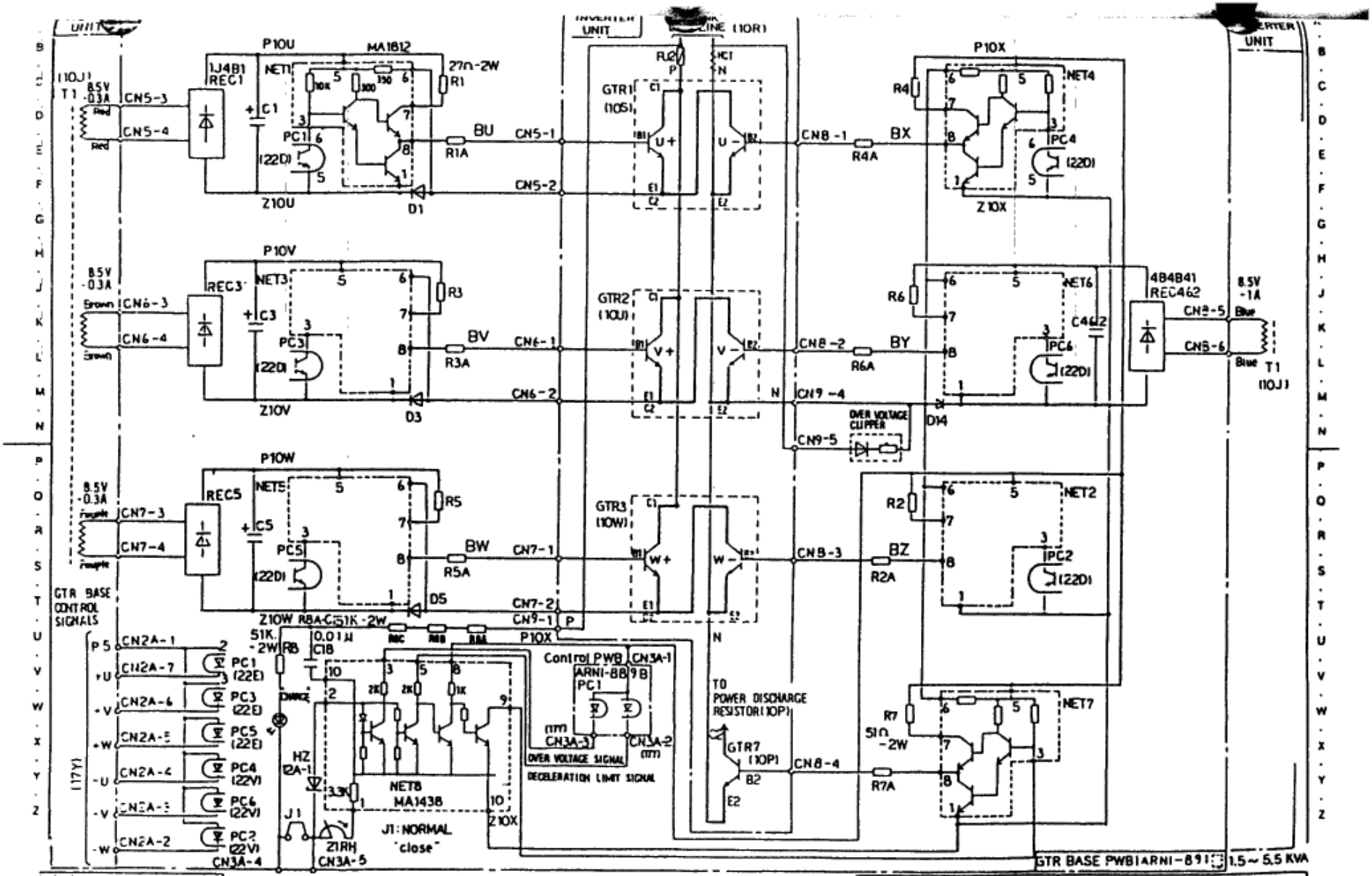

(OPTION) SPEED CONTROL PWB ARNI-921
CONTROL PWB ARNI-889E
AC To DC CONVERTER
(OPEN TERMINALS)
J8: OPENED WHEN SPEED CONTROL REQUIRED -12V-100%
J3
50Hz
60Hz
VF Converter Output Freq.
50 Hz 1152 x 67 Hz
60 Hz 1152 x 80Hz
V-BS
V-GN 4RH
FRQ 2RH
FM 1RH
VOLT REF. (5V/100%)
FREQ REF.
IC 14
V F CONVERTER
FULL SCALE 1mA
FREQ. LIMIT
UPPER
LOWER
IC SWITCH
CURR. IN 4-20mA
NET4 : MA1436
NET2 : MA1435
NET3 : MA1437
INVERTER UNIT
DEC. CONTROL
STALL DETECT.
OVER CURR. DETECT.
CURR. LIMIT
POWER AMPLIFIER
HCT 10H
FULL SCALE 1mA
FULL SCALE 0V 1mA



TOSHIBA CORPORATION

CHECKED BY T. Morisaka Dec. 9. 83	DESIGNED BY Y. Negura Dec. 9. 83	CONTROL CIRCUIT (2)
REGISTERED		7K3K0081-17


IC3 TA78005P
P5
(10J) T1
1J4B1 REC2
BV-0.35A (PINK) CN1-5
BV-0.35A (PINK) CN1-6
+C6 4700μF 16V
+C7 220μ 10V
0V
TA78015P IC2
P15
1J4B1 REC1
19V-0.35A (ORANGE) CN1-1
CN1-3
(GRAY)
19V-0.35A (ORANGE) CN1-2
+C4 470μF 35V
+C3 47μF 25V
+C1 470μF 35V
+C35 47μF 25V
N15
IC1 μPC16315H
CT1
INVERTER UNIT
E
GROUND
CN1-4
47μ C5
NET1 DK-481
ON/OFF DELAY
OFF TD 15ms
ON TD 100ms
POWER SUPPLY LOW LEVEL DETECTOR
IC13
J1 NORMAL "open"
UP
POWER SUPPLY "UNDER VOLTAGE"
NORMAL "0"
NORMAL "1"
ARN1-869E
CONTROL PWB
FL
RY
NB1E-24V
FLC
FLB
FLA
INVERTER FAULT SIGNAL
250V-3A
IC8
10K
NET1 DK-481
IC9 4002
IC10 IC4042 "D" LATCH
IC11
51K
MR3 10K
PC2
REMOTE PBS (OPTION)
RST
RESET PBS
NORMAL "0"
IC12
20K
0.033μ
DISCHARGE UNIT "OVER TEMPERATURE"
OH
THERMOSTAT
TM
P24V
POWER DISCHARGE UNIT TEMP.DETECT NORMAL "OPEN" CLOSE AT 90°C OPEN AT 60°C


GTR BASE CONTROL SIGNALS
P10U
P10V
P10W
P10X
MA1812
1J4B1 REC1
REC3
REC5
4B4B41 REC462
NET1
NET2
NET3
NET4
NET5
NET6
NET7
NET8 MA1438
GTR1 (10S)
GTR2 (10U)
GTR3 (10W)
GTR7 (10P)
R1
R2
R3
R4
R5
R6
R7
R1A
R2A
R3A
R4A
R5A
R6A
R7A
C1
C3
C5
C18
C4612
D1
D3
D5
D14
Z10U
Z10V
Z10W R8A-C51K-2W
Z10X
Z1RH
J1
J1: NORMAL "close"
BU
BV
BW
BX
BY
BZ
CN5-1
CN5-2
CN6-1
CN6-2
CN7-1
CN7-2
CN8-1
CN8-2
CN8-3
CN8-4
CN9-1
CN9-4
CN9-5
CN5-3
CN5-4
CN6-3
CN6-4
CN7-3
CN7-4
CN5-5
CN5-6
CN2A-1
CN2A-7
CN2A-6
CN2A-5
CN2A-4
CN2A-3
CN2A-2
CN3A-1
CN3A-2
CN3A-3
CN3A-4
CN3A-5
PC1 (22E)
PC3 (22E)
PC5 (22E)
PC4 (22V)
PC6 (22V)
PC2 (22V)
PC1 (22D)
PC3 (22D)
PC5 (22D)
PC4 (22D)
PC6 (22D)
PC2 (22D)
ARNI-889B PC1
Control PWB
OVER VOLTAGE SIGNAL
DECELERATION LIMIT SIGNAL
OVER VOLTAGE CLIPPER
TO POWER DISCHARGE RESISTOR(10P)
T1 (10J)
8.5V -0.3A
8.5V -1A
Red
Brown
Purple
Blue
51K, -2W
0.01μ
510 -2W
GTR BASE PWB ARNI-891
1.5~5.5 KVA
BASE DRIVE CIRCUIT
7K3K0081-22
TOSHIBA CORPORATION

DEVICE	NAME	VT130G1-4015 1.5KVA	VT130G1-4035 3.5KVA	VT130G1-4055 5.5KVA
PWB	CONTROL CIRCUIT PWB	ARNI-889E	ARNI-889E	ARNI-889E
PWB	BASE DRIVE PWB	ARNI-891D	ARNI-891D	ARNI-891E
C1, C2	CONDENSOR	330μ - 400V	680μ - 400V	1000μ - 400V
R (OPTION)	RESISTOR	270Ω - 66W	110Ω - 142W	110Ω - 142W
HCT	HALL EFFECT CURRENT TRANSFORMER	NNC-20CTA 4V/75A-18T	NNC-20CTA 4V/75A-9T	NNC-20CTA 4V/80A-6T
REC11	BRIDGE RECTIFIER	30U6P42 1600V-30A	30U6P42 1600V-30A	30U6P42 1600V-30A
GTR1~3	GIANT TRANSISTOR	MG25M2CK2 900V-25A	MG25M2CK2 900V-25A	MG50M2CK2 900V-50A
GTR7	GIANT TRANSISTOR	MG25M1BK1 900V-25A	MG25M1BK1 900V-25A	MG25M1BK1 900V-25A
D21	RECTIFIER	3NZ61 1000V-3A	3NZ61 1000V-3A	3NZ61 1000V-3A
FU1	FUSE	6JX3 KLM-3A	6JX3 KLM-3A	6JX3 KLM-3A
FU2	FUSE	FWP20-20A A070F020	FWP20-20A A070F020	FWP20-20A A070F020
MS1, MSX	MAGNETIC CONTACTOR	G2R-1123T-V CURR. RATING-16A	G2R-1123T-V	G2R-1123T-V

INVERTER UNIT TYPE FORM : VT130G1-40□□

VR : VARIABLE RESISTOR (RHEOSTAT)

	VR-NO	USE	STANDARD ADJUST
CONTROL PWB (ARNI-889E)	1RH	FREQUENCY METER ADJUST	0-NOTCH
	2RH	OUTPUT FREQUENCY ADJUST	REFER TO FIG 11.
	3RH	OUTPUT VOLTAGE ADJUST. (LOW LEVEL BIAS ADJUST)	〃
	4RH	OUTPUT VOLTAGE GAIN ADJUST.	〃
	5RH	I-IN : 4~20mA REF ADJUST. (BIAS)	〃
	6RH	I-IN : 4~20mA REF ADJUST. (GAIN)	〃
	7RH	ACCELERATION TIME (1~20 SEC)	20 SEC
	8RH	DECELERATION TIME (1~20 SEC)	20 SEC
	9RH	UPPER LIMIT (MAX. OUTPUT FREQUENCY LIMIT)	REFER TO FIG 12.
	10RH	LOWER LIMIT (MIN. OUTPUT FREQUENCY LIMIT)	〃
	12RH	UNDER VOLTAGE ADJUST	REFER TO "UP" LEVEL
MAIN CIRCUIT/ BASE DRIVE PWB (ARNI-891□)			
	HCT -GIN	HALL EFFECT CT OUTPUT GAIN ADJUST	PEAK 4V AT RATING CURR.
	HCT -OFS	HALL EFFECT CT OUTPUT NULL ADJUST	0V AT 0 AMPARE

STANDARD PROTECTION LEVEL

OC : OVER CURRENT	*1 225 %
OP : OVER POTENTIAL (OVER VOLTAGE)	DC 800V
UP : UNDER POTENTIAL (UNDER VOLTAGE)	*2 85 %
OH : GTR AND/OR POWER Discharge Unit OVER HEAT	90 °C
STALL CURR. LEVEL	*1 150 %
CURR. LIMIT LEVEL	*1 185 %

*1 : PERCENTAGE OF RATED OUTPUT CURRENT
*2 : PERCENTAGE OF RATED SUPPLY VOLTAGE

UNIT TYPE FORM VT130G1	Rating KVA	Rating Curr. At 110 % cont. -150% 30 sec	
-4015	1.5 KVA	2.5 A	
-4035	3.5 KVA	5 A	
-4055	5.5 KVA	8 A	

STANDARD JUMPER SELECTION

ARNI-889E

J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12
OPEN	"1"	"60Hz"	OPEN	CLOSE	CLOSE	CLOSE	CLOSE	CLOSE (A-D)	CLOSE	OPEN	OPEN

ARNI-891□

J1
CLOSE

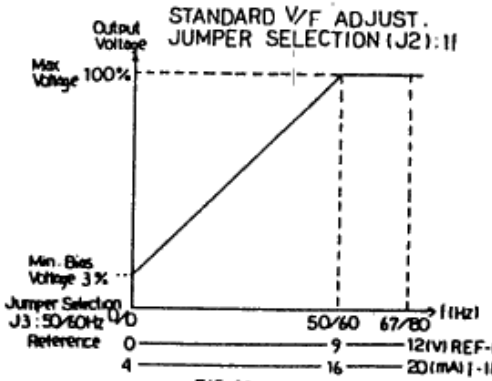


FIG 11.

