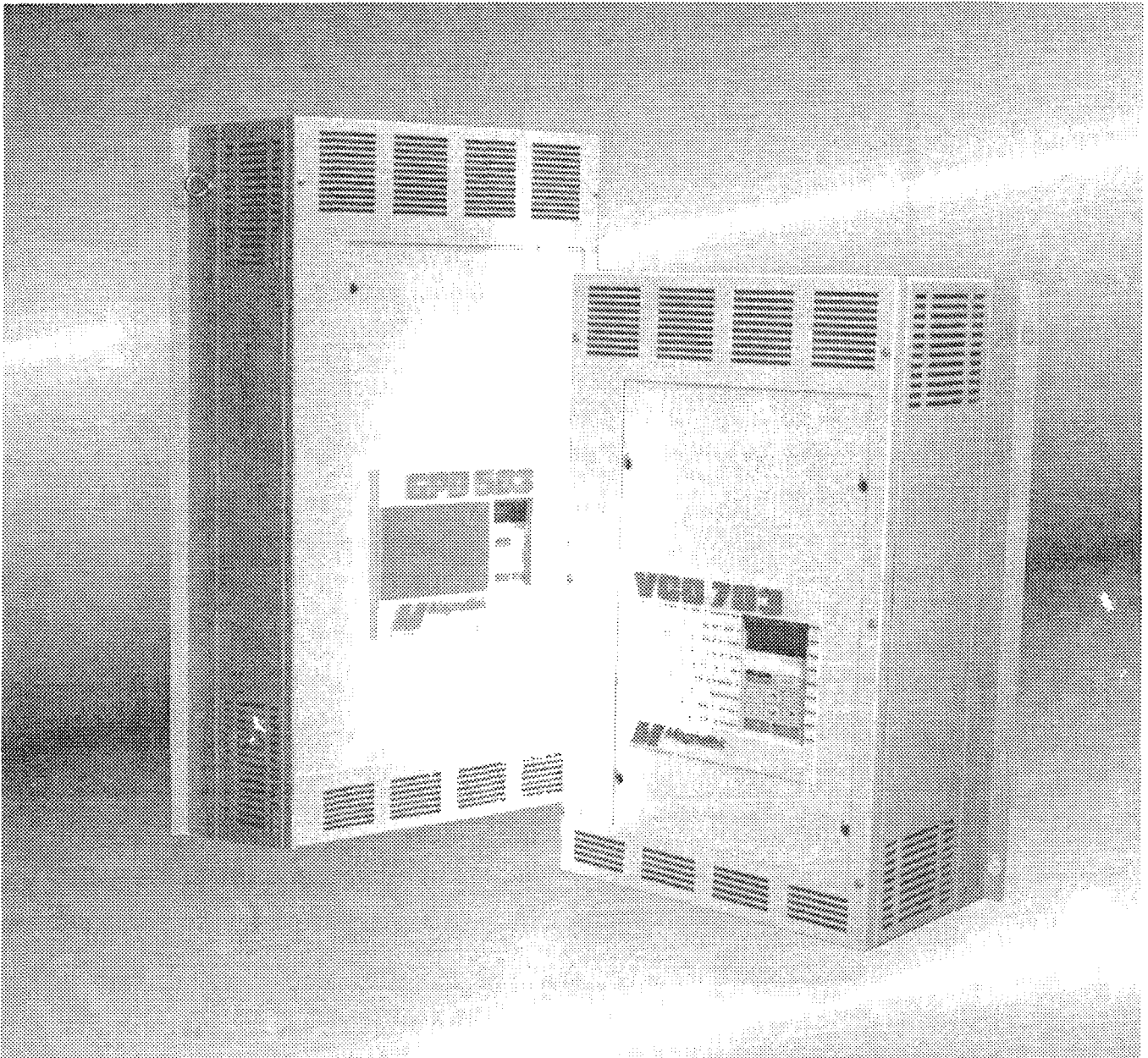


GPD 503, VCD 703

Field Repair Manual

for Drives in High HP Range



INTRODUCTION

This manual provides test and repair procedures for the power circuit of drive, beyond the scope of the troubleshooting procedures included in the drive Technical Manual.

This manual provides power circuit test procedures, and Start-Up procedure following repair, for the following MagneTek Adjustable Frequency drives:

	Procedures and Start-Up, for GPD 503:		Procedures only, for VCD 703:	
	<u>CT</u>	<u>HP</u>		<u>HP</u>
	40	Model No. DS2040		
2	50	Model No. DS2050	50	Model No. VCD703-A050
3	60	Model No. DS2060		
0	75	Model No. DS2075	75	Model No. VCD703-A075
V	100	Model No. DS2100	100	Model No. VCD703-A100
	75	Model No. DS075	75	Model No. VCD703-B075
4	100	Model No. DS100	100	Model No. VCD703-B100
6	150	Model No. DS150	150	Model No. VCD703-B150
0	200	Model No. DS200	200	Model No. VCD703-B200
V	250	Model No. DS250		
	300	Model No. DS303	300	Model No. VCD703-B300
	400	Model No. DS400	400	Model No. VCD703-B400

CONTENTS

This manual is divided into sections as follows:

Section 1	CHECKS WITHOUT POWER	Page 1
	Explains the steps used to check out the drive, WITH NO POWER APPLIED, using only an ohmmeter.	
Section 2	POWER CHECKS	Page 15
	Explains a systematic method of applying power to the drive and checking various points on the drive to verify proper operation.	
Section 3	START-UP PROCEDURE	Page 25
	Explains a systematic method of starting up the GPD 503 drive after completion of troubleshooting and repair.	
Appendix A	GPD 503 CONSTANT SETTINGS LIST	Page 33
Appendix B	COMMON PROBLEMS AND SOLUTIONS	Page 35
Appendix C	GPD 503 SCHEMATIC DIAGRAMS	Page 37

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Section 1. CHECKS WITHOUT POWER

WARNING

LETHAL VOLTAGES

Before attempting any checks in this manual, make sure that the three-phase power is disconnected, and locked out if possible. With the power removed from the unit, the DC bus capacitors will stay charged for up to 20 minutes. The "CHARGE" lamp in the unit will glow red until the DC bus is lower than 50 Vdc. To ensure that the DC bus is completely discharged, measure between the positive and negative bus with a DC voltmeter set on the highest scale.

DRIVE TEST EQUIPMENT

The basic tools used for troubleshooting a MagneTek Adjustable Frequency drive unit are:

1. An analog multimeter, such as a Simpson Model 260.
2. An ungrounded oscilloscope, with a 10X and 100X probe.
3. A rectifier-type voltmeter.
4. A 30 watt, 1 k-ohm resistor.

CHECKING THE UNIT FOR POWER

- Test equipment : DC voltmeter set to highest scale.

IMPORTANT

This test is a safety necessity! Before touching any components inside the drive unit, perform the following test to make sure that the unit is powered down and the DC bus capacitors have fully discharged.

With the unit powered down and the incoming three-phase power disconnected and locked out, look at the "CHARGE" lamp inside the drive unit. If high voltage is present on the DC bus, the "CHARGE" lamp will glow red. As the DC bus capacitors discharge, the "CHARGE" lamp will fade out. There is a possibility of there being at least 50 Vdc present on the DC bus even when the "CHARGE" lamp is off. To determine if the DC bus is completely discharged, measure between the positive and negative portions of the DC bus with a DC voltmeter. Set the meter to its highest scale and place the positive lead onto the positive portion of the DC bus and place the negative lead onto the negative portion on the DC bus. If the measured voltage is below 10 Vdc, you can safely work inside the unit.

CAUTION

The motor must be disconnected from the drive before performing any troubleshooting tests on the unit.

Power OFF
Motor Disconnected

INPUT DIODE CHECK

- Test equipment : Analog ohmmeter set to Rx1 scale

The input diodes are used to rectify the three-phase AC to DC bus voltage. The DC bus voltage will be directly proportional to the three-phase Ac voltage level. The input diodes can be easily checked by following the steps listed below.

Part Numbers:

Drive Rating (CT Rating, for GPD 503)	Diode Designation	Manufacturer Part Number	MagneTek Part Number	Specifications
230V, 40HP	DM 1-3	160L2G43	50207912	800V, 160A
230V, 50HP	DM 1-6	160L2G43	50207912	800V, 160A
230V, 60HP	DM 1-6	160L2G43	50207912	800V, 160A
230V, 75HP	DM 1-6	160L2G43	50207912	800V, 160A
230V, 100HP	DM 1-9	160L2G43	50207912	800V, 160A
460V, 75HP	DM1-6	160Q2G43	50207914	1200V, 160A
460V, 100HP	DM1-6	160Q2G43	50207914	1200V, 160A
460V, 150HP	DM 1-9	160Q2G43	50207914	1200V, 160A
460V, 200HP	DM 1-9	RM250DZ-24	50207915	1200V, 250A
460V, 250HP	DM 1-6	RM250DZ-24	50207915	1200V, 250A
460V, 300HP	DM 1-6	RM250DZ-24	50207915	1200V, 250A
460V, 400HP	DM 1-9	RM250DZ-24	50207915	1200V, 250A

Measurement Procedure:

Step No.	Ohmmeter Positive Lead	Ohmmeter Negative Lead	Expected Reading
1	<ul style="list-style-type: none"> • Connect to L1 terminal • Connect to L2 terminal • Connect to L3 terminal 	Negative DC bus terminal labeled "-"	Infinite ohms
2	<ul style="list-style-type: none"> • Connect to L1 terminal • Connect to L2 terminal • Connect to L3 terminal 	Positive DC bus terminal labeled "B1/+"	Approx 10 ohms
3	Negative DC bus terminal labeled "-"	<ul style="list-style-type: none"> • Connect to L1 terminal • Connect to L2 terminal • Connect to L3 terminal 	Approx 10 ohms
4	Positive DC bus terminal labeled "B1/+"	<ul style="list-style-type: none"> • Connect to L1 terminal • Connect to L2 terminal • Connect to L3 terminal 	Infinite ohms

Power OFF
Motor Disconnected

SOFT CHARGE RESISTOR CHECK

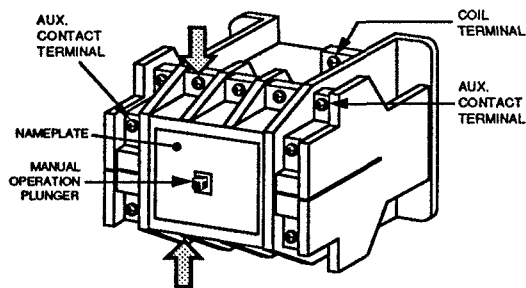
- Test equipment : Analog ohmmeter set to Rx1 scale

The soft charge resistor works in conjunction with the MC1 contactor to slowly charge the DC bus capacitors and minimize the inrush current, when power is applied to the drive. The soft charge resistor can be checked at the measurement points indicated below.

Part Numbers:

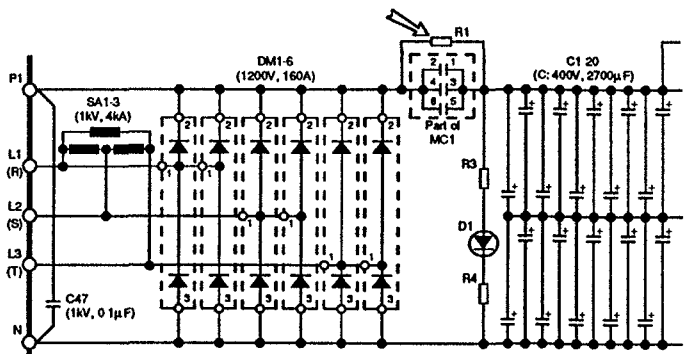
Drive Rating (CT Rating, for GPD 503)	Resistor Designation	Code Number	Specifications
230V, 40HP	R1	R7674	120W, 1 ohm
230V, 50HP	R1	R7674	120W, 1 ohm
230V, 60HP	R1	R7162	120W, 1 ohm
230V, 75HP	R1	R7162	120W, 1 ohm
230V, 100HP	R1	R7173	220W, 1 ohm
460V, 75HP	R1	R7669	220W, 2 ohm
460V, 100HP	R1	R7709	220W, 1.5 ohm
460V, 150HP	R1	R7174	220W, 3 ohm
460V, 200HP	R1, R2	R7173	220W, 1 ohm
460V, 250HP	R1-R4	R7174	220W, 3 ohm
460V, 300HP	R1-R4	R7174	220W, 3 ohm
460V, 400HP	R1-R4	R7174	220W, 3 ohm

Measurement Points



NOTE: This illustration not true to scale

Schematic Diagram



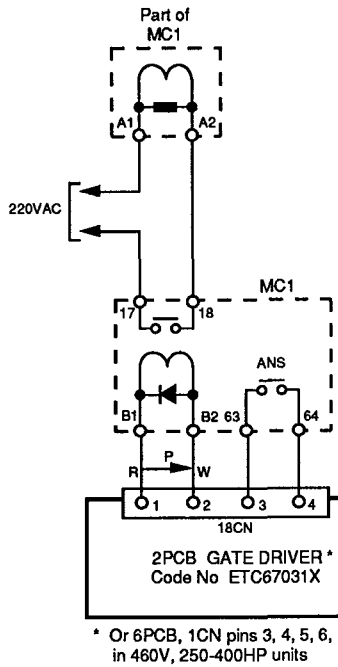
(460V, 100HP shown)

Power OFF
Motor Disconnected

MC1 CONTACTOR

- Test equipment : Analog ohmmeter set to Rx1 scale

The MC1 contactor will energize when the DC bus voltage has risen above the undervoltage detection point (210 Vdc for 230V units; 420 Vdc for 460V units).

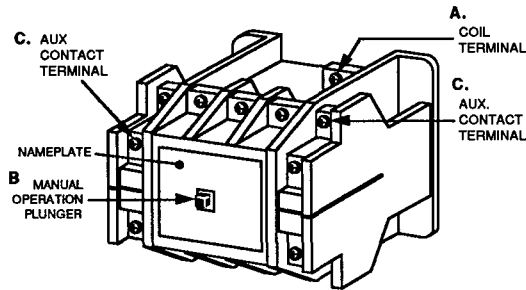


Sequence of Operation:

1. DC bus voltage rises above UV point.
2. 24 volt signal turns on at 18CN pins 1 & 2, on Gate Driver board, to turn on MC1's 24 Vdc pilot relay (terminals B1 & B2).
3. N.O. contact (terminals 17 & 18) closes, and energizes the 220 Vac main coil (terminals A1 & A2).
4. "Answer back" contact closes (terminals 63 & 64) to signal that contactor is energized.

Check Points:

- A. Measure coil (terminals A1 & A2) with analog meter, checking for open or short.
- B. Measure across main contacts (terminals 1 & 2, 3 & 4, 5 & 6), and press in the plunger to observe main contacts closing.
- C. Apply 24 Vdc to pilot relay coil (terminals B1 & B2); watch contacts at terminals 17 & 18 and 63 & 64 open and close.



NOTE: This illustration not true to scale

MC1 CONTACTOR (continued)

Power OFF
Motor Disconnected

Part Numbers:

Drive Rating (CT Rating, for GPD 503)	Contactor Designation	Manufacturer Part Number
230V, 40HP	MC1	HI-35E2T2CU-U
230V, 50HP	MC1	HI-35E2T2CU-U
230V, 60HP	MC1	HI-35E2T2CU-U
230V, 75HP	MC1	HI-35E2T2CU-U
230V, 100HP	MC1	SC-7N/UL
460V, 75HP	MC1	SC-3N/UL
460V, 100HP	MC1	SC-3N/UL
460V, 150HP	MC1	HI-35E2T2CU-U
460V, 200HP	MC1	SC-7N/UL
460V, 250HP	MC1	SC-8N/UL
460V, 300HP	MC1	SC-10N/UL
460V, 400HP	MC1	SC-11N/UL

<p style="text-align: center;">Power OFF Motor Disconnected</p>

DC BUS FUSE

- Test equipment : Analog ohmmeter set to Rx1 scale

The DC bus fuse is installed in the negative portion of the DC bus on all 230V drives and on the 460V 75-200HP drives. The DC bus fuse is installed in the positive portion of the DC bus on the 460V 250-400HP drives.

