



MAINTENANCE MANUAL

Double - Sided

Double - Density

Flexible Disk Drive

Model M2896-63

TJ2-G4305D



OPERATION MANUAL

CONTENTS

	Page
1. SCOPE	1
2. RELATED DOCUMENTS	1
3. MECHANICAL COMPONENTS	1
3.1 Component List	1
3.2 Operation	1
3.2.1 Spindle motor (drive motor)	1
3.2.2 Stepping motor (stepper motor)	2
3.2.3 Index sensor, LD ASSY	2
3.2.4 Index sensor, PT ASSY	2
3.2.5 TK00 sensor	2
3.2.6 Magnetic heads	2
3.2.7 Head load magnet	2
3.2.8 Write-protect sensor	2
3.2.9 Door-lock magnet	3
3.2.10 Indicator	3
3.2.11 Detector coil	3
3.2.12 Disk mounting detectin switch	3
4. CIRCUIT OPERATION	4
4.1 Input/Output Signals	4
4.1.1 Input signals	4
4.1.2 Output signals	4
4.1.3 Timing charts	5
4.2 PCB Circuits	8
4.3 Circuit Functions	8
4.4 Operation	9
4.4.1 Line driver circuit	9
4.4.2 Line receiver circuit	9
4.4.3 Write circuit	10
4.4.4 Erase circuit	11
4.4.5 Write-protect circuit	12
4.4.6 Read circuit	13
4.4.7 Positioning circuit	15
4.4.8 Head-load circuit	16
4.4.9 Head select circuit	17
4.4.10 Drive select circuit	18
4.4.11 Door-lock circuit	19
4.4.12 Track 00 detection circuit	20
4.4.13 Index detection circuit	21
4.4.14 Gate array clock circuit	21
4.5 Optional Functions	22
4.5.1 Selection with jumper plug	22
4.6 Test Points	32
4.7 Block Diagram	33

1. SCOPE

This manual describes the mechanical components and PCB circuits of the M2896-63 8-Inch Half-Height FDD.

2. RELATED DOCUMENTS

TJ2-G4301 Circuit Diagrams for Maintenance Purposes

3. MECHANICAL COMPONENTS

3.1 Component List

	Component	Abbreviation
1	Spindle motor (drive motor)	SPM
2	Stepping motor (stepper motor)	STM
3	Index sensor LD	IXLD
4	Index sensor PT	IXPT
5	TK00 sensor	TK00 DT
6	Magnetic head	HEAD 0, HEAD 1
7	Head-load magnet	HLMG
8	Write-protect sensor	WPDT
9	Door-lock magnet	DLMG
10	Indicator	IN USE LED
11	Detector coil	DTCL
12	Disk mounting detection switch	MICRO SW

3.2 Operation

3.2.1 Spindle motor (drive motor) - SPM

This 24-V DC direct drive motor rotates the disk at a constant speed. The drive PCB and motor are installed as one unit.

3.2.2 Stepping motor (stepper motor) - STM

This motor determines the position of the magnetic head. It rotates one step (3.6°) with each input pulse, advancing or retracting the head one track (0.529 mm) with each step by means of a steel band that converts the rotary motion of the motor to linear motion. The direction of rotation of the motor is determined by application of pulses to combinations of two of the four phase-excitation coils.

3.2.3 Index sensor, LD ASSY - IXLD

IXLD is composed of two LEDs, which are used as the light source for a circuit that detects the index holes in single- or double-sided disks.

3.2.4 Index sensor, PT ASSY - IXPT

IXPT is composed of two phototransistors that send a pulse to the index pulse detection circuit when illuminated by light passing through the index holes of a single- or double-sided disks.

3.2.5 TK00 sensor - TK00 DT

This photoelectric switch consists of light-emitting and light-receiving elements; it is turned on and off by a plate attached to the carriage that moves between the elements.

The switch is normally on. When the carriage is positioned at track 00, however, it turns off and a TK00 position detection signal is emitted.

3.2.6 Magnetic heads - HEAD 0, HEAD 1

These two heads contact the surfaces of the disk to record and play back data, and for tunnel erasure at recording.

3.2.7 Head-load magnet - HLMG

This solenoid brings the magnetic heads into contact with the disk surface for recording and playback. They normally are excited only at recording and playback.

3.2.8 Write-protect sensor - WPDT

This photoelectric switch consists of light-emitting and light-receiving elements and is used to detect the write-protect hole

in the disk. When an ordinary disk (one without a write-protect hole) is inserted in the drive, the light path between the elements in the switch is blocked so the switch is off and write operation is enabled. When a disk with a write-protect hole is inserted, the switch is on and write operation is inhibited by the write-protect circuit.

3.2.9 Door-lock magnet - DLMG

Under standard specifications, the door-lock magnet operates when the DRIVE SELECT signal is received so the door cannot be opened while the controller is accessing the drive. It may also be operated with the IN USE and HEAD LOAD signals if so required (see 4.5 for details).

3.2.10 Indicator - IN USE LED

This LED, mounted on the front panel, indicates that the controller is accessing the drive. It operates when the drive is in READ status and a DRIVE SELECT or IN USE signal is received.

3.2.11 Detector coil - DTCL

This coil is mounted on the head-load magnet. It detects (by means of the induced voltage) the speed at which the head is loaded or unloaded and outputs a feedback signal to the closed-loop circuit in the head-load circuit.

3.2.12 Disk mounting detection switch - MICRO SW

This is a microswitch to detect insertion of a disk into the disk drive.

4. CIRCUIT OPERATION

4.1 Input/Output Signals

4.1.1 Input signals

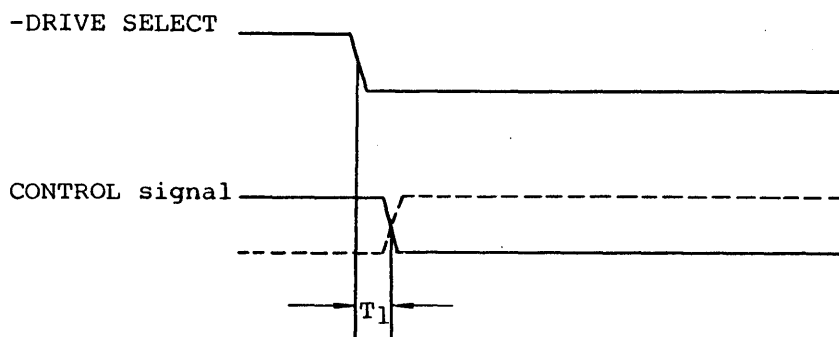
- ① - WRITE GATE
- ② - WRITE DATA
- ③ - WRITE CURRENT SWITCH
- ④ - STEP
- ⑤ - DIRECTION SELECT
- ⑥ - HEAD LOAD/(-MOTOR ON)
- ⑦ - SIDE SELECT
- ⑧ - IN USE
- ⑨ - DRIVE SELECT 1
- ⑩ - DRIVE SELECT 2
- ⑪ - DRIVE SELECT 3
- ⑫ - DRIVE SELECT 4
- ⑬ - MOTOR START

4.1.2 Output signals

- ⑭ - TRACK 00
- ⑮ - DISK CHANGE
- ⑯ - TWO SIDED
- ⑰ - INDEX
- ⑱ - READY
- ⑲ - ALTERNATE I/O 2
- ⑳ - ALTERNATE I/O 3
- ㉑ - ALTERNATE I/O 4
- ㉒ - READ DATA
- ㉓ - WRITE PROTECT

4.1.3 Timing charts

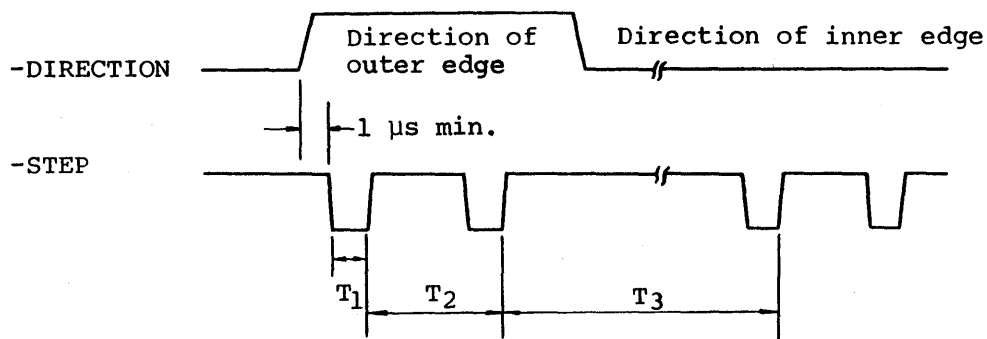
The primary I/O signal timing is shown in figures 4.1-1 through 4.1-6.



$T1 \geq 500 \text{ ns}$

A CONTROL signal must always be output after the DRIVE SELECT signal.

Figure 4.1-1 DRIVE SELECT and CONTROL Signals

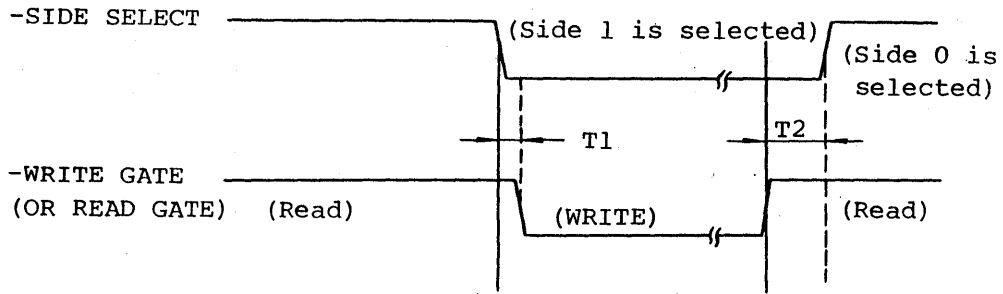


T1: $1 \mu\text{s}$ to 1 ms

T2: 3 ms min.

T3: When DIRECTION is inverted, the next step pulse is output a minimum of 18 ms after the step pulse previous to inversion.

Figure 4.1-2 DIRECTION and STEP Signals



T1: Head select delay time $T1 \leq 100 \mu s$ (R/W inhibited)

T2: Erase delay time $T2 \leq 590 \mu s$
(In reading $T2 \leq 100 \mu s$)

Figure 4.1-3 Head Select and WRITE GATE Signals, and Playback Operation

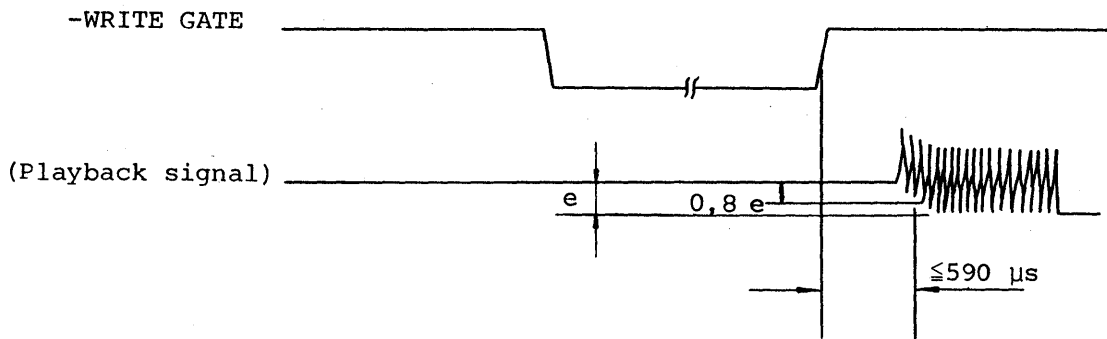


Figure 4.1-4 Read Recovery Time

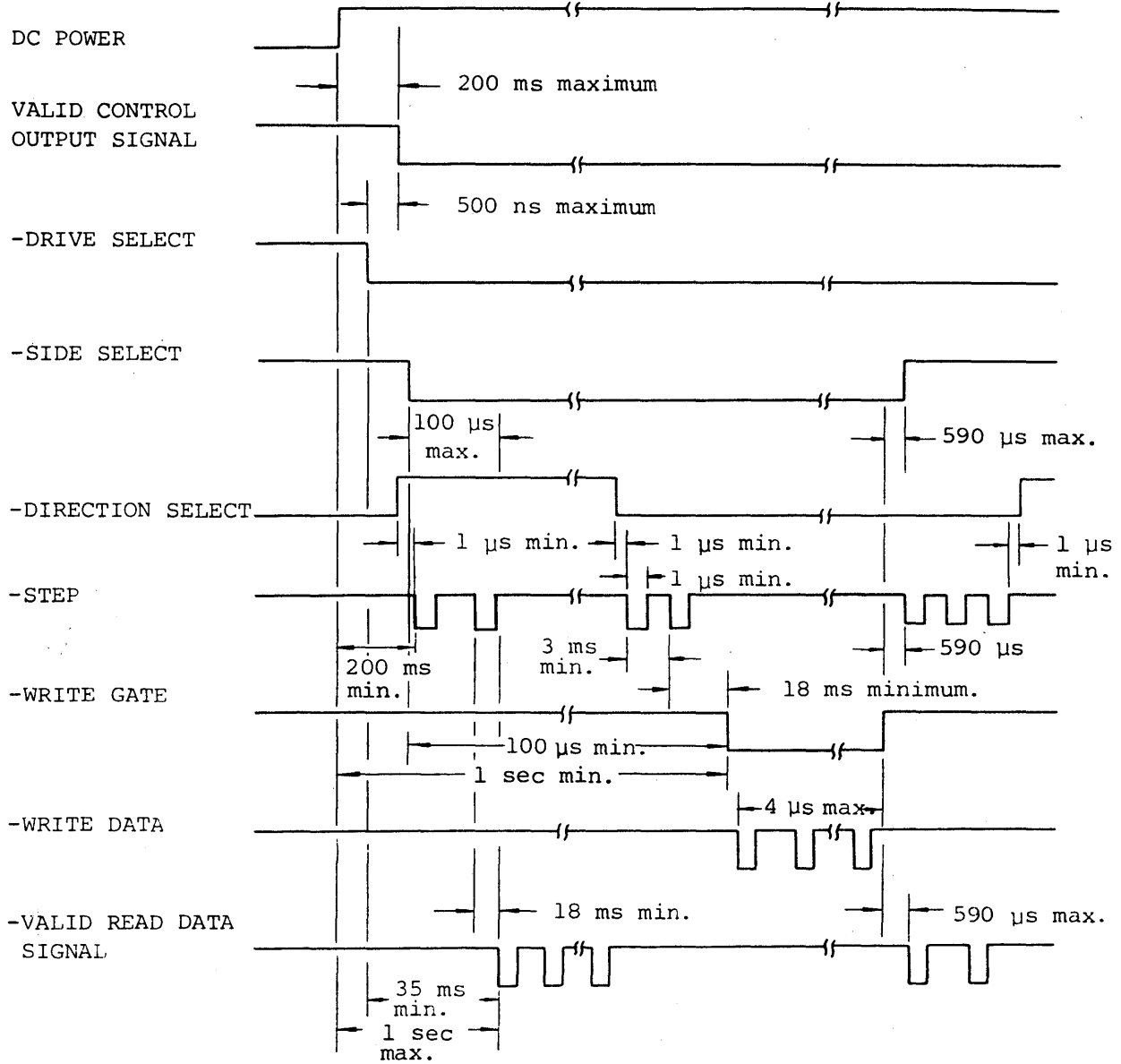
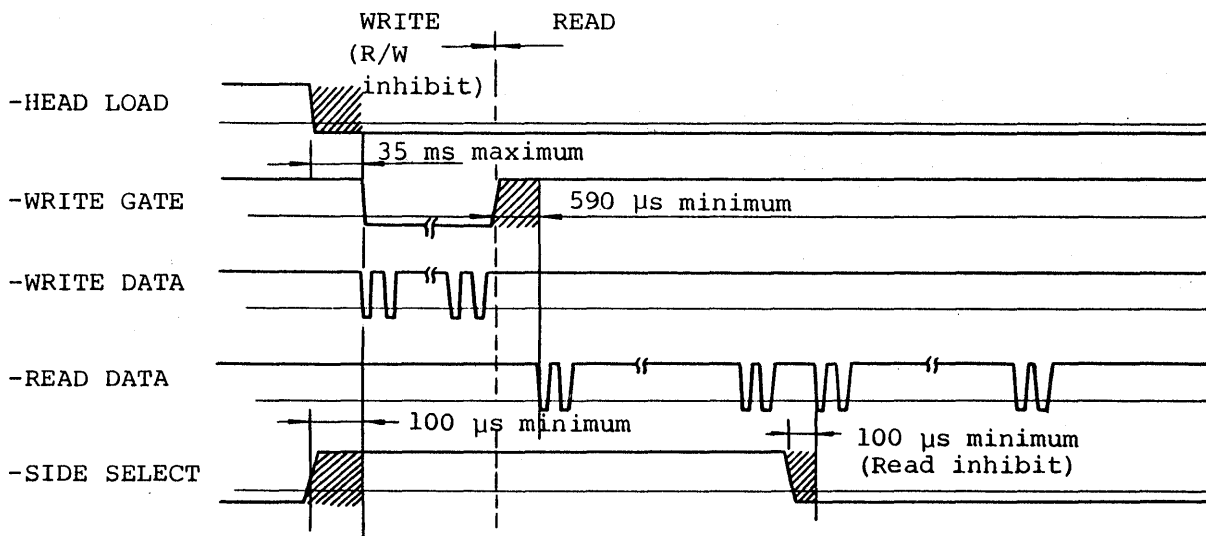


Figure 4.1-5 Write Operation



Note: R/W operation is impossible in the shaded areas.

Figure 4.1-6 Read Operation (following write operation)

4.2 PCB Circuits

- ① POWER CIRCUIT
- ② READ CIRCUIT
- ③ WRITE CIRCUIT 1, 2
- ④ DETECT CIRCUIT
- ⑤ CONTROL CIRCUIT 1, 2, 3
- ⑥ MOTOR, SOLENOID DRIVE CIRCUIT

4.3 Circuit Functions

- ① Line Driver Circuit
- ② Line Receiver Circuit
- ③ Write Circuit
- ④ Erase Circuit
- ⑤ Write-Protect Circuit
- ⑥ Playback Circuit
- ⑦ Positioning Circuit
- ⑧ Head-Load Circuit

- ⑨ Head-Select Circuit
- ⑩ Drive-Select Circuit
- ⑪ Door-Lock Circuit
- ⑫ Track 00 Detection Circuit
- ⑬ Index-Detection Circuit
- ⑭ Gate Array Clock Circuit

4.4 Operation

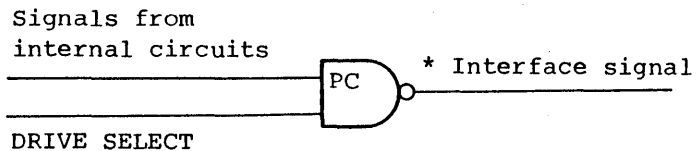
The interface signals between the controller and the FDD are indicated by *s.

4.4.1 Line driver circuit

When the AND condition occurs for the drive select signal and signals output by internal circuits, the drive circuit outputs an interface signal for the selected drive. The driver is an open-collector IC (SN7438N or equivalent) having a sink current (IoL) of 48 mA.

The following signals are ANDed:

READ DATA
 TWO SIDED
 DISK CHANGE
 READY
 INDEX
 WRITE PROTECT
 TRACK 00



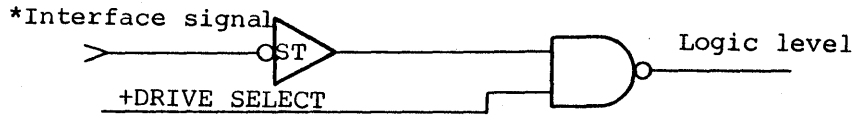
Note: PC is showing an open-collector IC

4.4.2 Line receiver circuit

An interface signal is input only to a drive that has been selected as a result of an AND condition of the drive select signal and receiver output. The receiver uses a Schmitt trigger IC (SN7414 or equivalent) to obtain a stable logic level.

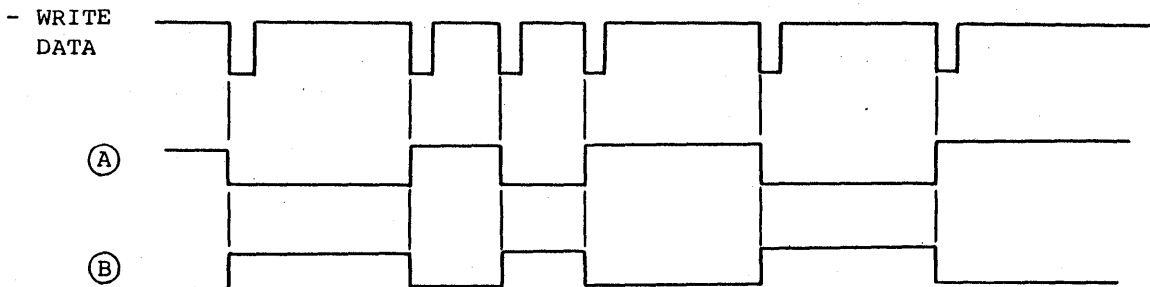
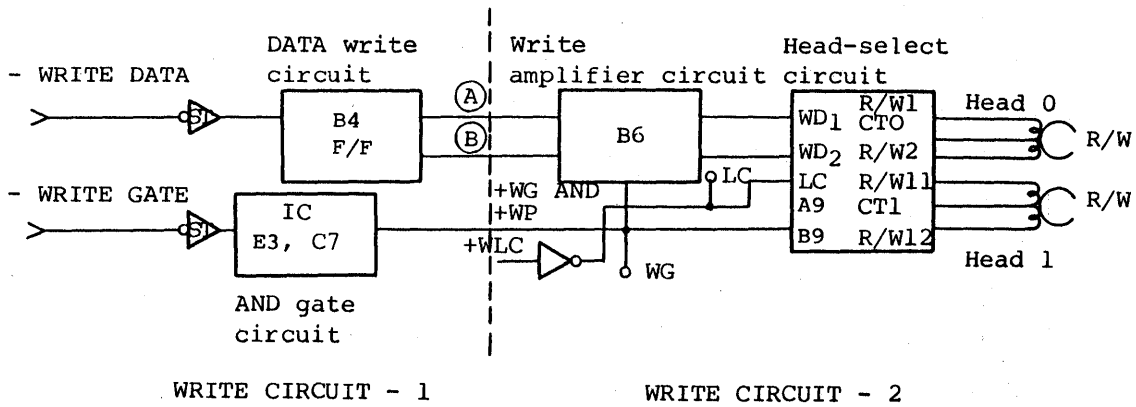
The following signals are ANDED:

- WRITE DATA
- WRITE GATE
- DIRECTION SELECT
- STEP
- IN USE
- HEAD LOAD
- MOTOR START
- SIDE SELECT



Note: ST is showing a Schmitt trigger IC

4.4.3 Write circuit



* The WRITE DATA (interface signal) passes through the receiver circuit and determines head write timing in the data write circuit.