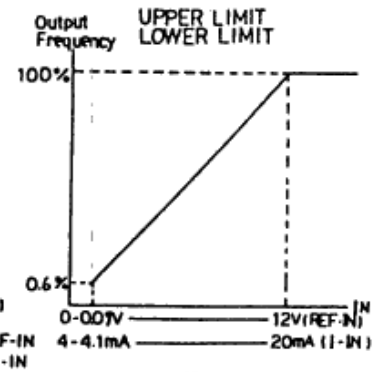
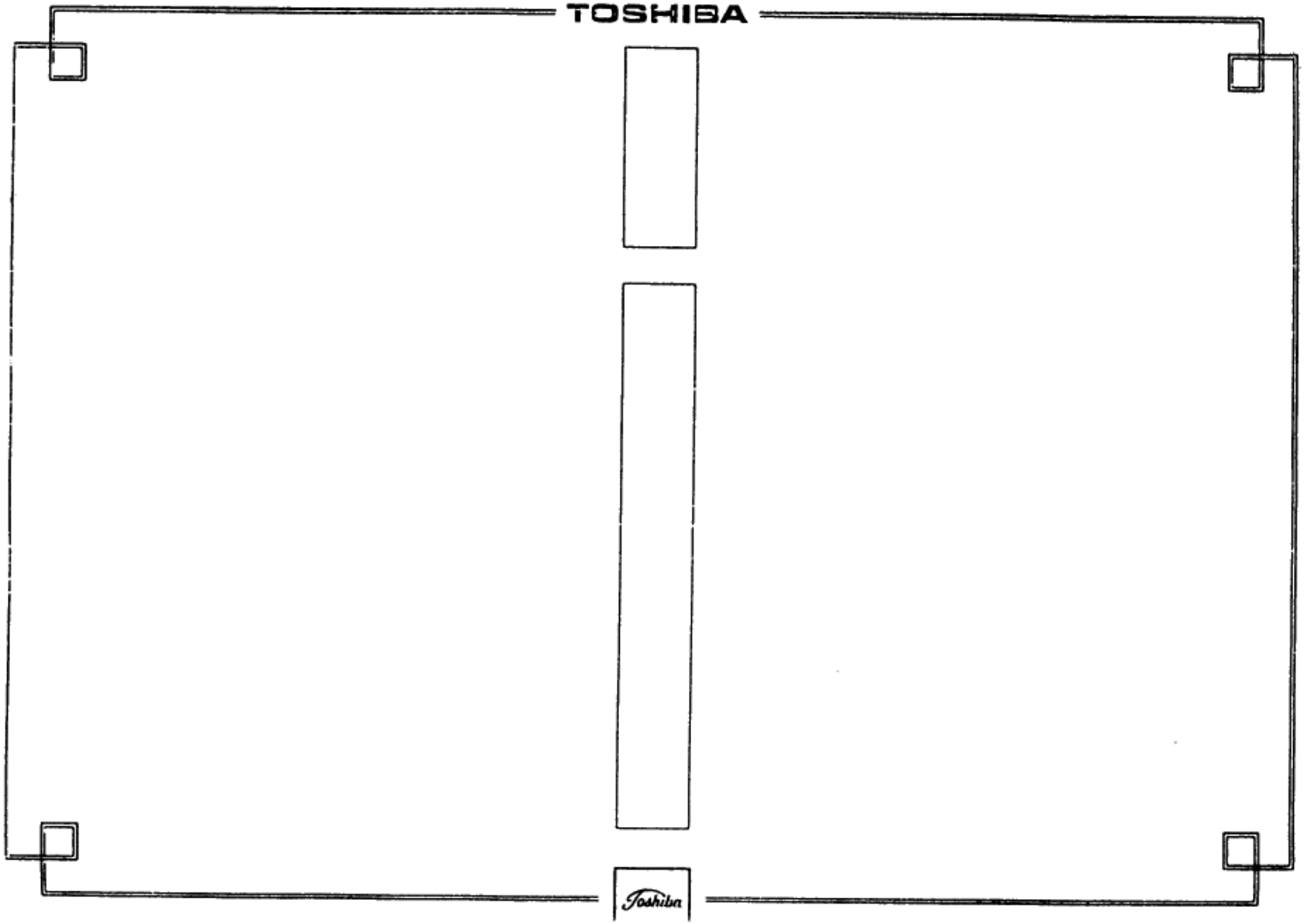


FIG 12.

CHECKED BY	DESIGNED BY	STANDARD ADJUSTMENT LIST
T. Morisato Dec. 1'83	Y. Maguro Dec. 8'83	7K3K0081-50

TOSHIBA CORPORATION


TOSHIBA
Toshiba

TOSVERT-130G1 460V 8~16KVA

SCHEMATIC DIAGRAMS

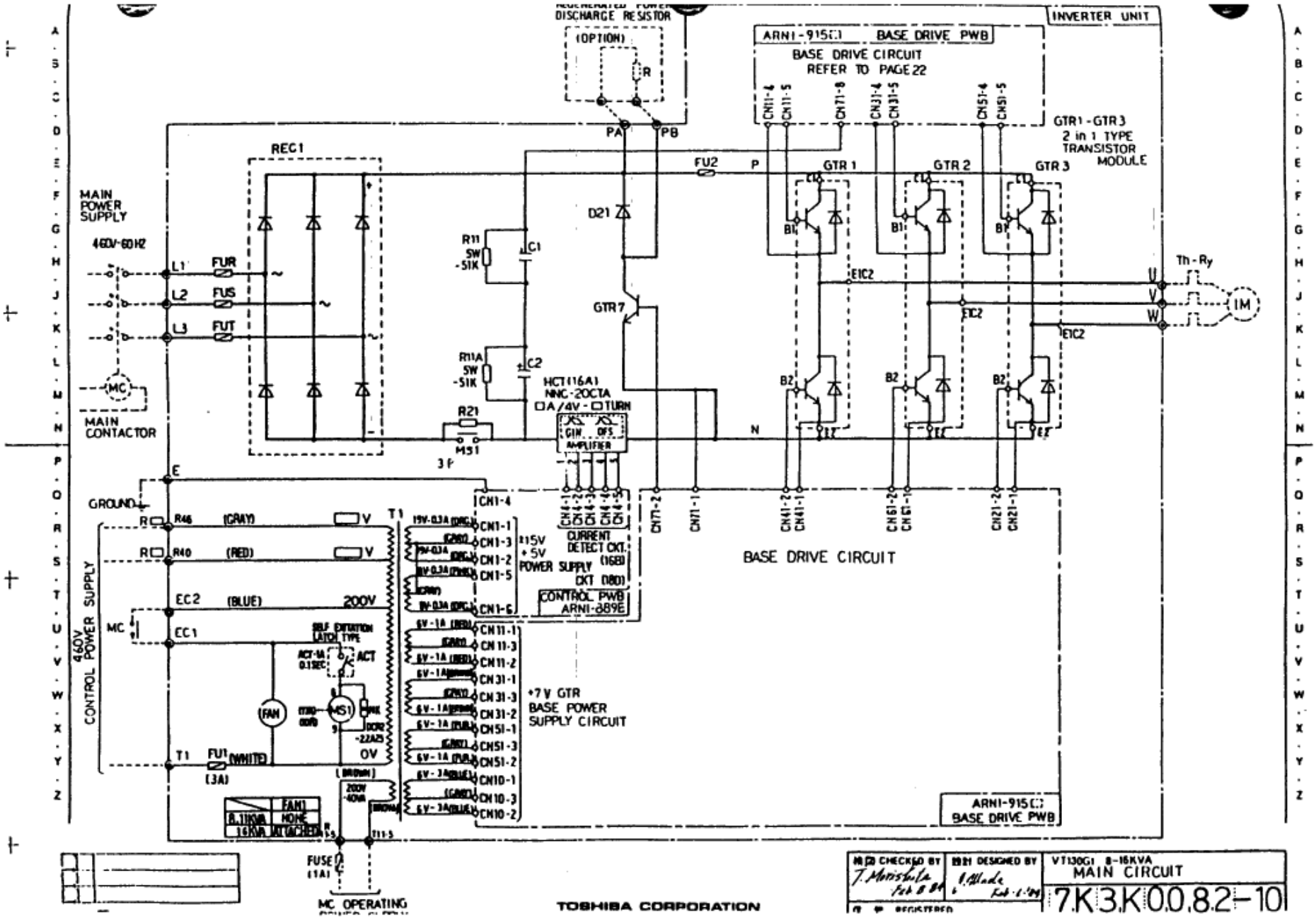
PAGE	TITLE	PAGE	TITLE	PAGE	TITLE	PAGE	TITLE
1	INDEX	16	CONTROL CIRCUIT(1)	31	OUTLINE	46	
2		17	CONTROL CIRCUIT(2)	32		47	
3	ABBREVIATION LIST	18	CONTROL CIRCUIT(3)	33		48	
4		19		34		49	
5	INTERFACE	20		35	PARTS LIST	50	STANDARD ADJUSTMENT LIST
6		21		36		51	
7		22	BASE DRIVE CIRCUIT	37		52	
8		23		38		53	
9		24		39		54	
10	MAIN CIRCUIT	25		40		55	
11		26		41		56	
12		27		42		57	
13		28		43		58	
14		29		44		59	
15		30		45		60	BACK COVER

TOSHIBA CORPORATION
TOKYO JAPAN

APPROVED BY	CHECKED BY	DESIGNED BY	DRAWN BY	TOSVERT-130G1
H. Sanata Feb. 16'84	T. Morishita Feb. 8'84	J. Ishida Feb. 6'84	A. Feb. 6'84	7K3K0082-1