Part Numbers:

Drive Rating (CT Rating, for GPD 503)	Fuse Designation	Manufacturer Part Number	MagneTek Part Number	Specifications
230V, 40HP	FU1	A50P-200	50184860	500V, 200A
230V, 50HP	FU1	A50P-275	50184890	500V, 275A
230V, 60HP	FU1	A50P-400	50207920	500V, 400A
230V, 75HP	FU1	A50P-400	50207920	500V, 400A
230V, 100HP	FU1	A50P-600	50207921	500V, 600A
460V, 75HP	FU1	CR6L-200/UL	50207971	600V, 200A
460V, 100HP	FU1	CR6L-300/UL	50207972	600V, 300A
460V, 150HP	FU1	A70P-350	50173998	700V, 350A
460V, 200HP	FU1	A70P-600	50207973	700V, 600A
460V, 250HP	FU1-FU12	A70P-100-4TA	50207981	700V, 100A
460V, 300HP	FU1-FU12	A70P-150-4TA	50207982	700V, 150A
460V, 400HP	FU1-FU12	A70P-200-4TA	50207983	700V, 200A

The DC bus fuse is used to protect the main circuit components if the output transistors short. If the DC bus fuse is open, at least one output transistor has failed. Never replace the DC bus fuse without replacing the shorted output transistor; non-warranty damage will occur.

CAUTION

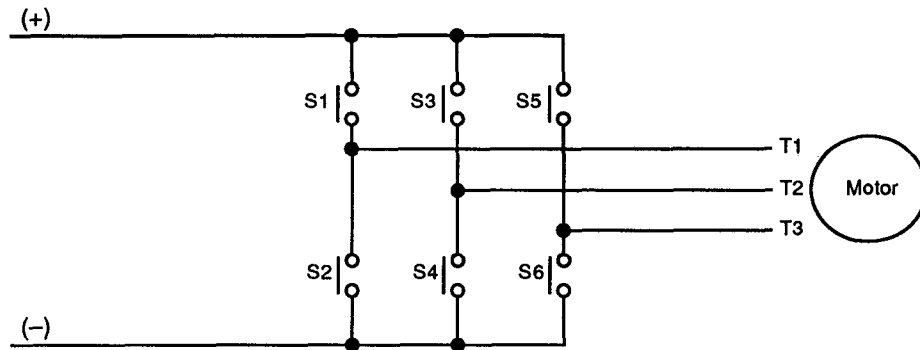
Never replace the DC bus fuse without replacing the failed transistors!

OUTPUT TRANSISTOR MODULES

Power OFF
Motor Disconnected

- Test equipment : Analog ohmmeter set to Rx1 scale
- Disconnect motor from drive.

The output transistors are used to produce an output voltage that will supply power to the motor. Think of them as switches that turn on and off to supply power to the motor.



Part Numbers:

Drive Rating (CT Rating, for GPD 503)	Transistor Designation	Qty	Manufacturer Part Number	MagneTek Part Number	Specifications
230V, 40HP	TRM 1-6	6	CM300HA-12E	50207905	600V, 300A
230V, 50HP	TRM 1-6	6	CM400HA-12E	50207906	600V, 400A
230V, 60HP	TRM 11-62	12	CM300HA-12E	50207905	600V, 300A
230V, 75HP	TRM 11-62	12	CM300HA-12E	50207905	600V, 300A
230V, 100HP	TRM 11-62	12	CM400HA-12E	50207906	600V, 400A
460V, 75HP	TRM 1-6	6	CM400HA-24	50207907	1200V, 400A
460V, 100HP	TRM 1-6	6	CM400HA-24	50207907	1200V, 400A
460V, 150HP	TRM 11-62	12	CM300HA-24E	50207908	1200V, 300A
460V, 200HP	TRM 11-62	12	CM400HA-24	50207909	1200V, 400A
460V, 250HP	TRM 1-24	24	CM300HA-24E	50207913	1200V, 300A
460V, 300HP	TRM 1-24	24	CM400HA-24E	50207910	1200V, 400A
460V, 400HP	TRM 1-24	24	CM600HA-24E	50207911	1200V, 600A

Power OFF Motor Disconnected

OUTPUT TRANSISTOR MODULES (continued)

Check 1 Procedure: Checking across the collector and emitter

Step No.	Ohmmeter Positive Lead	Ohmmeter Negative Lead	Expected Reading
1	<ul style="list-style-type: none"> • Connect to terminal T1 • Connect to terminal T2 • Connect to terminal T3 	Negative DC bus terminal labeled "-"	Infinite ohms
2	<ul style="list-style-type: none"> • Connect to terminal T1 • Connect to terminal T2 • Connect to terminal T3 	Positive DC bus terminal labeled "B1/+"	Approx 10 ohms
3	Negative DC bus terminal labeled "-"	<ul style="list-style-type: none"> • Connect to terminal T1 • Connect to terminal T2 • Connect to terminal T3 	Approx 10 ohms
4	Positive DC bus terminal labeled "B1/+"	<ul style="list-style-type: none"> • Connect to terminal T1 • Connect to terminal T2 • Connect to terminal T3 	Infinite ohms

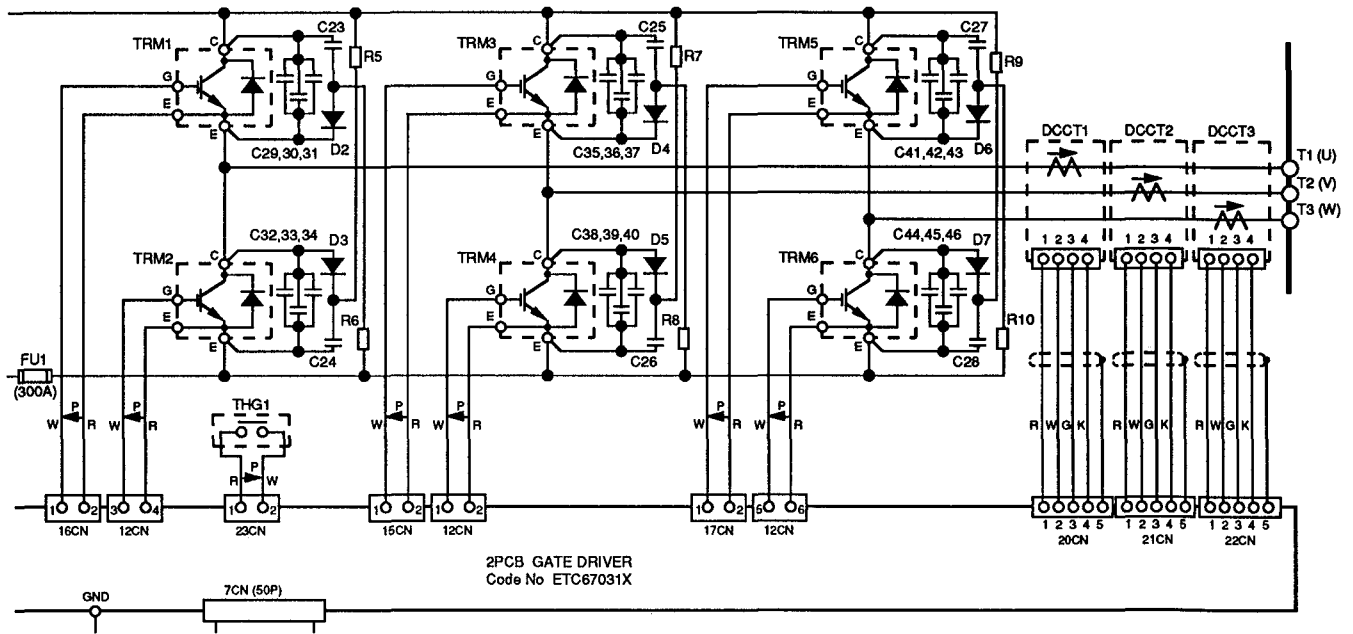
Check 2 Procedure: Checking the gate

Drive Rating (CT Rating, for GPD 503)	Gate Emitter Plugs	Expected Reading
230V, 40HP	12CN, 15CN, 16CN, 17CN Gate Drive Board	Infinite Ohms
230V, 50HP		
230V, 60HP		
230V, 75HP	30CN, 31CN, 32CN, 33CN, 34CN, 35CN Sub Drive Board	
230V, 100HP		
460V, 75HP		
460V, 100HP	12CN, 15CN, 16CN, 17CN Gate Drive Board	
460V, 150HP	30CN, 31CN, 32CN, 33CN, 34CN, 35CN Sub Drive Board	
460V, 200HP		
460V, 250HP		
460V, 300HP	1CN, 2CN Sub Drive Board (one board for each phase)	
460V, 400HP		

When a transistor fails, all the transistors in the failed phase must be replaced. They must be replaced with the identical transistor manufacturer and part number. The existing thermal compound must be wiped off and new thermal compound must be applied. Failure to follow any of these rules will lead to non-warranty drive damage.

- Typical for 230V 40, 50HP, or 460V 75, 100HP:
(460V, 100HP shown)

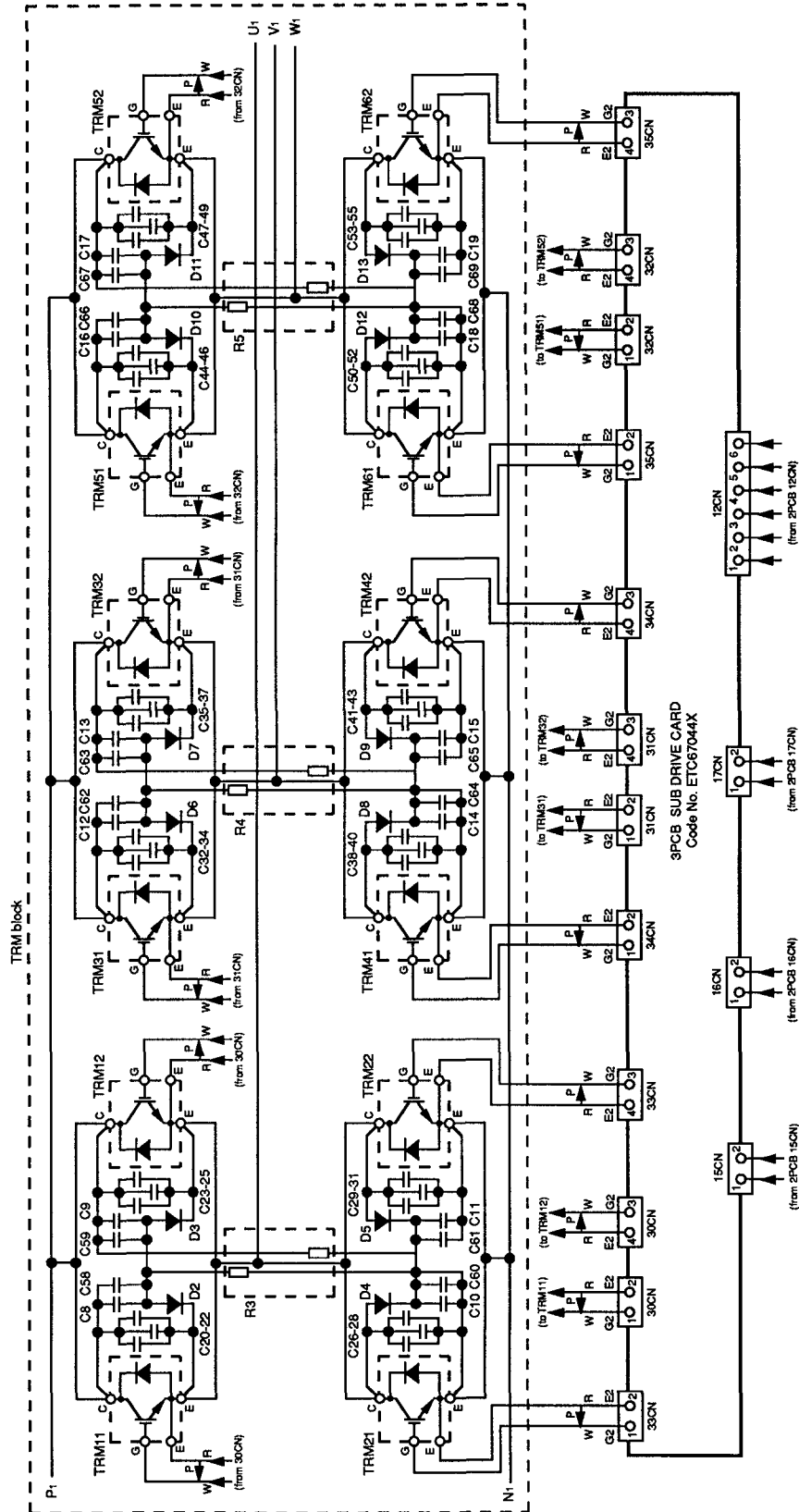
Power OFF
Motor Disconnected



OUTPUT TRANSISTOR MODULES (continued)

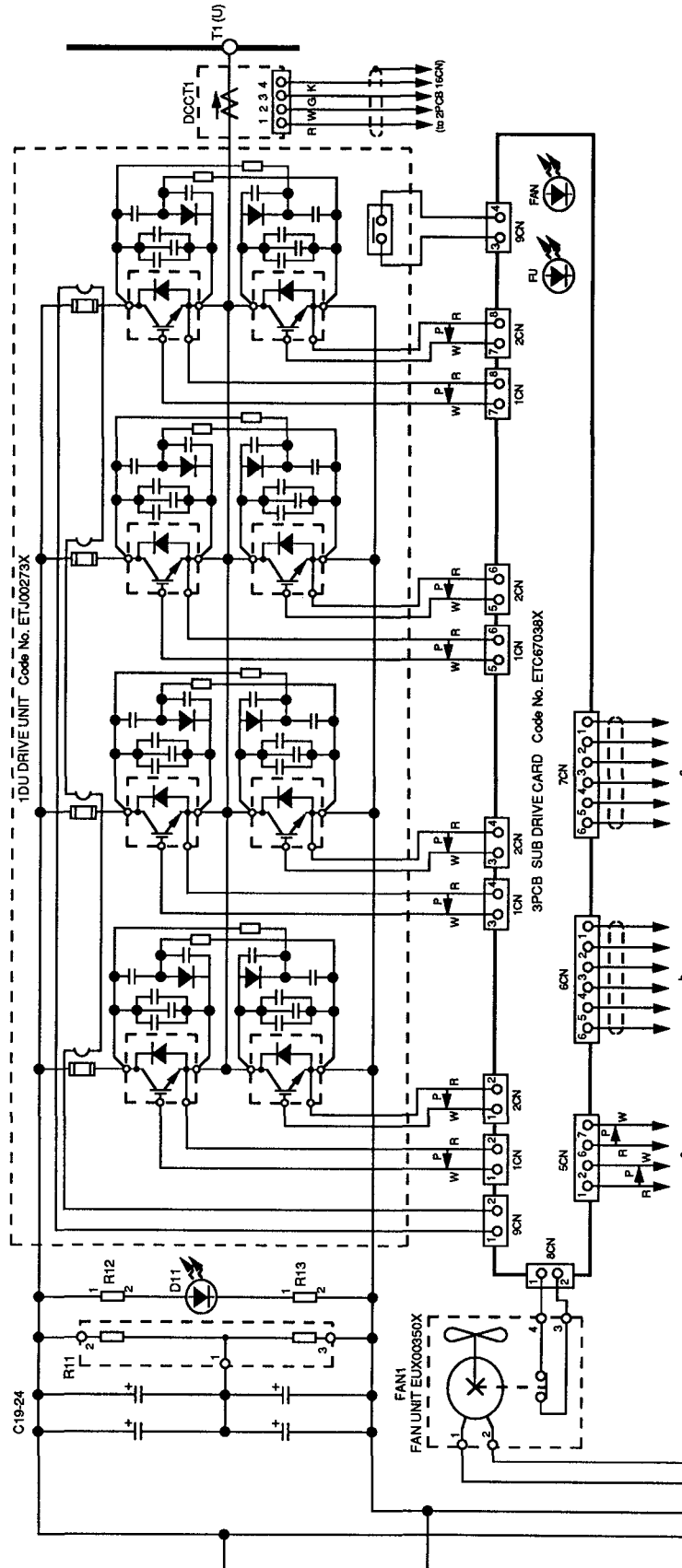
Power OFF
Motor Disconnected

- Typical for 230V 60, 75HP, or 460V 150, 200HP:



- Typical for 460V 250-400HP (one phase shown):

Power OFF
Motor Disconnected



CONTROL POWER/COOLING FAN FUSE

– Test equipment : Analog ohmmeter set to Rx1 scale

A small control circuit fuse is located inside the drive. In some units the fuse protects the control power circuit; in some it protects the cooling fan; and in others, it protects both.