- WRITE CIRCUIT - 1 -

The write amplifier circuit supplies current to the magnetic head in accordance with the data write circuit timing. Head select for a write operation and write current control are performed by hybrid ICs (A9, B9).

- WRITE CIRCUIT - 2 -

* The WRITE GATE interface signal (after it has passed through the receiver) is ANDed with DRIVE SELECT (+DS) and READY (+RDY). The output is then ANDed with -WP OR -RST OR -RDY to produce +WG AND +WP.

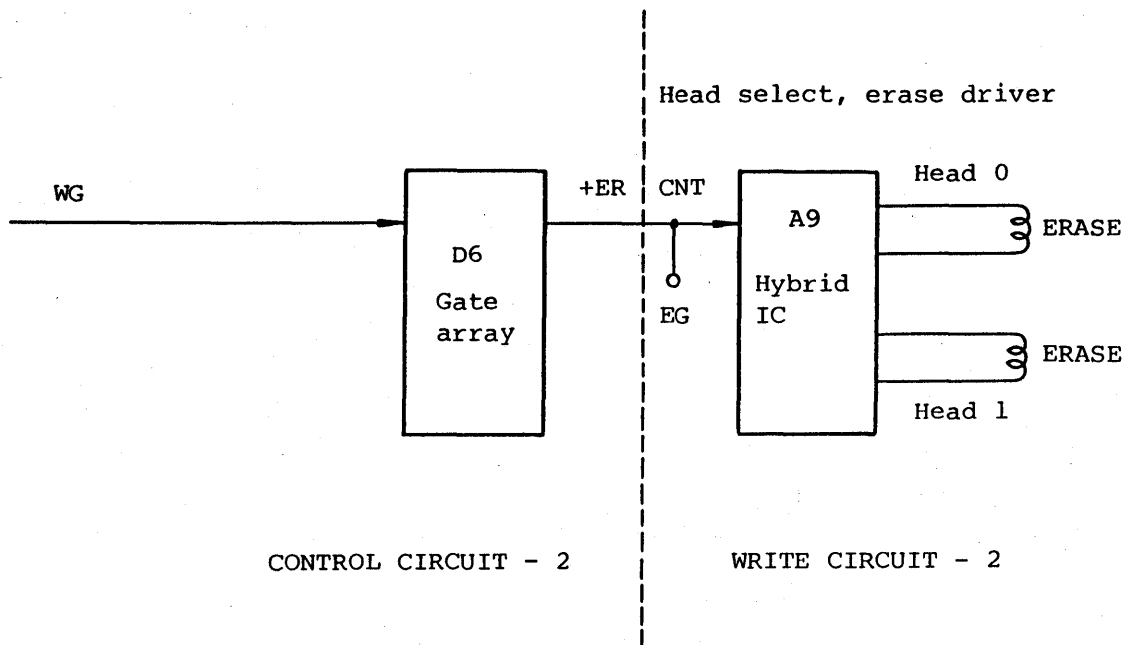
- WRITE CIRCUIT - 2 -

The +WG AND +WP signal is input to WE of the hybrid IC (A9). Write operation is then begun, provided that the drive is selected, in the ready status, and not write-protected.

- WRITE CIRCUIT - 2 -

- CONTROL CIRCUIT - 2 -

4.4.4 Erase circuit

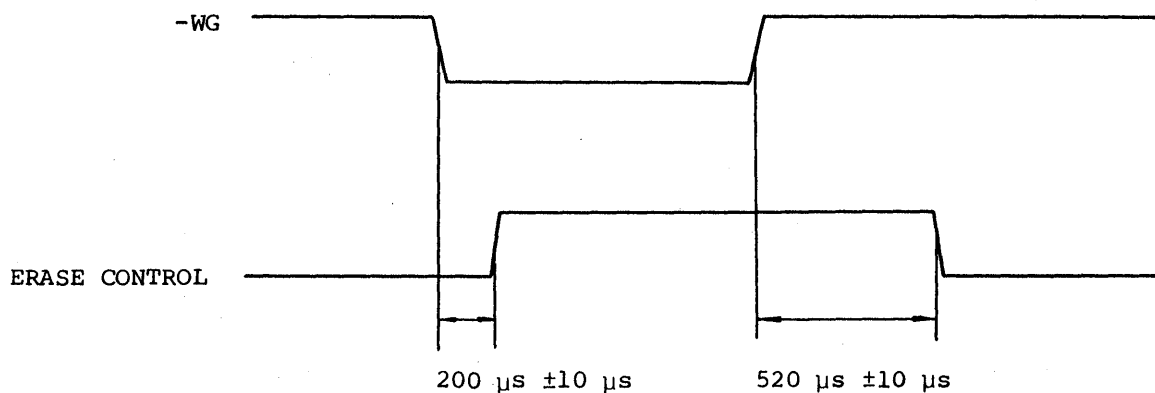


The erase signal (+ER CNT) is generated with the gate array (D6) using the WRITE GATE signal. Its rising edge occurs 200 μ s after the falling edge of the WG signal, and its falling edge is 520 μ s after the rising edge of the WG signal.

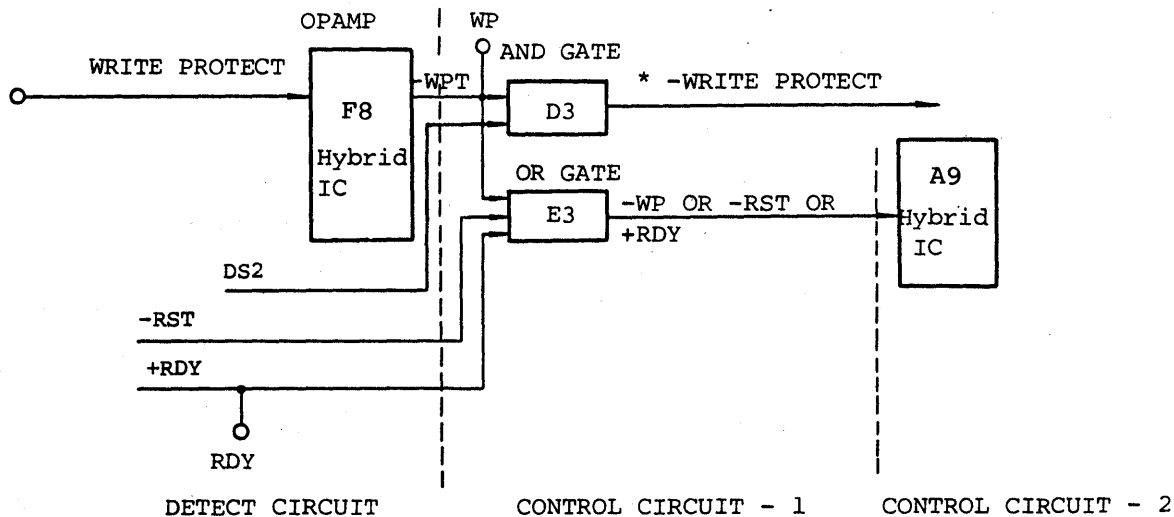
- CONTROL CIRCUIT - 2 -

The erase signal generated by the gate array (D6) is current-amplified by the hybrid IC erase driver (A9) and supplied to the head.

- WRITE CIRCUIT - 2 -



4.4.5 Write-protect circuit



The write-protect hole in the disk is detected by the optical sensor and a stable logic level is obtained using a hybrid IC (F8).

- DETECT CIRCUIT -

Logic level WPT is ORed with the gate array RDY and RST to produce the WP OR RST OR RDY signal.

- CONTROL CIRCUIT - 1 -

At data write, the WP OR RST OR RDY signal inhibits a write operation on a write-protected at disk, at power-on reset, and during not-ready condition of the drive.

- CONTROL CIRCUIT - 2 -

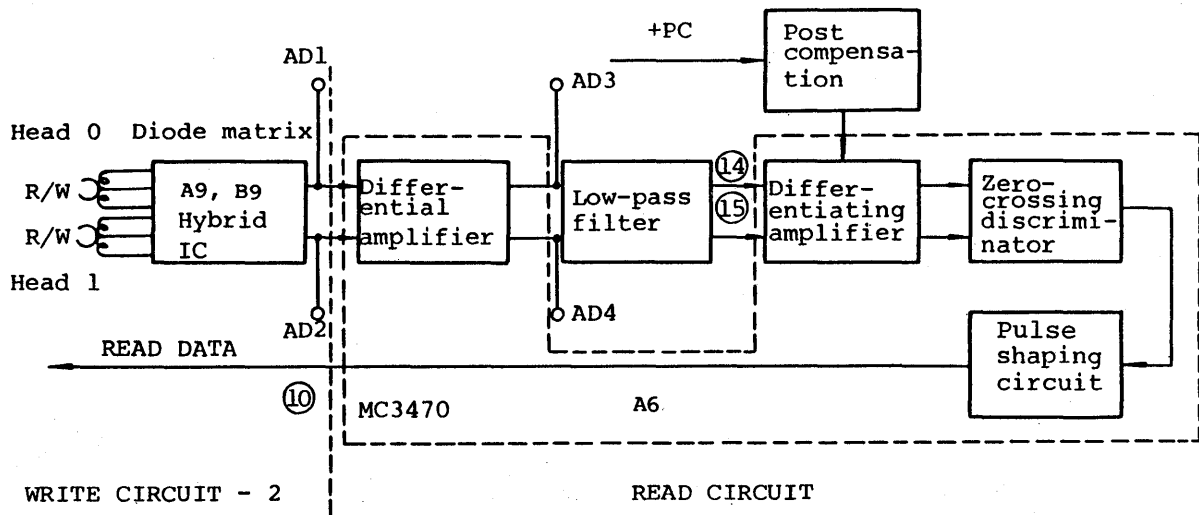
WPT is ANDed with DRIVE SELECT and output as the WRITE PROTECT interface signal.

- CONTROL CIRCUIT - 1 -

4.4.6 Read circuit

The read circuit consists of diode matrixes in hybrid ICs (A8, B8), a multifunctional IC (A5), and associated external components.

- READ CIRCUIT -



(1) Diode matrix

Heads are selected by the diode matrixes in the hybrid ICs.

(2) Differential amplifier

A linear amplifier amplifies the read signal voltage from the selected head.

(3) Low-pass filter

LCR filter used to remove high frequency noise.

(4) Differentiating amplifier

Used to differentiate the read signal voltage peak for zero conversion.

(5) Post compensation

The timing margin at reading is increased by switching the filter of the differentiating amplifier in response to the position of the reading track.

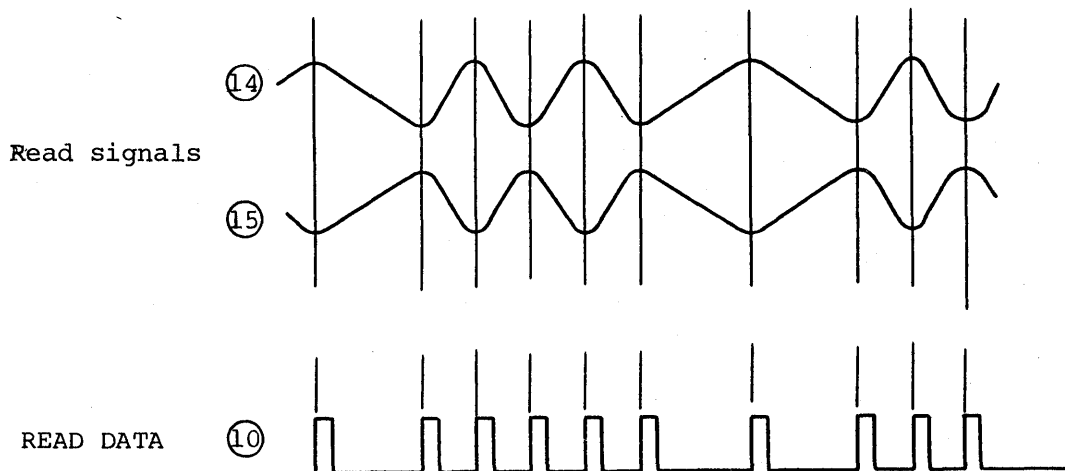
(6) Zero-crossing discriminator

Generates a pulse with the rising edge at the zero crossing of the differentiating amplifier output.

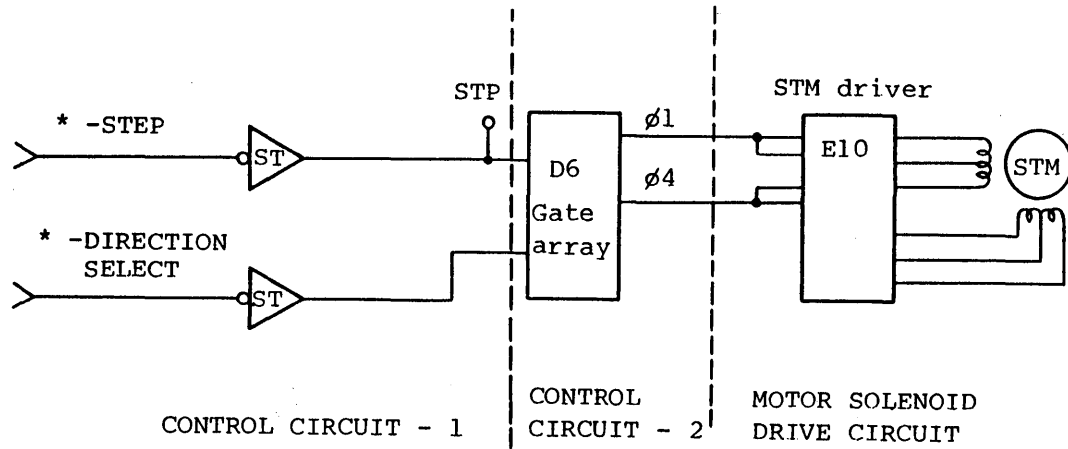
(7) Pulse shaping circuit

This arranges an output pulse shape into a certain width.

(8) Waveforms



4.4.7 Positioning circuit



The STEP interface signal is input to the gate array (D6) after passing through the receiver.

- CONTROL CIRCUIT - 1 -

The DIRECTION SELECT interface signal is input to the gate array after passing through the receiver.

- CONTROL CIRCUIT - 1 -

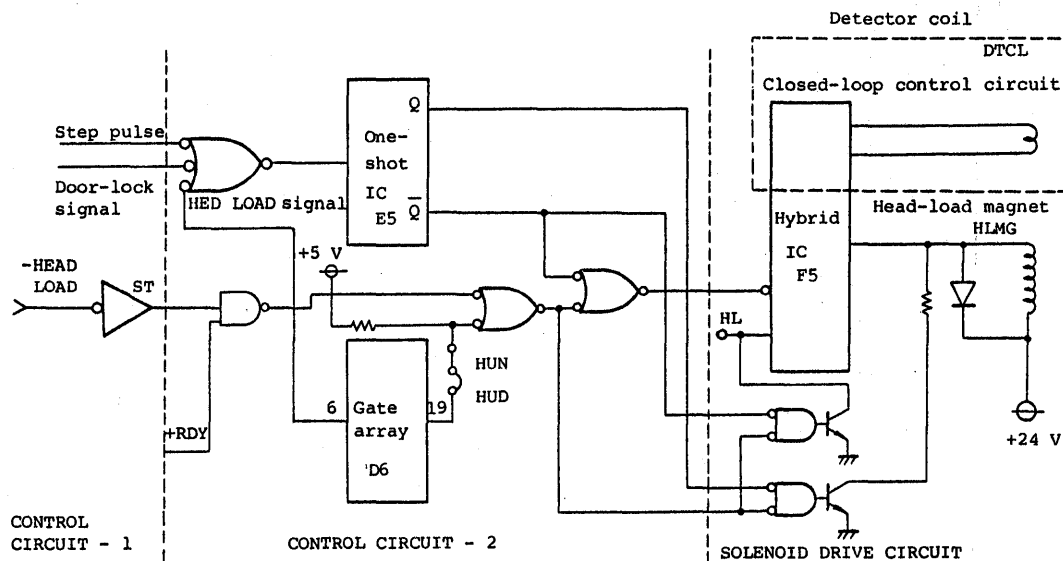
The two signals (above) input to the gate array are output from 01 and 02 of the gate array as step motor control pulses.

- CONTROL CIRCUIT - 2 -

The stepping motor is driven by the STM driver.

- MOTOR SOLENOID DRIVE CIRCUIT -

4.4.8 Head-load circuit



The HEAD LOAD interface signal is output to the gate array after passing through the receiver.

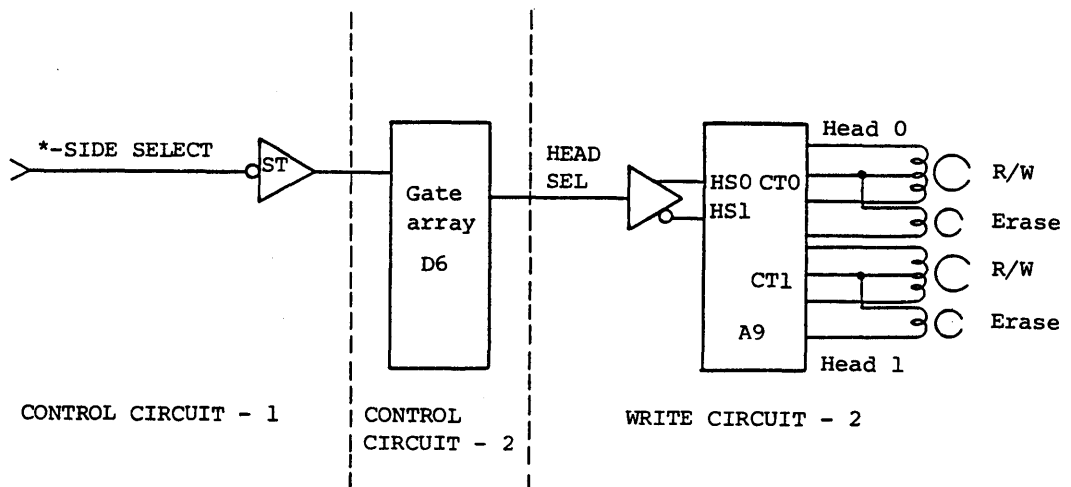
- CONTROL CIRCUIT - 1 -

After the HEAD LOAD signal goes low, a logic level signal (HEAD UNLOAD DELAY) is generated for approximately 0.5 second in the gate array. This is ORed with the HEAD LOAD signal to increase the actual time for which the head is unloaded. The delay may be eliminated by setting the HUD optional plug to HUN.

The HEAD LOAD signal is ORed with the output from the one-shot IC and the driver in the hybrid IC applies +24 V to HLMG for approximately 50 ms. The head loading speed is optimized by the closed-loop control circuit.

If a step pulse or door lock signal is not input to the one-shot IC approximately 50 ms later, the current applied to HLMG decreases so as to reduce the heat dissipation from the magnet.

4.4.9 Head select circuit



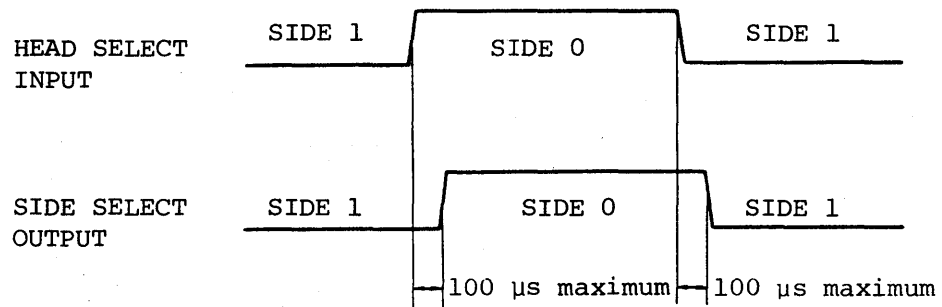
The SIDE SELECT interface signal is input to the gate array SIDE SEL 0/1 after passing through the receiver.

- CONTROL CIRCUIT - 1 -

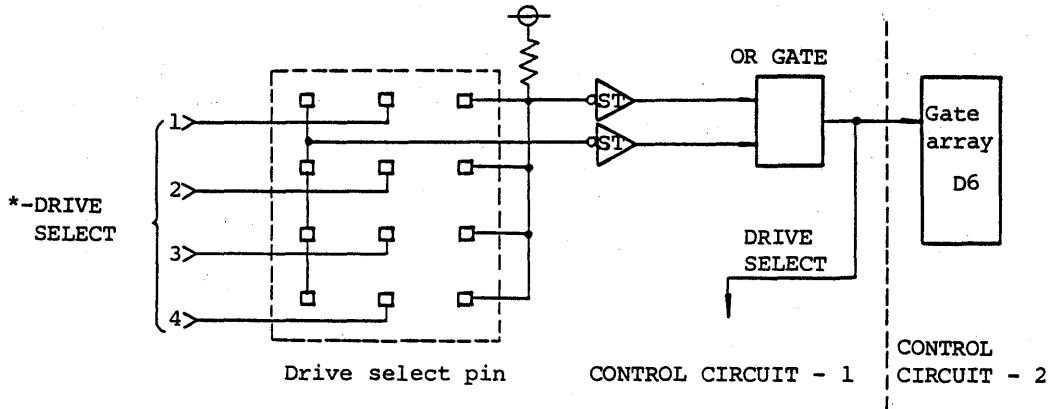
The HEAD SEL signal is input to HSO and HS1 of the hybrid IC (A9) to select a head for a read or write operation.

- WRITE CIRCUIT - 2 -

The delay with which the change occurs in the output after the SIDE SELECT signal is switched is shown in the diagram below.



4.4.10 Drive select circuit



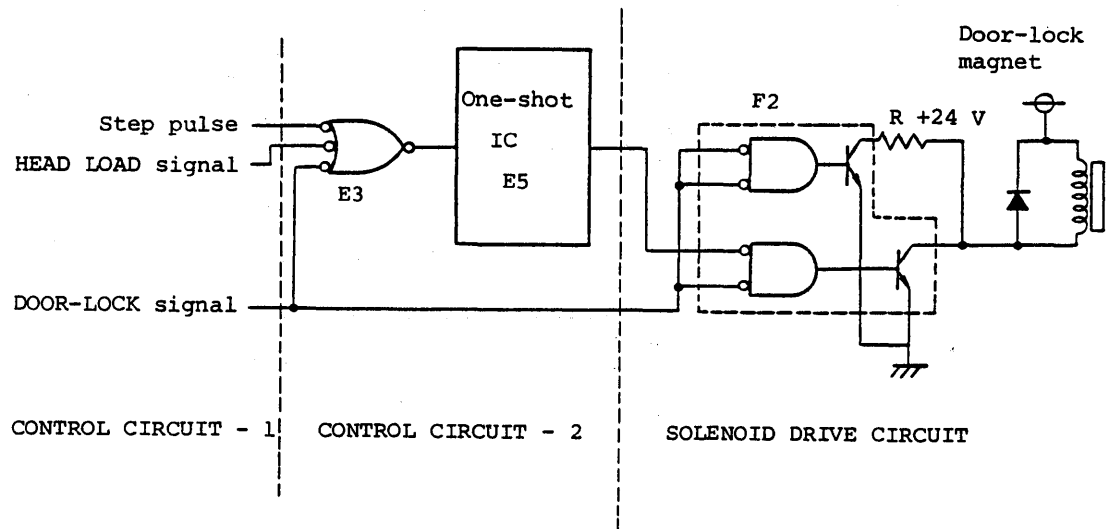
The DRIVE SELECT signal is only effective if specified with the drive select pin on the PCB. The input signal for the specified drive is input to the gate array after passing through the receiver.