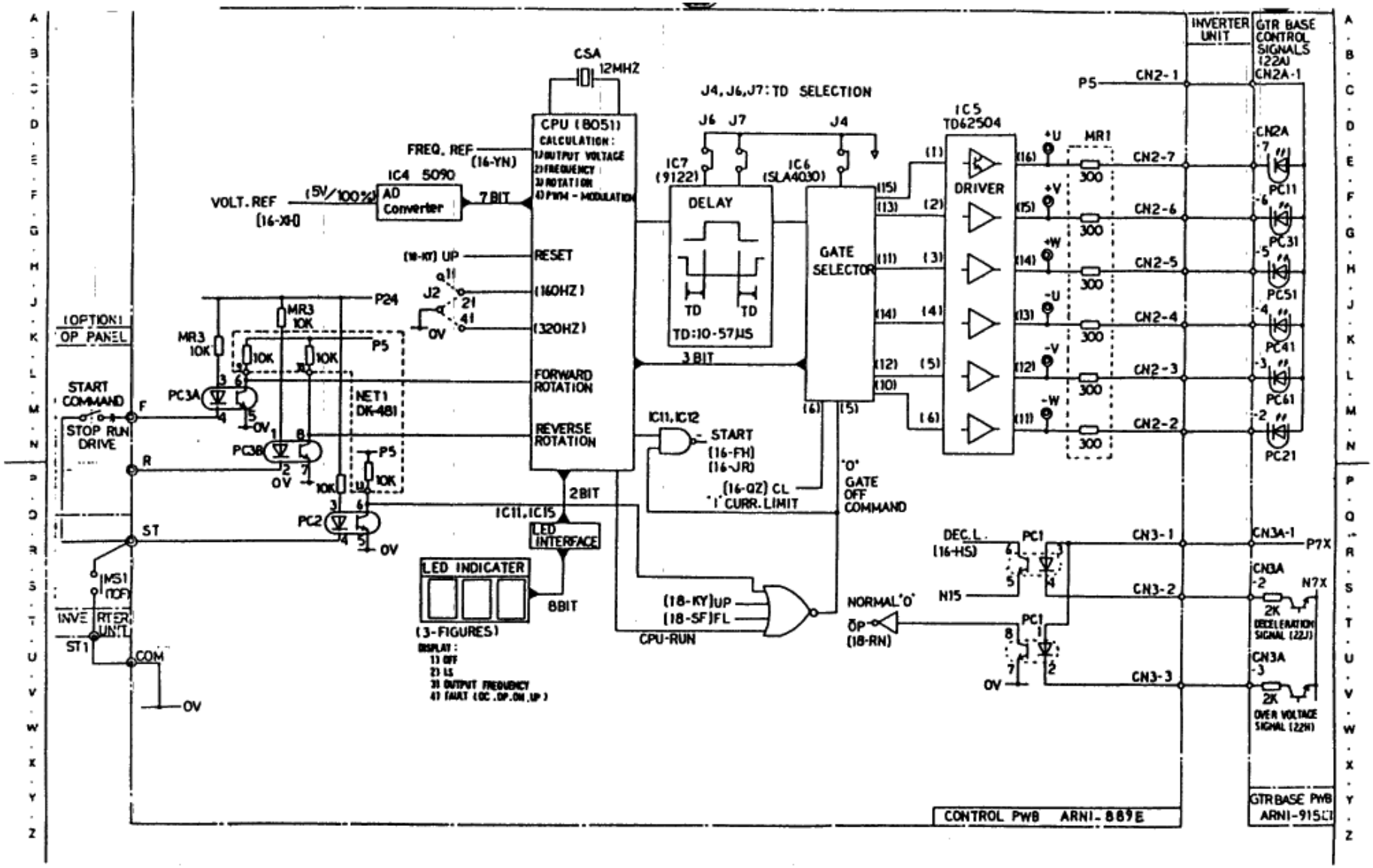
REGISTERED

ABBR.	DESCRIPTION	ABBR.	DESCRIPTION	ABBR.	DESCRIPTION
ACC.	ACCELERATION	NET	HINET----HYBRID IC	ACT	AC TIMER RELAY
AM	AMMETER	OA	OPERATIONAL AMPLIFIER		
C	CONDENSOR	OC	OVER CURRENT		
CN	CONNECTOR	OH	OVER HEAT		
CPU	CENTRAL PROCESSING UNIT	OP	1) OVER POTENTIAL/OVER VOLTAGE 2) OPERATIONAL PANEL		
D	DIODE	PC	PHOTO COUPLER		
DEC.	DECELERATION	PBS	PUSH BUTTOM SWITCH		
E	EARTH GROUND	PWB	PRINTED WIRING BOARD		
F	FORWARD	R	1) REVERSE 2) RESISTOR		
FL	FAULT	REC	RECTIFIER		
FM	FREQUENCY METER	REF.	REFERENCE		
FU	FUSE	RH	RHEOSTAT		
GTR	GIANT TRANSISTOR B: BASE E: EMITTER C: COLLECTOR	T	TRANSFORMER		
		TB	TERMINAL BLOCK		
		TG	TACHO GENERATOR		
HCT	HALL EFFECT CURRENT TRANSFORMER	TM	THERMOSTAT		
IC	INTEGRATED CIRCUIT	Th-Ry	THERMAL RELAY		
IM	INDUCTION MOTOR	UP	UNDER POTENTIAL UNDER VOLTAGE		
J	JUMPER	VFC	VOLTAGE TO FREQUENCY CONVERTER		
LED	LIGHT EMITTING DIODE	ADC	ANALOGUE TO DIGITAL CONVERTER		
MC	MAGNETIC CONTACTOR	CSA	CRYSTAL (OR CERAMIC) OSCILLATOR		
MCCB	MOLDED CACE CIRCUIT BREAKER	MR	MOLDED RESISTOR		
MS	MAGNETIC CONTACTOR FOR SHORTING	LS	LOW SPEED		



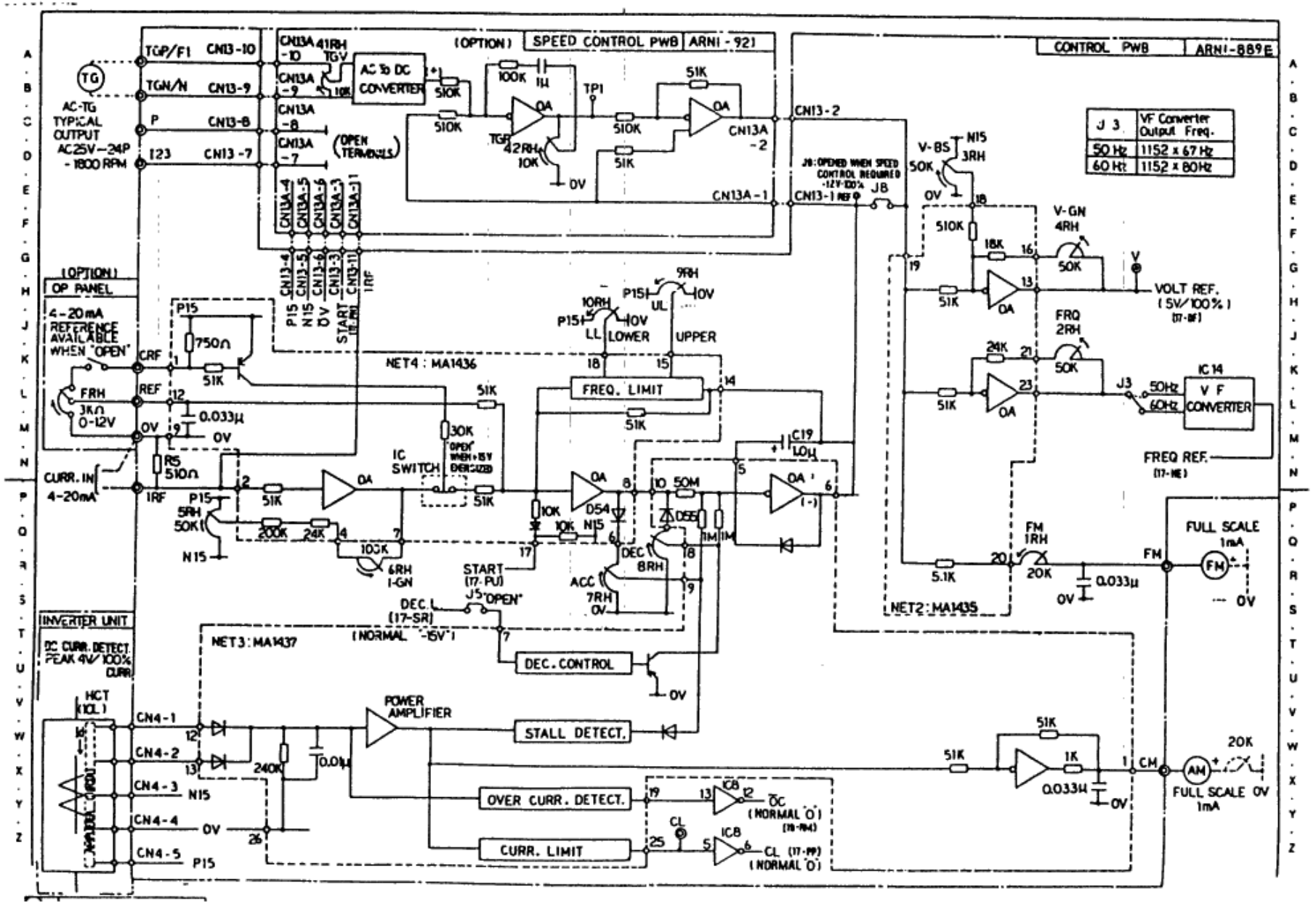
	CHECKED BY T. Morishita Feb 8 84	DESIGNED BY A. Maeda Feb 1 84	VT130G1 8-16KVA MAIN CIRCUIT
			7K3K00.82-10