Part Numbers:

Drive Rating (CT Rating, for GPD 503)	Fuse Designation	Manufacturer Part Number	MagneTek Part Number	Specifications
230V, 40HP	FU2	TRM 3 1/2	50207984	250V, 3 5A
230V, 50HP	FU2	TRM 3 1/2	50207984	250V, 3 5A
230V, 60HP	FU2	TRM 3 1/2	50207984	250V, 3 5A
230V, 75HP	FU2	TRM 3 1/2	50207984	250V, 3 5A
230V, 100HP	FU2	TRM 3 1/2	50207984	250V, 3 5A
460V, 75HP	Part of TM1	ATM 8	50207986	250V, 8A
460V, 100HP	Part of TM1	ATM 8	50207986	250V, 8A
460V, 150HP	Part of TM1	ATM 8	50207986	250V, 8A
460V, 200HP	Part of TM1	ATM 12	50207985	250V, 12A
460V, 250HP	Parts of 7PCB, Tap Change Card	ATM 8	50207986	250V, 8A
		ATM 12	50207985	250V, 12A
460V, 300HP	Parts of 7PCB, Tap Change Card	ATM 8	50207986	250V, 8A
		ATM 12	50207985	250V, 12A
460V, 400HP	Parts of 7PCB, Tap Change Card	ATM 8	50207986	240V, 8A
		ATM 12	50207985	250V, 12A

If the control fuse is open, check the following items for a problem:

- transformer TM1 or T1
- cooling fan(s)
- control circuit diode DM7 or DM10
- control circuit smoothing cap
- Gate Drive board or converter card power supply
- MC1 contactor coil
- external equipment connected to terminals x and y

COOLING FAN CHECK

- Test equipment : Analog ohmmeter set to Rx1 scale

The drive has a cooling fan that blows cooling air across the heat sink. If the cooling fan is not working properly, the drive will trip on a fan fault or an overheat fault. To check the cooling fan, follow the procedure detailed below:

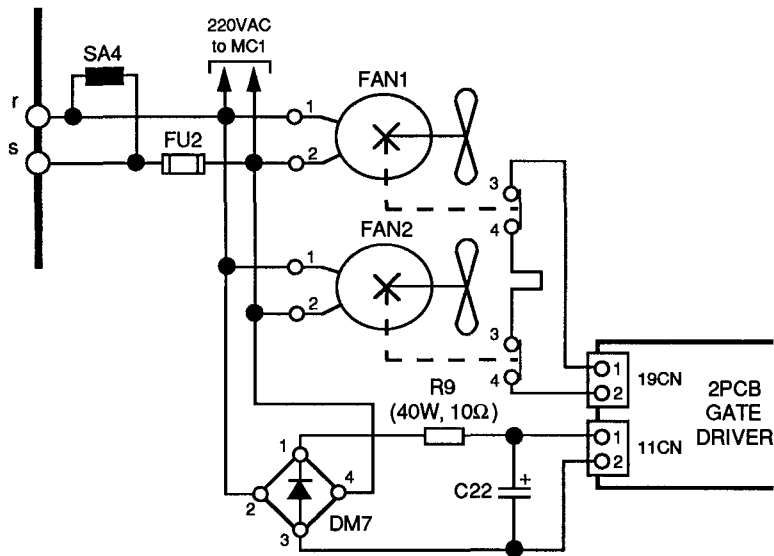
Procedure for all units except 460V 250-400HP:

1. Locate Fans 1 and 2.
2. Disconnect terminals 1 and 2 and measure with an analog ohmmeter. Ohmic value should be about 400-500 ohms.
3. Remove 19CN connector from the Gate Drive board.
4. Measure between pins 1 and 2, using the analog ohmmeter. Ohmic value should be zero.

Procedure for 460V 250-400HP:

1. Locate Fans 1, 2 and 3.
2. Disconnect terminals 1 and 2 and measure with an analog ohmmeter. Ohmic value should be about 400-500 ohms.
3. Remove 8CN connector from the Sub Drive card.
4. Measure between pins 1 and 2, using the analog ohmmeter. Ohmic value should be zero.

• Typical for all units except 460V 250-400HP:



COOLING FAN CHECK (continued)

Power OFF Motor Disconnected

Part Numbers:

Drive Rating (CT Rating, for GPD 503)	Fan Designation	Qty	Manufacturer Part Number	MagneTek Part Number	Specifications
230V, 40HP	Fan 1, Fan 2	2	THA1V-U7556MX	50207919	220V, 50/60Hz
230V, 50HP	Fan 1, Fan 2	2	THA1V-U7556MX	50207919	220V, 50/60Hz
230V, 60HP	Fan 1, Fan 2	2	THA1V-U7556MX	50207919	220V, 50/60Hz
230V, 75HP	Fan 1, Fan 2	2	THA1V-U7556MX	50207919	220V, 50/60Hz
230V, 100HP	Fan 1, Fan 2	2	THA1V-U7556MX	50207919	220V, 50/60Hz
460V, 75HP	Fan 1, Fan 2	2	THA1V-U7556MX	50207919	220V, 50/60Hz
460V, 100HP	Fan 1, Fan 2	2	THA1V-U7556MX	50207919	220V, 50/60Hz
460V, 150HP	Fan 1, Fan 2	2	THA1V-U7556MX	50207919	220V, 50/60Hz
460V, 200HP	Fan 1, Fan 2	2	THA1V-U7556MX	50207919	220V, 50/60Hz
460V, 250HP	Fan Unit 1, 2, 3	3	EUX00350X	50207929	220V, 50/60Hz
460V, 300HP	Fan Unit 1, 2, 3	3	EUX00350X	50207929	220V, 50/60Hz
460V, 400HP	Fan Unit 1, 2, 3	3	EUX00350X	50207929	220V, 50/60Hz

Section 2. POWER CHECKS

CAUTION

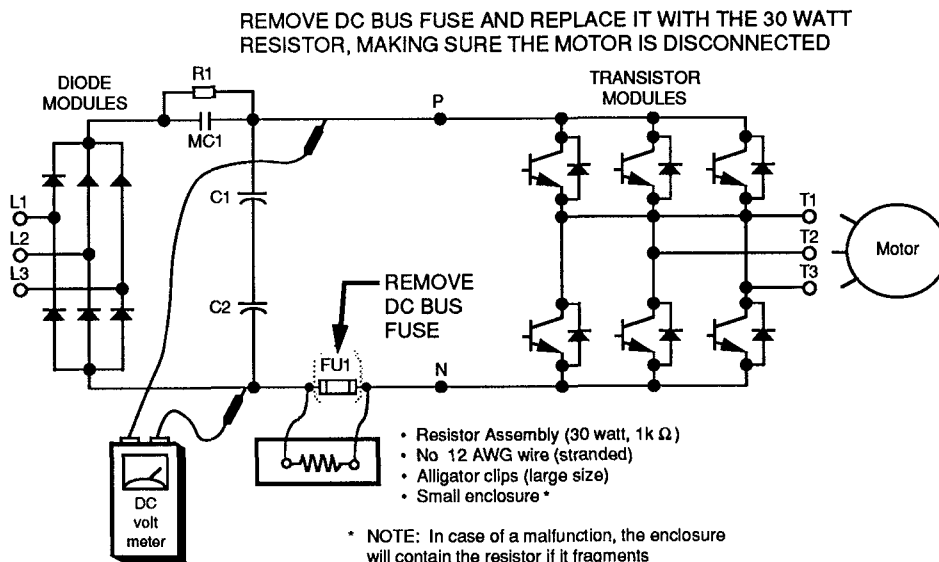
When performing checks with power, the DC bus voltage on a 230V drive will be 325 Vdc; on a 460V drive, it will be 650 Vdc. Extreme caution must be used when working on the drive. Make sure the "CHARGE" lamp is not glowing and the DC bus measures below 10 Vdc before touching any components. The motor must be disconnected to perform these tests!

Power OFF
Motor Disconnected

REMOVE DC BUS FUSE

– Test equipment : 30 watt, 1 k-ohm, DC resistor; DC voltmeter with 1,000 volt scale

Remove the DC bus fuse and install a 30 watt, 1 k-ohm resistor. Connect your DC voltmeter between P and N, on the DC bus.



Power ON
Motor Disconnected

Apply power to the drive and watch for three signs of trouble:

- voltage measured between P and N is low.
325 Vdc for 230V drive is normal
650 Vdc for 460V drive is normal
- Digital Operator displays an undervoltage (**Uu**) fault
- the 30 watt, 1 K-ohm resistor gets very hot.

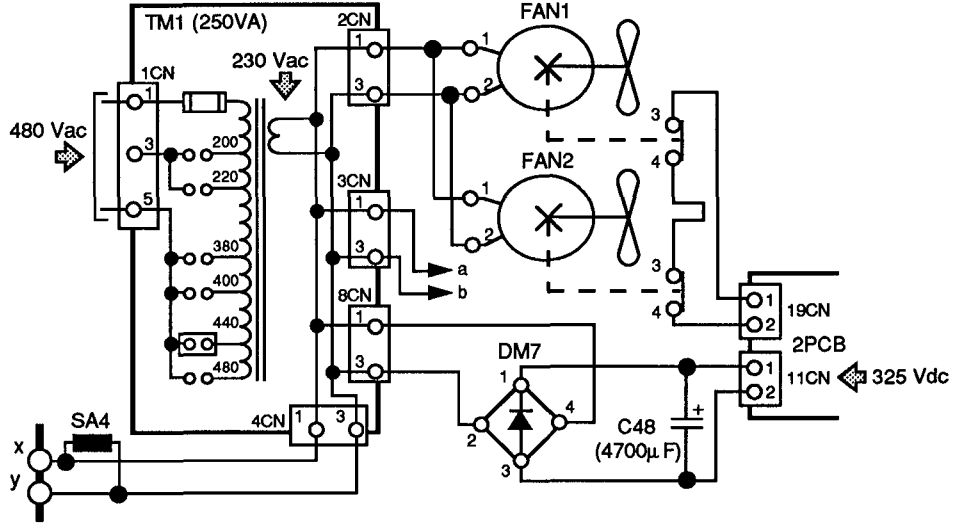
If any of these conditions occur, there is still a short between the P and N bus. Turn off the power immediately!

CONTROL POWER VOLTAGE CHECK

- Test equipment : DC voltmeter with 600V scale

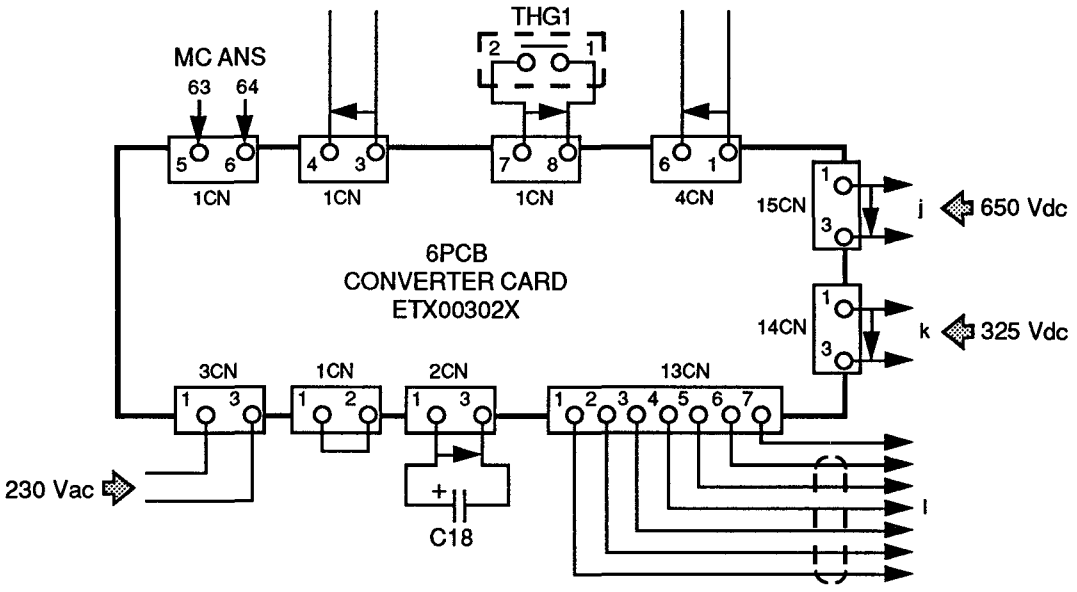
The control power circuit consists of a small bridge rectifier, a resistor and a smoothing capacitor. The control power can be measured at 11CN on the Gate Drive board. Normal voltage level is 310-325 Vdc.

- Typical for all except 460V 250-400HP (230V units do not require transformer TM1):



When measuring the control power on 460V 250-400HP, locate 6PCB converter card.

- Typical for 460V 250-400HP:



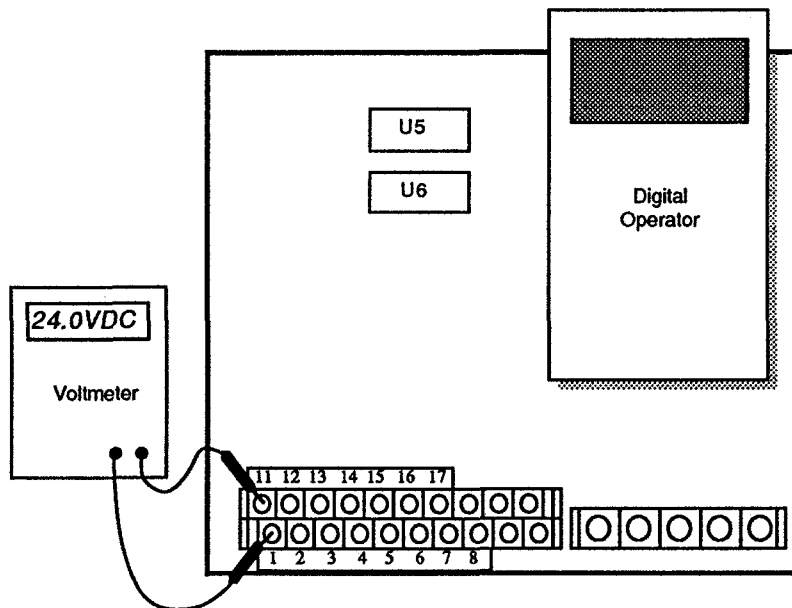
CONTROL BOARD POWER SUPPLY TEST

Power ON
Motor Disconnected

- Test equipment : DC voltmeter set at 50V scale

To check the power supplies on the control board external terminals, follow the steps listed below:

1. Apply power to the circuit.
2. Measure between terminal 11 (-) and terminals 1 (+) through 8 (+); +24 Vdc should be present.
3. Measure between terminals 15 (+) and 17 (-); +15 Vdc should be present.
4. Measure 8CN points 1 (+) and 2 (-); +24 Vdc should be present.
5. Measure between 8CN pins 3 (+) and 4 (-); +10 Vdc should be present.
6. Measure between 8CN pins 5 (+) and 6 (-); +18 Vdc should be present.



GATE CIRCUIT CHECK ON THE GATE DRIVE BOARD

- Test equipment : Ungrounded oscilloscope with X10 probe

Using the oscilloscope, measure across the gate and emitter pins, making sure that each has a negative bias*.