- CONTROL CIRCUIT - 1

The DRIVE SELECT signal hardware gates the following I/O signals (brackets indicate that the signal is optional):

Input signal	Output signal
(WRITE CURRENT SWITCH)	WRITE PROTECT
WRITE GATE	(DISK CHANGE)
WRITE DATA	(TWO SIDED)
(IN USE)	READ DATA
(HEAD LOAD/MOTOR START)	INDEX
SIDE SELECT	TRACK 00
DIRECTION SELECT	READY
STEP	

4.4.11 Door-lock circuit



An option setting allows the DOOR LOCK signal to be activated by the DRIVE SELECT, HEAD LOAD, or IN USE signal.

- CONTROL CIRCUIT - 1 -

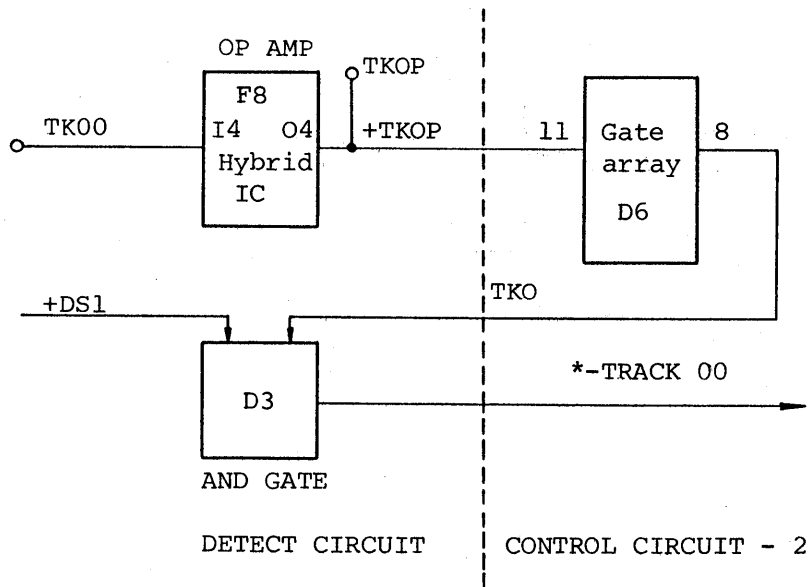
The one-shot IC (E5) is triggered by a step pulse, the HEAD LOAD, or DOOR LOCK signal. Output is active for approximately 50 ms.

- CONTROL CIRCUIT - 2 -

For approximately 50 ms after the DOOR LOCK signal is input, full current is supplied to the door-lock magnet by IC F2. The current is then decreased to reduce the heat dissipation by the magnet.

- SOLENOID DRIVE CIRCUIT -

4.4.12 Track 00 detection circuit



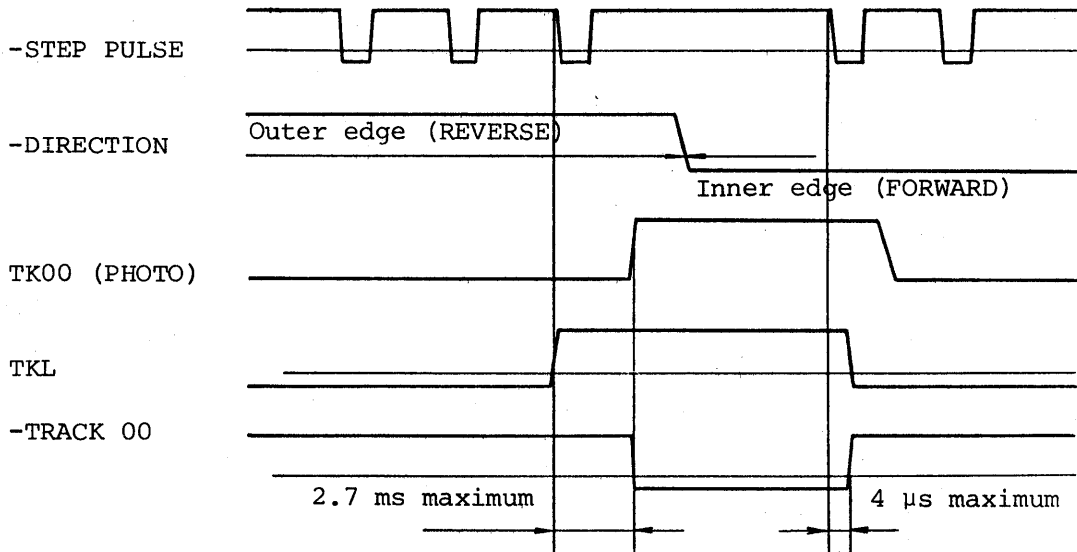
Track 00 is detected by the optical sensor and a stable logic level is obtained using a hybrid IC (F8).

- DETECT CIRCUIT -

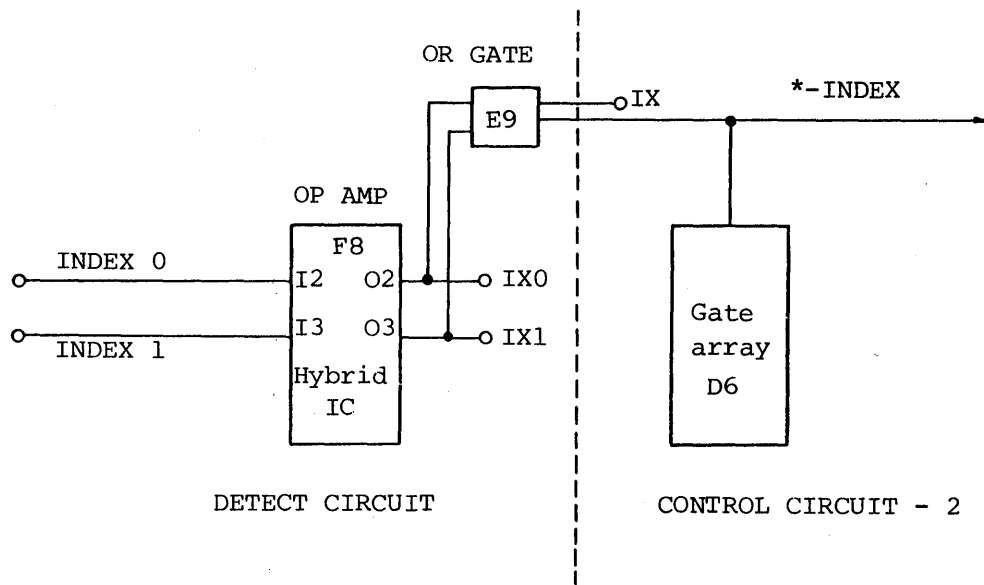
The +TKOP signal is input to the gate array (pin 11).

- CONTROL CIRCUIT - 2 -

The TKO signal is output upon a step pulse input when the DIRECTION signal is high (reverse) and the step driver STM (green) (connector P2, pin A1) and STM (red) (connector P2, pin B2) are both low.



4.4.13 Index detection circuit



The IX0 and IX1 signals are detected by the optical sensor and a stable logic level is obtained using a hybrid IC (F8).

- DETECT CIRCUIT -

IX0 and IX1 signals are ORed and the output is applied to the gate array for output as the INDEX signal.

- CONTROL CIRCUIT - 2 -

4.4.14 Gate array clock circuit

The gate array clock signal is generated by a 6-MHz ceramic oscillator and capacitor.

4.5 Optional Functions

4.5.1 Selection With Jumper Plug

Hardware selection of functions is possible, using the plugs on the PCB.

Plug: Insert plug Open: Remove plug Jumper: Jumper wire
Cut: Cut pattern

Jumper plug	Function
Plug RS Open RM	When single-sided disks are used, system is not in ready status when SIDE SELECT goes low.
Open RS Plug RM	When single-sided disks are used, system remains in ready status when SIDE SELECT goes low.
Plug D Plug IT* Open HI Jumper DL	IN USE is latched with DRIVE SELECT and used as DOOR LOCK and IN USE.
Plug A Plug B Plug X Open C	DRIVE SELECT is ANDED with READY and used as HEAD LOAD.

(con.)

Jumper plug	Function
Plug HI	Latched with DRIVE SELECT for HEAD LOAD input and HEAD LOAD output. HEAD UNLOAD is obtained by setting HEAD LOAD high and inputting DRIVE SELECT again.
Open IT	
Plug A	
Plug X	
Jumper DL	
Jumper HLL	
Open B	
Open C	
Open D	
Open HI	
Plug IT*	
Plug A	
Plug X	
Jumper DL	
Jumper HLL	
Open B	
Open C	
Plug D	

* With a daisy chain configuration, jumper plugs may be installed only in drives connected to terminals.

** When the disk drive is used with "Y1" open, "Y" must also be open.

*** If a plug to short "Y1" is not available, short "Y" with a jumper instead.

NOTE: "Y1" applies only to the P/N DC447248-04-E and latter versions.

Jumper plug	Function
Open S1 Plug S2 Open S3	SIDE SELECT and DIRECTION SELECT input separately.
Plug S1 Open S2 Open S3	SIDE SELECT and DIRECTION SELECT input on same line in succession.
DS1 to DS4 1B to 4B	Used for DRIVE SELECT allocation. Used for SIDE SELECT when a DRIVE SELECT line is used with two drives. In this case TRACE "S1" "S2" OPEN "S3" CLOSE.
Plug WP Open NP	Write-protect hole in disk is used and WRITE PROTECT signal is sent to host computer.
Open WP Plug NP	WRITE PROTECT signal ignored so that write operation is always possible.
Plug D Plug IT* Open Y1** Plug Z	IN USE is ORed with DRIVE SELECT to light IN USE LED.
Open D Plug IT* Plug HI Open Z Open Y1**	HEAD LOAD lights IN USE LED.

(con.)

Jumper plug	Function
Plug D	IN USE lights IN USE LED.
Plug IT*	
Open HI	
Open Z	
Plug D	IN USE or HEAD LOAD lights IN USE HEAD.
Plug IT*	
Plug Y1***	
Open Z	
Plug C	
Plug X	
Plug SE	"Low current" controlled with signal from pin 2 of connector J1 (external device).
Open SI	
Open SE	"Low current" controlled with gate array TRACK COUNTER value.
Plug SI	
Plug D	Door locked by IN USE.
Plug IT*	
Open HI	
Cut V	
Plug Y1***	
Open D	Door locked by HEAD LOAD.
Plug IT*	
Plug HI	
Cut V	
Plug Y1***	

(con.)

Jumper plug	Function
Plug D Plug IT* Plug C Plug X Open B Jumper V Open Y1**	Door locked by IN USE Or HEAD LOAD.
Plug D Plug IT* Open C Plug X Plug B Jumper V Open Y1** Plug A	Door locked by IN USE or DRIVE SELECT.
Plug D Plug IT* Open HI Jumper DL Plug A	Latched with DRIVE SELECT for IN USE input and door locked status maintained. The IN USE line is set high and a low DRIVE SELECT is input again.

(con.)

Jumper plug	Function
Open HUN Plug HUD	The head unload status is maintained for approximately 50 ms after HEAD LOAD goes from low to high in order to provide a delay in head unloading (head unload delay).
Plug HUN Open HUD	The head unload status is assumed immediately after HEAD LOAD goes from low to high (head unload normal).
First drive Plug R Cut RR	The ready line of each drive is monitored without drive selection. (To use alternate I/O pin No. 2, Cut "0-2" and Open "SE", Plug "SI".)
Other drives Open R Cut RR	
Jumper wire between alternate I/O and R	
First drive Plug I Cut RI	The index line of each drive is monitored without drive selection
Other drives Open I Cut RI	

(con.)

Jumper plug	Function
Plug A Plug B Plug C Open X Open HI	DRIVE SELECT is ANDed with HEAD LOAD to load head.
Plug A Open B Plug C Plug X Open HI	Used for seek with the door open and the head unloaded.
Open A Plug B Plug C Plug X	Used for disk-to-disk copy.
Open R Jumper Alternate I/O	Used for star connection of READY.
Open I Jumper Alternate I/O	Used for star connection of INDEX.

(con.)

Jumper plug	Function
Plug DC	Necessary when DISK CHANGE is used.
Plug 2S	Necessary when TWO SIDED is used.
Jumper wire between alternate I/O and I	(To use alternate I/O pin No. 2, cut "0-2" and Open "SE", Plug "SI".)
Plug MO Open MS	HEAD LOAD start motor.
Open MO Plug MS	DRIVE SELECT starts motor.
Plug MO Plug MS	HEAD LOAD is ANDED with DRIVE SELECT to start motor.
Open MO Open MS	Motor starts when DC power is supplied and disk is inserted.
Plug JFG Open JSG	Frame and signal grounds connected via capacitor.
Open JFG Plug JSG	Frame and signal grounds separated.
Plug PS Open PH	HEAD LOAD ANDED with standard READY.
Open PS Plug PH	HEAD LOAD ANDED with hold READY.

(con.)

Jumper plug	Function
Open HR Plug HY	Standard READY output to interface line.
Plug HR Open HY	Hold READY output to interface line.
Plug M1 Open M2 Plug MO Open MS	MOTOR START (signal connector J1 pin 4) starts motor.
Open M1 Plug M2 Plug MO Open MS	MOTOR START (signal connector J1 pin 18) starts motor.

(con.)

Jumper plug	Function
Jumper V3 Cut V4 (pattern) Jumper V5 Cut V6 Jumper V7 Cut V8	Power-down is canceled after DRIVE SELECT or STEP pulse is received, and is effectuated again after 50 ms irrelevantly HEAD LOAD.
Cut V3 Jumper V4 Jumper V5 Cut V6 Jumper V7 Cut V8	Power-down is canceled after HEAD LOAD or STEP pulse is received, and is effectuated again after 50 ms.
Jumper V3 Cut V4 Cut V5 Jumper V6 Cut V7 Jumper V8	Power-down is canceled whenever HEAD LOAD is received (factory setting).

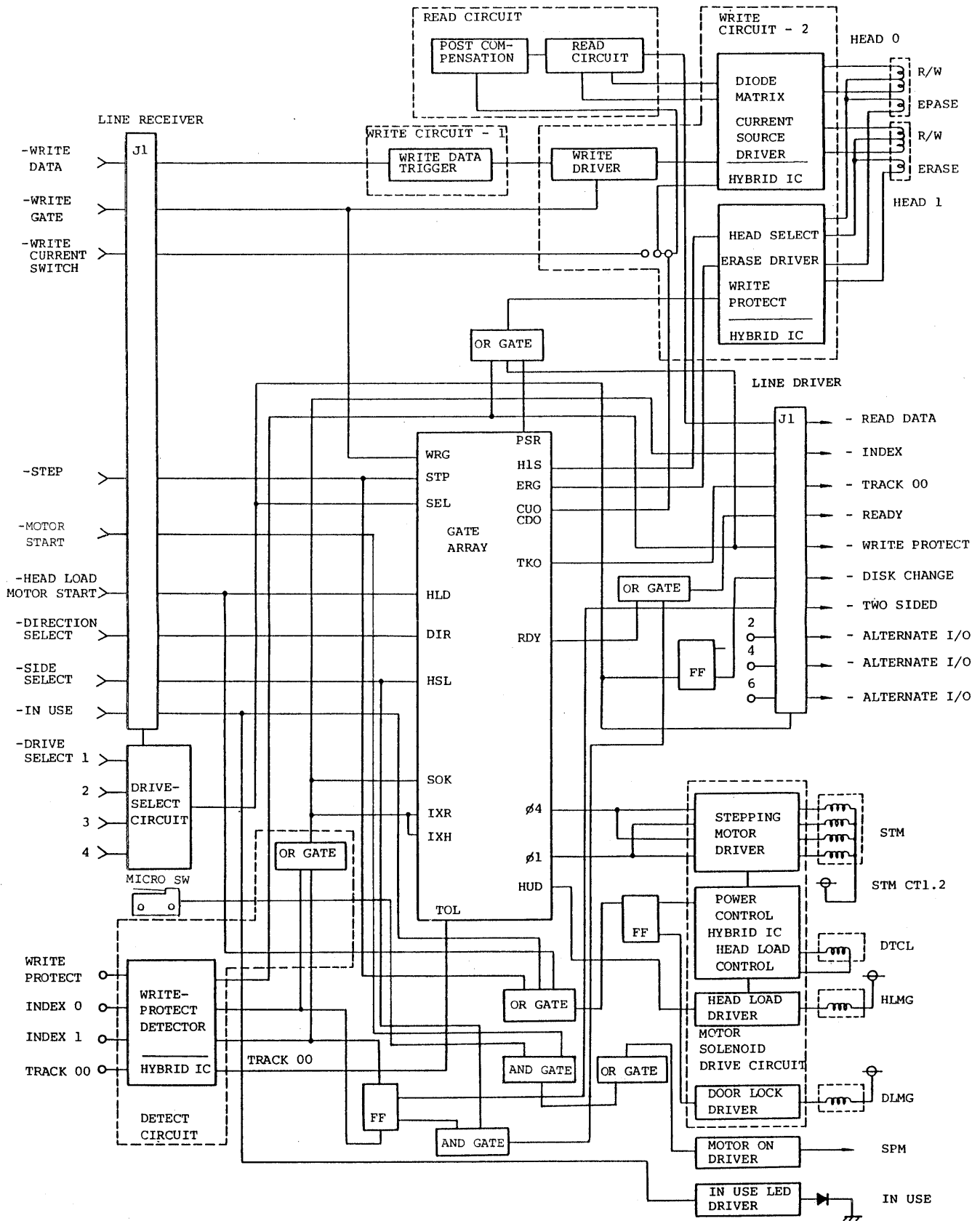
4.6 Test Points

Test points are shown in Table 4.6-1.

Table 4.6-1 Test Points

Test pin number	Description
AD 3	ANALOG DATA (Amplified Signal)
AD 4	ANALOG DATA (Amplified Signal)
(RFa)	+READ DATA
WG	+WRITE GATE (This is ANDED signal with -WRITE PROTECT and -WRITE GATE.)
LC	-WRITE LOW-CURRENT SWITCH
HS	-HEAD SELECT (HEAD 1)
EG	-ERASE GATE
RDY	+READY
WP	-WRITE PROTECT
IX0	-INDEX 0
IX1	-INDEX 1
TKOP	+TRACK 00 PHOTO
HL	-HEAD LOAD
TK00	+TRACK 00
STP	+STEP
IX	+INDEX (This is ORed signal with -INDEX 0 and -INDEX 1)
DE	+DRIVE ENABLE
HLA, HLC	+HEAD LOAD ANALOG, +HEAD LOAD CONTROL

4.7 Block Diagram



TJ2-G4296D



MAINTENANCE MANUAL

CONTENTS

	Page
1. INTRODUCTION	1
2. RELATED DOCUMENTS AND DATA	1
3. MAJOR COMPONENTS	2
4. OPERATION	3
4.1 Operating Environment	3
4.2 Disk Handling	4
4.3 Mounting and Dismounting Disks	5
4.4 Cable Connections	6
4.5 Grounding	6
4.6 Termination Resistor Setting	7
4.7 Select Plug Setting	7
5. MAINTENANCE PRECAUTIONS AND TOOLS	8
5.1 Maintenance Precautions	8
5.2 Tools	8
6. PERIODIC MAINTENANCE	9
6.1 Maintenance Tasks	9
6.2 Maintenance Procedures	10
6.2.1 Confirmation of operation by CE disks	10
6.2.2 Track 00 detection confirmation and adjustment	15

1. INTRODUCTION

This manual describes the operation, maintenance, and adjustment of the M2896-63 Double-Sided, Double-Density, 8-inch half-height Flexible Disk Drive.

2. RELATED DOCUMENTS AND DATA

SJ2-G3404D M2896-63 Standard Specification

TJ2-G4302D Logic Manual

TJ2-G4305D Technical Manual

TJ2-G4308D Illustrated Parts List

TJ2-G4314A Packing Procedure

TJ2-G4311D M2896-63 Maintenance Parts List

3. MAJOR COMPONENTS

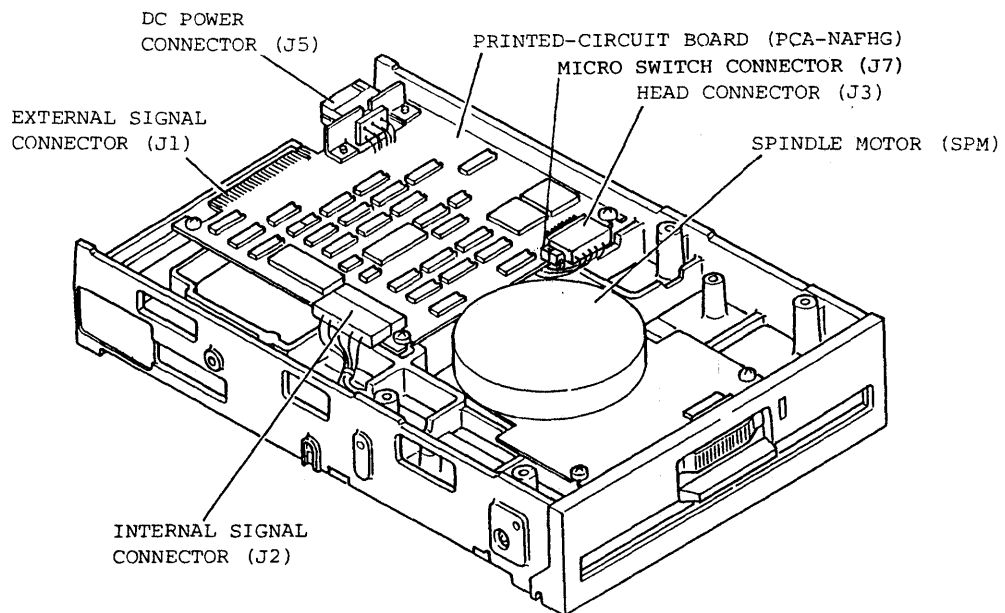
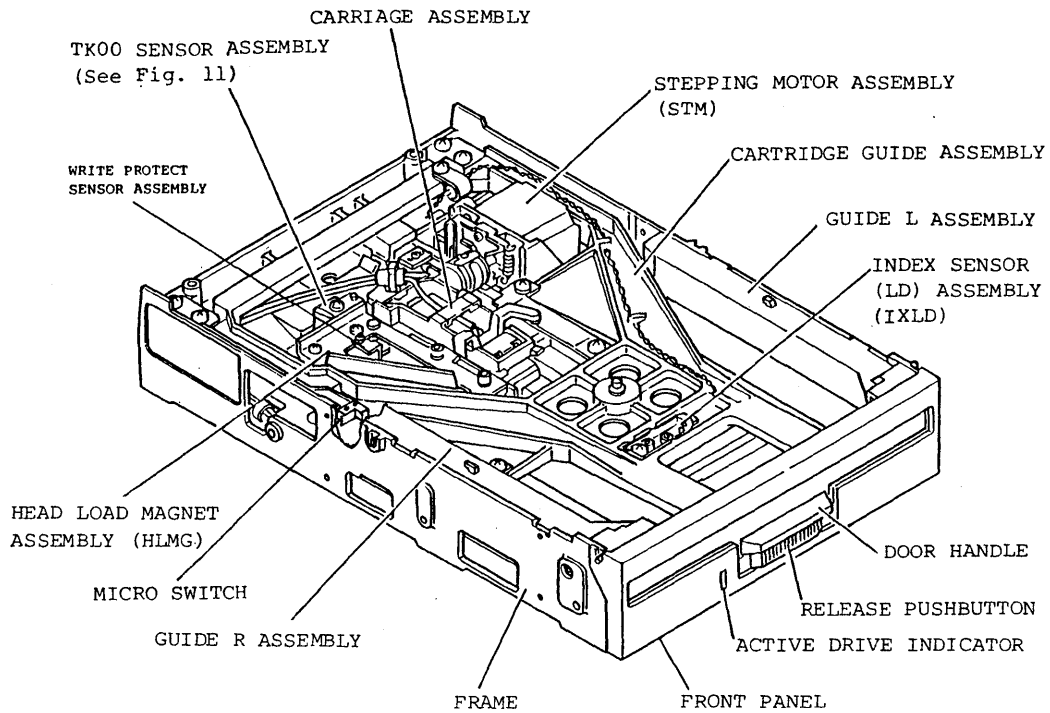


Fig. 1 Major Components

4. OPERATION

4.1 Operating Environment

This disk drive operates properly in a normal office environment. The disk drive and disks may be damaged or operate poorly, however, if operated under the conditions except the following:

	<u>Operating</u>	<u>Non-Operating</u>
① Temperature and humidity		
Temperature	41 to 109°F (5 to 43°C)	-14 to 122°F (-10 to 50°C)
Relative humidity	20 to 80% (non-condensing)	20 to 80% (Non-condensing)
	(Wet bulb 84°F (29°C) maximum)	
② Shock and vibration	Less than 0.25 G (10 to 100 Hz)	Less than 2G continuous vibration (10 to 100 Hz)
③ Dust		
	Be sure dust cannot enter the equipment; it damages the magnetic heads and recording surfaces of disks.	
④ Temperature change rate		
	Less than 20°C per hour (when not packed)	

* All values are general specifications.