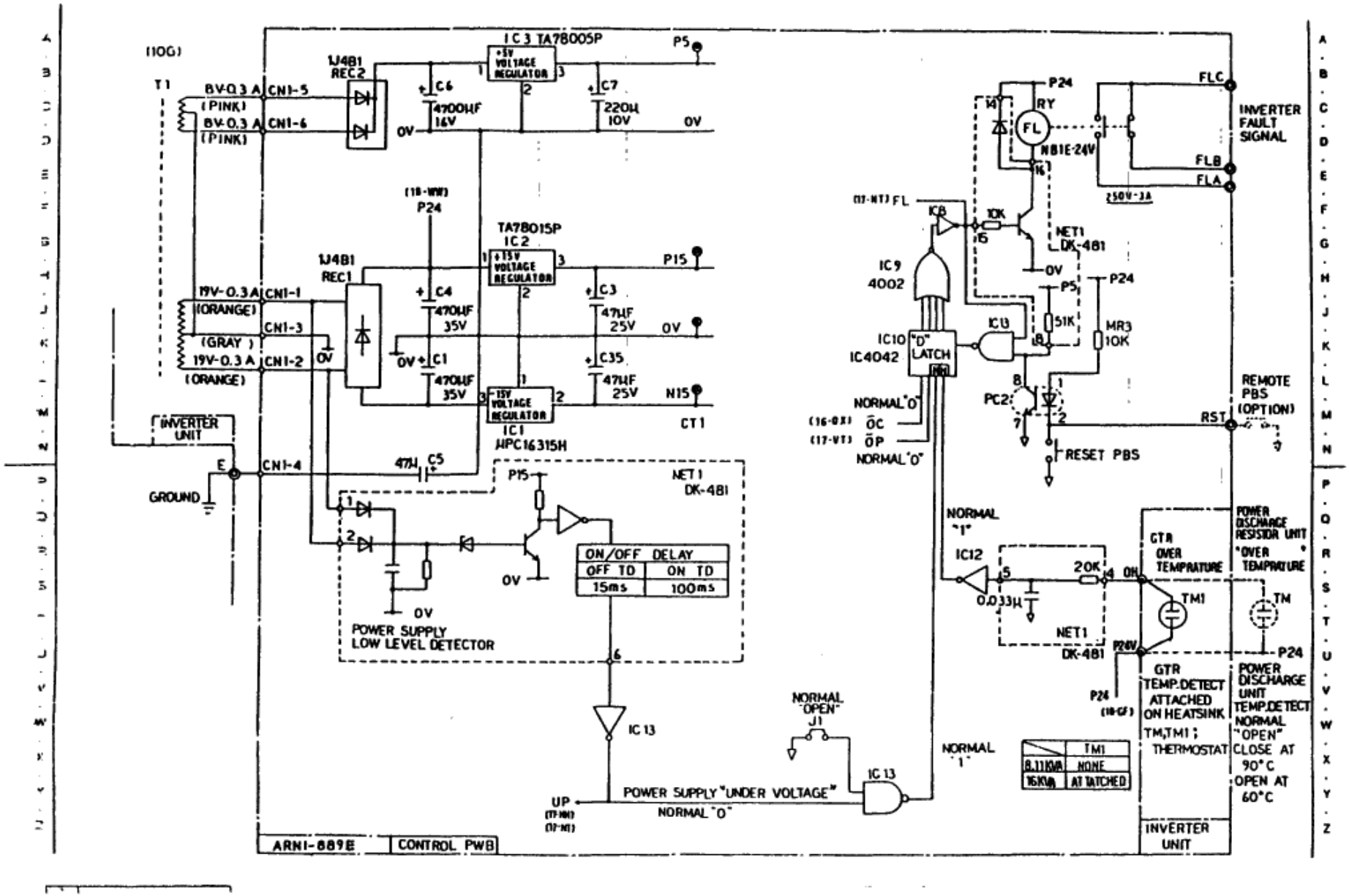
TOSHIBA CORPORATION

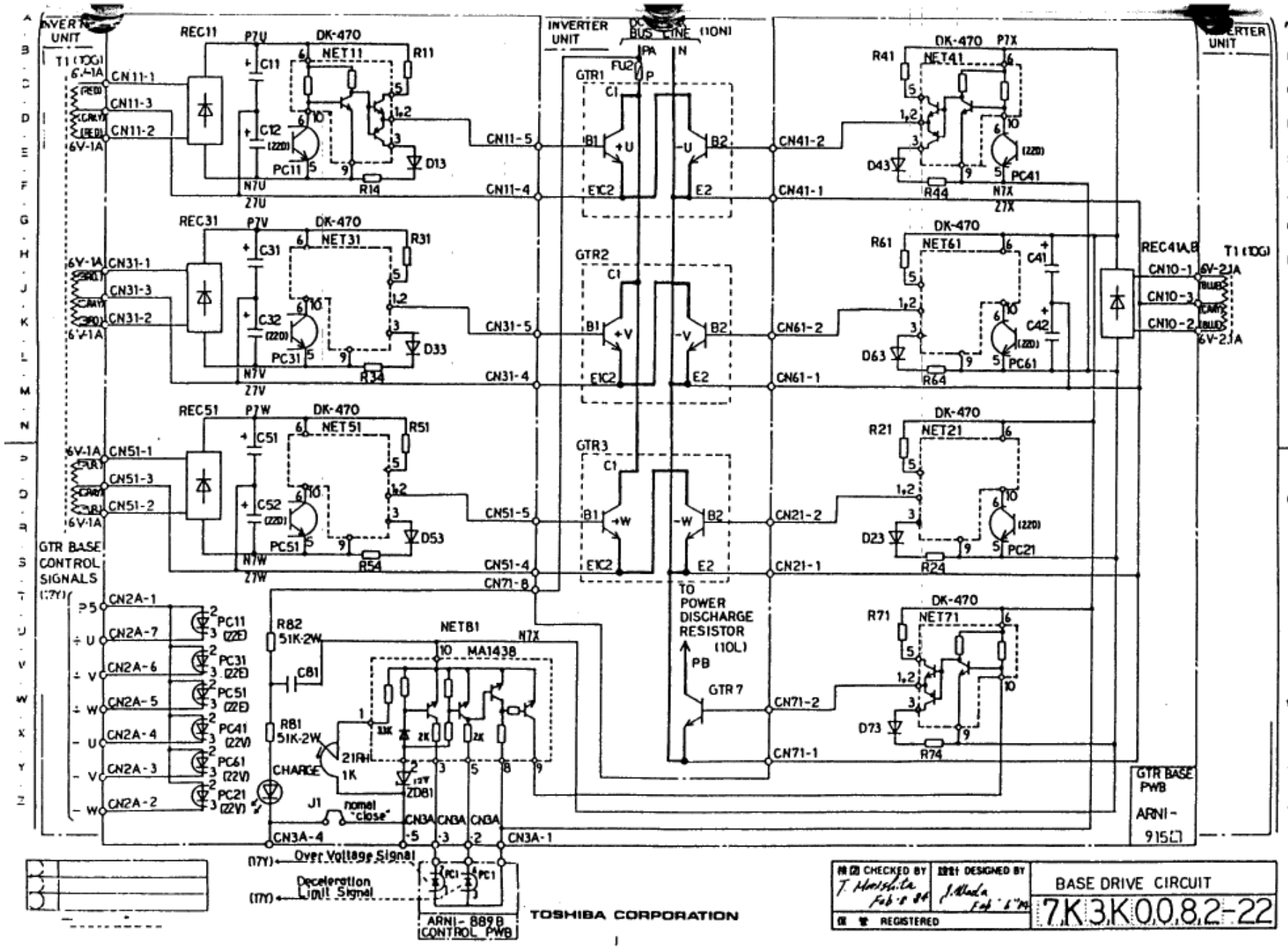


TOSHIBA CORPORATION

CHECKED BY T. Morisato Feb-8	DESIGNED BY J. Ueda Feb-1	CONTROL CIRCUIT (2)
REGISTERED		7K3K0082-17


(OPTION) SPEED CONTROL PWB ARNI-921
CONTROL PWB ARNI-889E
TG
AC-TG TYPICAL OUTPUT AC25V-24P -1800 RPM
TGP/F1 CN13-10
TGN/N CN13-9
P CN13-8
123 CN13-7
AC to DC CONVERTER
(OPEN TERMINALS)
CN13A-10
CN13A-9
CN13A-8
CN13A-7
CN13A-4
CN13A-5
CN13A-6
CN13A-3
CN13A-1
CN13A-2
CN13A-1
CN13-2
CN13-1 REF
JB: OPENED WHEN SPEED CONTROL REQUIRED -12V-100%
J3
VF Converter Output Freq.
50 Hz 1152 x 67 Hz
60 Hz 1152 x 80Hz
(OPTION) OP PANEL
4-20mA REFERENCE AVAILABLE WHEN "OPEN"
FRH 3kΩ 0-12V
CRF
REF
0V
CURR. IN 4-20mA
IRF
R5 510Ω
P15
750Ω
51K
0.033μ
30K
IC SWITCH
NET4 : MA1436
FREQ. LIMIT
UPPER
LOWER
LL
UL
V-BS
V-GN 4RH
FRQ 2RH
VOLT REF. (5V/100%)
IC 14
V F CONVERTER
50Hz
60Hz
FREQ REF.
FM 1RH
FULL SCALE 1mA
NET2 : MA1435
INVERTER UNIT
DC CURR. DETECT. PEAK 4V/100% CURR
NET3 : MA1437
START (17-PU)
DEC. (17-SR)
J5 "OPEN"
(NORMAL "5V")
DEC. CONTROL
ACC 7RH
DEC 8RH
6RH I-GN
HCT (KOL)
CN4-1
CN4-2
CN4-3
CN4-4
CN4-5
N15
P15
POWER AMPLIFIER
STALL DETECT.
OVER CURR. DETECT.
CURR. LIMIT
(NORMAL "0")
(NORMAL "0")
240K
0.01μ
20K
1K
CM
FULL SCALE 1mA
FULL SCALE 0V


IC3 TA78005P
+5V VOLTAGE REGULATOR
P5
1J4B1 REC2
T1
BV-0.3 A (PINK) CN1-5
BV-0.3 A (PINK) CN1-6
+C6 4700μF 16V
+C7 220μ 10V
0V
TA78015P
IC2
+15V VOLTAGE REGULATOR
P15
1J4B1 REC1
19V-0.3 A (ORANGE) CN1-1
CN1-3
(GRAY)
19V-0.3 A (ORANGE) CN1-2
+C4 470μF 35V
+C3 47μF 25V
+C1 470μF 35V
+C35 47μF 25V
N15
CT1
IC1 μPC16315H
INVERTER UNIT
E
GROUND
CN1-4
47μ C5
NET1 DK-481
ON/OFF DELAY
OFF TD 15ms
ON TD 100ms
POWER SUPPLY LOW LEVEL DETECTOR
IC 13
UP
POWER SUPPLY "UNDER VOLTAGE"
NORMAL "0"
NORMAL "OPEN" J1
NORMAL "1"
IC13
P24
RY
FL
NB1E-24V
FLC
FLB
FLA
INVERTER FAULT SIGNAL
250V-3A
IC8
10K
NET1 DK-481
IC9 4002
IC10 "D" LATCH IC4042
IC11
51K
MR3 10K
PC2
REMOTE PBS (OPTION)
RST
RESET PBS
NORMAL "0"
ŌC
ŌP
IC12
20K
0.033μ
NET1 DK-481
GTR OVER TEMPRATURE
TM1
TM
POWER DISCHARGE RESISTOR UNIT "OVER TEMPRATURE"
GTR TEMP.DETECT ATTACHED ON HEATSINK
TM,TM1 ; THERMOSTAT
POWER DISCHARGE UNIT TEMP.DETECT NORMAL "OPEN" CLOSE AT 90°C OPEN AT 60°C
TM1
8.1KVA NONE
16KVA ATTATCHED
INVERTER UNIT
ARNI-889E
CONTROL PWB


INVERTER UNIT
REC11
P7U
DK-470
NET11
R11
C11
C12
PC11
D13
R14
N7U
Z7U
CN11-1
CN11-3
CN11-2
CN11-5
CN11-4
REC31
P7V
NET31
R31
C31
C32
PC31
D33
R34
N7V
Z7V
CN31-1
CN31-3
CN31-2
CN31-5
CN31-4
REC51
P7W
NET51
R51
C51
C52
PC51
D53
R54
N7W
Z7W
CN51-1
CN51-3
CN51-2
CN51-5
CN51-4
CN71-8
GTR BASE CONTROL SIGNALS
(17Y)
CN2A-1
CN2A-7
CN2A-6
CN2A-5
CN2A-4
CN2A-3
CN2A-2
PC11 (22E)
PC31 (22E)
PC51 (22E)
PC41 (22V)
PC61 (22V)
PC21 (22V)
R82 51K-2W
C81
R81 51K-2W
CHARGE
21RH
1K
NET81
MA1438
N7X
ZD81
J1
normal "close"
CN3A-4
CN3A-5
CN3A-3
CN3A-2
CN3A-1
(17Y) Over Voltage Signal
(17Y) Deceleration Limit Signal
ARNI-889B CONTROL PWB
INVERTER UNIT
DC BUS LINE (10N)
PA
N
FU2
P
GTR1
GTR2
GTR3
C1
B1
B2
+U
-U
+V
-V
+W
-W
E1C2
E2
CN11-5
CN11-4
CN31-5
CN31-4
CN51-5
CN51-4
CN71-8
TO POWER DISCHARGE RESISTOR (10L)
PB
GTR7
CN71-2
CN71-1
DK-470
P7X
NET41
R41
D43
R44
PC41
N7X
Z7X
CN41-2
CN41-1
NET61
R61
C41
C42
D63
R64
PC61
CN61-2
CN61-1
NET21
R21
D23
R24
PC21
CN21-2
CN21-1
NET71
R71
D73
R74
CN71-2
CN71-1
REC41A,B
CN10-1
CN10-3
CN10-2
T1 (10G)
6V-2.1A
GTR BASE PWB
ARNI-915[ ]
CHECKED BY
T. Hanishita
Feb. 8 '84
DESIGNED BY
J. Maeda
Feb. 17 '84
REGISTERED
BASE DRIVE CIRCUIT
7K3K0082-22
TOSHIBA CORPORATION

DEVICE	NAME	TYPE FORM & RATING		
		VT130GI-4080□	VT130GI-4110□	VT130GI-4160□
R21	RESISTOR	SCH40C 9·64·20 20Ω−35W20Ω·50W	SCH40C 9·64·20 20Ω−35W 20Ω·50W	SCH40C 9·64·10 10Ω−35W 10Ω·50W
C1. C2	CONDENSOR	1800μ−400V	1800μ−400V	2700μ−400V
GTR1 - GTR3	GIANT TRANSISTOR	MG50M2CK2 50A−900V	MG50M2CK2 50A−900V	MG75M2CK1 75A−900V
REC 1	RECTIFIER	30U6P42 30A−1600V	30U6P42 30A−1600V	50U6P41 50A−1600V
FUR, FUS, FUT	FUSE	FWH40 or A050F040 A050F040	FWH40 or A050F040 A050F040	FWH60 or A050F060 A050F060
FU1	FUSE	PC1 6JX3 3A−500V	PC1 6JX3 3A−500V	PC1 6JX3 3A−500V
FAN	COOLING FAN	—	—	109−008 (125XR028) 200/220V
		C−10FE A40 208V COIL	C−10FE A40 208V COIL	C−10FE A40 208V COIL
MS1	MAGNETIC CONTACTOR	C−10−FS 200/220V−4A	C−10−FS 200/220V−4A	C−10−FS 200/220V−4A
ACT	AC TIMER	ACT−1A 220V−0.1SEC	ACT−1A 220V−0.1SEC	ACT−1A 220V−0.1SEC
HCT	HALL FF CURRENT TRANSFORMER	NNC−20CTA 75A−4V− 4T	NNC−20CTA 100A−4V− 4T	NNC−20CTA 150A−4V− 4T
TM (OPTION)	THERMOSTAT	US−602AYTFL or OHD3 90MU 90°C ON · 60°C OFF	US−602AYTFL or OHD3 90MU 90°C ON · 60°C OFF	US−602AYTFL or OHD3 90MU 90°C ON · 60°C OFF
FU2	FUSE	FWP40 or A070F040 A070F040	FWP40 or A070F040 A070F040	FWP60 or A070F060 A070F060
TM1	THERMOSTAT	—	—	US−602AYTFL or OHD3 90MU 90°C ON · 60°C OFF
BASE DRIVE PWB	PWB	ARNI-915C	ARNI-915C	ARNI-915D
CONTROL CIRCUIT PWB	PWB	ARNI-889E	ARNI-889E	ARNI-889E
GTR7	GIANT TRANSISTOR	MG25M1BK1 25A−900V	MG25M1BK1 25A−900V	MG50M1BK1 50A−900V
D21	RECTIFIER	25NC12 25A−1000V	25NC12 25A−1000V	25NC12 25A−1000V
R (OPTION)	RESISTOR	55Ω−200W	55Ω−200W	36Ω−400W
FRH (OPTION)	RHEOSTAT	RV24YN-ME 3KΩ−S−20L	RV24YN-ME 3KΩ−S−20L	RV24YN-ME 3KΩ−S−20L
SW (OPTION)	SWITCH	PW−2012−W2W	PW−2012−W2W	PW−2012−W2W

NOTE) *1 : FWH, FWP TYPE FUSES ARE USED FOR 460V UNIT OF INPUT VOLTAGE.