Do not remove white "CN" connectors from the board! Removing the connectors from the board will cause transistors to be damaged.

Perform these tests with the connectors in place. Do not attempt to run the drive at this time.

Drive Rating (CT Rating, for GPD 503)	Connector Number				Expected Reading
	Pin Numbers				
	12CN	15CN	16CN	17CN	
230V, 40HP	1 & 2			1 & 2 3 & 4 5 & 6	-8 to -10 Vdc
230V, 50HP					
230V, 60HP					
230V, 75HP					
230V, 100HP					
	12CN	15CN	16CN	17CN	
460V, 75HP	1 & 2			1 & 2 3 & 4 5 & 6	-8 to -10 Vdc
460V, 100HP					
460V, 150HP					
460V, 200HP					
	4CN	5CN	6CN		
460V, 250HP	1 & 2 6 & 7			-8 to -10 Vdc	
460V, 300HP					
460V, 400HP					

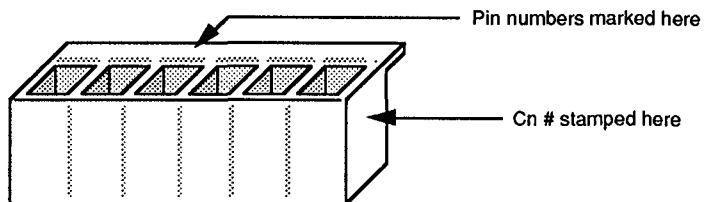
* The positive scope probe should be connected to the gate point (labeled "G") and the negative scope probe should be connected to the emitter point (labeled "E").

All gate emitter voltage measurements should be the same.

Look for these signs of trouble:

- negative bias voltage is missing
- voltage measurement has excessive ripple.

**White Connector
Physical Diagram**



GATE CIRCUIT CHECK ON THE SUB DRIVE BOARD

- Test equipment : Ungrounded oscilloscope with X10 probe

Using the oscilloscope, measure across the gate and emitter pins, making sure that each has a negative bias*.

Do not remove white "CN" connectors from the board! Removing the connectors from the board will cause transistors to be damaged.

Perform these tests with the connectors in place. Do not attempt to run the drive at this time.

Drive Rating (CT Rating, for GPD 503)	Connector Number						Expected Reading
	Pin Numbers						
230V, 40HP	Does not have a Sub Drive board						Does not apply
230V, 50HP							
	30CN	31CN	32CN	33CN	34CN	35CN	
230V, 60HP	1 & 2 3 & 4						-8 to -10 Vdc
230V, 75HP							
230V, 100HP							
460V, 75HP	Does not have a Sub Drive board						Does not apply
460V, 100HP							
	30CN	31CN	32CN	33CN	34CN	35CN	
460V, 150HP	1 & 2 3 & 4						-8 to -10 Vdc
460V, 200HP							
	1CN			2CN			
460V, 250HP	1 & 2 3 & 4 5 & 6 7 & 8						-8 to -10 Vdc
460V, 300HP							
460V, 400HP							

* The positive scope probe should be connected to the gate point (labeled "G") and the negative scope probe should be connected to the emitter point (labeled "E").

All gate emitter voltage measurements should be the same.

Look for these signs of trouble:

- negative bias voltage is missing
- voltage measurement has excessive ripple.

GATE CIRCUIT WAVEFORM CHECK ON THE GATE DRIVE BOARD

Power ON
Motor Disconnected

- Test equipment : Ungrounded oscilloscope with X10 probe

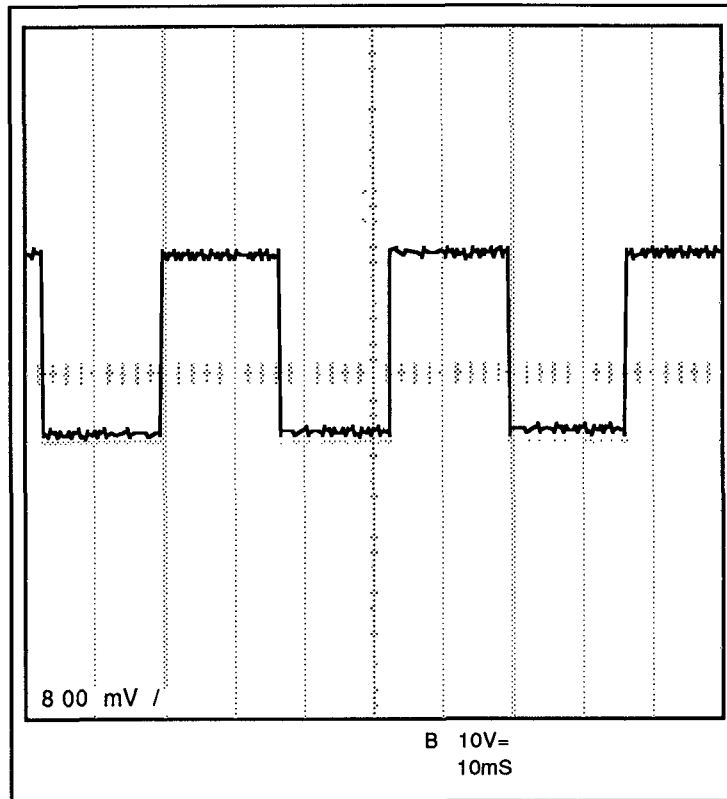
Using the oscilloscope, measure across the gate and emitter pins.

1. Run the drive at 10Hz.
2. Compare the waveforms to Waveform 1, on page 21.
3. When finished checking all gate and emitter pins, increase output frequency to 60Hz.
4. Compare the waveforms to Waveform 2, on page 21.

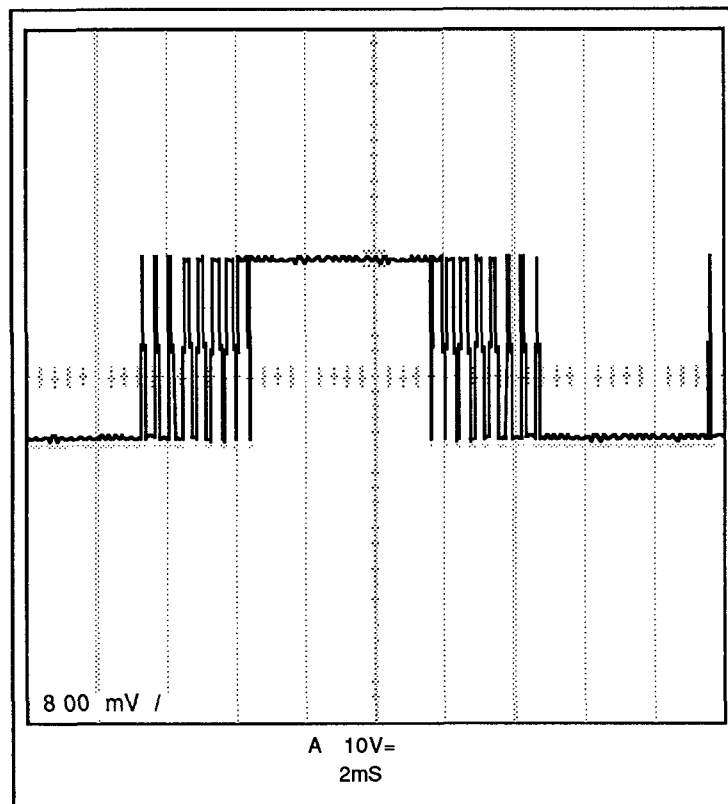
Drive Rating (CT Rating, for GPD 503)	Connector Number			
	Pin Numbers			
	12CN	15CN	16CN	17CN
230V, 40HP	1 & 2			1 & 2 3 & 4 5 & 6
230V, 50HP				
230V, 60HP				
230V, 75HP				
230V, 100HP				
460V, 75HP				
460V, 100HP				
460V, 150HP				
460V, 200HP				
	4CN	5CN	6CN	
460V, 250HP	1 & 2 6 & 7			
460V, 300HP				
460V, 400HP				

* The positive scope probe should be connected to the gate point (labeled "G") and the negative scope probe should be connected to the emitter point (labeled "E").

Waveform 1 - Gate Emitter Waveform at 10Hz



Waveform 2 - Gate Emitter Waveform at 60Hz



GATE CIRCUIT WAVEFORM CHECK ON THE SUB DRIVE BOARD

Power ON
Motor Disconnected

- Test equipment : Ungrounded oscilloscope with X10 probe

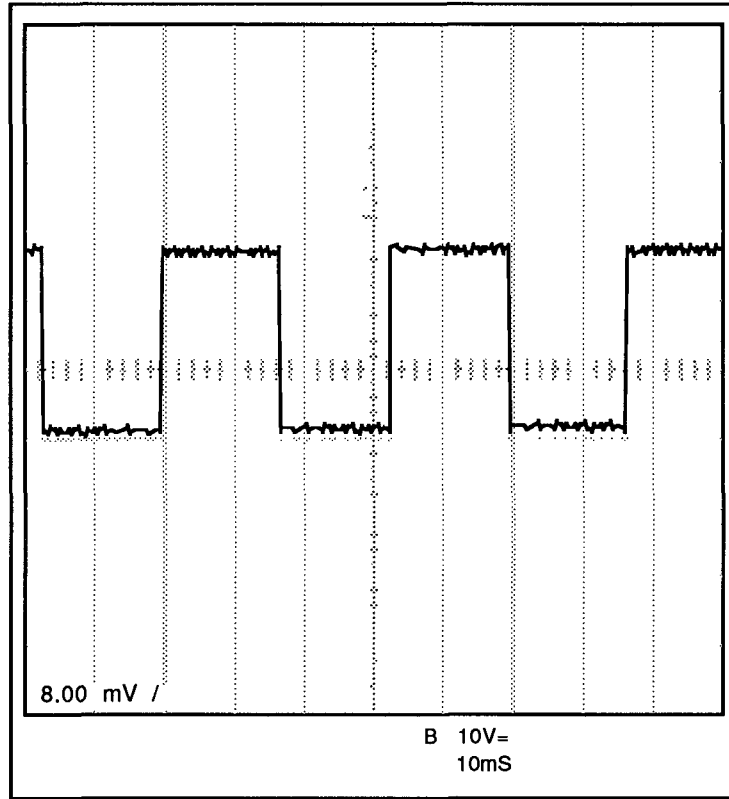
Using the oscilloscope, measure across the gate and emitter pins.

1. Run the drive at 10Hz.
2. Compare the waveforms to Waveform 3, on page 23.
3. When finished checking all gate and emitter pins, increase output frequency to 60Hz.
4. Compare the waveforms to Waveform 4, on page 23.

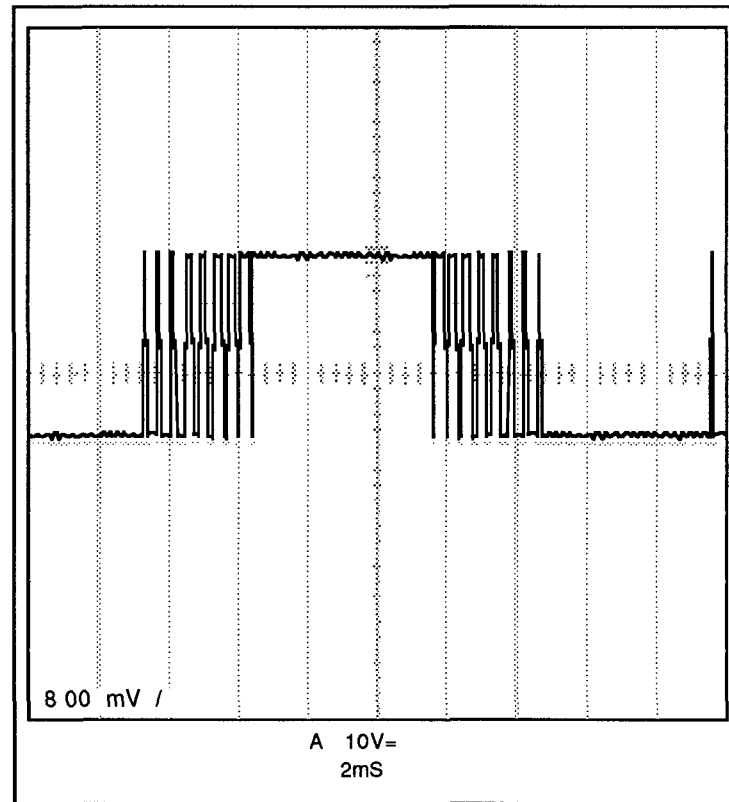
Drive Rating (CT Rating, for GPD 503)	Connector Number						Expected Reading
	Pin Numbers						
230V, 40HP	Does not have a Sub Drive board						Does not apply
230V, 50HP							
	30CN	31CN	32CN	33CN	34CN	35CN	
230V, 60HP	1 & 2 3 & 4						-8 to -10 Vdc
230V, 75HP							
230V, 100HP							
460V, 75HP	Does not have a Sub Drive board						Does not apply
460V, 100HP							
	30CN	31CN	32CN	33CN	34CN	35CN	
460V, 150HP	1 & 2 3 & 4						-8 to -10 Vdc
460V, 200HP							
	1CN			2CN			
460V, 250HP	1 & 2 3 & 4 5 & 6 7 & 8						-8 to -10 Vdc
460V, 300HP							
460V, 400HP							

* The positive scope probe should be connected to the gate point (labeled "G") and the negative scope probe should be connected to the emitter point (labeled "E").

Waveform 3 - Gate Emitter Waveform at 10Hz



Waveform 4 - Gate Emitter Waveform at 60Hz



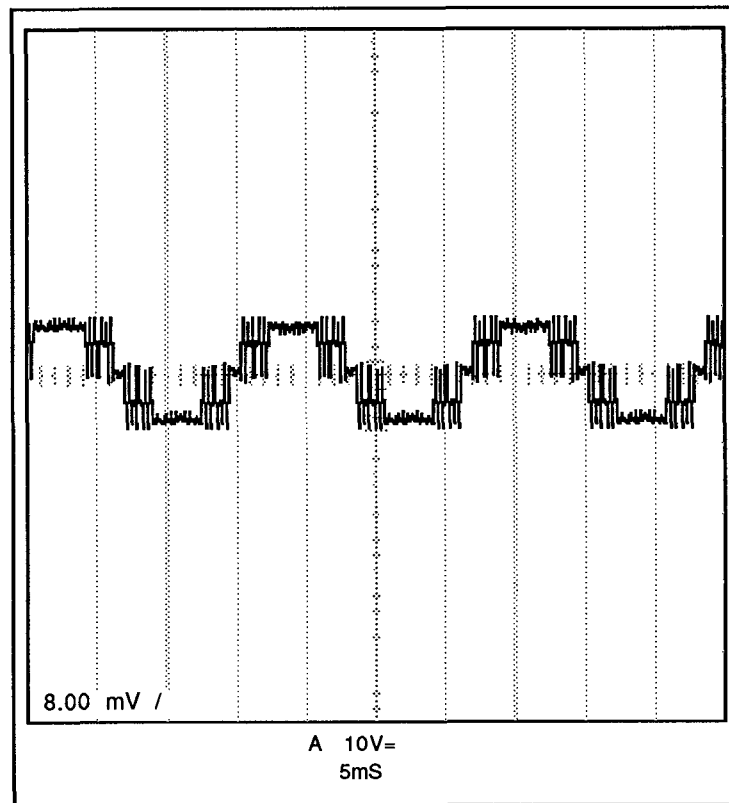
OUTPUT VOLTAGE WAVEFORM

- Test equipment : Ungrounded oscilloscope with X100 probe

After testing all the gate emitter waveforms, the output voltage waveform must be checked.

1. Using the oscilloscope, measure between T1 and T2.
2. Run the drive up to 60Hz, watching the waveform as it accelerates.
3. Compare the waveform at 60Hz with Waveform 5 below.
4. Stop the drive.
5. Repeat steps 1 through 4, measuring T1 to T3, and T2 to T3.