4.2 Disk Handling

Especially be careful about the following items (see Fig. 2):

- ① Do not put a disk near the equipment that radiates a magnetic field (radios, TV sets, motors, generators, and other electrical equipment).
- ② Do not move magnetic materials near the disk (rubber magnets, round magnets for blackboard, screwdrivers, tweezers, etc.).
- ③ Do not fold or bend a disk under any circumstances.
- ④ Be sure to put the disk in an envelope and dedicated box when carrying or storing it.
- ⑤ Absolutely never touch a disk in the data area. Do not use alcohol, etc. for cleaning disk.
- ⑥ Do not place in direct sunshine, where the temperature is high, or where it is dusty.
- ⑦ Do not write on the jacket with hard-tipped pen except in the label area. Use only soft-tipped markers, such as felt-tip pens.

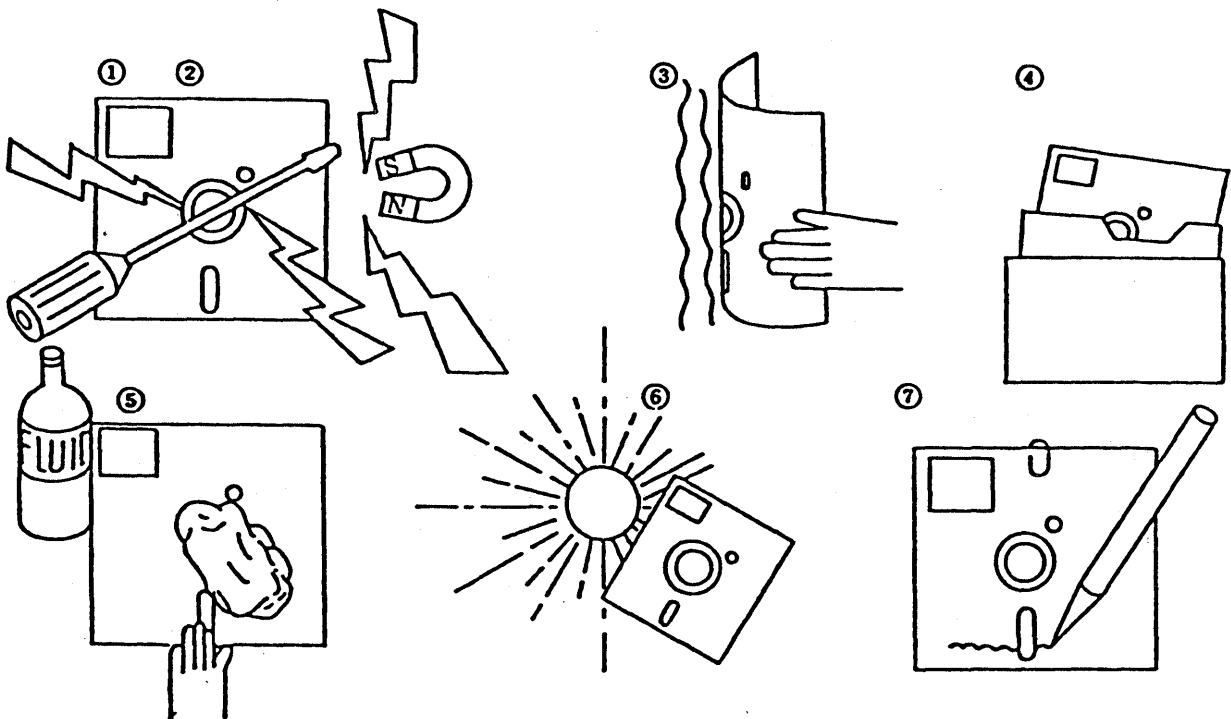


Fig. 2 Disk Handling

4.3 Mounting and Dismounting Disks

To mount the disk,

- ① Open the insertion door by pressing the release pushbutton on the front panel.
- ② Insert the disk until spring pressure stops and a click is heard. (See Fig. 3 for the disk label surface, etc.).
- ③ Close the insertion door by moving the door handle, preferably holding the handle at its center. Mounting of the disk is now complete.

To dismount the disk,

- ① Release the head load and door lock, then
- ② Press the release pushbutton.

The disk springs out of the insertion opening.

Cautions for insertion

- ① When inserting a disk, do it slowly and hold the disk as shown in Fig. 3.

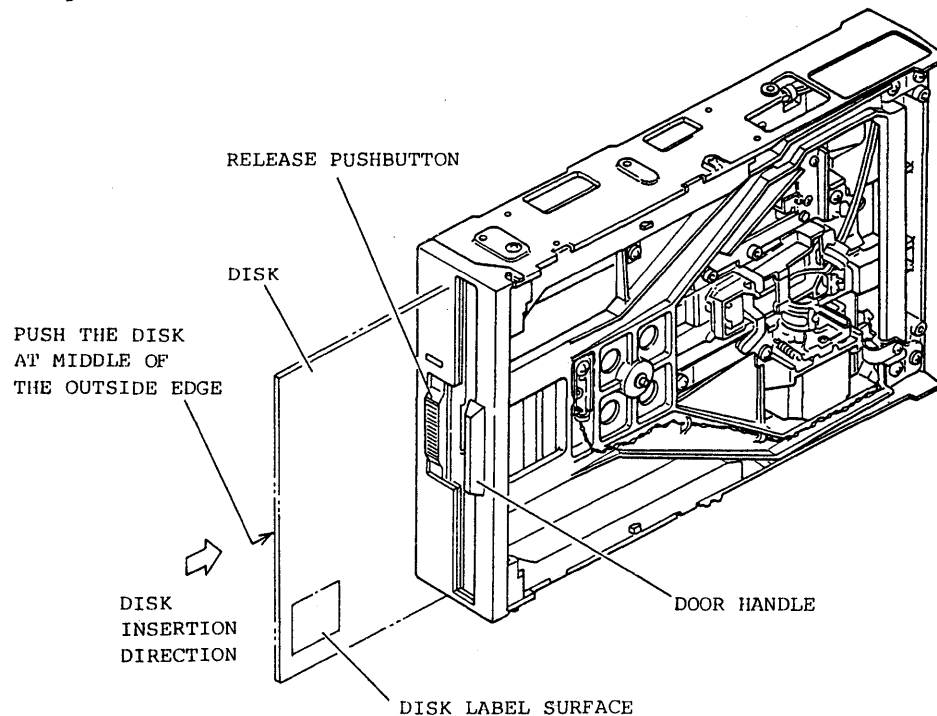


Fig. 3 Disk Insertion

4.4 Cable Connections

Connect cables as follows

Turn off the power supply before connecting or disconnecting a connector, or moving the disk drive.

- ① . Connect the DC power cable connector, J5.
- ② Connect the signal cable connector, J1.

4.5 Grounding

Either of two grounding types can be selected by setting the jumper plug position. (See Fig. 4.)

- ① Frame ground and signal ground are tied ----- JFG jumper
- ② Frame ground and signal ground are separate ----- JSG jumper

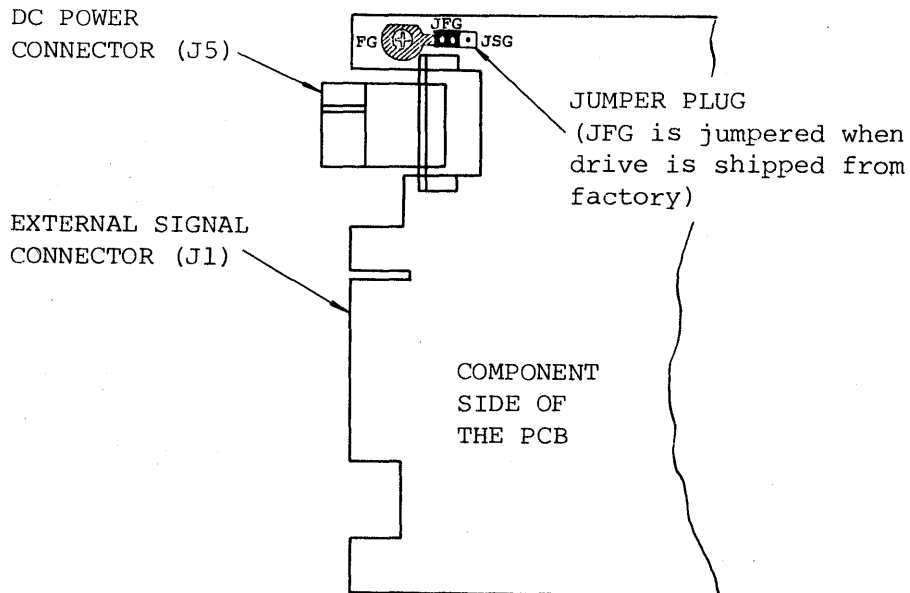


Fig. 4 Grounding Selection

4.6 Termination Resistor Setting (Daisy-chain connection configuration)

A termination resistor (TERMINATOR RT in Fig. 5) should be inserted into the printed-circuit board IC socket of only the disk drive to be connected to the farthest terminal of the signal cable. An M16A-150 OHMJ (Iwaki Musen) or 898-3-R150 (Beckman) shall be used as the termination resistor.

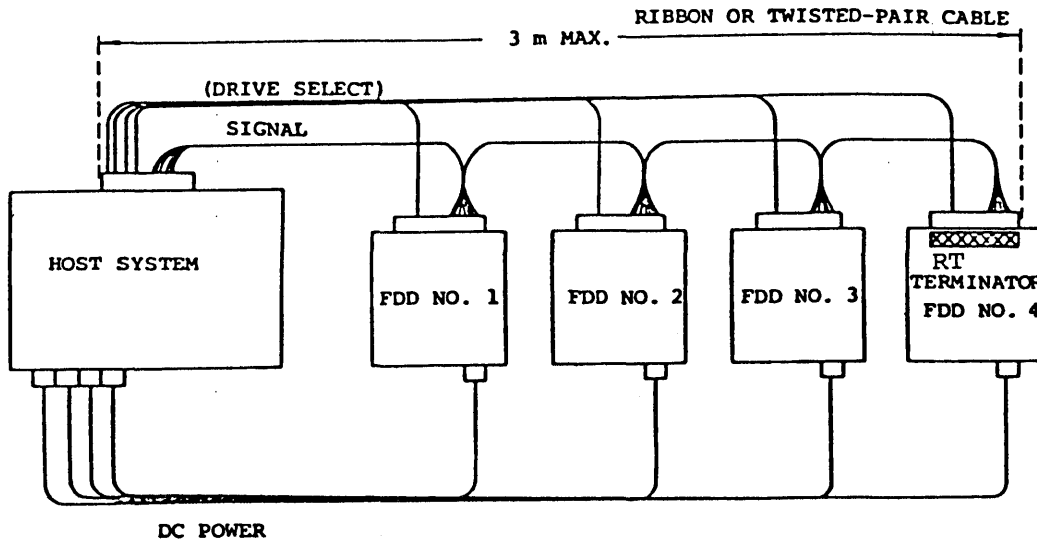


Fig. 5 Daisy-Chain Configuration

4.7 Select Plug Setting (Daisy-chain connection configuration)

Insert select plugs into printed-circuit boards on location D1 according to the drive numbers as shown in Fig. 6.

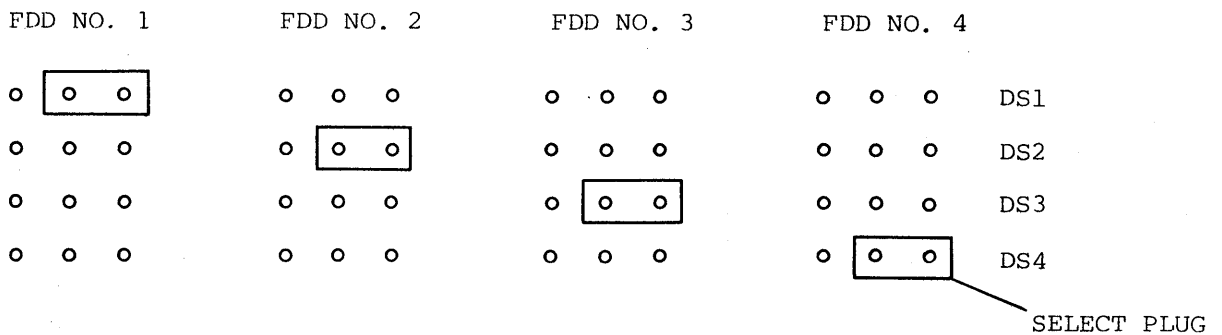


Fig. 6 Drive Select Plug Positions

5. MAINTENANCE PRECAUTIONS AND TOOLS

5.1 Maintenance Precautions

- ① Be careful during maintenance work that dust does not get into the disk drive and that the heads, etc., are not damaged.
- ② Do not proceed with maintenance work before confirming that the DC power supply is turned off.
- ③ Do not mount or dismount printed-circuit board connectors before confirming that the DC power is turned off. This is important to prevent damage to semiconductor devices.
- ④ Under any circumstances do not touch the disk surface or magnetic head surface by hand, or move magnetic material near them.
- ⑤ When using this drive in read-only mode (for example when using the CE disk), be sure that the disk is write-protected and the drive is in write-protect mode; otherwise do not attempt write operation to prevent destruction of written records.
- ⑥ Never touch the steel band by hand nor adjust the related mechanism.
- ⑦ Do not apply undue force, impacts etc. to the head carriage assembly; it has been precisely adjusted. Do not loosen and readjust nuts, screws, etc. unless it is specifically required by procedures given in the manual.

5.2 Tools

Use only designated tools for maintenance or adjustments. Work will be difficult and drive function may be impaired if the specified tools are not used.

- ① Special tools and equipment
 - Ⓐ Maintenance tester: P/N KEISAKI-J20944
 - Ⓑ Alignment disk (CE disk): P/N DC342795-001
- ② General-purpose tools and equipment
 - Ⓐ Phillips screwdriver: No. 2
 - Ⓑ Oscilloscope (with probe): Triggerable, frequency band more than 10 MHz

- ③ Maintenance supplies
 - Ⓐ Sylvon paper
 - Ⓑ Isopropyl alcohol (95% reagent 1st class)

6. PERIODIC MAINTENANCE

Parts and devices corrode and wear out during use over a long period of time. Periodic and special visual inspection, cleaning, exchange of consumable supplies, confirmation of operation, and other steps help to maintain drive functions and to discover trouble at an early stage.

The maintenance period is 12 months.

6.1 Maintenance Tasks

Maintenance items are shown in Table 6-1.

Table 6-1 Periodic Maintenance Tasks

No.	Item	Details and Method	Remarks
1	Cleaning and visual check	1) Remove dust and corrosion from contact surface of Guide L, Guide R, Guide rod, sensors, and connectors. 2) Tighten the screws if any-one of them is loose.	
2	Confirmation of operation by CE disk	1) R/W head radial alignment 2) R/W head azimuth 3) Index sensor alignment	
3	Confirmation and adjustment of Track 00 detection	1) Track 00 output timing 2) Adjustment of TK00 sensor	

6.2 Maintenance Procedures

6.2.1 Confirmation of operation by the CE disk

Head and track number for confirmation items are shown on Table 6-2.

Table 6-2 Operation Confirmation

Item	Head	Track No.
R/W head radial alignment	0	38
	1	34
R/W head azimuth	0	76
	1	72
Index sensor alignment (Index photodetector alignment)	0	00
	0	73

CAUTION: To protect the data, the CE disk should not be written on. Be sure the disk is write-protected and the write-protect circuit is operating.

(1) Read/write head radial alignment

- ① Connect TP-WP to ground to prevent recording on the CE disk even in the event of a malfunction.
- ② Mount the CE disk.
- ③ Connect an oscilloscope

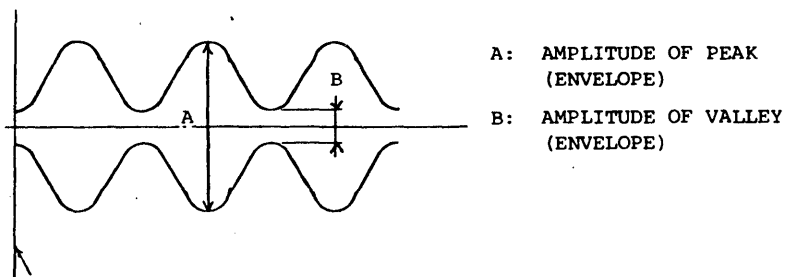
Synchronous trigger EXT: +INDEX (TP-IX) polarity + DC mode

CH1/CH2: TP-AD3/TP-AD4 ADD (differential)
AC mode

Vertical deflection: 100 mV/div

Horizontal deflection: 0.2 ms/div

- ④ Seek Track 38 (Side "0"), Track 34 (Side "1")
 - ① When seeking Track 38 (34) from Track 00
 - ② When seeking Track 38 (34) from Track 76
- ⑤ Load the head.
- ⑥ The oscilloscope waveforms should be within the tolerances shown in Fig. 7 for both cases ④ - ① and ④ - ②.
- ⑦ Read/write head radial alignment is not acceptable when the readings are out of tolerance. Replace the deck.



INDEX TRIGGER STANDARD FOR CHECKING $\frac{B}{A} \times 100 \times \alpha \leq 0 \pm 85 \mu\text{m}$
 at $23 \pm 3^\circ\text{C}$ and $50\% \pm 5\% \text{ RH}$.

- NOTES:
- ① α is a coefficient supplied by CE disk correction guide.
 - ② Radial alignment readings may exceed the standard for checking slightly when checked with the drive in an upright position.
 - ③ Do not adjust the radial alignment in the field, as the adjustment requires other procedures and standards.
 - ④ Standard specification for checking is 60% on Dysan CE disk at $23 \pm 3^\circ\text{C}$ and $50\% \pm 5\% \text{ RH}$.

Fig. 7 Read/Write Head Radial Alignment

(2) Read/write head azimuth

- ① Connect TP-WP to ground to prevent recording on the CE disk even in the event of malfunction.
- ② Mount the CE disk.

- ③ Connect an oscilloscope.

Synchronous trigger EXT: + INDEX (TP-IX) polarity + DC mode

CH1/CH2: TP-AD3/TP-AD4 ADD (differential)
AC mode

Vertical deflection: 50 mV/div

Horizontal deflection: 0.2 ms/div

- ④ Seek Track 76 (Side "0"), Track 72 (Side "1").

- ⑤ Load the head.

- ⑥ Confirm that oscilloscope readings are similar to the patterns and within the tolerances shown in Fig. 8.

Read/write head azimuth standard for check: $0^\circ \pm 18'$

- ⑦ Read/write head azimuth is not acceptable if the readings are outside the tolerance. Replace the deck.