INVERTER UNIT TYPE FORM. : VT130G1-4□□□

VR : VARIABLE RESISTOR (RHEOSTAT)

	VR-NO.	USE	STANDARD ADJUST
CONTROL PWB (ARNI-889E)	1RH	FREQUENCY METER ADJUST.	0-NOTCH
	2RH	OUTPUT FREQUENCY ADJUST.	REFER TO FIG 11.
	3RH	OUTPUT VOLTAGE ADJUST. (LOW LEVEL BIAS ADJUST)	〃
	4RH	OUTPUT VOLTAGE GAIN ADJUST.	〃
	5RH	I-IN: 4~20mA REF ADJUST. (BIAS)	〃
	6RH	I-IN: 4 20mA REF ADJUST. (GAIN)	〃
	7RH	ACCELERATION TIME (1~20SEC)	20 SEC
	8RH	DECELERATION TIME (1~20SEC)	20 SEC
	9RH	UPPER LIMIT (MAX. OUTPUT FREQUENCY LIMIT)	REFER TO FIG 12.
	10RH	LOWER LIMIT (MIN. OUTPUT FREQUENCY LIMIT)	0-NOTCH
	12RH	UNDER VOLTAGE ADJUST	REFER TO "UP" LEVEL
MAIN CIRCUIT/BASE DRIVE PWB (ARNI-915(2))			
	HCT-GIN	HALL EFFECT CT CIRCUIT OUTPUT GAIN ADJUST.	PEAK 4V At Rating Curr.
	HCT-OFS	HALL EFFECT CT CIRCUIT OUTPUT NULL ADJUST.	0V At 0 AMPARE

OC : OVER CURRENT	*1 225 %
OP : OVER POTENTIAL (OVER VOLTAGE)	DC800V
UP : UNDER POTENTIAL (UNDER VOLTAGE)	*2 85 %
OH : GTR AND/OR POWER Discharge Unit OVER HEAT	90 ℃
STALL CURR. LEVEL	*1 150 %
CURR. LIMIT LEVEL	*1 185 %

*1 : PERCENTAGE OF RATED OUTPUT CURRENT
*2 : PERCENTAGE OF RATED SUPPLY VOLTAGE

UNIT TYPE FORM VT-130G1	Rating KVA	Rating Curr. At 110 % cont. -150% 30sec	
-4080	8 KVA	11 A	
-4110	11 KVA	15 A	
-4160	16 KVA	22 A	
-	KVA	A	
-	KVA	A	

ARNI-915B

J1	J2
CLOSE	CLOSE

STANDARD JUMPER SELECTION

ARNI-889E

J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12
OPEN	"1"	"60Hz"	OPEN	CLOSE	CLOSE	CLOSE	CLOSE	CLOSE (A-D)	CLOSE	OPEN	OPEN

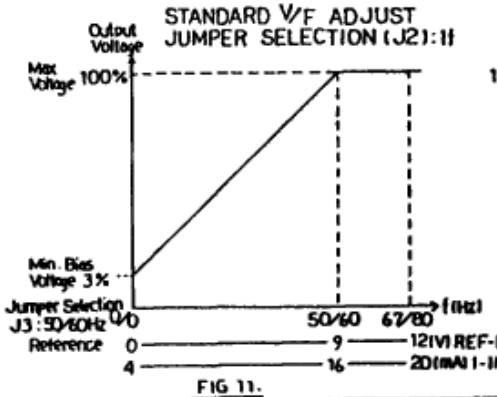


FIG 11.

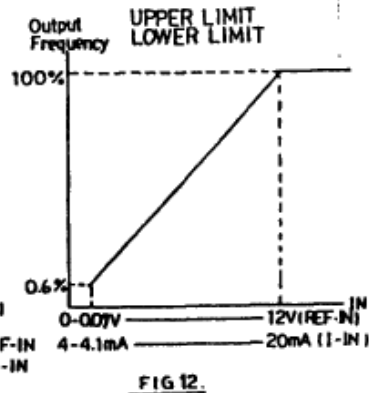
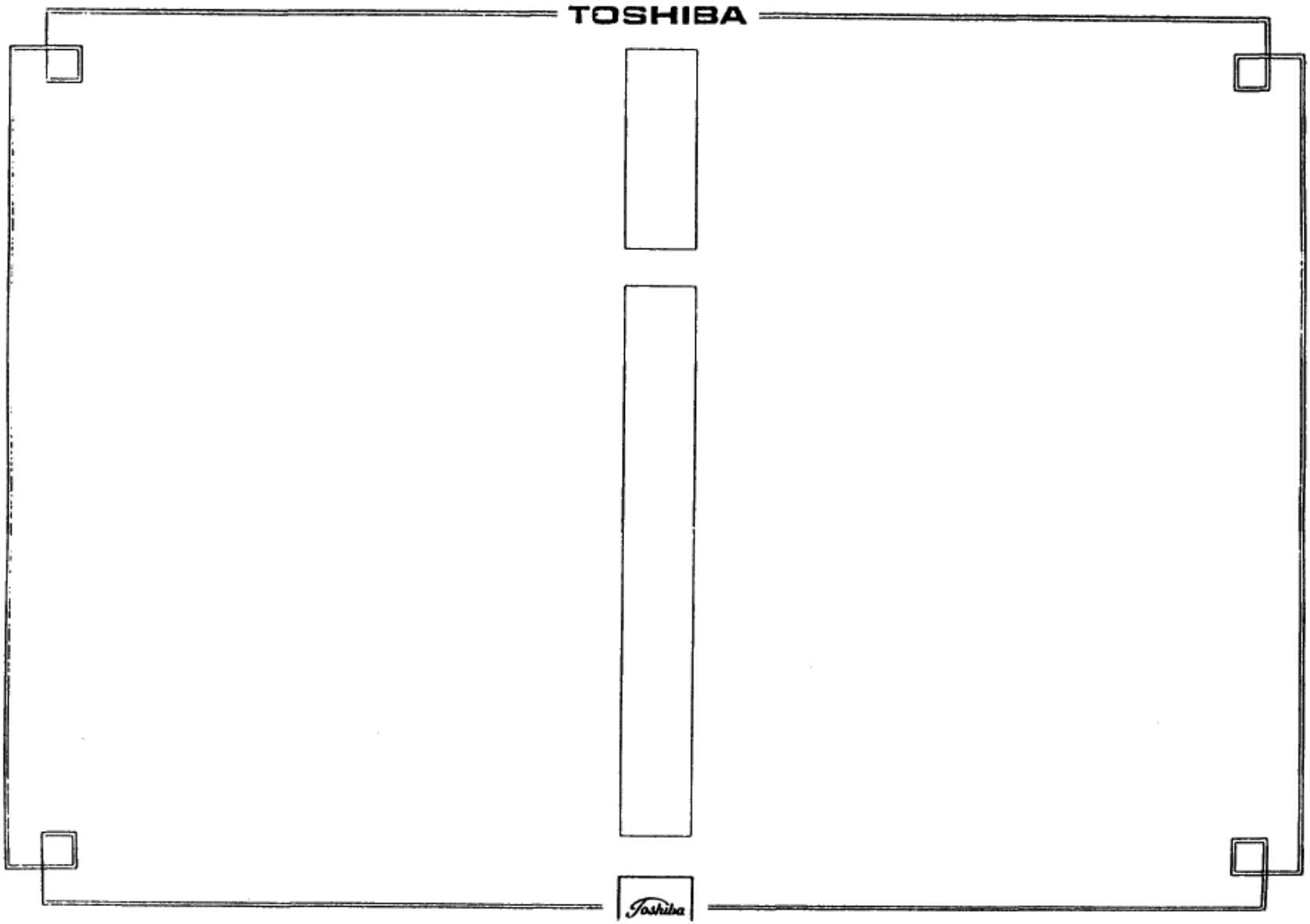


FIG 12.

(C) CHECKED BY T. Morishita Feb-8 '89	(D) DESIGNED BY I. Maeda Feb-1 '89	STANDARD ADJUSTMENT LIST
(R) REGISTERED		7K3K0082-50

TOSHIBA CORPORATION


TOSHIBA
Toshiba

TOSHIBA

TOSVERT-130G1 -460V 22~33 KVA

SCHEMATIC DIAGRAMS

PAGE	TITLE	PAGE	TITLE	PAGE	TITLE	PAGE	TITLE
1	INDEX	16	CONTROL CIRCUIT (1)	31	OUTLINE	46	
2		17	CONTROL CIRCUIT (2)	32		47	
3	ABBREVIATION LIST	18	CONTROL CIRCUIT (3)	33		48	
4		19		34		49	
5	INTERFACE	20		35	PARTS LIST	50	STANDARD ADJUSTMENT LIST
6		21		36		51	
7		22	BASE DRIVE CIRCUIT	37		52	
8		23		38		53	
9		24		39		54	
10	MAIN CIRCUIT	25		40		55	
11		26		41		56	
12		27		42		57	
13		28		43		58	
14		29		44		59	
15		30		45		60	BACK COVER

TOSHIBA CORPORATION
TOKYO JAPAN

APPROVED BY	CHECKED BY	DESIGNED BY	DRAWN BY
H. Imata Feb. '27 '84	T. Morisato Feb 27 '84	J. Wada Feb '27 '84	A. Okabe Feb '27 '84

REGISTERED

TOSVERT-130G1
CODE V,T,1,3,0,G,1,
7K3K0083-1

ABBR.	DESCRIPTION	ABBR.	DESCRIPTION	ABBR.	DESCRIPTION
ACC.	ACCELERATION	NET	HINET----HYBRID IC	ACT	AC TIMER DELAY
AM	AMMETER	OA	OPERATIONAL AMPLIFIER		
C	CONDENSOR	OC	OVER CURRENT		
CN	CONNECTOR	OH	OVER HEAT		
CPU	CENTRAL PROCESSING UNIT	OP	1) OVER POTENTIAL/OVER VOLTAGE 2) OPERATIONAL PANEL		
D	DIODE	PC	PHOTO COUPLER		
DEC.	DECELERATION	PBS	PUSH BUTTOM SWITCH		
E	EARTH GROUND	PWB	PRINTED WIRING BOARD		
F	FORWARD	R	1) REVERSE 2) RESISTOR		
FL	FAULT	REC	RECTIFIER		
FM	FREQUENCY METER	REF.	REFERENCE		
FU	FUSE	RH	RHEOSTAT		
GTR	GIANT TRANSISTOR B: BASE E: EMITTER C: COLLECTOR	T	TRANSFORMER		
		TB	TERMINAL BLOCK		
		TG	TACHO GENERATOR		
HCT	HALL EFFECT CURRENT TRANSFORMER	TM	THERMOSTAT		
IC	INTEGRATED CIRCUIT	Th-Ry	THERMAL RELAY		
IM	INDUCTION MOTOR	UP	UNDER POTENTIAL UNDER VOLTAGE		
J	JUMPER	VFC	VOLTAGE TO FREQUENCY CONVERTER		
LED	LIGHT EMITTING DIODE	ADC	ANALOGUE TO DIGITAL CONVERTER		
MC	MAGNETIC CONTACTOR	CSA	CRYSTAL (OR CERAMIC) OSCILLATOR		
MCCB	MOLDED CACE CIRCUIT BREAKER	MR	MOLDED RESISTOR		
MS	MAGNETIC CONTACTOR FOR SHORTING	LS	LOW SPEED		