Waveform 5 – Output Voltage Waveform at 60Hz



This completes all of the checks needed to verify that mechanical repairs in the drive were done properly.

Remove AC power from the drive and allow the DC bus capacitors to discharge. When the DC bus measures less than 10 Vdc, remove the 30 watt, 1 k-ohm resistor and reinstall the DC bus fuse.

After making a mechanical repair, it is necessary to verify that the cause of component failure has been eliminated. Many times the failure is caused by incorrect programming of constants in the drive. Therefore, a thorough Start-Up procedure must be performed (see Section 3 of this manual).

Section 3. START-UP PROCEDURE

This Start-Up procedure must be performed after making a physical repair to a GPD 503, or when starting up a new unit.

START-UP CHECKLIST

Check off when completed

- 1. Make a wiring diagram of the drive installation.
- 2. Record all constants on settings list (see Appendix A).
- 3. Verify motor connections, megger the motor (when possible, or if transistor failure has occurred).
- 4. Verify drive and motor wiring.
- 5. Check tightness of main circuit components.
- 6. Install test equipment.
- 7. Perform setting adjustments, per "Setting Adjustment Before Start-Up" in this section.
- 8. Follow "Large Drive Start-Up Flow Chart" in this section.
- 9. Document any programming constant or wiring changes.

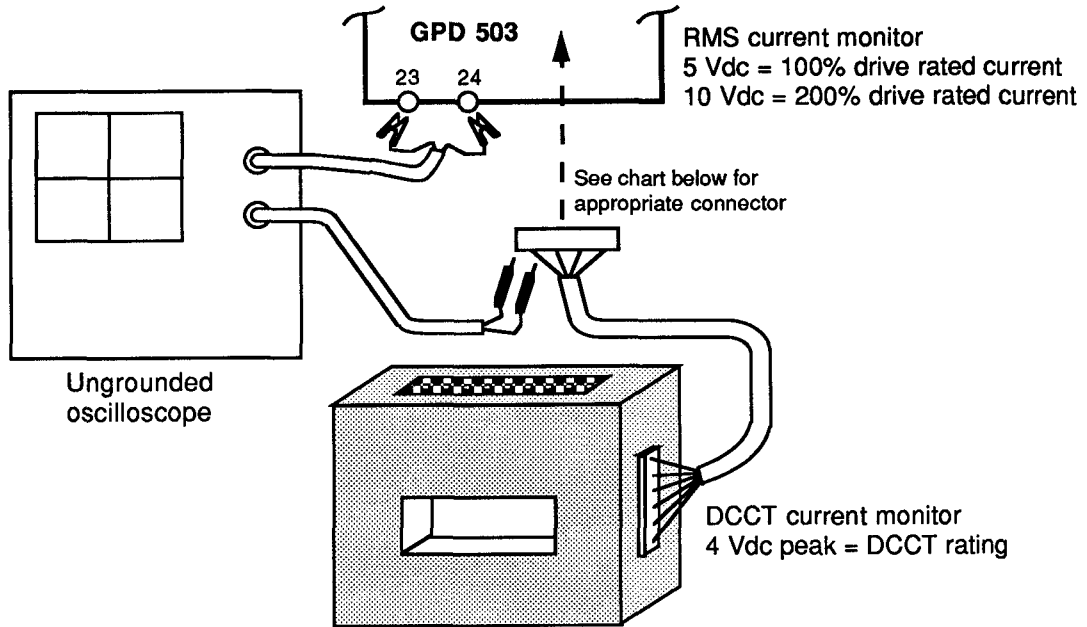
10. Start-Up completed by: _____

Date: _____

START-UP TEST POINTS

- Test equipment : Ungrounded oscilloscope with two channels and two X10 probes

When starting the drive, you must monitor two (2) check points to be able to monitor the running conditions.



Drive Rating (CT Rating, for GPD 503)	Connector Number	Measure Between
230V, 40HP	20CN, 21CN, 22CN	Black - 0V Green - Signal
230V, 50HP		
230V, 60HP		
230V, 75HP		
230V, 100HP		
460V, 75HP	16CN, 17CN, 18CN	
460V, 100HP		
460V, 150HP		
460V, 200HP		
460V, 250HP		
460V, 300HP		
460V, 400HP		

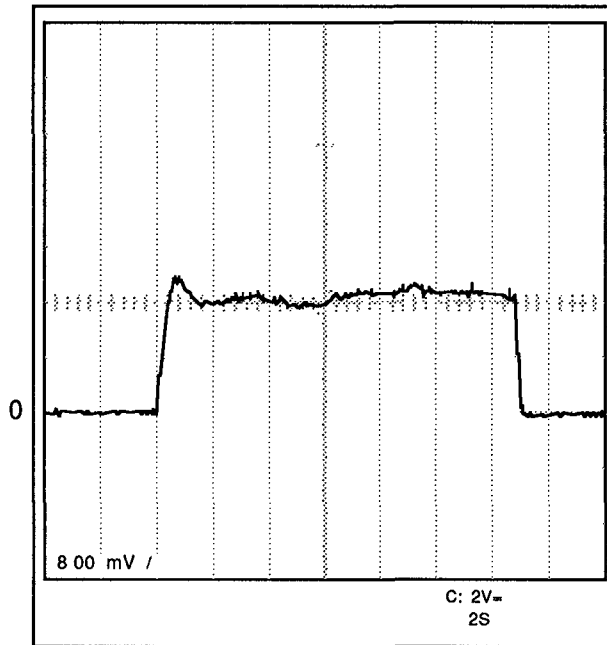
- **RMS Current Monitor**

This allows monitoring of the RMS output current going to the motor. It is much better than using an external clamp-on, which will be inaccurate due to the changing frequency.

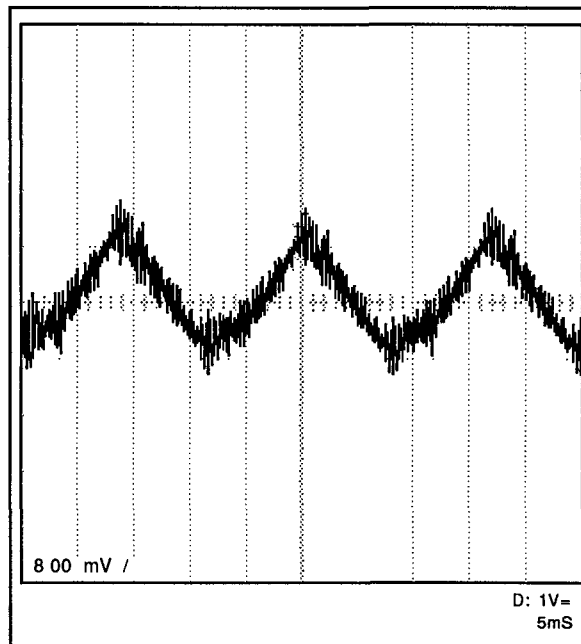
- **DCCT Current Monitor**

This allows monitoring of the output current waveform. This test point is important to determine if the current is “stable” or not.

Example of RMS Current Reading From Oscilloscope



Example of RMS Current Reading From Oscilloscope



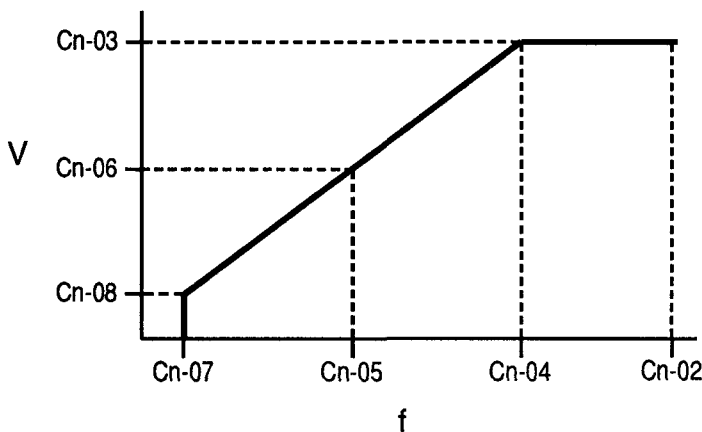
SETTING ADJUSTMENTS BEFORE START-UP

When Using a Pre-programmed V/f Pattern (Sn-02 = 00-0E) :

1. Set Cn-01 input voltage to nameplate voltage of motor.
2. Set Cn-09 to motor nameplate full-load current.
3. Set Cn-11, Cn-12, and Cn-12 DC injection controls to 0.0.
4. Set Cn-28 stall prevention level during accel to 120%.
5. Set bn-01 and bn-02 accel and decel time to 2 times customer's specifications or 10 seconds, whichever is longer.

When Using the Adjustable (i.e. Custom) V/f Pattern (Sn-02 = 0F) :

1. Set Cn-01 input voltage to AC nput line voltage.
2. Set Cn-09 to motor nameplate full-load current.
3. Set Cn-11, Cn-12, and Cn-12 DC injection controls to 0.0.
4. Set Cn-28 stall prevention level during accel to 120%.
5. Set bn-01 and bn-02 accel and decel time to 2 times customer's specifications.
6. Set Cn-02 through Cn-08 (see below).



Cn-02 – set to desired maximum frequency.

Cn-03 – set to motor nameplate voltage rating.

Cn-04 – set to motor nameplate frequency rating.

Cn-05 – set equal to Cn-07. (1)

Cn-06 – disregard. (1)

Cn-07 – set frequency using the following formula:

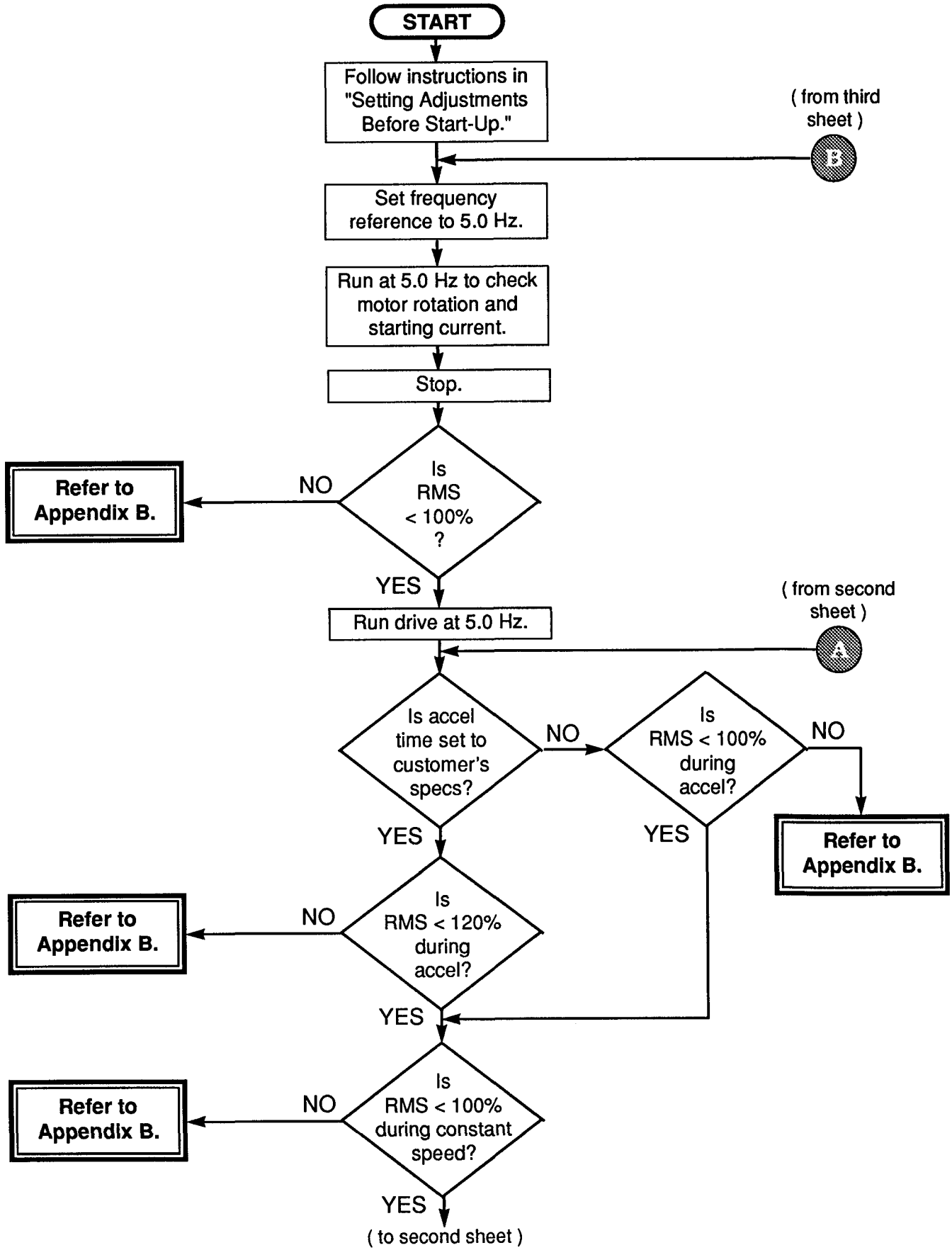
$$\frac{1800^{(2)} - \text{Motor RPM}}{1800^{(2)}} \times \text{Cn-04.}$$

Cn-08 – (for 460V drive) Cn-07 x 12
(for 230V drive) Cn-07 x 6.

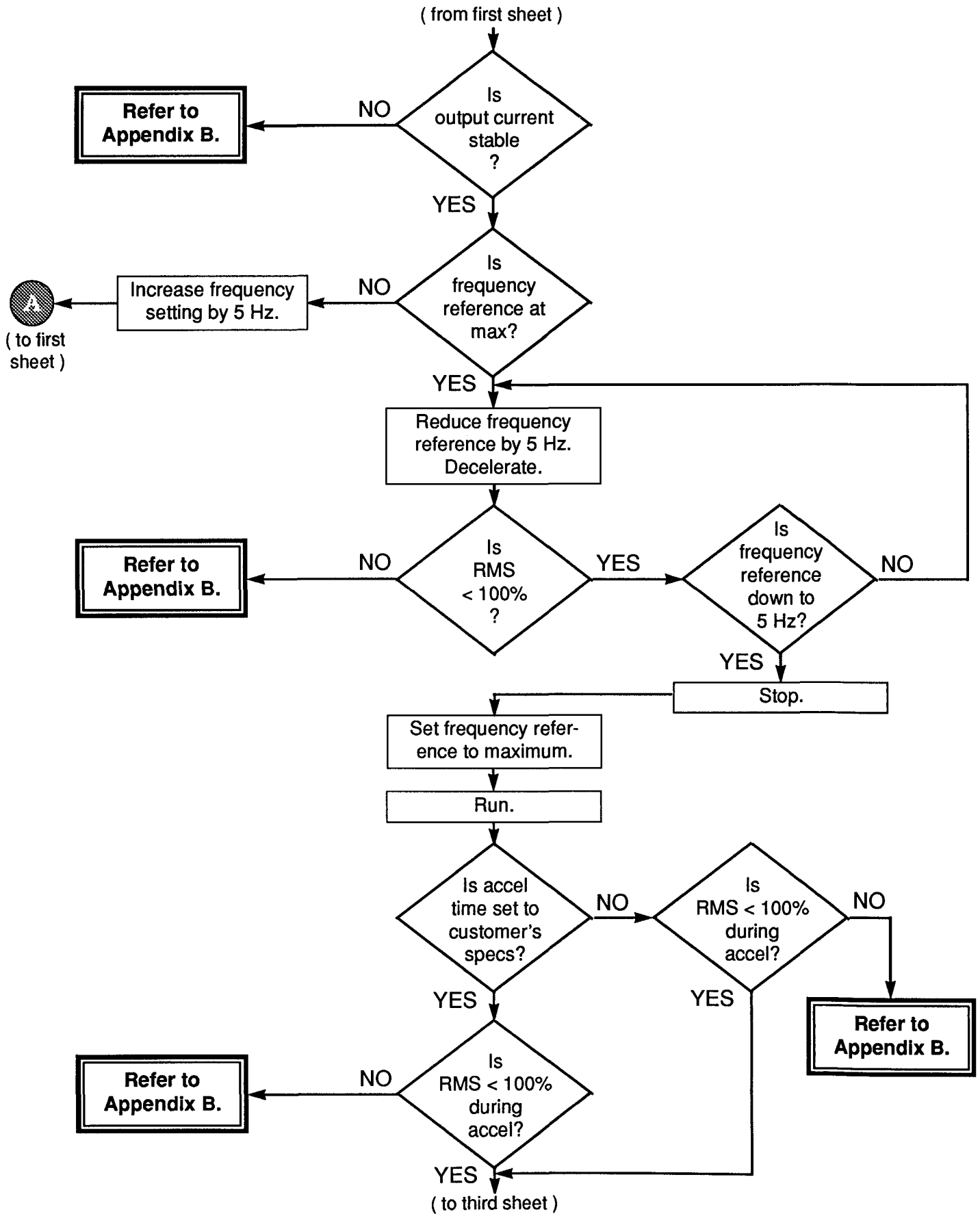
(1) When making a “straight” pattern.