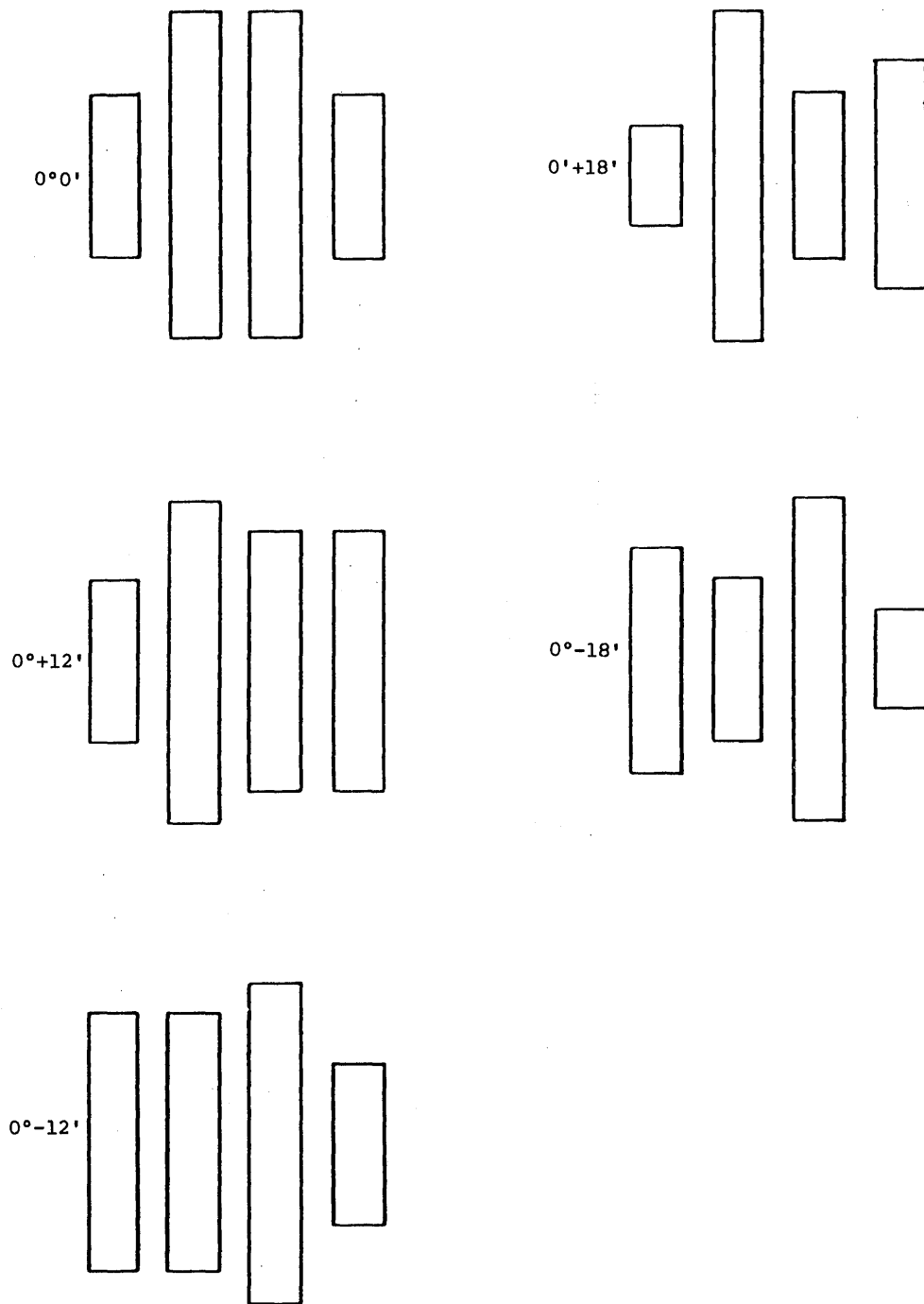


Fig. 8 Azimuth Burst Patterns

(3) Index sensor alignment (index photodetector)

- ① Connect TP-WP to ground to prevent recording on the CE disk even in the event of malfunction.
- ② Mount the CE disk.
- ③ Connect the oscilloscope.

Synchronous trigger EXT: +INDEX (TP-IX) polarity + DC mode

CH1/CH2: TP-AD3/TP-AD4 ADD (differential)
AC mode

Vertical deflection: 500 mV/div

Horizontal deflection: 100 μ s/div

- ④ Load the head.
- ⑤ Readings on the oscilloscope shall be within the following tolerance:

$t = 700 \pm 200 \mu$ s (for both Track 00 and Track 73)

- ⑥ The index sensor alignment is not acceptable if readings are outside the tolerance. Replace the deck.

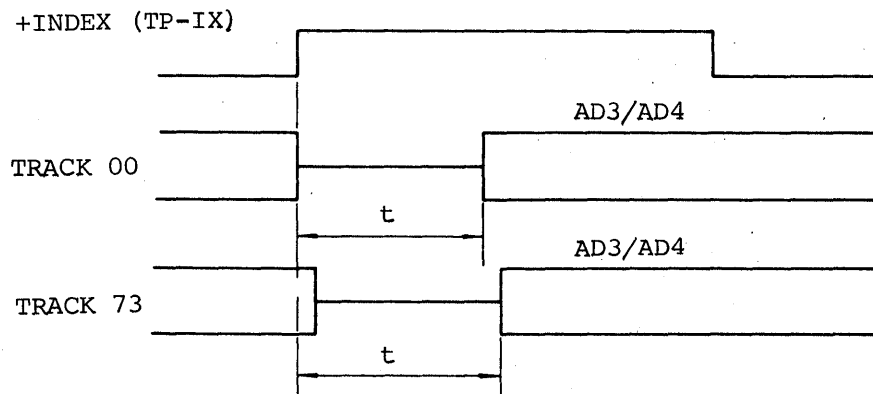


Fig. 9 Index Sensor Alignment

6.2.2 Track 00 detection confirmation and adjustment

(1) Confirmation of Track 00 output timing

- ① First, confirm that the read/write head radial alignment is within tolerance.

NOTE: Perform read/write head radial alignment check according to paragraph 6.2.1-(1).

- ② Mount the disk.
- ③ Connect the oscilloscope.

CH1: TP-STP

CH2: TP-TK00

Synchronous trigger: +STEP (TP-STP)

Vertical deflection: 1 V/div

Horizontal deflection: 1 ms/div

- ④ Repetitively seek Track 00-01 and confirm that the TP-TK00 timing is within tolerance. (Refer to Fig. 10.)

Standard: Within 2.7 ms

NOTE: The step time (track-to-track time) of the head carriage assembly must be $3^{+0.2}_{-0}$ ms.

- ⑤ Confirm that the output of TP-TKOP is within tolerance:

Track 00: Above +2.5 V

Track 01: Below +0.5 V

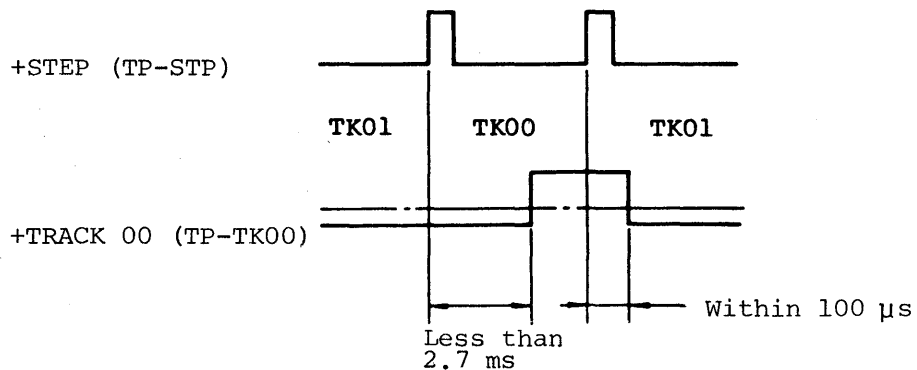


Fig. 10 Track 00 Detection

(2) Adjustment of Track 00 (TK00) sensor

- ① Perform steps ① through ② in Confirmation Procedure (1).
- ② Turn the setscrew of the Track 00 sensor counterclockwise to loosen it (rotate 1/2 to 1 turn).
- ③ Connect the oscilloscope.

CH1: TP-STP
CH2: TP-TKOP
Synchronous trigger: +STEP (TP-STP)
Vertical deflection: 1 V/div
Horizontal deflection: 1 ms/div

- ④ Repetitively seek Track 00-02.
- ⑤ Move the Track 00 sensor right or left (toward Track 00) or Track 76), adjust to the standard level, and tighten the setscrew (see Figs. 11 and 12).

Standard: TP-TKOP timing: T1 = 4.0 to 5.0 ms
T2 = 6.0 to 8.0 ms
TP-TKOP output: Track 00; +2.5 V or above
Track 02; +0.5 V or below

NOTE: Move the Track 00 sensor right or left for adjustment while pushing the sensor toward the padded surfaces of the frame.

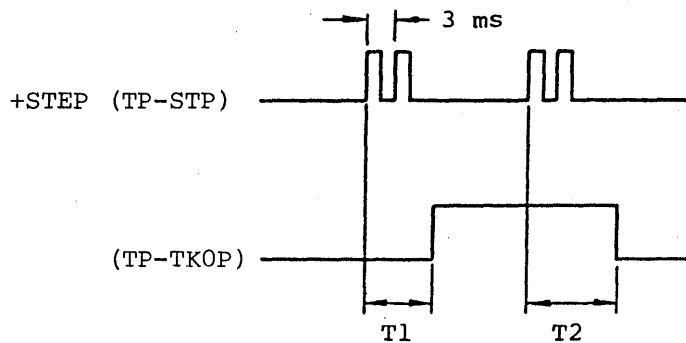


Fig. 11 Track 00 Sensor Adjustment

HLMG ASSEMBLY

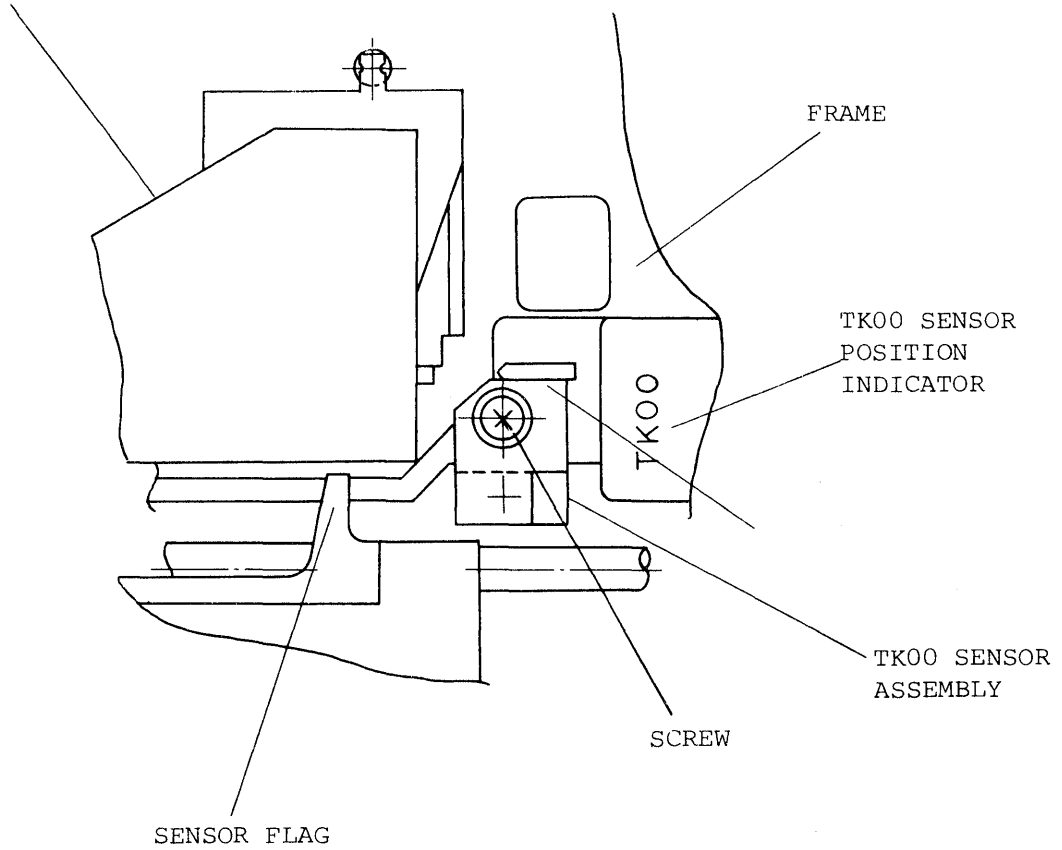


Fig. 12 Detail of Track 00 Sensor



ILLUSTRATED PARTS LIST

PARTS LIST OF PCA, NAFHG (P/N DC447248-03-D)

Reference Designation	Part Number	Description	Qty per PCB	
	DC447093-G01	PWB,NAFHG	1	* * (See page 7)
E1	IC-31-2803	IC-SOCKET	1	YAMAICHI (JAPAN)
P7	IL-2P-S3FP2-1	CONNECTOR	1	JAF (JAPAN)
P3	65625-114 #6 or -214 #6	CONNECTOR	1	BERG
P2	PS-32PA-D4LT1-A1	CONNECTOR	1	JAF (JAPAN)
B5,C1,C1,D1, D2,D2,D3,D4, D4,D9,E2,E6, E6,E8,F1,E8	00-8261-0232-10-854	PIN,MODULE	16	ELCO INTERNATIONAL
A1,B7,C1,C2, C3,C5,C5,D1, D1,D4,F2,F9, F9,C3,D1,D2	00-8261-0333-10-854	PIN,MODULE	14	ELCO INTERNATIONAL
D1,D2	00-8261-0632-10-854	PIN,MODULE	2	ELCO INTERNATIONAL
D1	00-8261-1233-10-854	PIN,MODULE	1	ELCO INTERNATIONAL
A1,C1,C1,C1, C3,C4,C6,D1, D1,D1,D1,D1, D1,D1,D3,D3, F2,F9	00-8261-0282-00-878	PIN,MODULE	18	ELCO INTERNATIONAL
IC D4	M53202P	IC,DIGITAL	1	* * * (See page 7)
IC C3 E8	M53204P	IC,DIGITAL	2	* * *
IC B5 C9	M53206P	IC,DIGITAL	2	* * *
IC C5	M53208P	IC,DIGITAL	1	* * *

(con)

Reference Designation	Part Number	Description	Qty per PCB	
IC E2	M53214P	IC,DIGITAL	1	* * *
IC C2 D2 D3 E9	M53238P	IC,DIGITAL	4	* * *
IC D9	M74LS02P	IC,DIGITAL	1	* * *
IC D5 C7	M74LS04P	IC,DIGITAL	2	* * *
IC E3	M74LS10P	IC,DIGITAL	1	* * *
IC B4 D10 C4	SN74LS74AN	IC,DIGITAL	3	TEXAS INSTRUMENTS
IC E4 E5	M74LS123P	IC,DIGITAL	2	* * *
IC D8	M74LS193P	IC,DIGITAL	1	* * *
IC C10	M74LS393P	IC,DIGITAL	1	* * *
IC C6	M74LS08P	IC,DIGITAL	1	* * *
IC A6	MC3470P	IC,LINEAR	1	MOTOROLA
IC E10	ULN2003AN	IC,LINEAR	1	TEXAS INSTRUMENTS
IC B6	SN75472P	IC,LINEAR	1	TEXAS INSTRUMENTS
IC F1 F2	SN75473P	IC,LINEAR	2	TEXAS INSTRUMENTS
IC E7	NE555P	IC,LINEAR	1	TEXAS INSTRUMENTS
IC B9	AS-1412-02	IC,HYBRID	1	* *
IC A9	AS-1413	IC,HYBRID	1	* *
IC F8	722053A	IC,HYBRID	1	* *
IC F5	J20037	IC,HYBRID	1	* *

(con)

Reference Designation	Part Number	Description	Qty per PCB	
IC D6	MB14079M	GATE,ARRAY	1	* *
C12,13,14,18, 28,29,45,46, 47,48,49,19, 101,102,103, 104,105,106, 107,108,109, 110,111,112, 113,114,115	RPE122-127C103K50	CAPACITOR,CER. 0.01 μ F 50V \pm 10% (CER.=CERAMIC)	27	MURATA WORKS (JAPAN)
C33	DE1105E472Z1KV	CAPACITOR,CER. 4700pF 1kV +80% -20%	1	MURATA WORKS (JAPAN)
C3,4,50,51	RPE122-127CH471J50	CAPACITOR,CER. 470pF 50V \pm 5%	4	MURATA WORKS (JAPAN)
C8	RPE122-127CH151J50	CAPACITOR,CER. 150pF 50V \pm 5%	1	MURATA WORKS (JAPAN)
C11	RPE122-127CH101J50	CAPACITOR,CER. 100pF 50V \pm 5%	1	MURATA WORKS (JAPAN)
C36,60,71	RPE122-127CH102J50	CAPACITOR,CER. 1000pF 50V \pm 5%	3	MURATA WORKS (JAPAN)
C34,61	RPE123-127F155Z25	CAPACITOR,CER. 1.5 μ F 25V +80% -20%	2	MURATA WORKS (JAPAN)
C7	RPE122-127CH331J50	CAPACITOR,CER. 330pF 50V \pm 5%	1	MURATA WORKS (JAPAN)
C1,2	MFLP5002-223K	CAPACITOR,PLA. 0.022 μ F 50V \pm 10% (PLA.=PLASTIC)	2	MATSUO ELEC- TRIC (JAPAN)
C5	MFLP5002-222K	CAPACITOR,PLA. 2200pF 50V \pm 10%	1	MATSUO ELEC- TRIC (JAPAN)
C6	MFLP5002-102K	CAPACITOR,PLA. 0.001 μ F 50V \pm 10%	1	MATSUO ELEC- TRIC (JAPAN)

(con)

Reference Designation	Part Number	Description	Qty per PCB	
C9	242M2502-475M	CAPACITOR, TANT. 4.7 μ F 25V \pm 20% (TANT.=TANTALUM)	1	MATSUO ELECTRIC (JAPAN)
C10	242M1602-226M	CAPACITOR, TANT. 22 μ F 10V \pm 20%	1	MATSUO ELECTRIC (JAPAN)
C15, 26	242M3502-155M	CAPACITOR, TANT. 1.5 μ F 35V \pm 20%	2	MATSUO ELECTRIC (JAPAN)
C40	242M1602-106M	CAPACITOR, TANT. 10 μ F 16V \pm 20%	1	MATSUO ELECTRIC (JAPAN)
C24, 30	242M1002-156M	CAPACITOR, TANT. 15 μ F 10V \pm 20%	2	MATSUO ELECTRIC (JAPAN)
C22, 31, 32	242M3502-225M	CAPACITOR, TANT. 2.2 μ F 35V \pm 20%	3	MATSUO ELECTRIC (JAPAN)
C21, 23	244M1602-335M	CAPACITOR, TANT. 3.3 μ F 16V \pm 20%	2	MATSUO ELECTRIC (JAPAN)
CL1	CSA6.00MS	OSCILLATOR, CER.	1	MURATA WORKS (JAPAN)
D1, 2	DC447733-G01	DIODE, PAIR	1	* *
D5	NDP115	DIODE	1	NATIONAL COMPONENT INC.
D12	SR1FM-2	DIODE	1	* * *
D3	MZ312	DIODE, ZENER 12V	1	* * *
D4	MZ306-B	DIODE, ZENER 6V	1	* * *
D18	MZ305	DIODE, ZENER 5V	1	* * *
D10	RD3.0EB2	DIODE, ZENER 3V	1	NEC (JAPAN)
D11	RD15FB	DIODE, ZENER 15V	1	NEC (JAPAN)
D19	RD6.8FB	DIODE, ZENER 6.8V	1	NEC (JAPAN)

(con)

Reference Designation	Part Number	Description	Qty per PCB	
L1,2	TP0410-331J	INDUCTOR 330 μ H \pm 5%	2	TDK (JAPAN)
L3,4,5	TP-0206-101K	INDUCTOR 100 μ H \pm 10%	3	TDK (JAPAN)
R81	NL1/4J8201F	RESISTOR 8.2k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R1,2	NL1/4J6801F	RESISTOR 6.8k Ω 1/4W \pm 1%	2	SEF (JAPAN)
R4,5	NL1/4J4700F	RESISTOR 470 Ω 1/4W \pm 1%	2	SEF (JAPAN)
R6,7,28,70, 71	NL1/4J1001F	RESISTOR 1k Ω 1/4W \pm 1%	5	SEF (JAPAN)
R9,19,26,27, 82	NL1/4J1500F	RESISTOR 150 Ω 1/4W \pm 1%	5	SEF (JAPAN)
R12,22,53,54	NL1/4J2201F	RESISTOR 2.2k Ω 1/4W \pm 1%	4	SEF (JAPAN)
R13,15,18	NL1/4J3301F	RESISTOR 3.3k Ω 1/4W \pm 1%	3	SEF (JAPAN)
R14,30	NL1/4J4702F	RESISTOR 47k Ω 1/4W \pm 1%	2	SEF (JAPAN)
R17	NL1/4J1200F	RESISTOR 120 Ω 1/4W \pm 1%	1	SEF (JAPAN)
R20,21,23,24, 25,33,40,43, 45,46,60,48, 11,80,83,84	NL1/4J4701F	RESISTOR 4.7k Ω 1/4W \pm 1%	16	SEF (JAPAN)
R38	NL1/4J1502F	RESISTOR 15k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R37	NL1/4J2701F	RESISTOR 2.7k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R8,29,59,72	NL1/4J1501F	RESISTOR 1.5k Ω 1/4W \pm 1%	4	SEF (JAPAN)

(con)

Reference Designation	Part Number	Description	Qty per PCB	
R31	NL1/4J3902F	RESISTOR 39k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R58	NL1/4J1002F	RESISTOR 10k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R57	NL1/4J5601F	RESISTOR 5.6k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R39	NL1/4J2203F	RESISTOR 220k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R51,52	NL1/4J3900F	RESISTOR 390 Ω 1/4W \pm 1%	2	SEF (JAPAN)
R55,56	NL1/4J3300F	RESISTOR 330 Ω 1/4W \pm 1%	2	SEF (JAPAN)
R42	NL1/4J1800F	RESISTOR 180 Ω 1/4W \pm 1%	1	SEF (JAPAN)
RM2	PSR1.5A301J	RESISTOR,MODULE 300 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
RM3	PSR1.5A441J	RESISTOR,MODULE 440 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
RM7	PSR1.5A561J	RESISTOR,MODULE 560 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
RM5	PSR1.5B821J	RESISTOR,MODULE 820 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
RM1	M16A-151J	RESISTOR,MODULE 150 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
R10	3321P-1-503	RESISTOR,VARIABLE	1	MURATA WORKS (JAPAN)
R34	3321P-1-202	RESISTOR,VARIABLE	1	MURATA WORKS (JAPAN)
R35	3321P-1-103	RESISTOR,VARIABLE	1	MURATA WORKS (JAPAN)