Section 12
TROUBLESHOOTING PROCEDURES

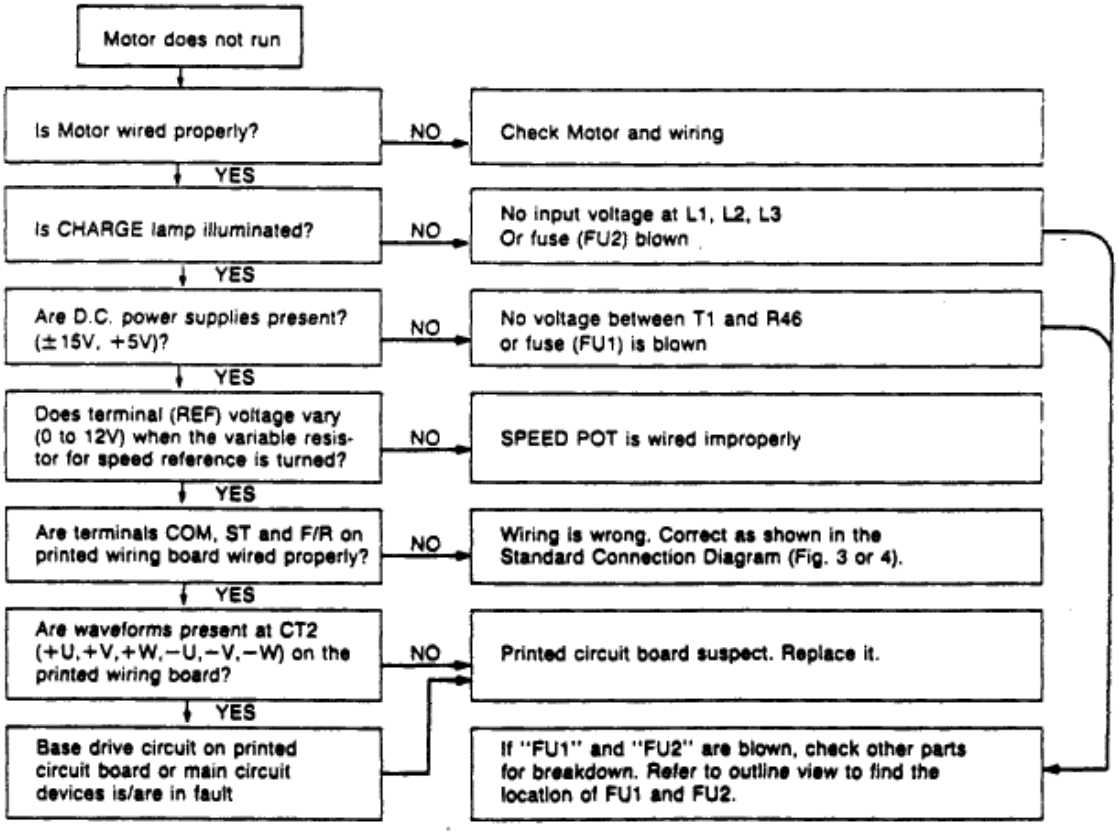
Improper adjustment, wiring, or inverter malfunction can cause the fault relay to latch. To reset a fault, the reset button must be pressed or reset by remote signal.

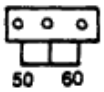
Figure 12-1 is a trouble shooting flow chart in the event the motor does not run. Table 10 shows some trouble indications and causes.

WARNING

When troubleshooting with power on, care must be taken to avoid electric shock. Grounded test equipment may damage inverter. D.C. BUS voltage remains charged for several minutes after power is removed.

FIGURE 12-1 Troubleshooting Flow Chart When Motor Does Not Run



No.	PC Board Symbol	Function	Factory Connection	Remarks
J2		1f: Output frequency × 1 2f: Output frequency × 2 4f: Output frequency × 4	1f	Note 1
J3		60 Hz: Maximum output frequency 80 Hz 50 Hz: Maximum output frequency 67 Hz	60 Hz	Voltage increases up to 460 V at 60 Hz constant 460 V from 60 to 80 Hz
J5		BUS discharge control ON DECEL	Connected	Cut when Dynamic Brake Option used

NOTE: Other Jumper connections are for factory use. Removing or changing may cause improper operation.

NOTE 1: If extended frequency ranges are required: A jumper at 2F will raise the maximum to 120 HZ (or double the original frequency). The testpoint OF now gives a frequency pulse 576 times output frequency. A jumper at 4F will raise the maximum to 240HZ (or 4 times the original frequency). The testpoint OF now gives a frequency pulse 288 times output frequency.

Transformer T1 Troubleshooting

Fuse FU1 blowing can indicate a wiring problem, a bad transformer, or a bad regulator board. Page 6 of the wiring diagram (main circuit) shows transformer connections and output voltages.

Section 13
PARTS REPLACEMENT AND PRECAUTIONS

1. Before replacing parts, check that power is not supplied to the inverter and the main circuit capacitor is not charged (CHARGE lamp is not illuminated).

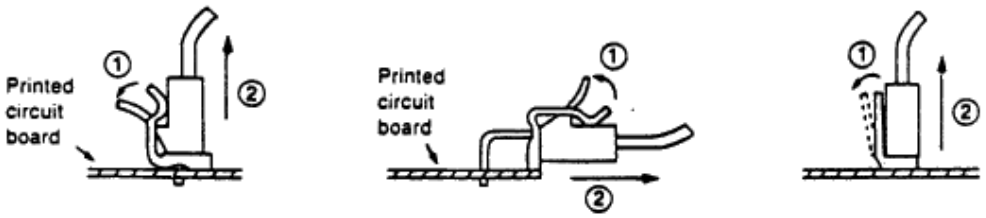
2. Replacement of parts on the printed circuit board must be performed by trained personnel. Please contact your dealer.

3. Removing the printed circuit board

   The printed circuit board is fastened with locking supports at four corners. Remove the connectors on the circuit board, remove the locking support and then remove the circuit board.

4. Removing connectors on the printed circuit board

   Connectors are held with stoppers. Release the stopper and pull the connector out carefully. Do not pull on the wire.



   To plug the connector back in, push it in place to lock with the stopper.

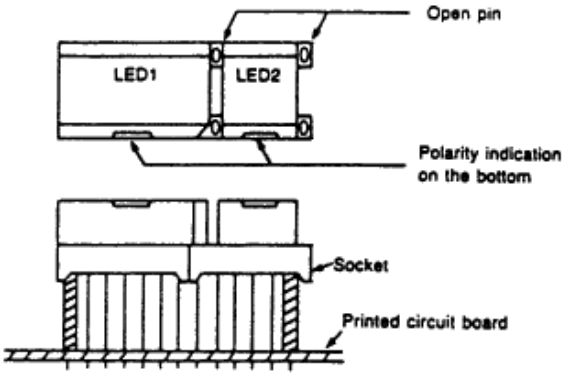
   Excessive force may cause damage. Hold the circuit board and push gently. Also check the connector numbers and match the pins correctly.

   In some models the connector on the base drive circuit board is difficult to get at. In such case, remove the locking support and lift the circuit board so that the connector can be grasped easily before removing.

5. Replacing LED (7 segment indicator)

   The LED indicator is plugged in a socket and can be easily replaced, but it should not be removed unless necessary.

If it must be replaced, refer to the following figure. The location and direction must be checked carefully.



6. Replacing main circuit. G-TR (Transistor)

The connecting wires are not numbered. Therefore, when replacing, numbering the wires is suggested to prevent mis-connection.

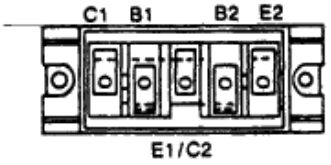
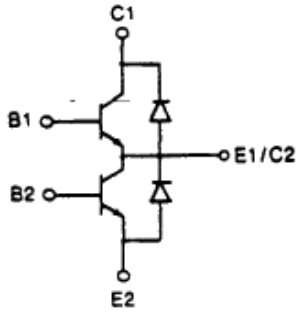
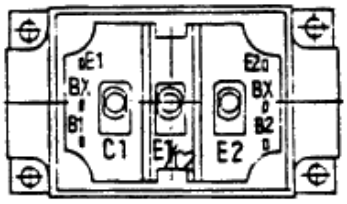
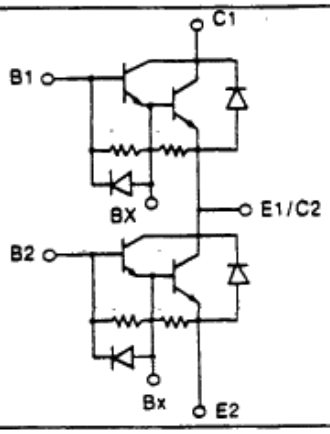
Apply a silicone compound on the contact surface of G-TR cooling fins.

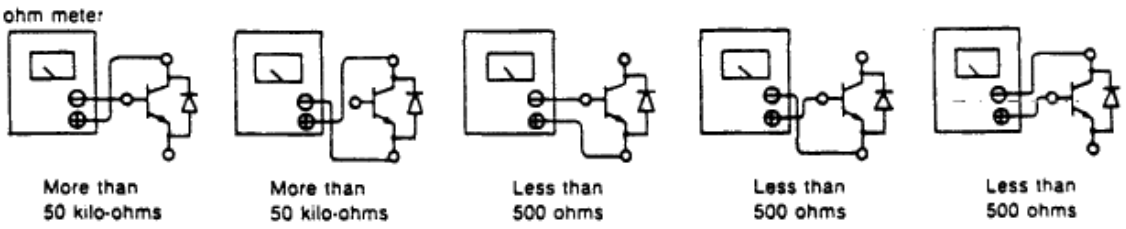
Typical types of silicone compound are as follows. Alcan by Alcan,Jointal S-200 by Nikkei Kako. The method of GTR checkout is shown on page 61.

7. Replacing fuse:

Refer to section 15 – OUTLINE VIEW and check the location of fuses FU1 and FU2. In some models, they are located at the center of the unit.

G-TR (Transistor)

Name	Outline	Equivalent Circuit
MG25M2CK2 (VT130G1-4015 -4025 -4035) MG50M2CK2 (VT130G1-4055 -4080 -4110) MG75M2CK1 (VT130G1-4160)		
MG150N2CK1 (VT130G1-4220 -4270 -4330)		



Note: Check the polarity of the meter internal battery at the ohmmeter terminals, with polarity as shown. It is necessary to apply a thin coat of a heat-conductive silicone compound to the surface of the heat sink before attaching new G-TR.

Section 14
SPARE PARTS

It is recommended that the following parts be ordered with the inverter unit in order to reduce system downtime. Rank A signifies parts of relatively high necessity. Rank B signifies parts of relatively low necessity.

RANK A

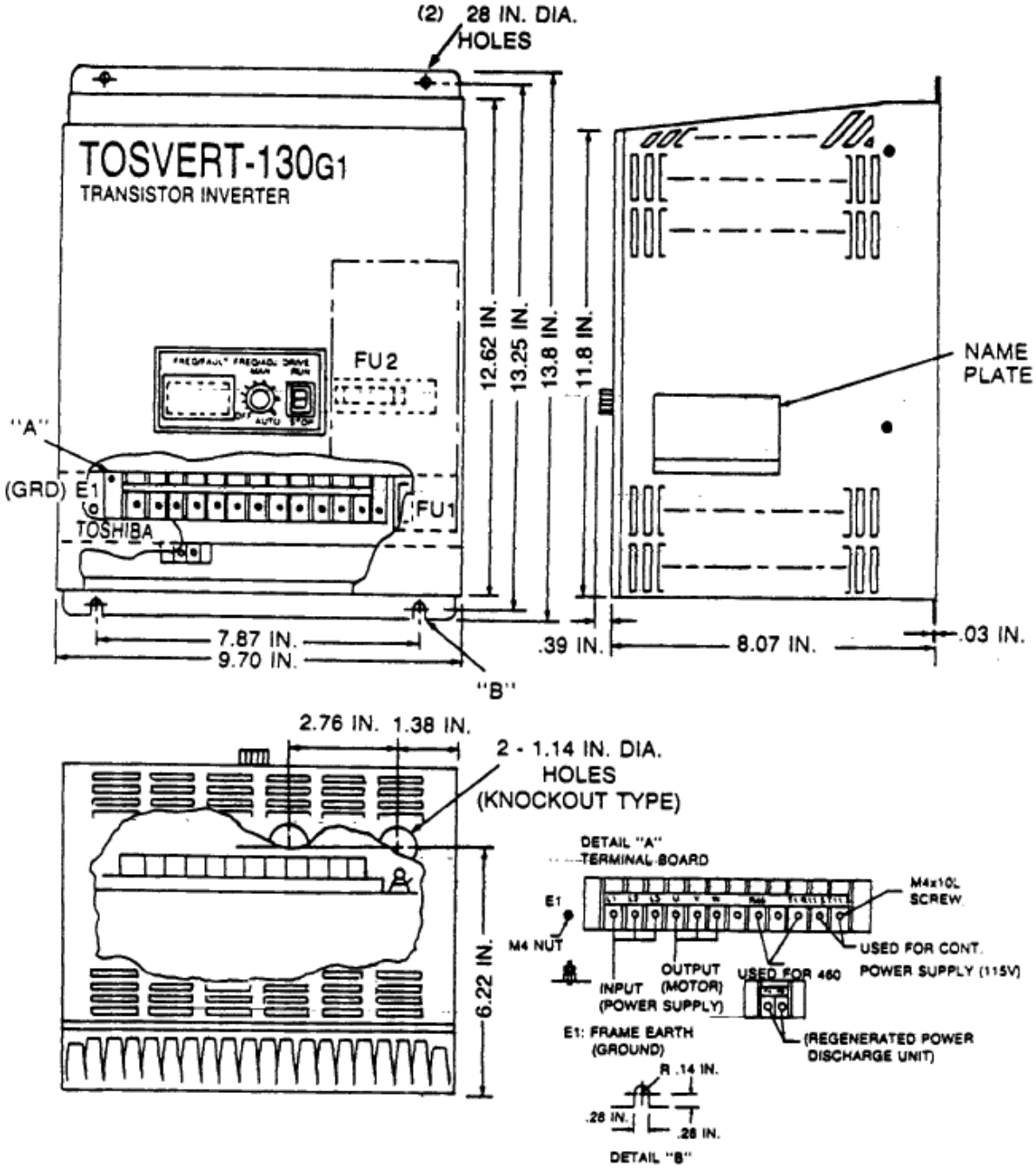
Inverter Model	Fuse		GTR	
VT-130G1	Model	Quantity Used	Model	Quantity Used
-4015	FWP20 or A070F020	1	MG25M1BK1	1
	KLM3 or 6JX03	1	MG25M2CK2	3
-4025 -4035	FWP20 or A070F020	1	MG25M1BK1	1
	KLM3 or 6JX03	1	MG25M2CK2	3
-4055	FWP20 or A070F020	1	MG25M1BK1	1
	KLM3 or 6JX03	1	MG50M2CK2	3
-4080	FWH40 or A050F040	3	MG25M1BK1	1
	FWP40 or A070F040	1		
-4110	PC1-3A	1	MG50M2CK2	3
-4160	FWH60 or A050F060	3	MG50M1BK1	1
	FWP60 or A070F060	1		
	PC1-3A	1	MG75M2CK1	3
-4220	FWH80 or A050F080	3	MG75M1BK1	1
	FWP80	1		
-4270	PC1-3A	1	MG150N2CK1	3
-4330	FWH100 or A050F100	3	MG75M1BK1	1
	FWP100	1		
	PC1-3A	1	MG150N2CK1	3