(2) Change to 3600 for a 2 pole motor.

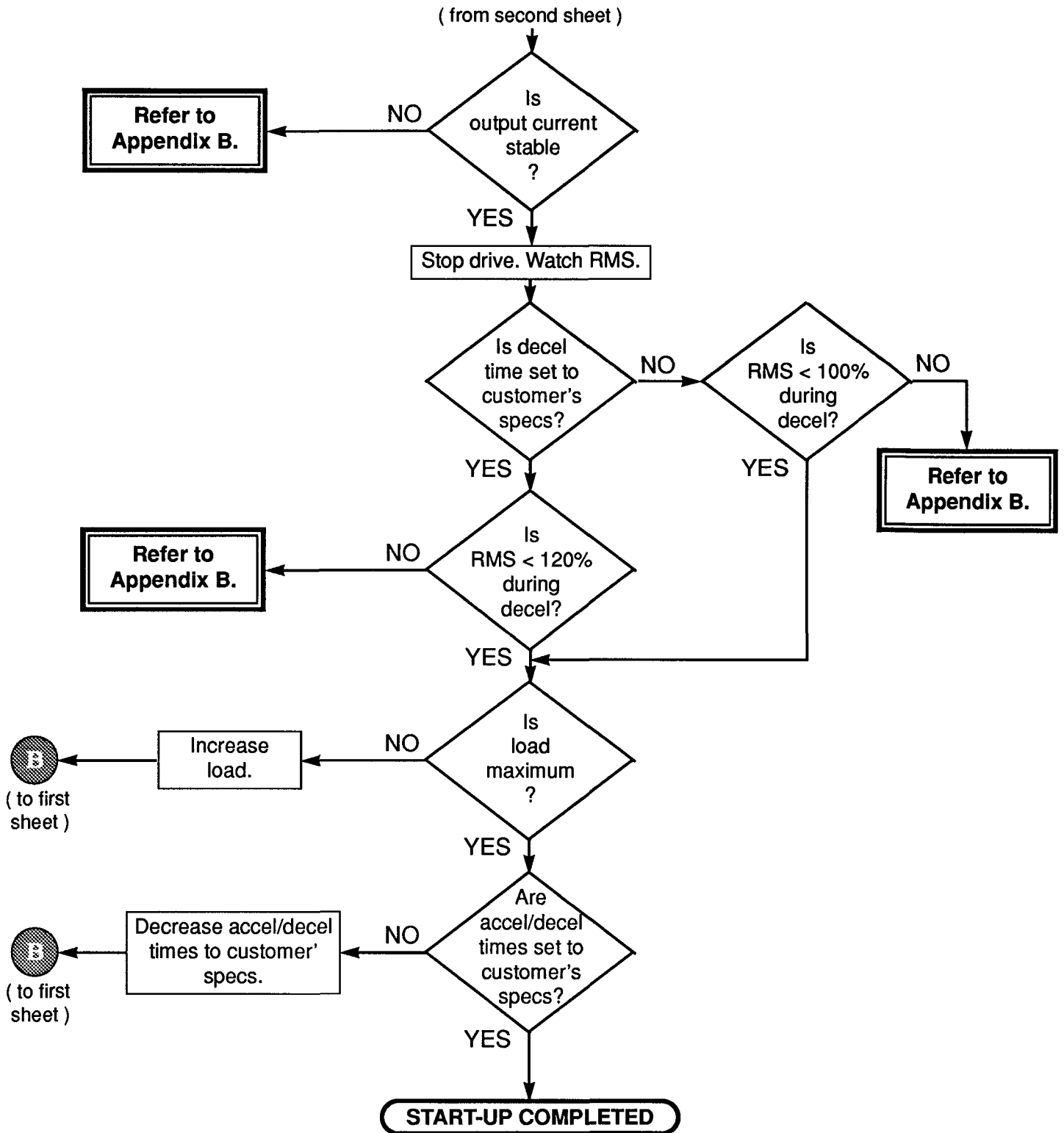
Large Drive Start-Up Flow Chart



Large Drive Start-Up Flow Chart (continued)



Large Drive Start-Up Flow Chart (continued)



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Appendix A. GPD 503 CONSTANT SETTINGS LIST

CONSTANT NUMBER	USER SETTING	CONSTANT NUMBER	USER SETTING	CONSTANT NUMBER	USER SETTING
An-01 An-02 An-03		Sn-19 Sn-20 Sn-21		Cn-22 Cn-23 Cn-24	
An-04 An-05 An-06		Sn-22 Sn-23 Sn-24		Cn-25 Cn-26 Cn-27	
An-07 An-08 An-09		Sn-25 Sn-26 Sn-27		Cn-28 Cn-29 Cn-30	
bn-01 bn-02 bn-03		Sn-28 Sn-29 Sn-30		Cn-31 Cn-32 Cn-33	
bn-04 bn-05 bn-06		Sn-31 Sn-32 Sn-33		Cn-34 Cn-35 Cn-36	
bn-07 bn-08 bn-09		Sn-34 Sn-35 Sn-36		Cn-37 Cn-38 Cn-39	
bn-10 bn-11 bn-12		Sn-37 Sn-38 Sn-39		Cn-40 Cn-41 Cn-42	
bn-13 bn-14 bn-15		Sn-40 Sn-41		Cn-43 Cn-44 Cn-45	
bn-16 bn-17 bn-18		Cn-01 Cn-02 Cn-03		Cn-46 Cn-47 Cn-48	
Sn-01 Sn-02 Sn-03		Cn-04 Cn-05 Cn-06		Cn-49 Cn-50 Cn-51	
Sn-04 Sn-05 Sn-06		Cn-07 Cn-08 Cn-09		Cn-52 Cn-53 Cn-54	
Sn-07 Sn-08 Sn-09		Cn-10 Cn-11 Cn-12		Cn-55 Cn-56 Cn-57	
Sn-10 Sn-11 Sn-12		Cn-13 Cn-14 Cn-15		Cn-58 Cn-59 Cn-60	
Sn-13 Sn-14 Sn-15		Cn-16 Cn-17 Cn-18		Cn-61 Cn-62 Cn-63	
Sn-16 Sn-17 Sn-18		Cn-19 Cn-20 Cn-21		Cn-64 Cn-65	

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Appendix B. COMMON PROBLEMS AND SOLUTIONS

PROBLEM: STARTING CURRENT TOO HIGH

POSSIBLE CAUSE	SOLUTION
Accel time too short.	Lengthen by acceptable amount.
Torque compensation is too low.	Raise by 1/10 increments (1.0, 1.1, 1.2).
Starting voltage is too low.	Raise by 2V increments.
Torque compensation is too high.	Lower by 1/10 increments. DO NOT set to 0.
Starting voltage is too high.	Lower by 2V increments.
Drive is too small.	Replace with drive of next higher rating.

PROBLEM: DRIVE TRIPS ON OVERVOLTAGE

POSSIBLE CAUSE	SOLUTION
Input voltage is too high.	Lower input voltage to specifications.
Decel time is too short.	Lengthen decel time, or enable stall prevention.
DB resistor ohmic value is too high.	Re-calculate resistor value; refer to TD 4071 in GPD 503 Product and Application Guide.
Voltage transients are reaching the drive.	Install transient monitor. Install reactor, if necessary.
Input power harmonic distortion.	AC input normal, DC bus voltage is high: Are PF capacitors present?

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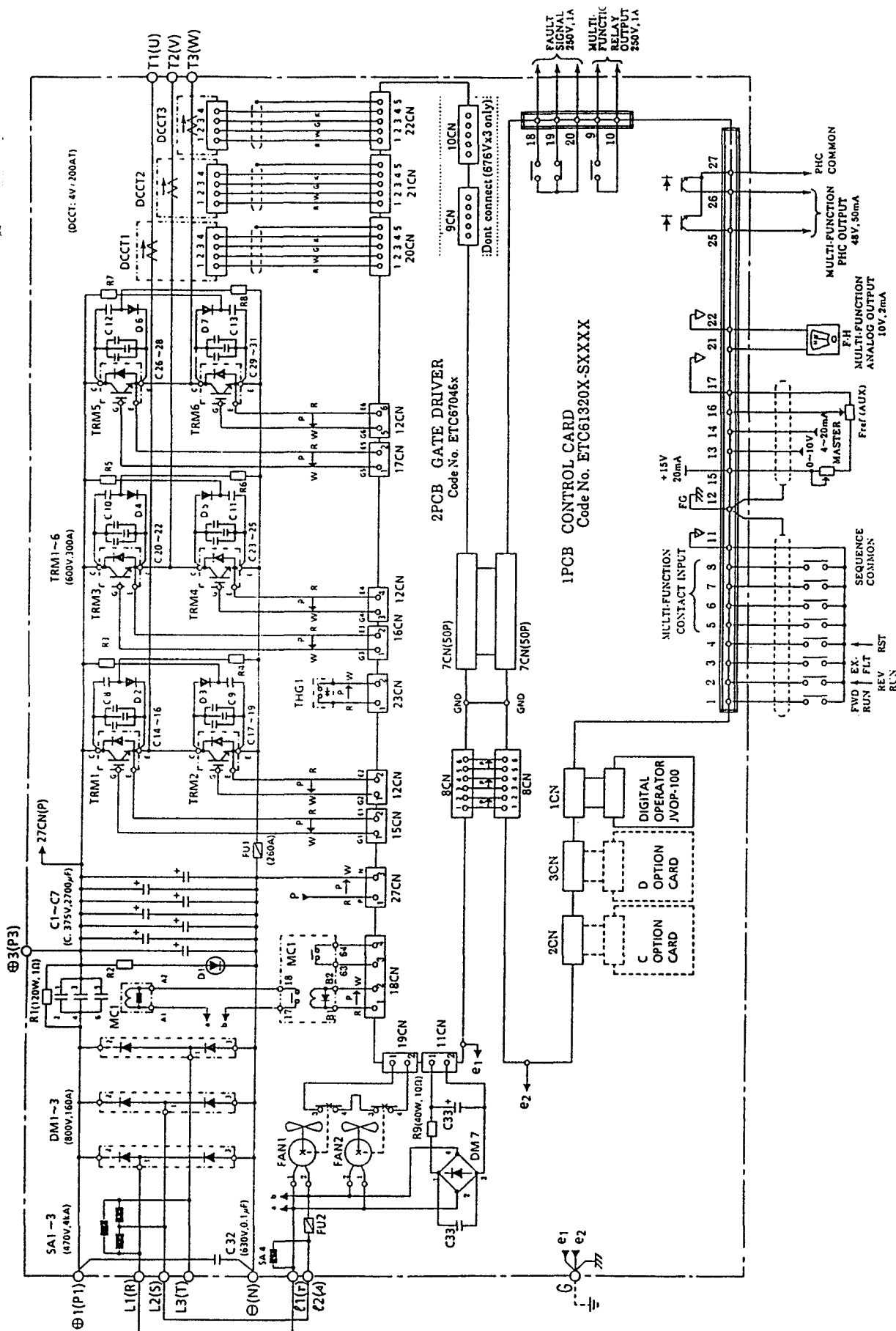
Appendix C. GPD 503 SCHEMATIC DIAGRAMS

This section contains detail schematic diagrams for High Horsepower range GPD 503s.

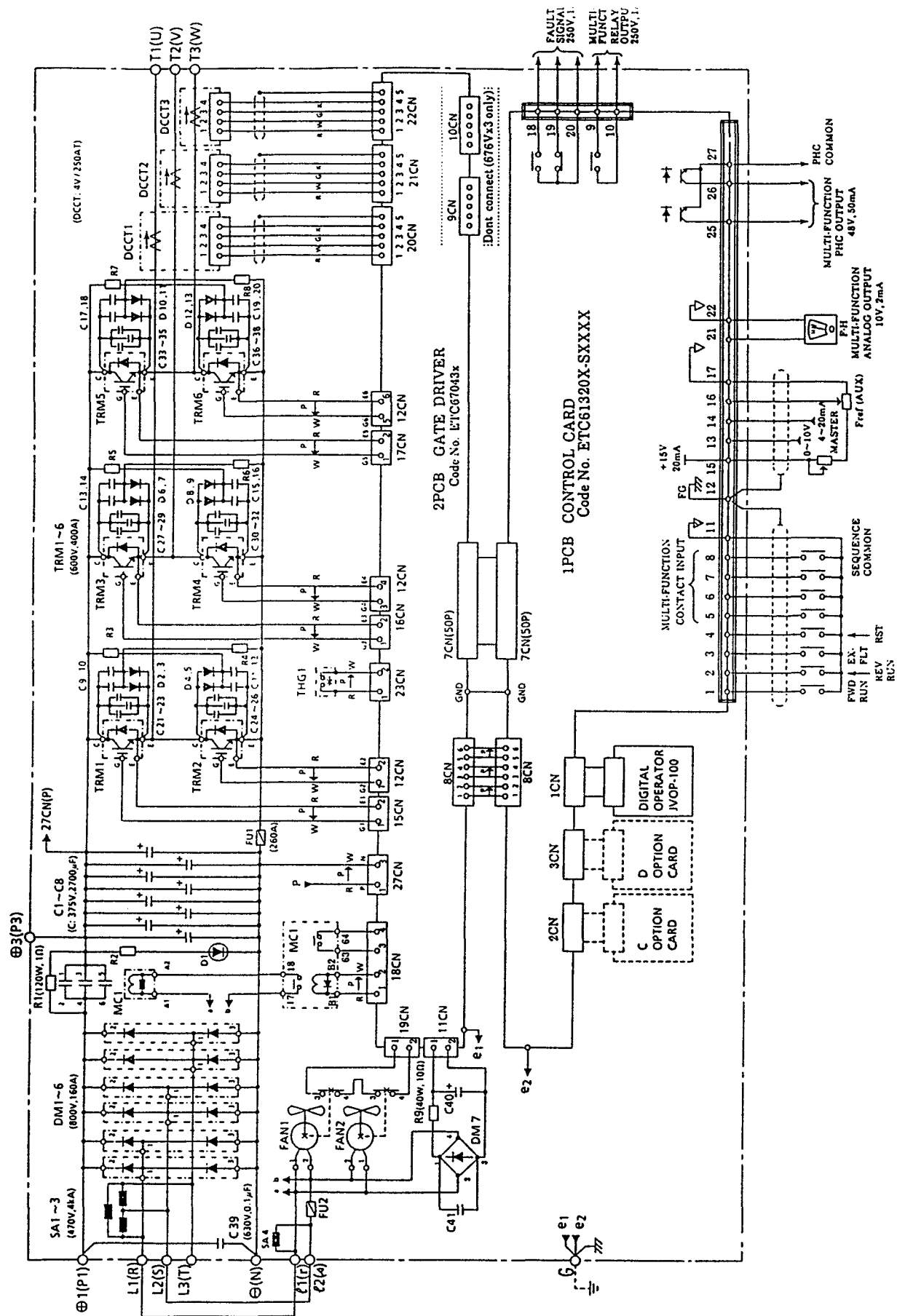
The following diagrams are included:

	<u>Page</u>
230V, 40HP	38
230V, 50HP	39
230V, 60HP – Sheet 1 of 2	40
230V, 60HP – Sheet 2 of 2	41
230V, 75HP – Sheet 1 of 2	42
230V, 70HP – Sheet 2 of 2	43
230V, 100HP – Sheet 1 of 2	44
230V, 100HP – Sheet 2 of 2	45
460V, 150HP – Sheet 1 of 2	46
460V, 150HP – Sheet 2 of 2	47
460V, 200HP – Sheet 1 of 2	48
460V, 200HP – Sheet 2 of 2	49
460V, 300HP	51
460V, 400HP	52

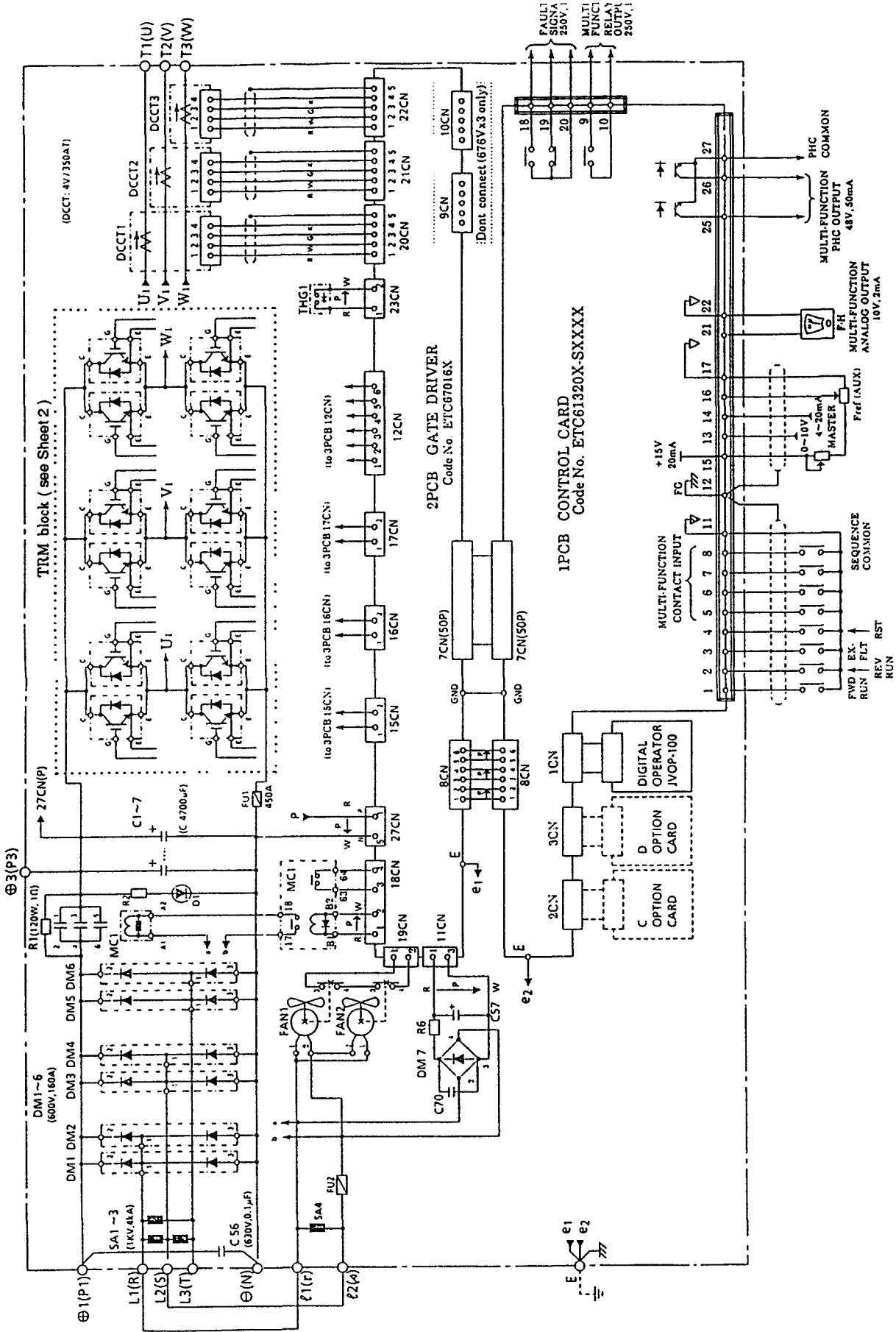
NOTE: For schematics for any ratings not included in this section, contact MagneTek.