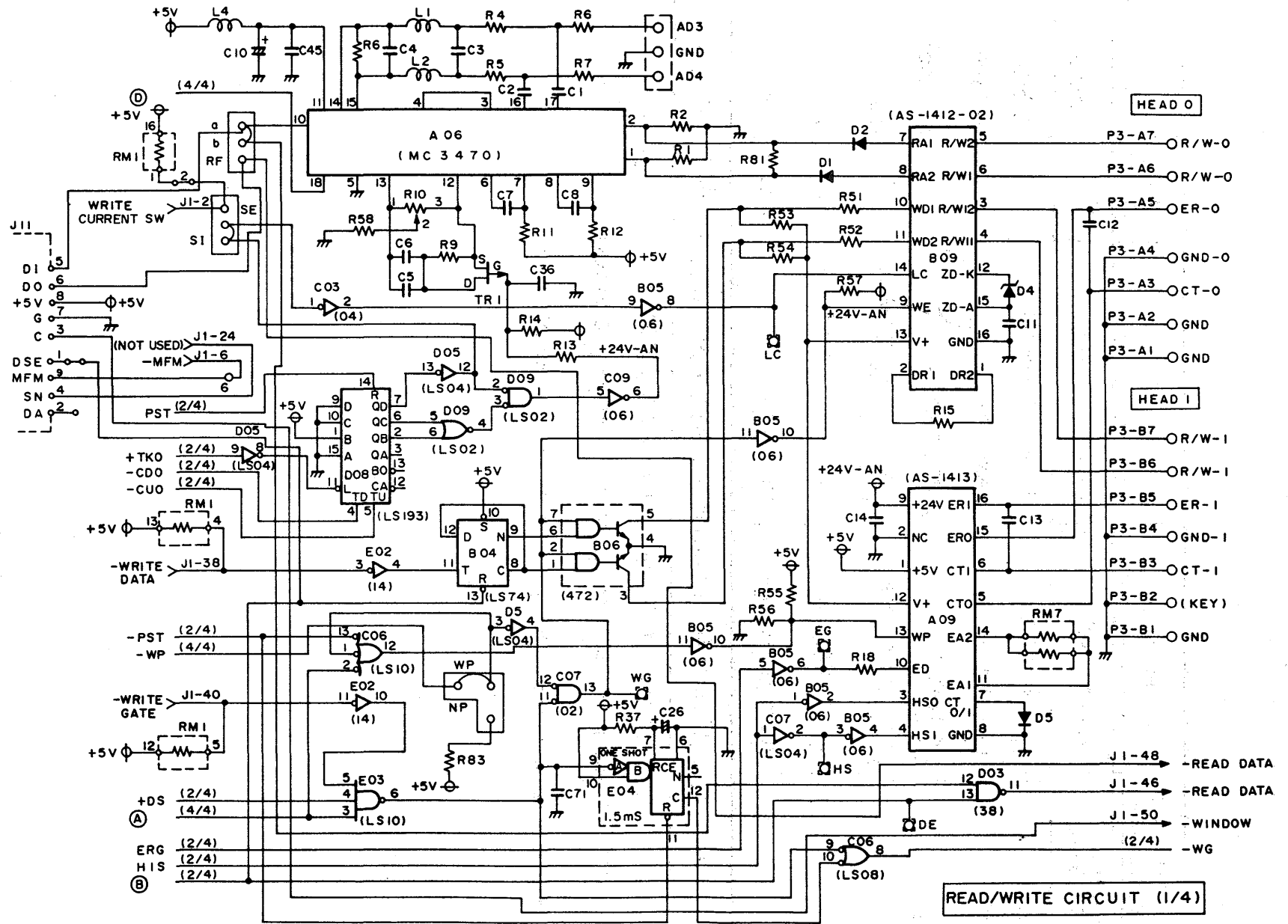
(con)

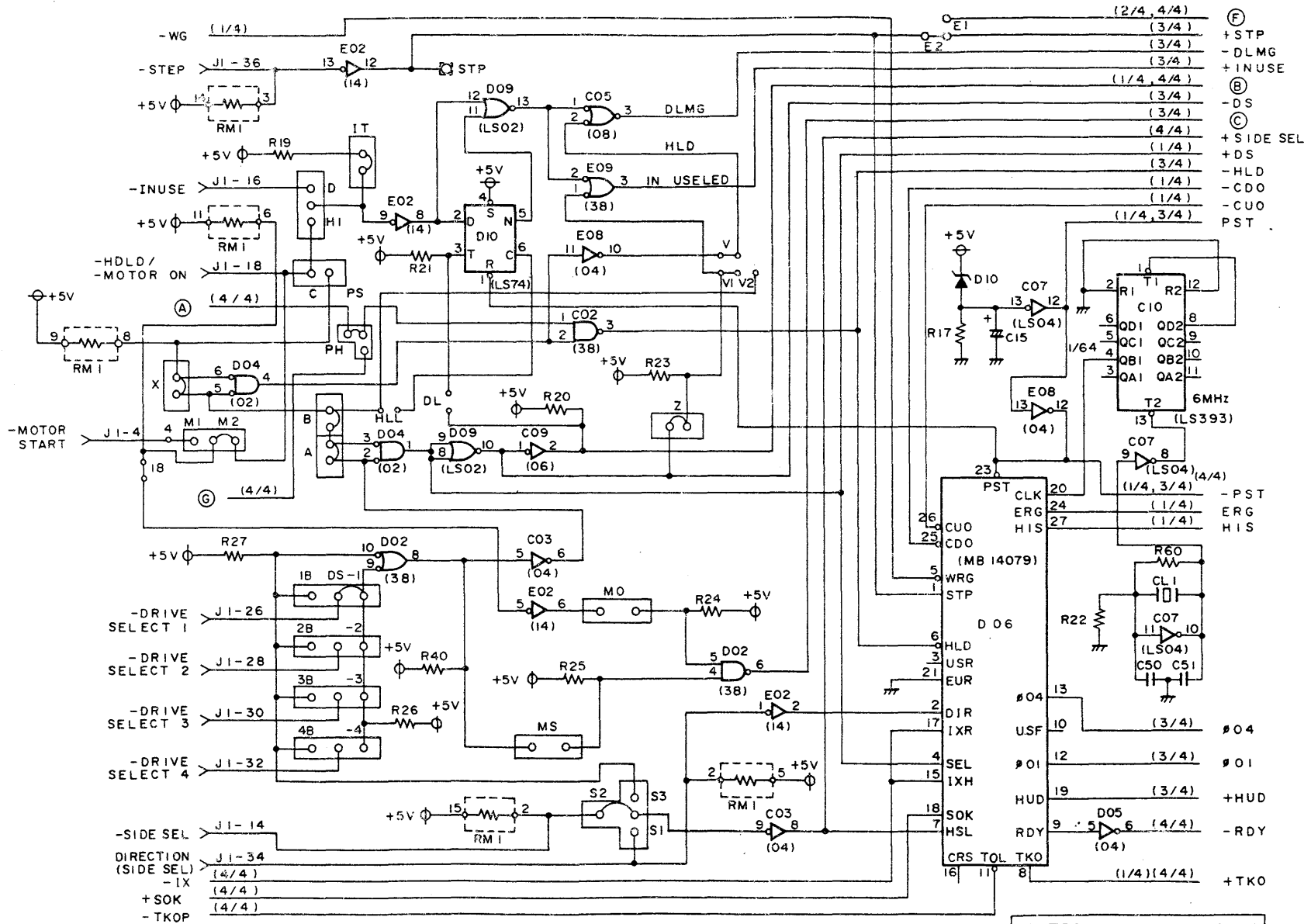
Reference Designation	Part Number	Description	Qty per PCB	
TR1	MPF970	TRANSISTOR,FET	1	MOTOROLA
	DC446629-001	BRACKET,CONNECTOR	1	* * *
J5	1-480271-0	CONNECTOR	1	AMP INC.
	60618-1	CONTACT,CONNECTOR	5	AMP INC.
	DCPS-112002-006	SCREW,PAN HD,WASHERED, M3 x 0.5 x 6BS	2	
	UL1061AWG24(7)-2	WIRE,VINYL	0.1MR	* *
	UL1061AWG24(7)-0	WIRE,VINYL	0.15MR	* *

* This parts list applies to the PCA, NAFHG part No. DC447248-03-D.

* * Means "Custom-made for MELCO Computer Works".

* * * Means parts made by MELCO Semiconductor Division.





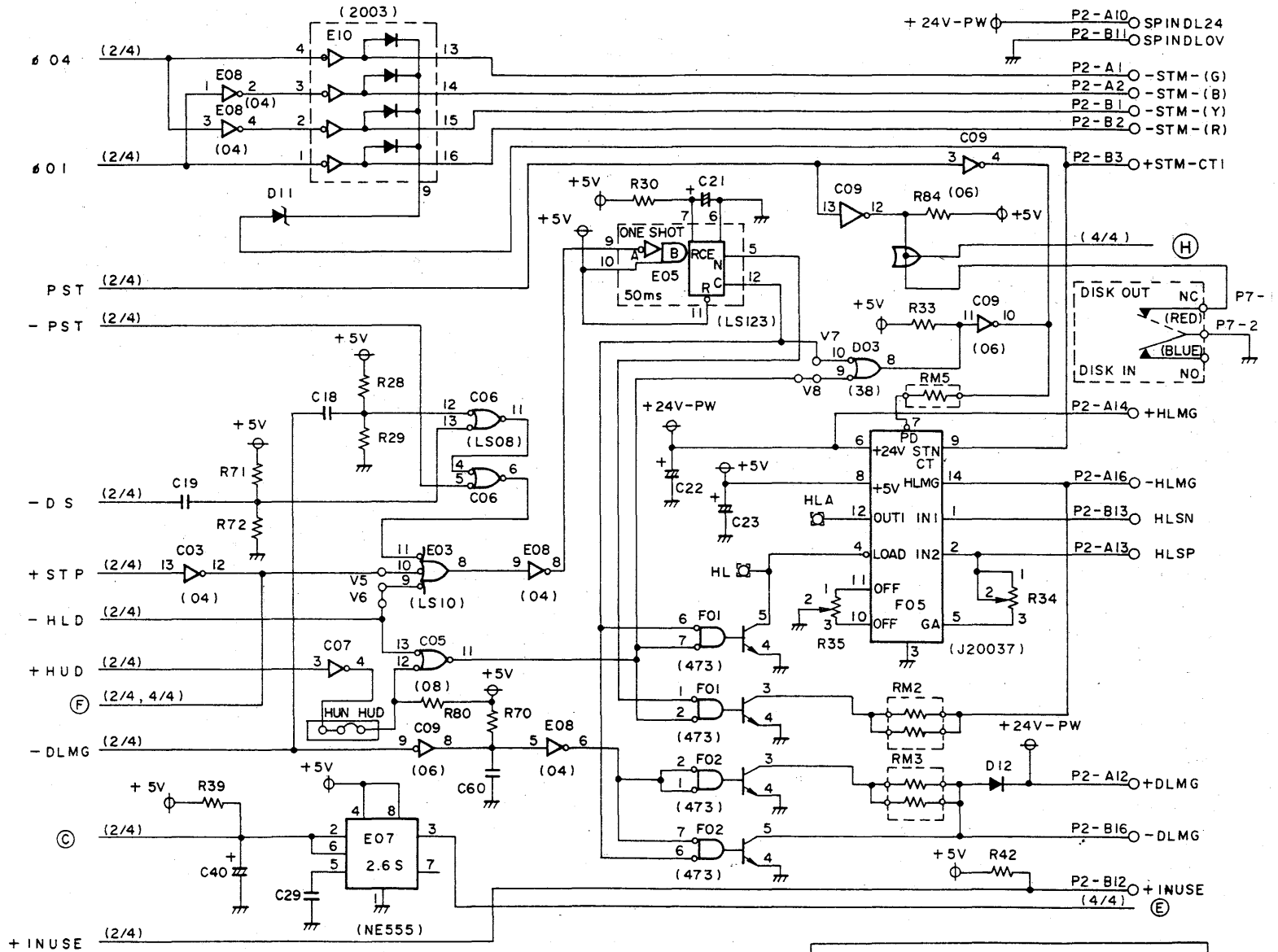
CONTROL CIRCUIT (2/4)

1
6
1

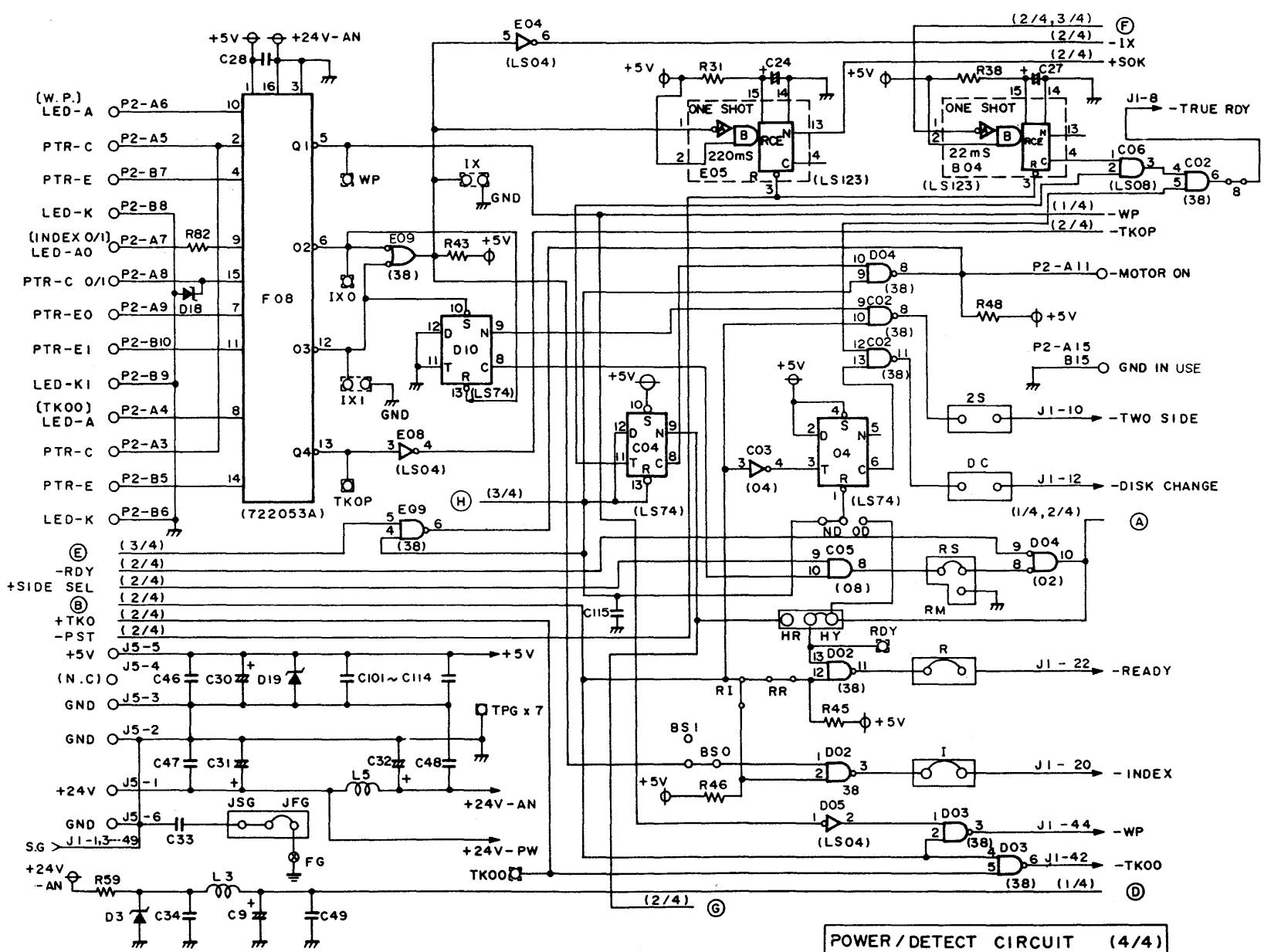
- (F) +STP (3/4)
- DLMG (3/4)
- +IN USE (3/4)
- (B) -DS (4/4)
- (C) +SIDE SEL (1/4)
- +DS (3/4)
- HLD (1/4)
- CDO (1/4)
- CUO (1/4, 3/4)
- PST

- PST (1/4)
- ERG (1/4)
- HIS (1/4)

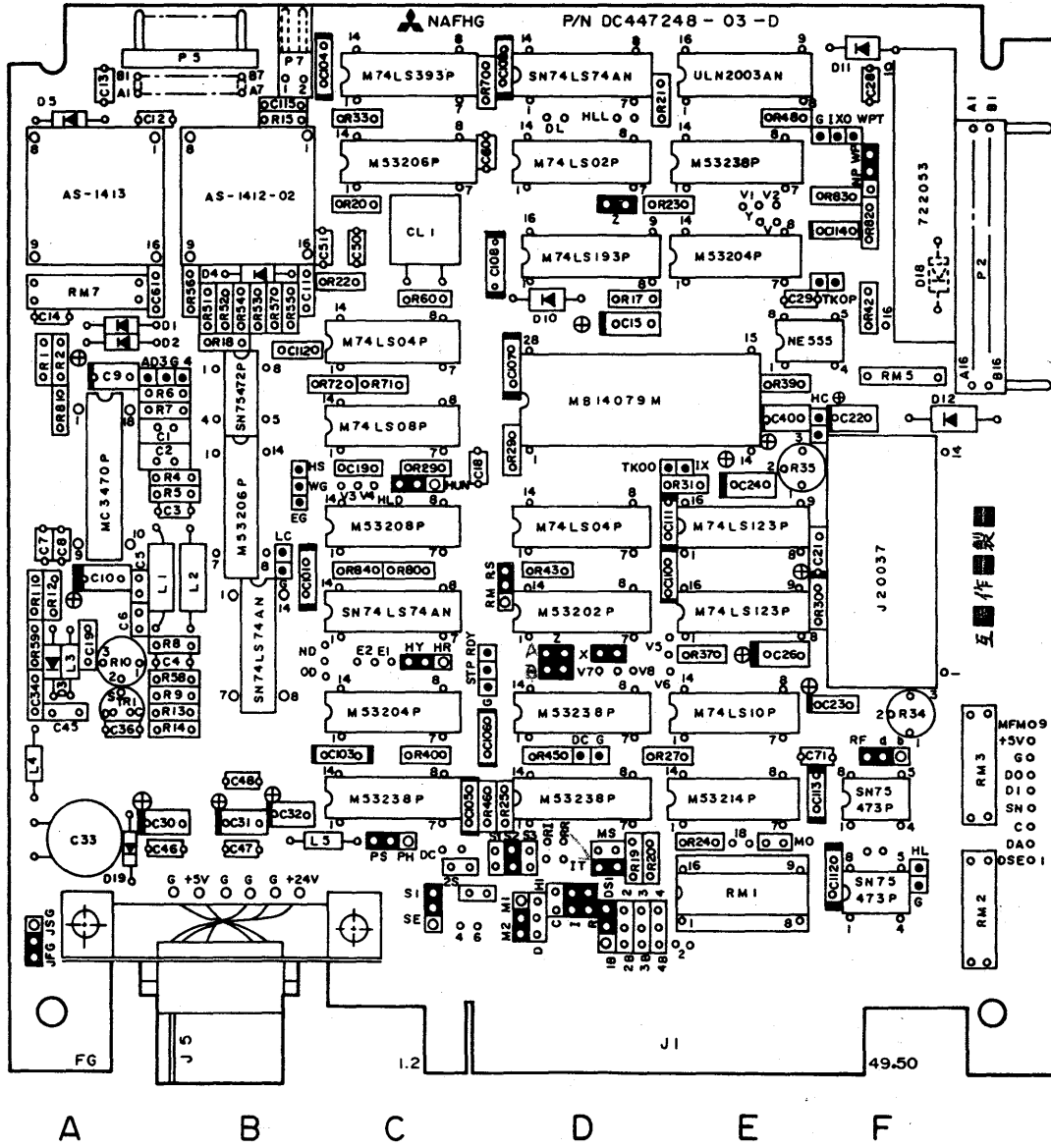
- #04 (3/4)
- #01 (3/4)
- +HUD (3/4)
- RDY (4/4)
- +TKO (1/4, 4/4)



MOTOR/SOLENOID DRIVE CIRCUIT (3/4)



POWER/DETECT CIRCUIT (4/4)



PCB (PCA, NAFHG) COMPONENT LOCATIONS

PARTS LIST OF PCA, NAFHG (P/N DC447248-03-E)

Reference Designation	Part Number	Description	Qty per PCB	
	DC447093-G01	PWB, NAFHG	1	* * (See page 19)
E1	IC-31-2803	IC-SOCKET	1	YAMAICHI (JAPAN)
P7	IL-2P-S3FP2-1	CONNECTOR	1	JAF (JAPAN)
P3	65625-114 #6 or -214 #6	CONNECTOR	1	BERG
P2	PS-32PA-D4LT1-A1	CONNECTOR	1	JAF (JAPAN)
B5,C1,C1,D1, D2,D2,D3,D4, D4,D9,E2,E6, E6,E8,F1,E8	00-8261-0232-10-854	PIN,MODULE	16	ELCO INTERNATIONAL
A1,B7,C1,C2, C3,C5,C5,D1, D1,D4,F2,F9, F9,C3,D1,D2	00-8261-0033-10-854	PIN,MODULE	14	ELCO INTERNATIONAL
D1,D2	00-8261-0632-10-854	PIN,MODULE	2	ELCO INTERNATIONAL
D1	00-8261-1233-10-854	PIN,MODULE	1	ELCO INTERNATIONAL
A1,C1,C1,C1, C3,C4,C6,D1, D1,D1,D1,D1, D1,D1,D3,D3, F2,F9	00-8261-0282-00-878	PIN,MODULE	18	ELCO INTERNATIONAL
IC D4	M53202P	IC,DIGITAL	1	* * * (See page 19)
IC C3 E8	M53204P	IC,DIGITAL	2	* * *
IC B5 C9	M53206P	IC,DIGITAL	2	* * *
IC C5	M53208P	IC,DIGITAL	1	* * *

(con)

Reference Designation	Part Number	Description	Qty per PCB	
IC E2	M53214P	IC,DIGITAL	1	* * *
IC C2 D2 D3 E9	M53238P	IC,DIGITAL	4	* * *
IC D9	M74LS02P	IC,DIGITAL	1	* * *
IC D5 C7	M74LS04P	IC,DIGITAL	2	* * *
IC E3	M74LS10P	IC,DIGITAL	1	* * *
IC B4 D10 C4	SN74LS74AN	IC,DIGITAL	3	TEXAS INSTRUMENTS
IC E4 E5	M74LS123P	IC,DIGITAL	2	* * *
IC D8	M74LS193P	IC,DIGITAL	1	* * *
IC C10	M74LS393P	IC,DIGITAL	1	* * *
IC C6	M74LS08P	IC,DIGITAL	1	* * *
IC A6	MC3470P	IC,LINEAR	1	MOTOROLA
IC E10	ULN2003AN	IC,LINEAR	1	TEXAS INSTRUMENTS
IC B6	SN75472P	IC,LINEAR	1	TEXAS INSTRUMENTS
IC F1 F2	SN75473P	IC,LINEAR	2	TEXAS INSTRUMENTS
IC E7	NE555P	IC,LINEAR	1	TEXAS INSTRUMENTS
IC B9	AS-1412-02	IC,HYBRID	1	* *
IC A9	AS-1413	IC,HYBRID	1	* *
IC F8	722053A	IC,HYBRID	1	* *
IC F5	J20037	IC,HYBRID	1	* *

son)