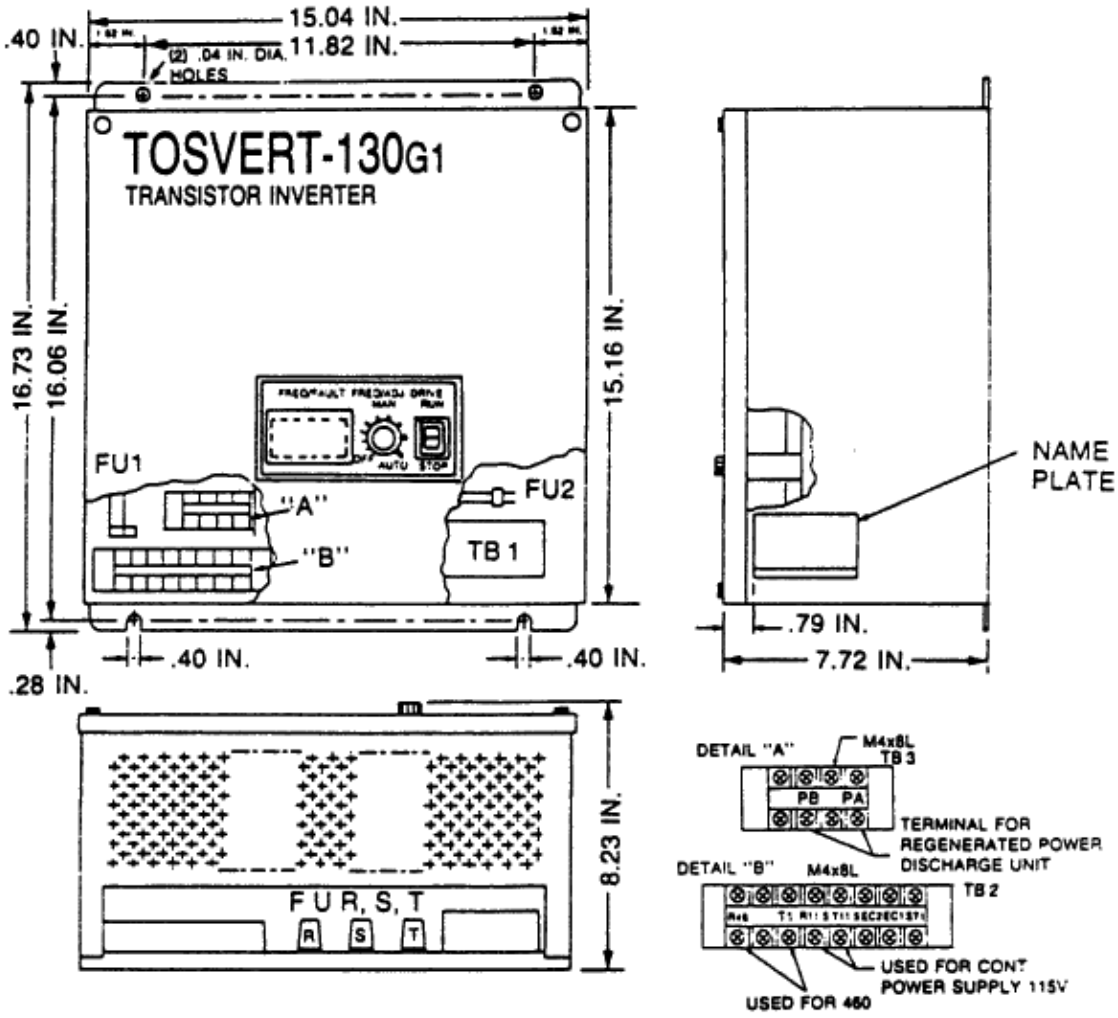
RANK B

Inverter Model	Main circuit Electrolytic capacitor		Printed circuit board			
			Model			
VT-130G1	Rating	Quantity Used	Control	Base Drive Old	Base Drive New	Quantity Used
-4015	400V-330μF	2	ARNI -889E	ARNI -891C	ARNI -891D	1 each
-4025 -4035	400V-680μF	2				
-4055	400V-1000μF	2			-891E	
-4080 -4110	400V-1800μF	2	ARNI -889E	ARNI-915C		1 each
-4160	400V-2700μF	2	ARNI -889E	ARNI-915D		1 each
-4220	400V-2200μF	4	ARNI -889F	ARNI-910C		1 each
-4270 -4330		6				

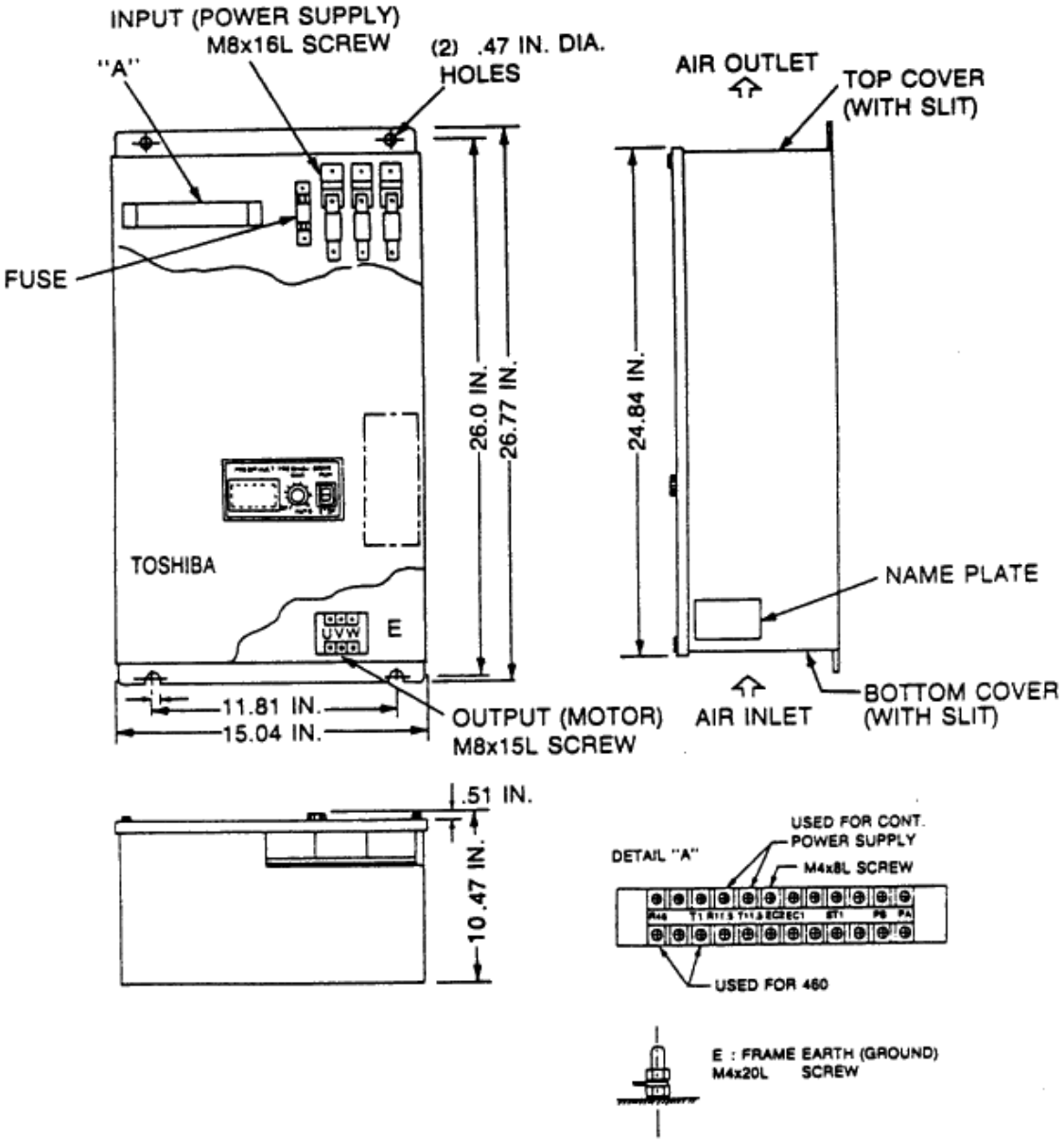
Section 15
OUTLINE VIEW

Type Form: VT130G1-4015, 4025, 4035, 4055




15.04 IN.
11.82 IN.
.40 IN.
(2) .04 IN. DIA. HOLES
TOSVERT-130G1
TRANSISTOR INVERTER
16.73 IN.
16.06 IN.
15.16 IN.
FU1
FU2
"A"
"B"
TB 1
.40 IN.
.40 IN.
.28 IN.
.79 IN.
7.72 IN.
NAME PLATE
8.23 IN.
F U R, S, T
R
S
T
DETAIL "A"
M4x8L
TB 3
PB PA
TERMINAL FOR REGENERATED POWER DISCHARGE UNIT
DETAIL "B"
M4x8L
TB 2
USED FOR CONT POWER SUPPLY 115V
USED FOR 460