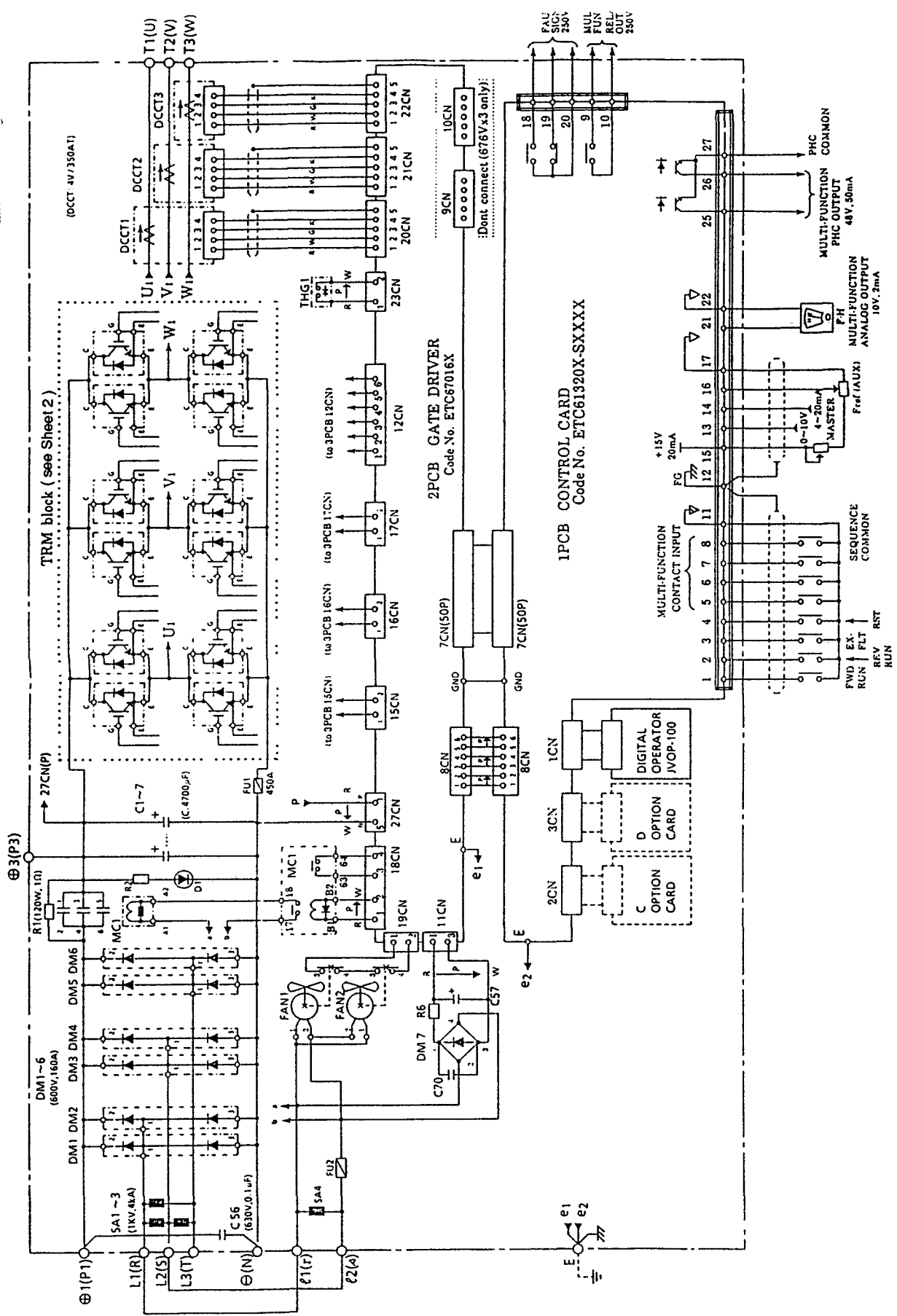
Schematic Diagram GPD 503 230V, 40HP



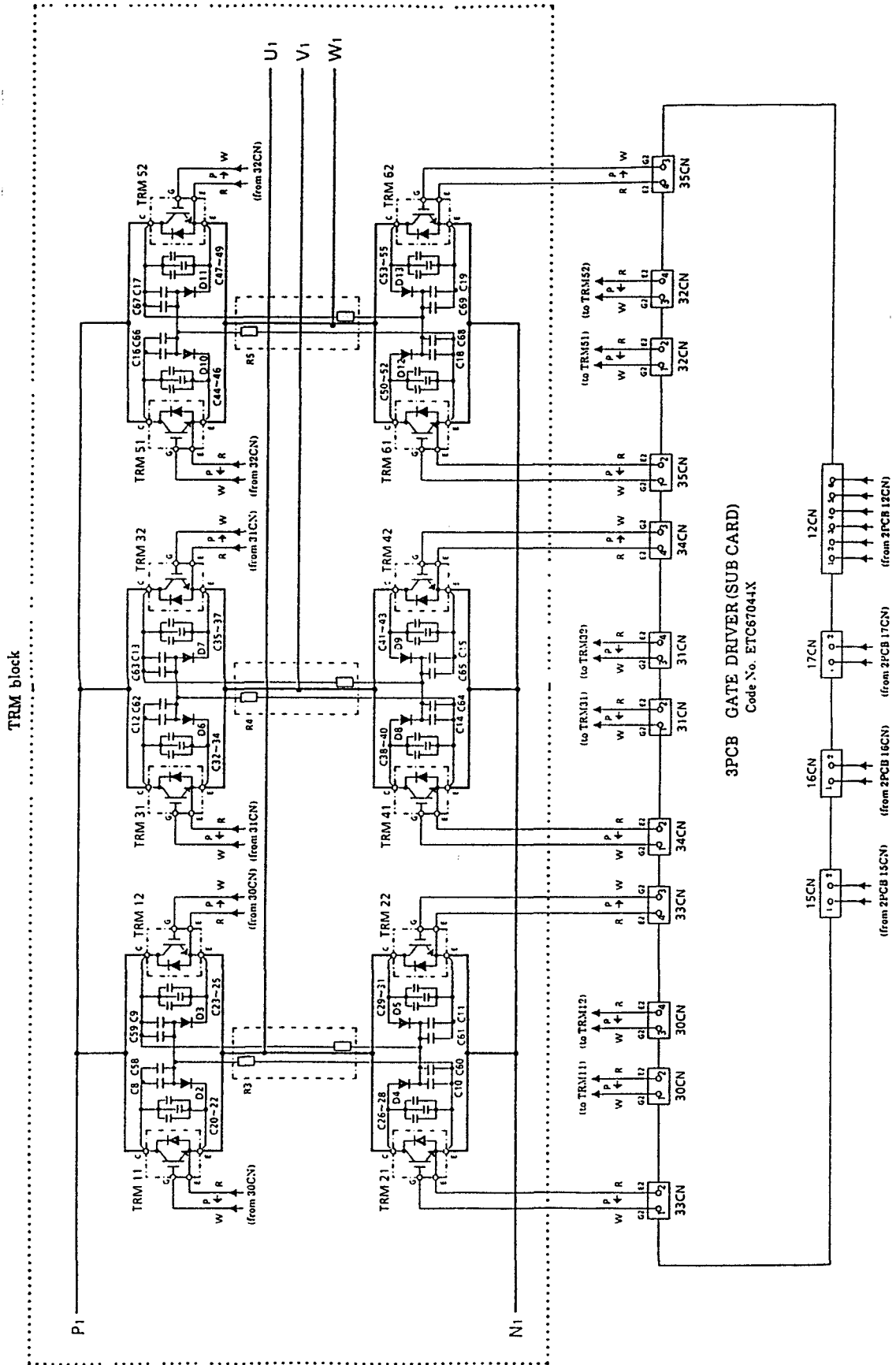
Schematic Diagram GPD 503 230V, 50HP



Schematic Diagram GPD 503 230V, 60HP Sheet 1 of 2

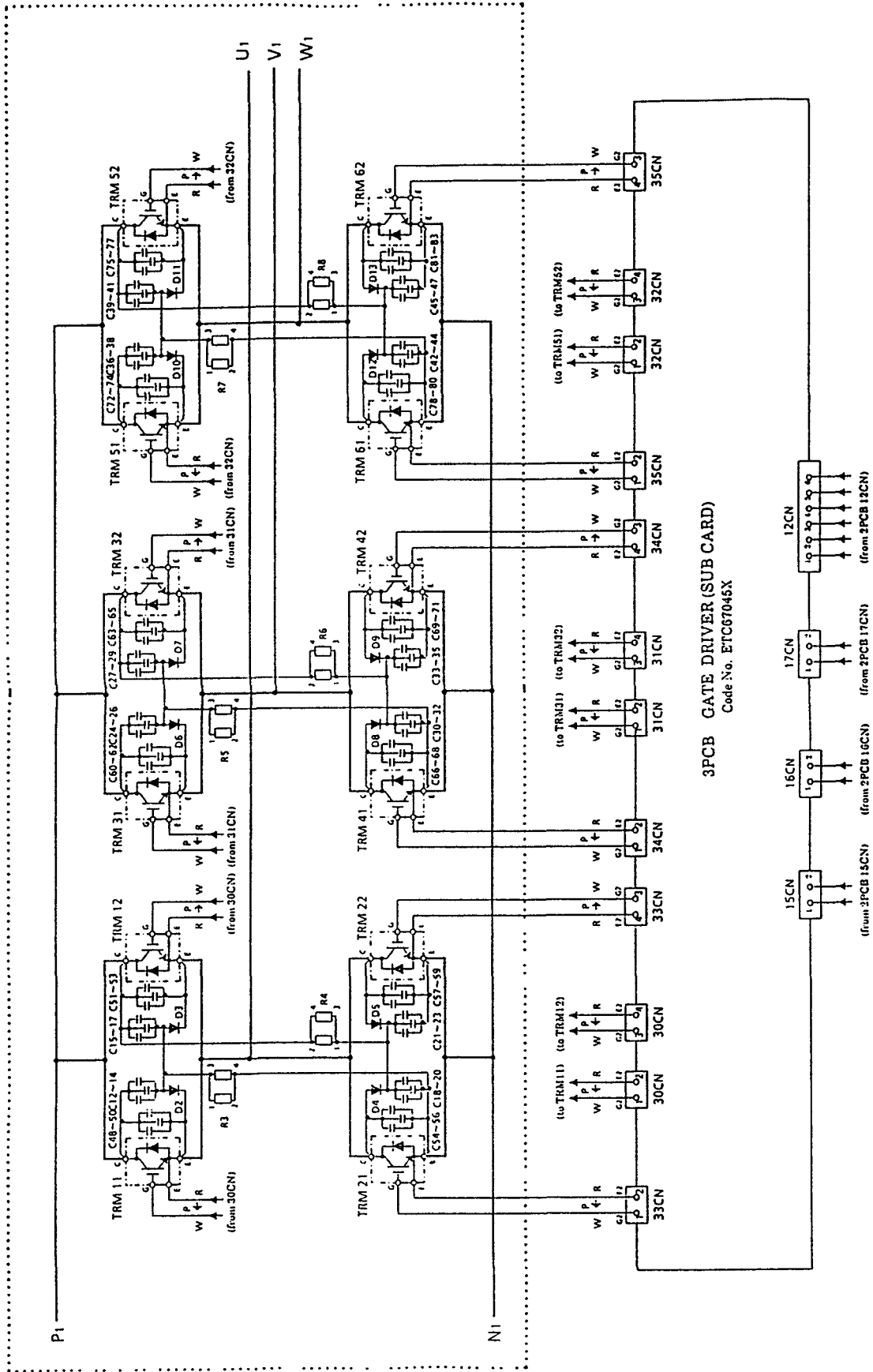


Schematic Diagram GPD 503 230V, 75HP Sheet 1 of 2



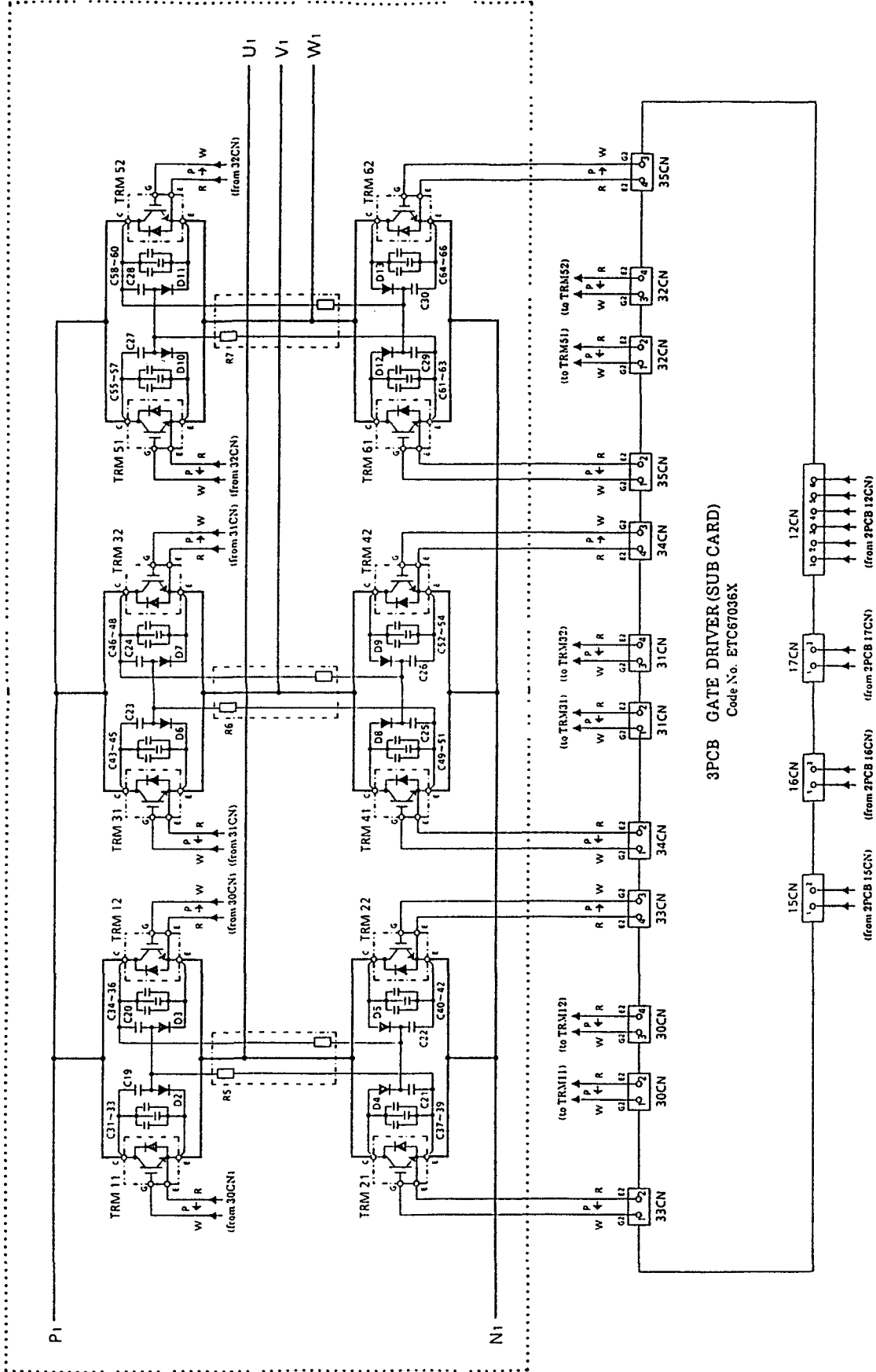
3PCB GATE DRIVER (SUB CARD)
Code No. ETC67044X

TRM block

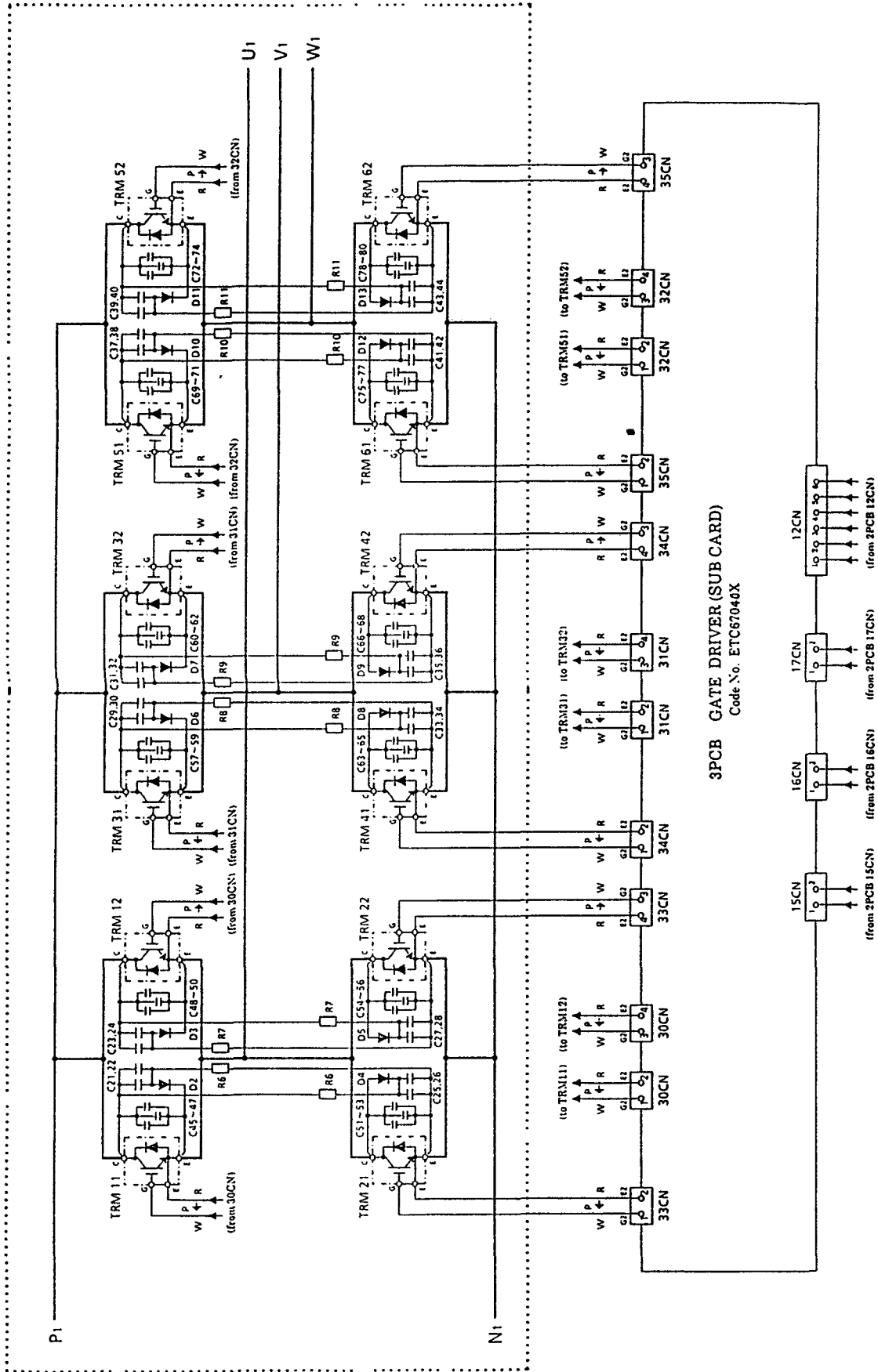


Schematic Diagram GPD 503 230V, 100HP Sheet 2 of 2

TRM block

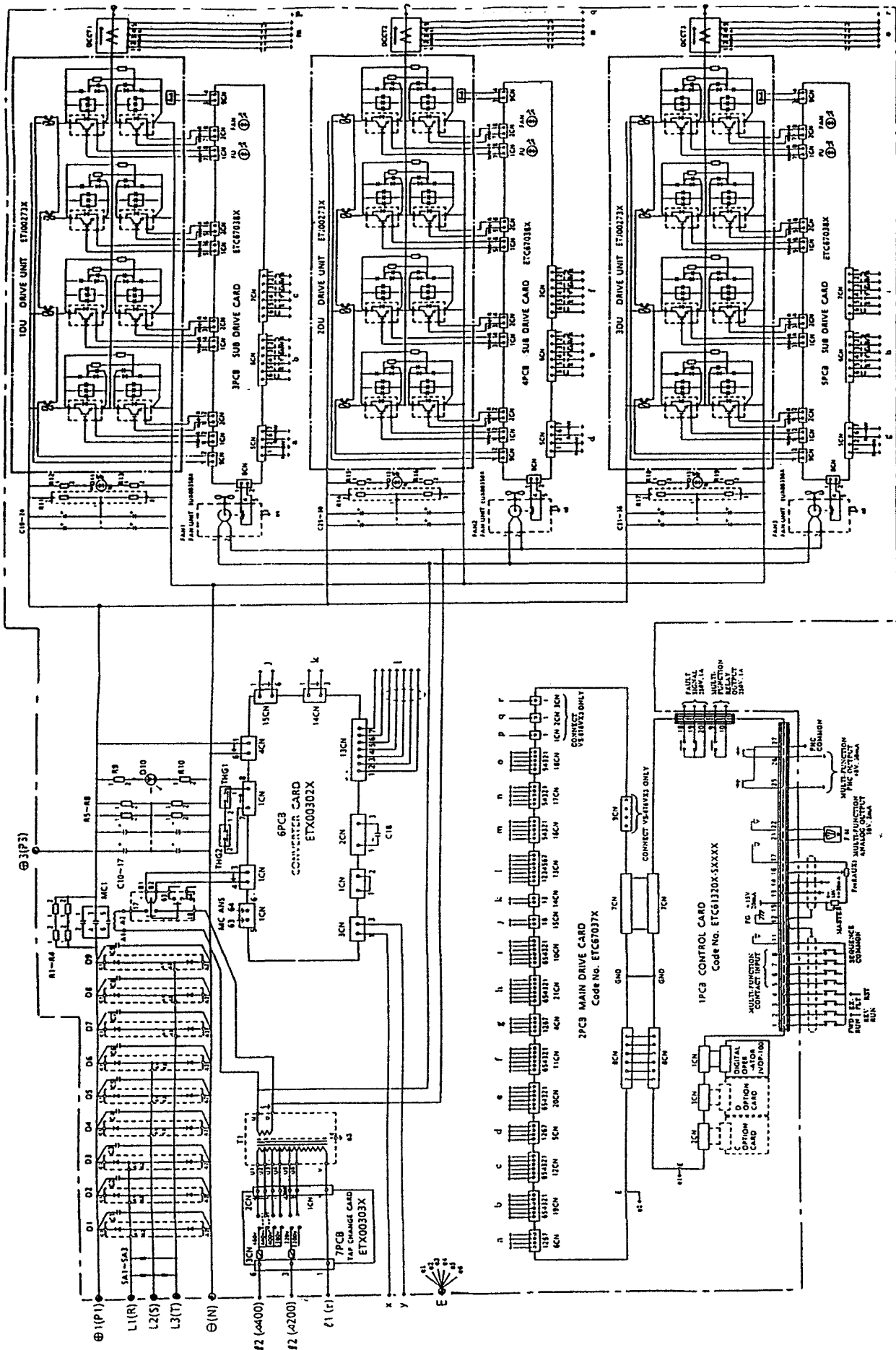


TRM block

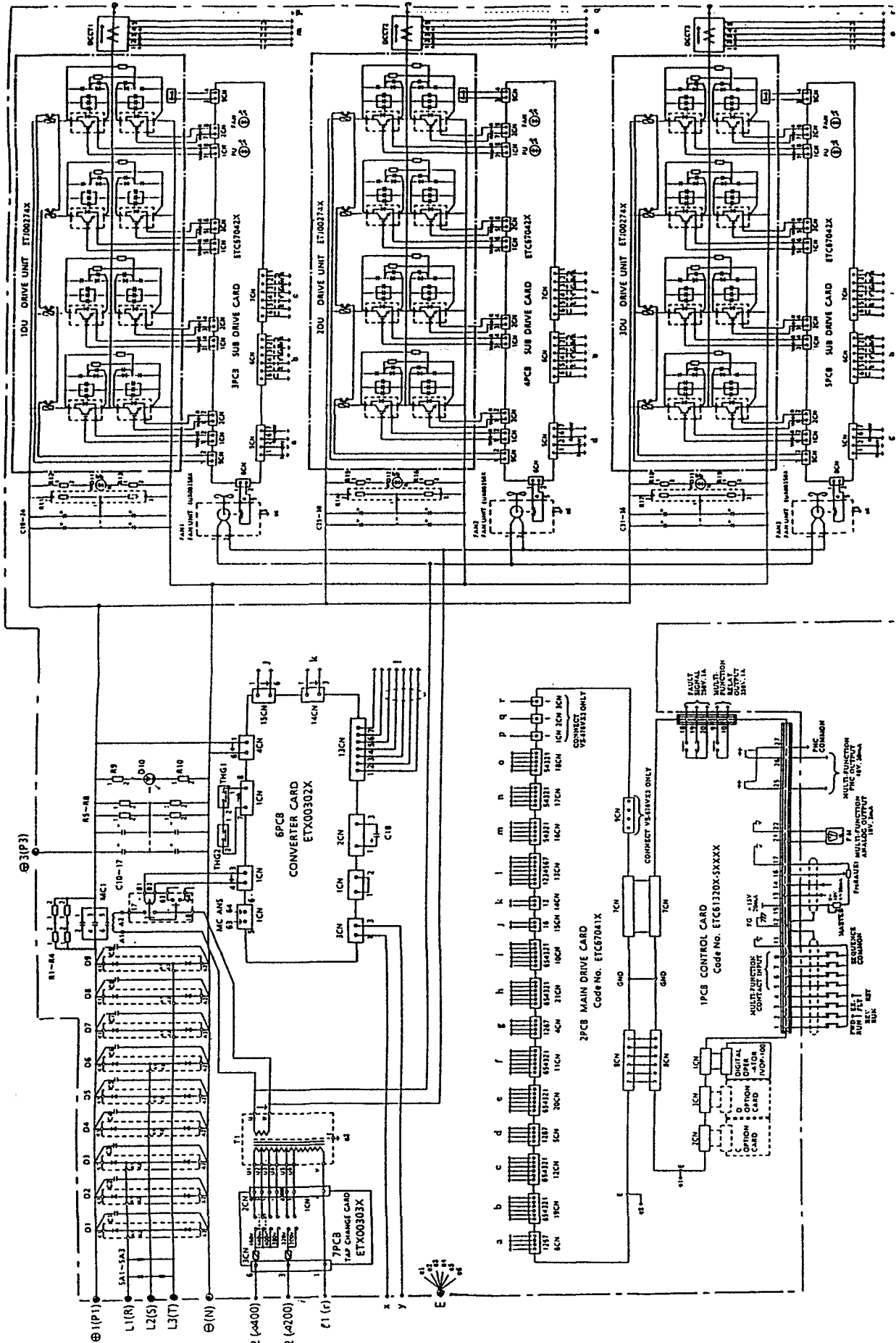


3PCB GATE DRIVER (SUB CARD)
Code No. ETC67040X

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Schematic Diagram GPD 503 460V, 300HP



Schematic Diagram GPD 503 460V, 400HP

GPD 503

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