Reference Designation	Part Number	Description	Qty per PCB	
IC D6	MB14079M	GATE,ARRAY	1	* *
C12,13,14,18, 28,29,45,46, 47,48,49,19, 101,102,103, 104,105,106, 107,108,109, 110,111,112, 113,114,115	PRE122-127C103K50	CAPACITOR,CER. 0.01 μ F 50V \pm 10% (CER.=CERAMIC)	27	MURATA WORKS (JAPAN)
C33	DE1105E472Z1KV	CAPACITOR,CER. 4700pF 1kv +80% -20%	1	MURATA WORKS (JAPAN)
C3,4,50,51	RPE122-127CH471J50	CAPACITOR,CER. 470pF 50V \pm 5%	4	MURATA WORKS (JAPAN)
C8	RPE122-127CH151J50	CAPACITOR,CER. 150pF 50V \pm 5%	1	MURATA WORKS (JAPAN)
C11	RPE122-127CH101J50	CAPACITOR,CER. 100pF 50V \pm 5%	1	MURATA WORKS (JAPAN)
C36,60,71	RPE122-127CH102J50	CAPACITOR,CER. 1000pF 50V \pm 5%	3	MURATA WORKS (JAPAN)
C34,61,22, 23,31,32	RPE123-127F155Z25	CAPACITOR,CER. 1.5 μ F 25V +80% -20%	6	MURATA WORKS (JAPAN)
C7	RPE122-127CH331J50	CAPACITOR,CER. 330pF 50V \pm 5%	1	MURATA WORKS (JAPAN)
C1,2	MFLP5002-223K	CAPACITOR,PLA. 0.022 μ F 50V \pm 10% (PLA.=PLASTIC)	2	MATSUO ELEC- TRIC (JAPAN)
C5	MFLP5002-222K	CAPACITOR,PLA. 2200pF 50V \pm 10%	1	MATSUO ELEC- TRIC (JAPAN)
C6	MFLP5002-102K	CAPACITOR,PLA. 0.001 μ F 50V \pm 10%	1	MATSUO ELEC- TRIC (JAPAN)

(con)

Reference Designation	Part Number	Description	Qty per PCB	
C9	242M2502-475M	CAPACITOR, TANT. 4.7 μ F 25V \pm 20% (TANT.=TANTALUM)	1	MATSUO ELECTRIC (JAPAN)
C10, 30	242M1602-226M	CAPACITOR, TANT. 22 μ F 10V \pm 20%	2	MATSUO ELECTRIC (JAPAN)
C15, 26	242M3502-155M	CAPACITOR, TANT. 1.5 μ F 35V \pm 20%	2	MATSUO ELECTRIC (JAPAN)
C40	242M1602-106M	CAPACITOR, TANT. 10 μ F 16V \pm 20%	1	MATSUO ELECTRIC (JAPAN)
C24	242M1002-156M	CAPACITOR, TANT. 15 μ F 10V \pm 20%	1	MATSUO ELECTRIC (JAPAN)
C21	244M1602-335M	CAPACITOR, TANT. 3.3 μ F 16V \pm 20%	1	MATSUO ELECTRIC (JAPAN)
CL1	CSA6.00MS	OSCILLATOR, CER.	1	MURATA WORKS (JAPAN)
D1, 2	DC447733-G01	DIODE, PAIR	1	* *
D5	NDP115	DIODE	1	NATIONAL COMPONENT INC.
D12	SR1FM-2	DIODE	1	* * *
D3	MZ312	DIODE, ZENER 12V	1	* * *
D4	MZ306-B	DIODE, ZENER 6V	1	* * *
D18	MZ305	DIODE, ZENER 5V	1	* * *
D10	RD3.0EB2	DIODE, ZENER 3V	1	NEC (JAPAN)
D11	RD15FB	DIODE, ZENER 15V	1	NEC (JAPAN)
D19	RD6.8FB	DIODE, ZENER 6.8V	1	NEC (JAPAN)
L1, 2	TP0410-331J	INDUCTOR 330 μ H \pm 5%	2	TDK (JAPAN)
L3, 4, 5	TP-0206-101K	INDUCTOR 100 μ H \pm 10%	3	TDK (JAPAN)

(con)

Reference Designation	Part Number	Description	Qty per PCB	
R81	NL1/4J8201F	RESISTOR 8.2k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R1,2	NL1/4J6801F	RESISTOR 6.8k Ω 1/4W \pm 1%	2	SEF (JAPAN)
R4,5	NL1/4J4700F	RESISTOR 470 Ω 1/4W \pm 1%	2	SEF (JAPAN)
R6,7,28,70, 71	NL1/4J1001F	RESISTOR 1k Ω 1/4W \pm 1%	5	SEF (JAPAN)
R9,19,26,27, 82	NL1/4J1500F	RESISTOR 150 Ω 1/4W \pm 1%	5	SEF (JAPAN)
R12,22,53,54	NL1/4J2201F	RESISTOR 2.2k Ω 1/4W \pm 1%	4	SEF (JAPAN)
R13,15,18	NL1/4J3301F	RESISTOR 3.3k Ω 1/4W \pm 1%	3	SEF (JAPAN)
R14,30	NL1/4J4702F	RESISTOR 47k Ω 1/4W \pm 1%	2	SEF (JAPAN)
R17	NL1/4J1200F	RESISTOR 120 Ω 1/4W \pm 1%	1	SEF (JAPAN)
R20,21,23,24, 25,33,40,43, 45,46,60,48, 11,80,83,84	NL1/4J4701F	RESISTOR 4.7k Ω 1/4W \pm 1%	16	SEF (JAPAN)
R38	NL1/4J1502F	RESISTOR 15k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R37	NL1/4J2701F	RESISTOR 2.7k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R8,29,59,72	NL1/4J1501F	RESISTOR 1.5k Ω 1/4W \pm 1%	4	SEF (JAPAN)
R31	NL1/4J3902F	RESISTOR 39k Ω 1/4W \pm 1%	1	SEF (JAPAN)

(con)

Reference Designation	Part Number	Description	Qty per PCB	
R58	NL1/4J1002F	RESISTOR 10k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R57	NL1/4J5601F	RESISTOR 5.6k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R39	NL1/4J2203F	RESISTOR 220k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R51,52	NL1/4J3900F	RESISTOR 390 Ω 1/4W \pm 1%	2	SEF (JAPAN)
R55,56	NL1/4J3300F	RESISTOR 330 Ω 1/4W \pm 1%	2	SEF (JAPAN)
R42	NL1/4J1800F	RESISTOR 180 Ω 1/4W \pm 1%	1	SEF (JAPAN)
RM2	PSR1.5A301J	RESISTOR,MODULE 300 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
RM3	PSR1.5A441J	RESISTOR,MODULE 440 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
RM7	PSR1.5A561J	RESISTOR,MODULE 560 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
RM5	PSR1.5B821J	RESISTOR,MODULE 820 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
RM1	M16A-151J	RESISTOR,MODULE 150 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
R10	3321P-1-503	RESISTOR,VARIABLE	1	MURATA WORKS (JAPAN)
R34	3321P-1-202	RESISTOR,VARIABLE	1	MURATA WORKS (JAPAN)
R35	3321P-1-103	RESISTOR,VARIABLE	1	MURATA WORKS (JAPAN)
TR1	MPF970	TRANSISTOR,FET	1	MOTOROLA
	DC446629-001	BRACKET,CONNECTOR	1	* * *

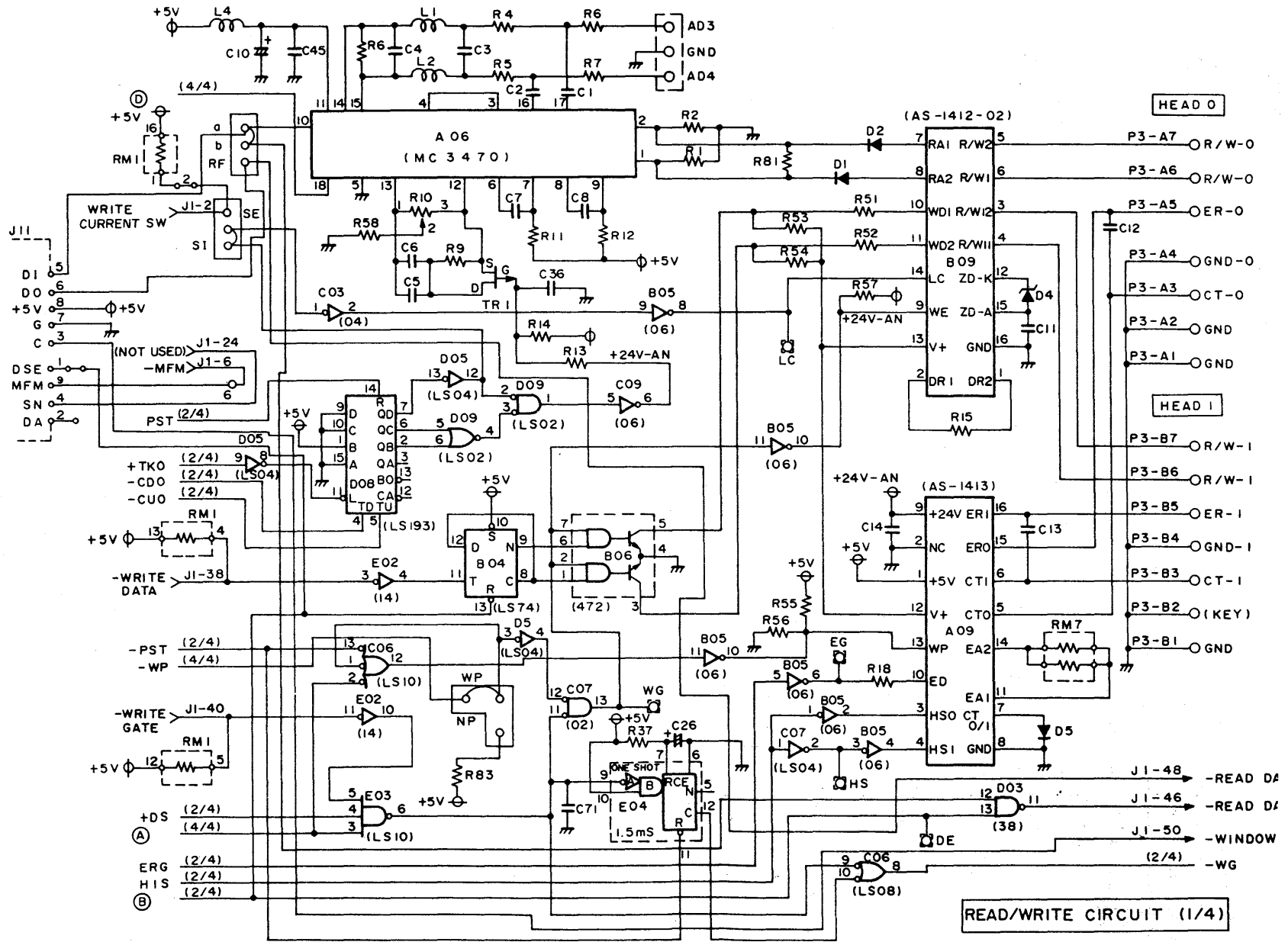
(con)

Reference Designation	Part Number	Description	Qty per PCB	
J5	1-480271-0	CONNECTOR	1	AMP INC.
	60618-1	CONTACT,CONNECTOR	5	AMP .INC.
	DCPS-112002-006	SCREW,PAN HD,WASHERED, M3 x 0.5 x 6BS	2	
	UL1061AWG24 (7) -2	WIRE,VINYL	0.1MR	* *
	UL1061AWG24 (7) -0	WIRE,VINYL	0.15MR	* *

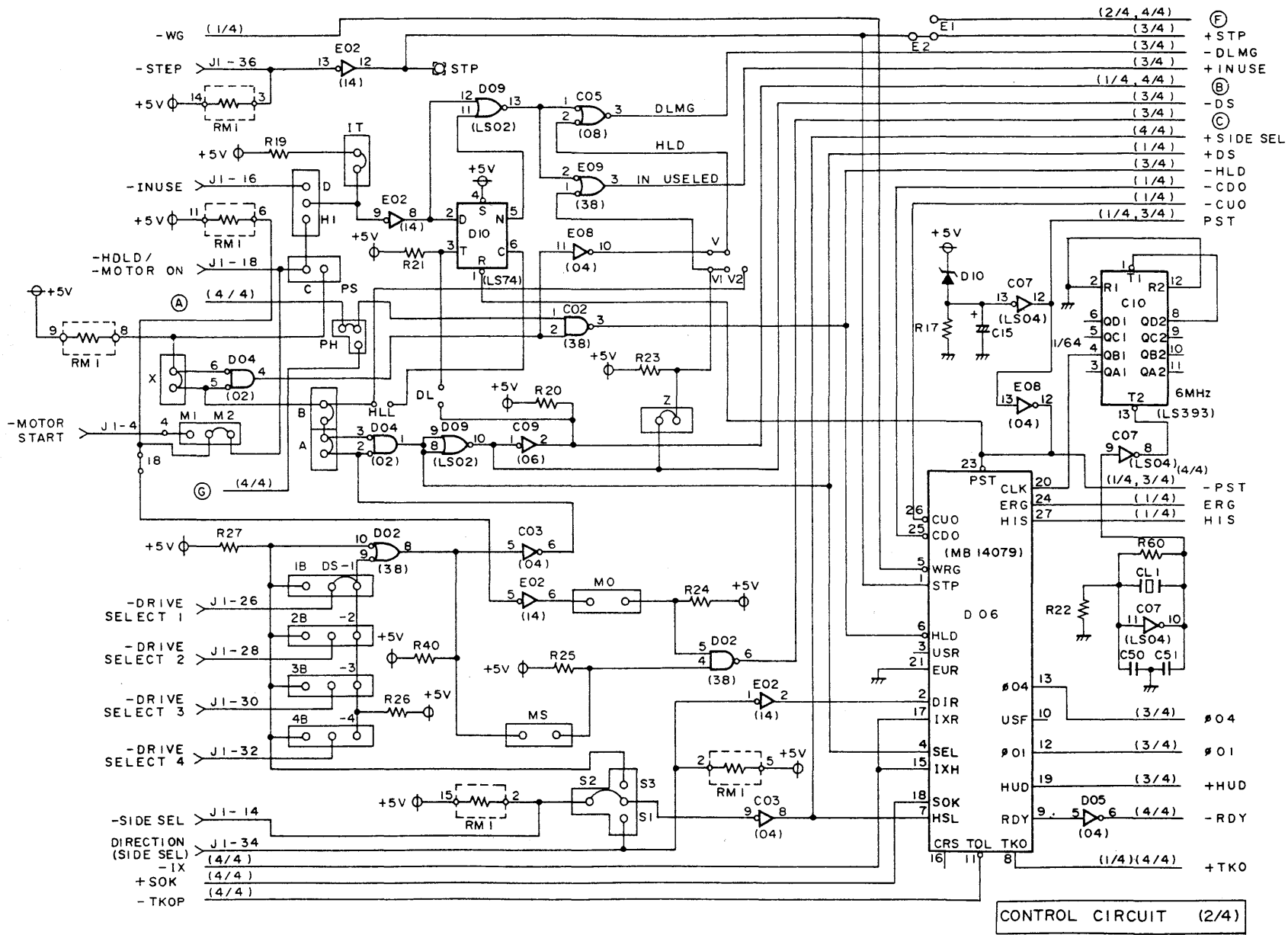
* This parts list applies to the PCA, NAFHG part No. DC447248-03-E.

* * Means "Custom-made for MELCO Computer Works".

* * * Means parts made by MELCO Semiconductor Division.

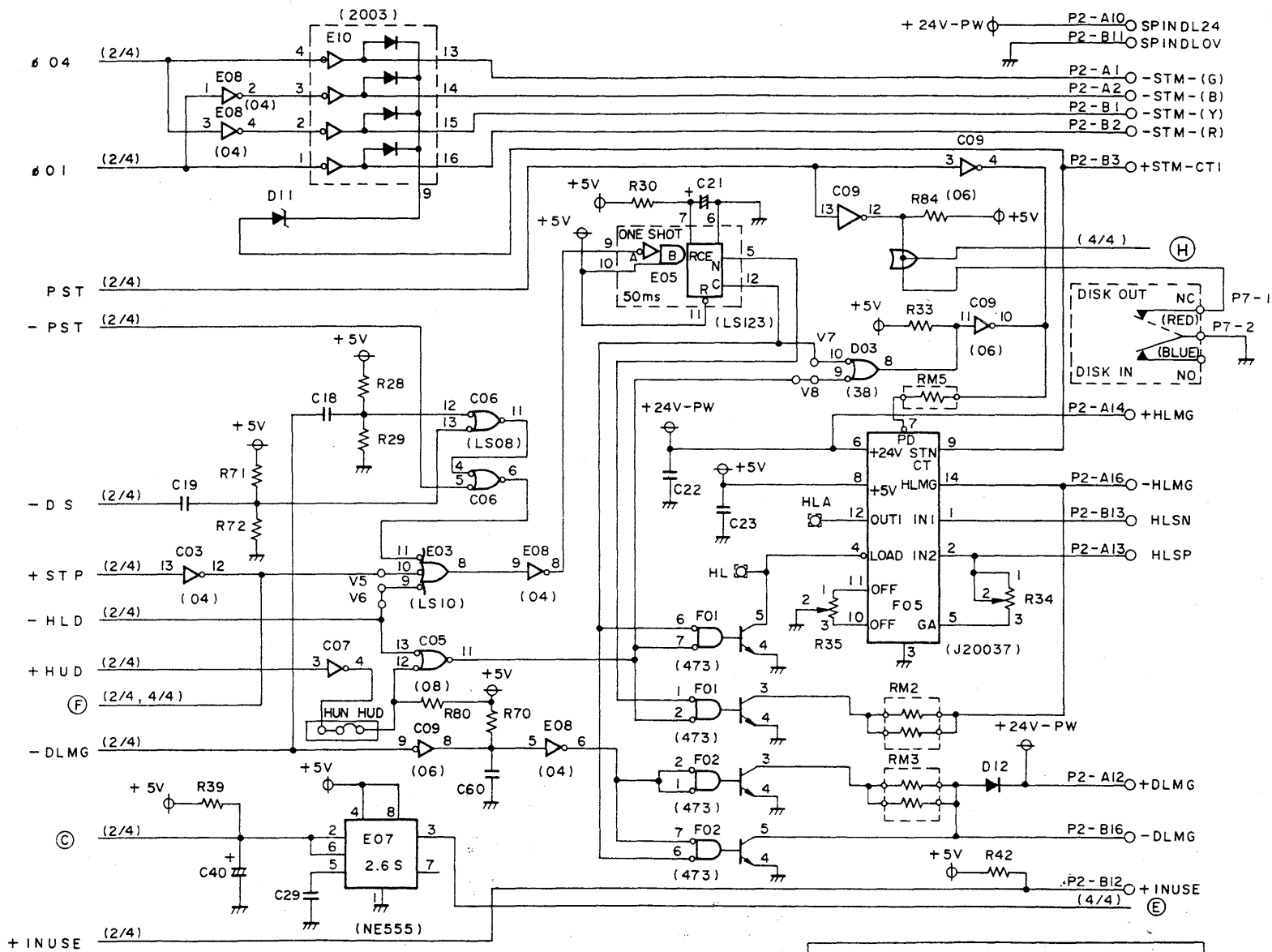


READ/WRITE CIRCUIT (1/4)

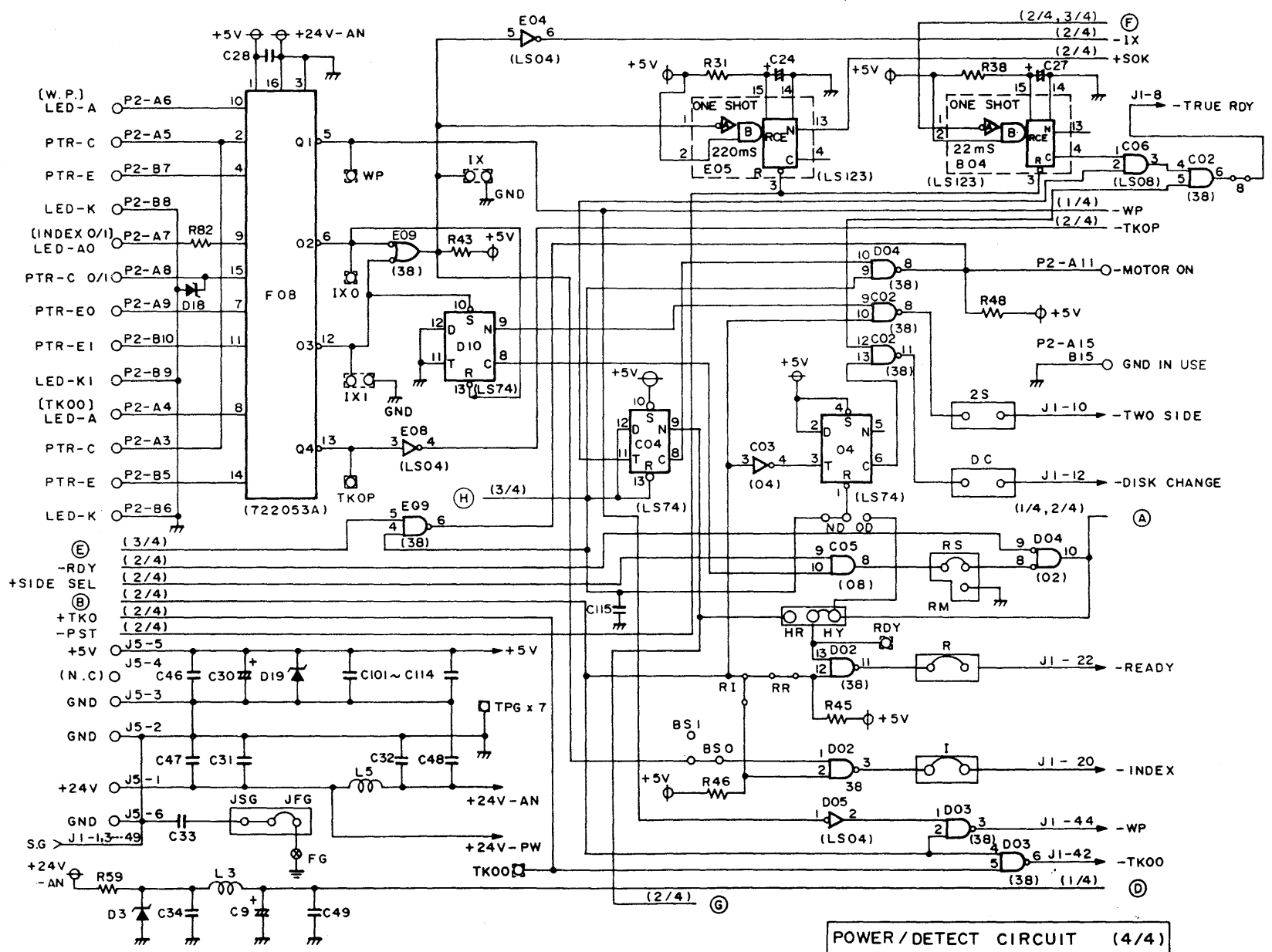


- (2/4, 4/4) E1
- (3/4) E2
- (3/4) + STP
- (3/4) - DLMG
- (3/4) + INUSE
- (1/4, 4/4) (B)
- (3/4) - DS
- (3/4) (C)
- (4/4) + SIDE SEL
- (1/4) + DS
- (3/4) - HLD
- (1/4) - CDO
- (1/4) - CUO
- (1/4, 3/4) PST