Type Form: VT130G1-4220, 4270, 4330



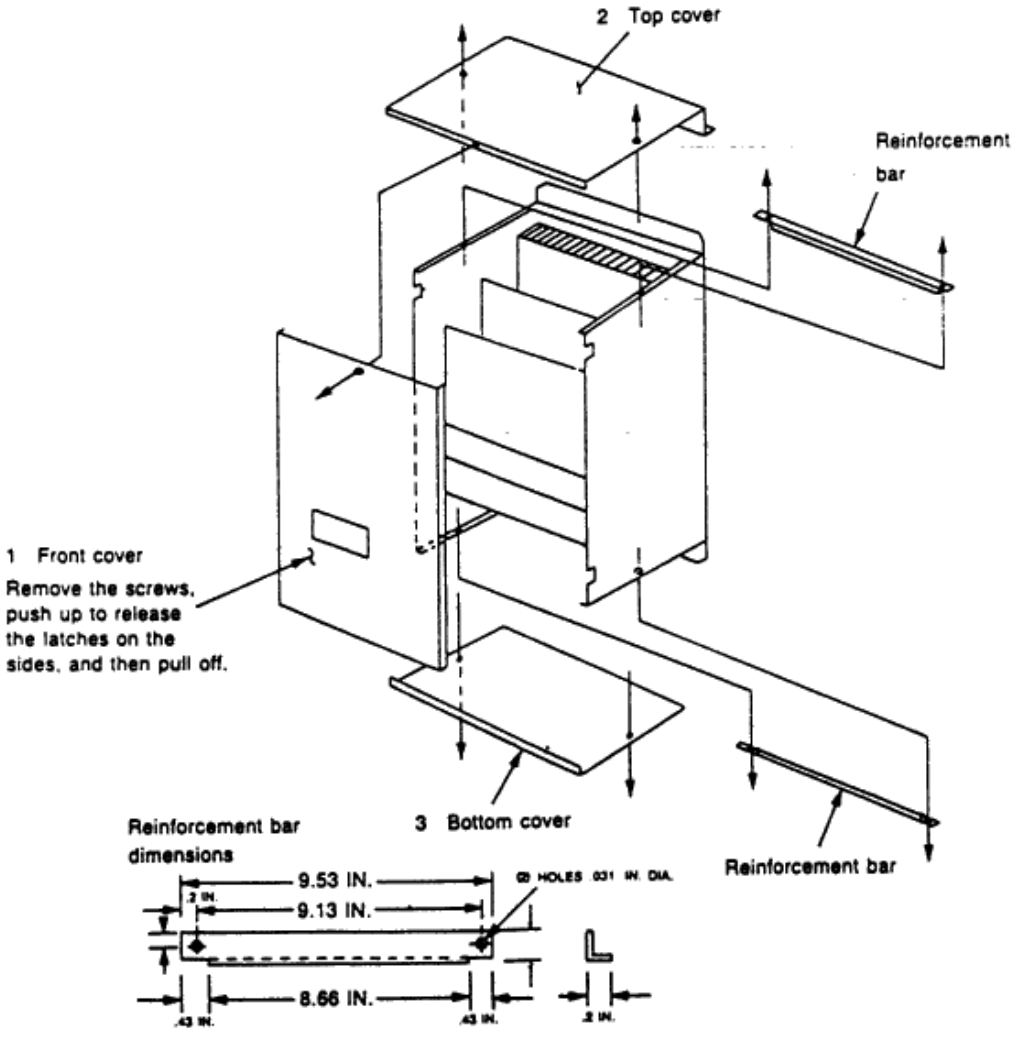
Section 15

Cover Removal and Reinforcement Bar

If the inverter ambient temperature specification (−10°C to +40°C) cannot be maintained, remove the top, bottom, and front cover as shown. Then the allowable temperature can be between −10°C and +50°C. When removing the top and bottom covers, fasten reinforcement bar at the top and bottom as shown.

<Removing sequence> (1) Front cover (2) Top cover

(3) Bottom cover

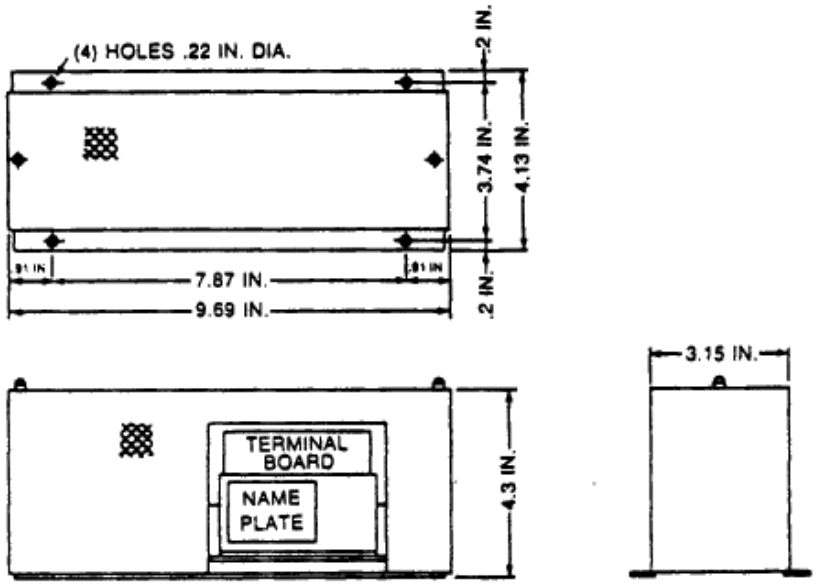


Thickness: .13 IN.

Section 16
PERIPHERAL DEVICES OUTLINE

1. Regenerative Power Discharge Resistor Unit

(1~5.5KVA)



Model and Rating

Inverter Model	Regenerative Power Discharge Resistor Unit	Capacity, Resistance	Weight (kg)
VT-130G1 -4015	PBR 4015	66W-270Ω	2.5
VT-130G1 -4025	PBR 4055	142W-110Ω	
VT130G1 -4035			
VT130G1 -4055			

Section 16

(8~33KVA)

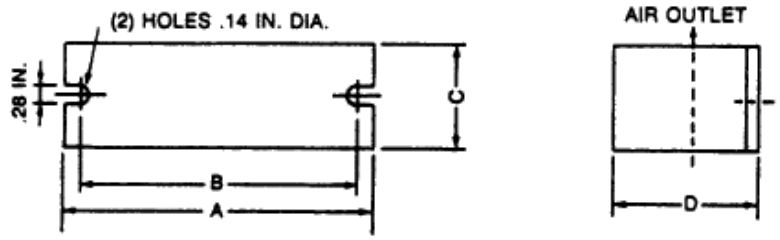


FIGURE A

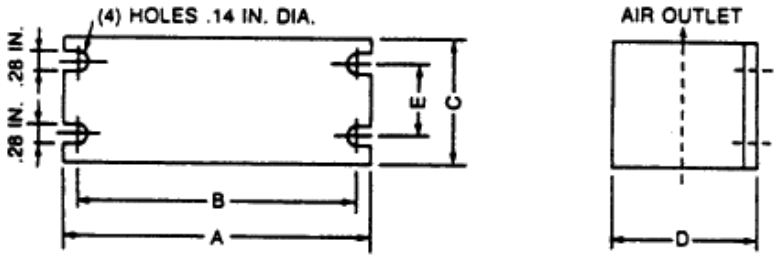


FIGURE B

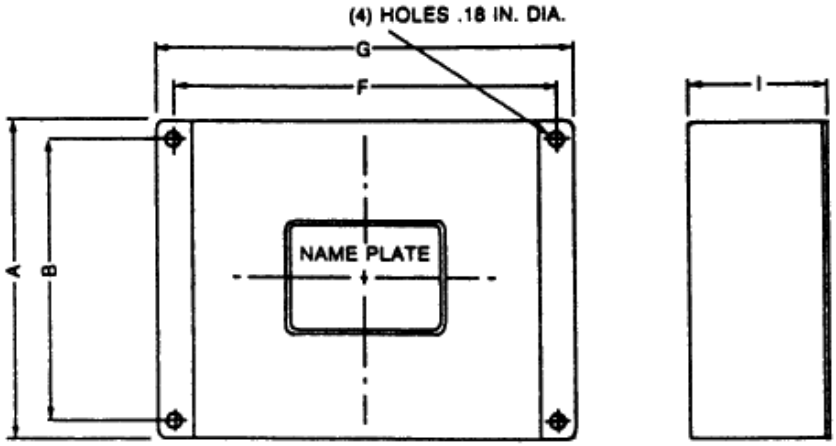
Form \ Size	A	B	C	D	E	Figure	Weight Approx. (kg)
VT130G1-4080,4110	12.2	11.5	4.1	5.12	—	A	
-4160	12.2	11.5	4.1	7.68	—	A	
-4220	18.4	17.44	8.66	8.66	2.76	B	
-4270	18.4	17.44	8.66	8.66	2.76	B	
-4330	18.4	17.44	8.66	8.66	2.76	B	

(IN.)

Model and Rating

Inverter Type Form	Regenerative Discharge Unit Type Form	Resistor Value
VT130G1-4080	PBR4110-20	200W-55 Ω
VT130G1-4110		
VT130G1-4160	PBR4160-20	400W-36 Ω
VT130G1-4220	PBR4330-20	1080W-16.7 Ω
VT130G1-4270		
VT130G1-4330		

2. EMI Noise Reduction Filter



Dimensions

Filter Model No.	Dimensions (mm)						Weight (kg)
	A	B		F	G	I	
3H3K0006P21	4.72	4.33		3.54	4.33	1.77	0.7
P22	7.10	6.69		5.31	5.91	2.56	1.9
—							
P24	7.10	6.69		5.31	5.91	2.56	2.3
P25	7.10	6.69		5.31	5.91	2.56	2.4
P26	7.10	6.30		8.66	9.45	3.15	5.3
P27	7.10	6.30		8.66	9.45	3.15	5.3

Model and Rating

Inverter Model	Filter Model No.	Rated Current (A)
VT130G1-4015	3H3K0006 P21	5
-4025	3H3K0006 P22	10
-4035		
-4055		
-4080	3H3K0006 P24	20
-4110		
-4160	3H3K0006 P25	30
-4220	3H3K0006 P26	40
-4270	3H3K0006 P27	50
-4330	3H3K0006 P28	60

Section 17
BASIC SCHEMATIC DIAGRAMS

VT 130G1 460V Transistor Inverter (1 to 30 HP)

- 1.5 to 5.5 KVA Pages 7K3K0081 – 1 to 50
- 8 to 16 KVA Pages 7K3K0082 – 1 to 50
- 22 to 33 KVA Pages 7K3K0083 – 1 to 50

TOSHIBA

TOSVERT - 130G1 460V 1.5~5.5KVA

SCHEMATIC DIAGRAMS

PAGE	TITLE	PAGE	TITLE	PAGE	TITLE	PAGE	TITLE
1	INDEX	16	CONTROL CIRCUIT (1)	31		46	
2		17	CONTROL CIRCUIT (2)	32		47	
3	ABBREVIATION LIST	18	CONTROL CIRCUIT (3)	33		48	
4		19		34		49	
5	INTERFACE	20		35	PARTS LIST	50	STANDARD ADJUSTMENT LIST
6		21		36		51	
7		22	BASE DRIVE CIRCUIT	37		52	
8		23		38		53	
9		24		39		54	
10	MAIN CIRCUIT	25		40		55	
11		26		41		56	
12		27		42		57	
13		28		43		58	
14		29		44		59	
15		30		45		60	BACK COVER

TOSHIBA CORPORATION
TOKYO JAPAN

APPROVED BY	CHECKED BY	DESIGNED BY	DRAWN BY
H. Imata Dec. '13 '83	T. Morishita Dec. 9 '83	Y. Meguro Dec. 8 '83	A. Saito Dec. 7 '83

REGISTERED

TOSVERT -130G1
CODE V T 1 3 0 G 1
7K3K0081 -1

ABBR	DESCRIPTION	ABBR	DESCRIPTION
ACC	ACCELERATION	NET	HINET----HYBRID IC
AM	AMMETER	OA	OPERATIONAL AMPLIFIER
C	CONDENSOR	OC	OVER CURRENT
CN	CONNECTOR	OH	OVER HEAT
CPU	CENTRAL PROCESSING UNIT	OP	1) OVER POTENTIAL/OVER VOLTAGE 2) OPERATION PANEL
D	DIODE	PC	PHOTO COUPLER
DEC	DECELERATION	PBS	PUSH BUTTON SWITCH
E	EARTH GROUND	PWB	PRINTED WIRING BOARD
F	FORWARD	R	1) REVERSE 2) RESISTOR
FL	FAULT	REC	RECTIFIER
FM	FREQUENCY METER	REF	REFERENCE
FU	FUSE	RH	RHEOSTAT
GTR	GIANT TRANSISTOR B: BASE E: EMITTER C: COLLECTOR	T	TRANSFORMER
		TB	TERMINAL BLOCK
		TG	TACHO GENERATOR
HCT	HALL-EFFECT CURRENT TRANSFORMER	TM	THERMOSTAT
IC	INTEGRATED CIRCUIT	Th-Ry	THERMAL RELAY
IM	INDUCTION MOTOR	-UP	UNDER POTENTIAL UNDER VOLTAGE
J	JUMPER	VFC	VOLTAGE TO FREQUENCY CONVERTER
LED	LIGHT EMITTING DIODE	ADC	ANALOGUE TO DIGITAL CONVERTER
MC	MAGNETIC CONTACTOR	CSA	CRYSTAL (OR CERAMIC) OSCILLATOR
MCCB	MOLDED CACE CIRCUIT BREAKER	MR	MOLDED RESISTOR
MS	MAGNETIC CONTACTOR FOR SHORTING	LS	LOW SPEED