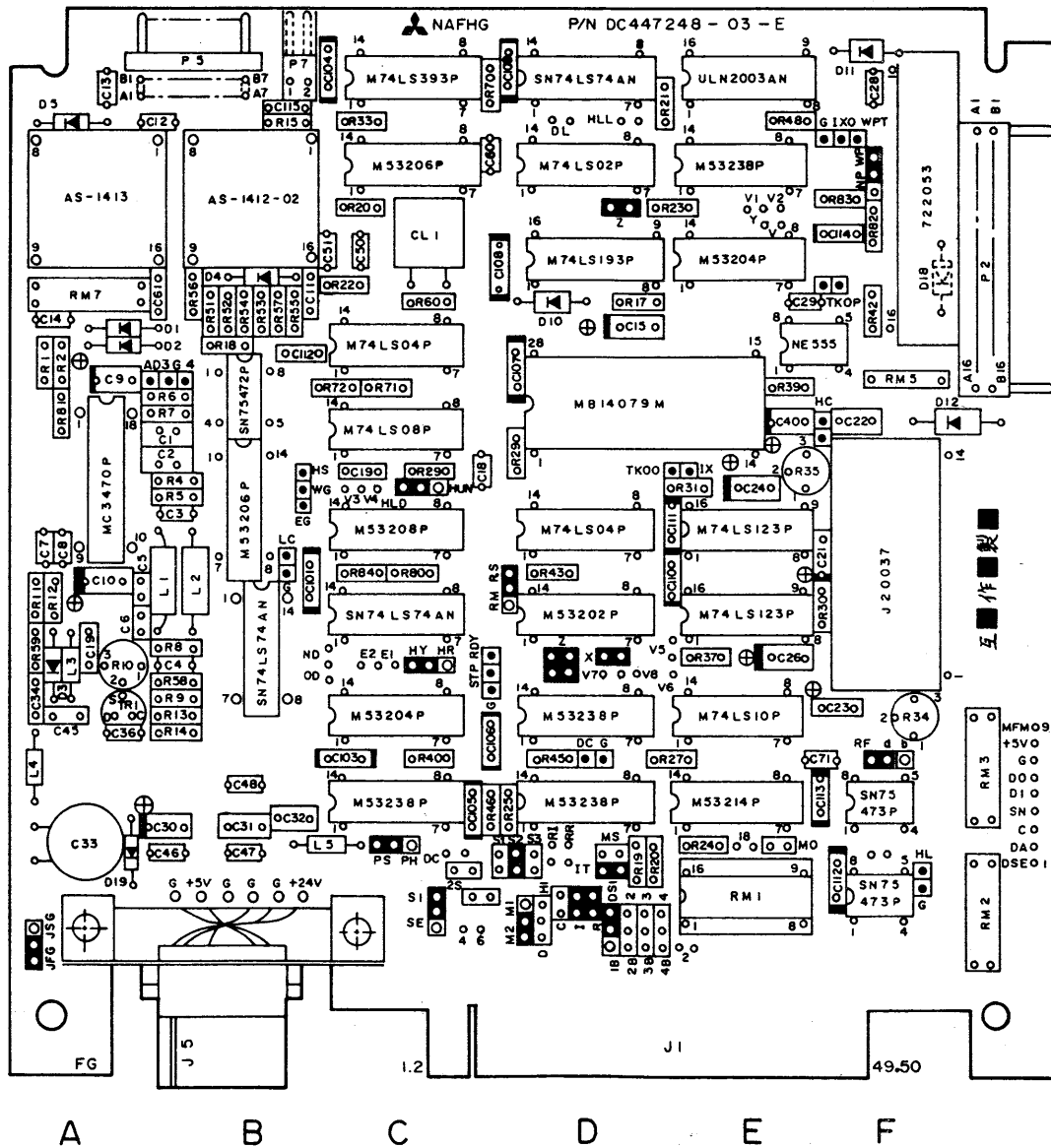
- (4/4) - PST
- (1/4) ERG
- (1/4) HIS
- (4/4) (LS04) (4/4)
- (1/4, 3/4) (1/4)
- (1/4) (1/4)
- (1/4) (1/4)
- (3/4) #04
- (3/4) #04
- (3/4) #01
- (3/4) + HUD
- (4/4) - RDY
- (1/4, 4/4) + TKO



MOTOR/SOLENOID DRIVE CIRCUIT (3/4)



POWER/DETECT CIRCUIT (4/4)



PCB (PCA, NAFHG) COMPONENT LOCATIONS

PARTS LIST OF PCA, NAFHG (P/N DC447248-04-E)

Reference Designation	Part Number	Description	Qty per PCB	
	DC447093-G01	PWB, NAFHG	1	* * * (See page 31)
E1	IC-31-2803	IC-SOCKET	1	YAMAICHI (JAPAN)
P7	IL-2P-S3FP2-1	CONNECTOR	1	JAF (JAPAN)
P3	65625-114 #6 or -214 #6	CONNECTOR	1	BERG
P2	PS-32PA-D4LT1-A1	CONNECTOR	1	JAF (JAPAN)
B5,C1,C1,D1, D2,D2,D3,D4, D4,D9,E2,E6, E6,E8,F1,E8	00-8261-0232-10-854	PIN,MODULE	16	ELCO INTERNATIONAL
A1,B7,C1,C2, C3,C5,C5,D1, D1,D4,F2,F9, F9,C3,D1,D2	00-8261-0033-10-854	PIN,MODULE	14	ELCO INTERNATIONAL
D1,D2	00-8261-0632-10-854	PIN,MODULE	2	ELCO INTERNATIONAL
D1	00-8261-1233-10-854	PIN,MODULE	1	ELCO INTERNATIONAL
A1,C1,C1,C1, C3,C4,C6,D1, D1,D1,D1,D1, D1,D1,D3,D3, F2,F9	00-8261-0282-00-878	PIN,MODULE	18	ELCO INTERNATIONAL
IC D4	M53202P	IC,DIGITAL	1	* * * (See page 31)
IC C3 E8	M53204P	IC,DIGITAL	2	* * *
IC B5 C9	M53206P	IC,DIGITAL	2	* * *
IC C5	M53208P	IC,DIGITAL	1	* * *

(con)

Reference Designation	Part Number	Description	Qty per PCB	
IC E2	M53214P or M74LS14P	IC,DIGITAL	1	* * *
IC C2 D2 D3 E9	M53238P	IC,DIGITAL	4	* * *
IC D9	M74LS02P	IC,DIGITAL	1	* * *
IC D5 C7	M74LS04P	IC,DIGITAL	2	* * *
IC E3	M74LS10P	IC,DIGITAL	1	* * *
IC B4 D10 C4	SN74LS74AN	IC,DIGITAL	3	TEXAS INSTRUMENTS
IC E4 E5	M74LS123P	IC,DIGITAL	2	* * *
IC D8	M74LS193P	IC,DIGITAL	1	* * *
IC C10	M74LS393P	IC,DIGITAL	1	* * *
IC C6	M74LS08P	IC,DIGITAL	1	* * *
IC A6	MC3470P	IC,LINEAR	1	MOTOROLA
IC E10	ULN2003AN	IC,LINEAR	1	TEXAS INSTRUMENTS
IC B6	SN75472P or SN75462P	IC,LINEAR	1	TEXAS INSTRUMENTS
IC F1 F2	SN75473P or SN75463P	IC,LINEAR	2	TEXAS INSTRUMENTS
IC E7	NE555P	IC,LINEAR	1	TEXAS INSTRUMENTS
IC B9	AS-1412-02	IC,HYBRID	1	* *
IC A9	AS-1413	IC,HYBRID	1	* *
IC F8	722053A	IC,HYBRID	1	* *
IC F5	J20037	IC,HYBRID	1	* *

(con)

Reference Designation	Part Number	Description	Qty per PCB	
IC D6	MB14079M	GATE, ARRAY	1	* *
C12,13,14,18, 28,29,45,46, 47,48,49,19, 101,102,103, 104,105,106, 107,108,109, 110,111,112, 113,114,115	PRE122-127C103K50	CAPACITOR, CER. 0.01 μ F 50V \pm 10% (CER.=CERAMIC)	27	MURATA WORKS (JAPAN)
C33	DE1105E472Z1KV	CAPACITOR, CER. 4700pF 1kV +80% -20%	1	MURATA WORKS (JAPAN)
C3,4,50,51	RPE122-127CH471J50	CAPACITOR, CER. 470pF 50V \pm 5%	4	MURATA WORKS (JAPAN)
C8	RPE122-127CH151J50	CAPACITOR, CER. 150pF 50V \pm 5%	1	MURATA WORKS (JAPAN)
C11	RPE122-127CH101J50	CAPACITOR, CER. 100pF 50V \pm 5%	1	MURATA WORKS (JAPAN)
C36,60,71	RPE122-127CH102J50	CAPACITOR, CER. 1000pF 50V \pm 5%	3	MURATA WORKS (JAPAN)
C34,61,22, 23,31,32	RPE123-127F155Z25	CAPACITOR, CER. 1.5 μ F 25V +80% -20%	6	MURATA WORKS (JAPAN)
C7	RPE122-127CH331J50	CAPACITOR, CER. 330pF 50V \pm 5%	1	MURATA WORKS (JAPAN)
C1,2	MFLP5002-223K	CAPACITOR, PLA. 0.022 μ F 50V \pm 10% (PLA.=PLASTIC)	2	MATSUO ELEC- TRIC (JAPAN)
C5	MFLP5002-222K	CAPACITOR, PLA. 2200pF 50V \pm 10%	1	MATSUO ELEC- TRIC (JAPAN)
C6	MFLP5002-102K	CAPACITOR, PLA. 0.001 μ F 50V \pm 10%	1	MATSUO ELEC- TRIC (JAPAN)

(con)

Reference Designation	Part Number	Description	Qty per PCB	
C9	242M2502-475M	CAPACITOR,TANT. 4.7 μ F 25V \pm 20% (TANT.=TANTALUM)	1	MATSUO ELEC- TRIC (JAPAN)
C10,30	242M1602-226M	CAPACITOR,TANT. 22 μ F 10V \pm 20%	2	MATSUO ELEC- TRIC (JAPAN)
C15,26	242M3502-155M	CAPACITOR,TANT. 1.5 μ F 35V \pm 20%	2	MATSUO ELEC- TRIC (JAPAN)
C40	242M1602-106M	CAPACITOR,TANT. 10 μ F 16V \pm 20%	1	MATSUO ELEC- TRIC (JAPAN)
C24	242M1002-156M	CAPACITOR,TANT. 15 μ F 10V \pm 20%	1	MATSUO ELEC- TRIC (JAPAN)
C21	244M1602-335M	CAPACITOR,TANT. 3.3 μ F 16V \pm 20%	1	MATSUO ELEC- TRIC (JAPAN)
CL1	CSA6.00MS	OSCILLATOR,CER.	1	MURATA WORKS (JAPAN)
D1,2	DC447733-G01	DIODE,PAIR	1	* *
D5	NDP115	DIODE	1	NATIONAL COMPONENT INC.
D12	SR1FM-2	DIODE	1	* * *
D3	MZ312	DIODE,ZENER 12V	1	* * *
D4	MZ306-B	DIODE,ZENER 6V	1	* * *
D18	MZ305	DIODE,ZENER 5V	1	* * *
D10	RD3.0EB2	DIODE,ZENER 3V	1	NEC (JAPAN)
D11	RD15FB	DIODE,ZENER 15V	1	NEC (JAPAN)
D19	RD6.8FB	DIODE,ZENER 6.8V	1	NEC (JAPAN)
L1,2	TP0410-331J	INDUCTOR 330 μ H \pm 5%	2	TDK (JAPAN)
L3,4,5	TP-0206-101K	INDUCTOR 100 μ H \pm 10%	3	TDK (JAPAN)

(con)

Reference Designation	Part Number	Description	Qty per PCB	
R81	NL1/4J8201F	RESISTOR 8.2k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R1,2	NL1/4J6801F	RESISTOR 6.8k Ω 1/4W \pm 1%	2	SEF (JAPAN)
R4,5	NL1/4J4700F	RESISTOR 470 Ω 1/4W \pm 1%	2	SEF (JAPAN)
R6,7,28,70, 71	NL1/4J1001F	RESISTOR 1k Ω 1/4W \pm 1%	5	SEF (JAPAN)
R9,19,26,27, 82	NL1/4J1500F	RESISTOR 150 Ω 1/4W \pm 1%	5	SEF (JAPAN)
R12,22,53,54	NL1/4J2201F	RESISTOR 2.2k Ω 1/4W \pm 1%	4	SEF (JAPAN)
R13,15,18	NL1/4J3301F	RESISTOR 3.3k Ω 1/4W \pm 1%	3	SEF (JAPAN)
R14,30	NL1/4J4702F	RESISTOR 47k Ω 1/4W \pm 1%	2	SEF (JAPAN)
R17	NL1/4J1200F	RESISTOR 120 Ω 1/4W \pm 1%	1	SEF (JAPAN)
R20,21,23,24, 25,33,40,43, 45,46,60,48, 11,80,83,84	NL1/4J4701F	RESISTOR 4.7k Ω 1/4W \pm 1%	16	SEF (JAPAN)
R38	NL1/4J1502F	RESISTOR 15k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R37	NL1/4J2701F	RESISTOR 2.7k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R8,29,59,72	NL1/4J1501F	RESISTOR 1.5k Ω 1/4W \pm 1%	4	SEF (JAPAN)
R31	NL1/4J3902F	RESISTOR 39k Ω 1/4W \pm 1%	1	SEF (JAPAN)

(con)

Reference Designation	Part Number	Description	Qty per PCB	
R58	NL1/4J1002F	RESISTOR 10k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R57	NL1/4J5601F	RESISTOR 5.6k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R39	NL1/4J2203F	RESISTOR 220k Ω 1/4W \pm 1%	1	SEF (JAPAN)
R51,52	NL1/4J3900F	RESISTOR 390 Ω 1/4W \pm 1%	2	SEF (JAPAN)
R55,56	NL1/4J3300F	RESISTOR 330 Ω 1/4W \pm 1%	2	SEF (JAPAN)
R42	NL1/4J1800F	RESISTOR 180 Ω 1/4W \pm 1%	1	SEF (JAPAN)
RM2	PSR1.5A301J	RESISTOR,MODULE 300 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
RM3	PSR1.5A441J	RESISTOR,MODULE 440 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
RM7	PSR1.5A561J	RESISTOR,MODULE 560 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
RM5	PSR1.5B821J	RESISTOR,MODULE 820 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
RM1	M16A-151J	RESISTOR,MODULE 150 Ω \pm 5%	1	IWAKI MUSEN (JAPAN)
R10	3321P-1-503	RESISTOR,VARIABLE	1	MURATA WORKS (JAPAN)
R34	3321P-1-202	RESISTOR,VARIABLE	1	MURATA WORKS (JAPAN)
R35	3321P-1-103	RESISTOR,VARIABLE	1	MURATA WORKS (JAPAN)
TR1	MPF970	TRANSISTOR,FET	1	MOTOROLA
	DC446629-001	BRACKET,CONNECTOR	1	* * *

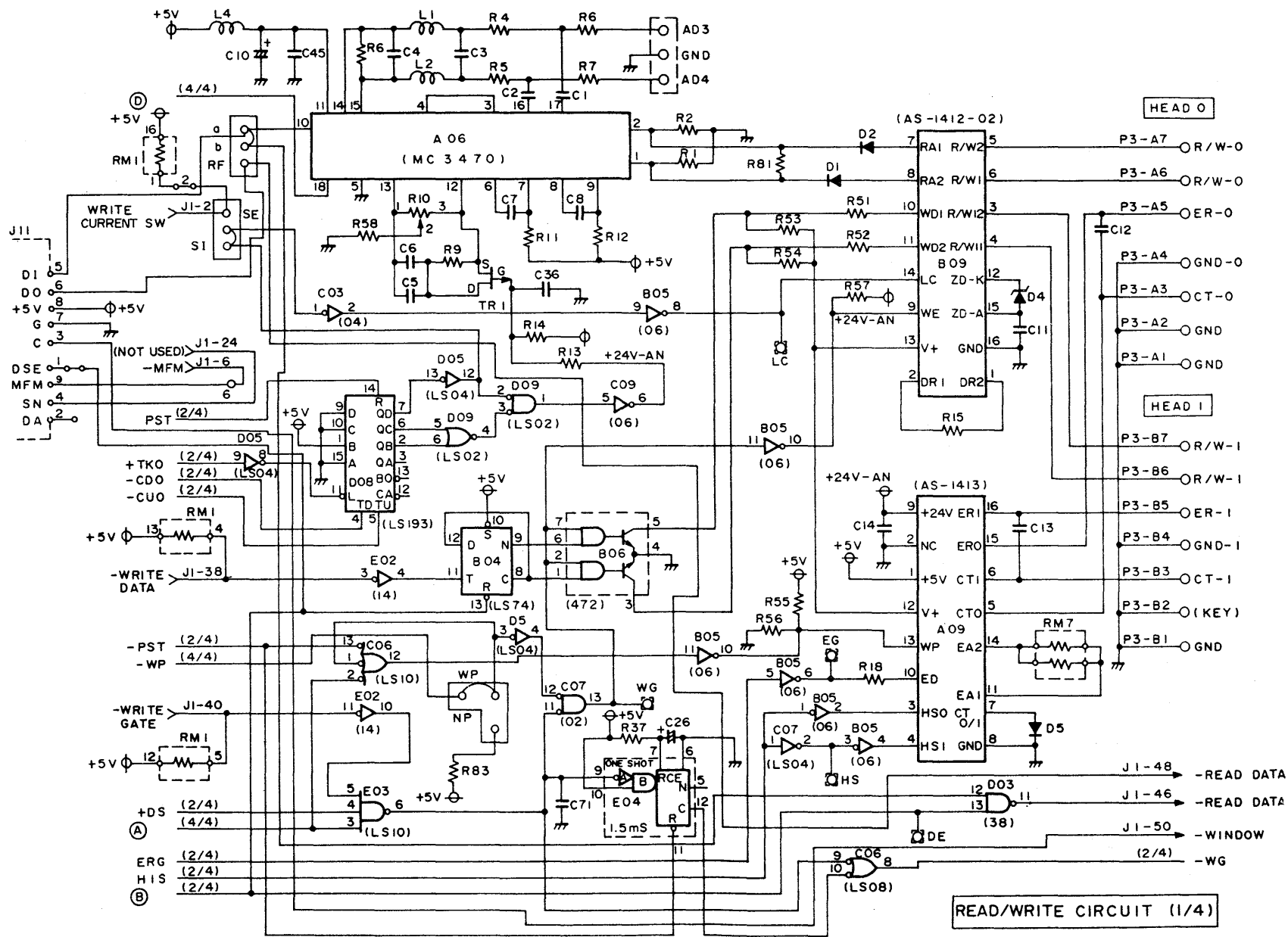
(con)

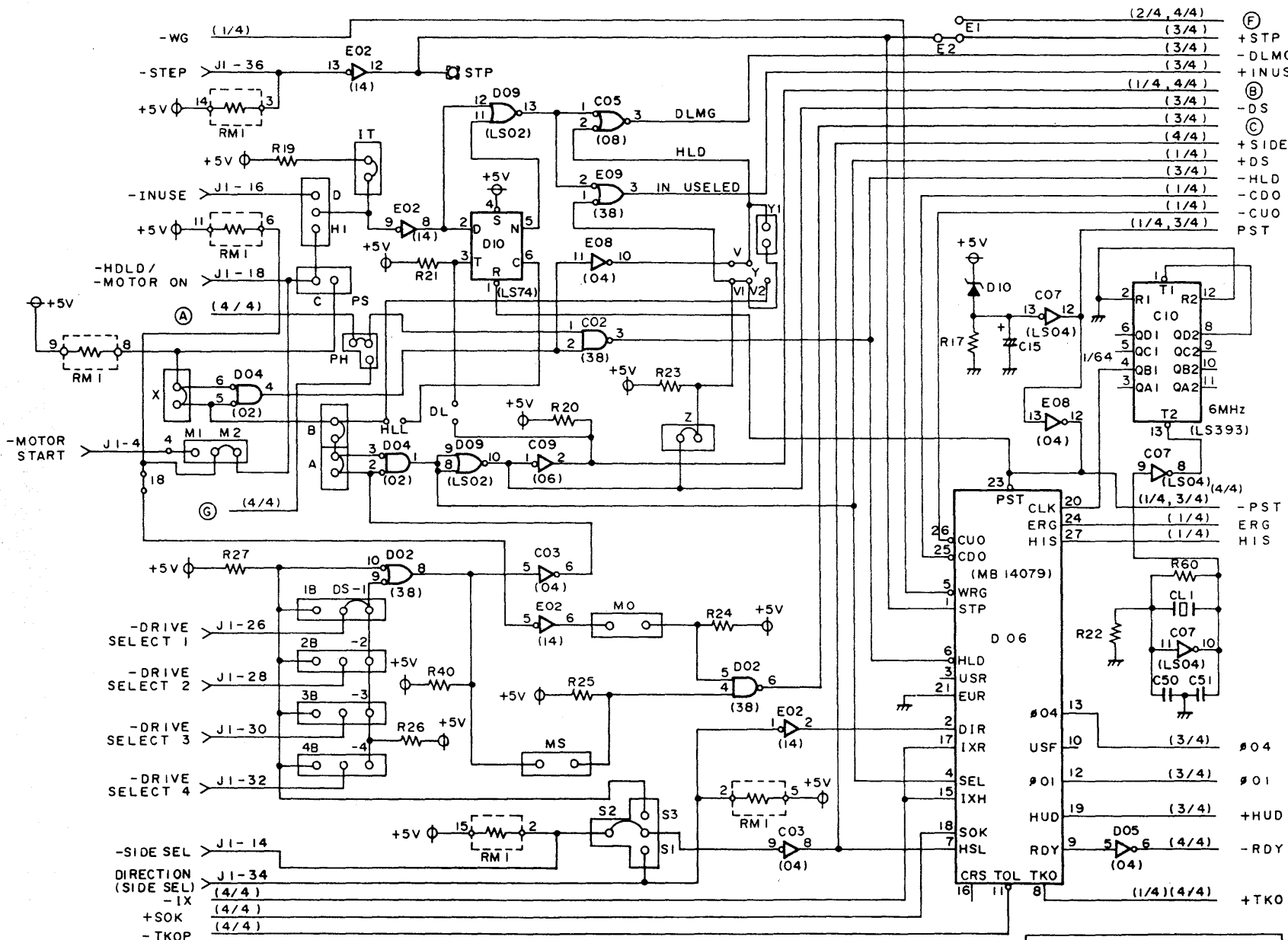
Reference Designation	Part Number	Description	Qty per PCB	
J5	1-480271-0	CONNECTOR	1	AMP INC.
	60618-1	CONTACT,CONNECTOR	5	AMP INC.
	DCPS-112002-006	SCREW,PAN HD,WASHERED, M3 x 0.5 x 6BS	2	
	UL1061AWG24(7)-2	WIRE,VINYL	0.1MR	* *
	UL1061AWG24(7)-0	WIRE,VINYL	0.15MR	* *

* This parts list applies to the PCA, NAFHG part No. DC447248-04-E.

* * Means "Custom-made for MELCO Computer Works".

* * * Means parts made by MELCO Semiconductor Division.

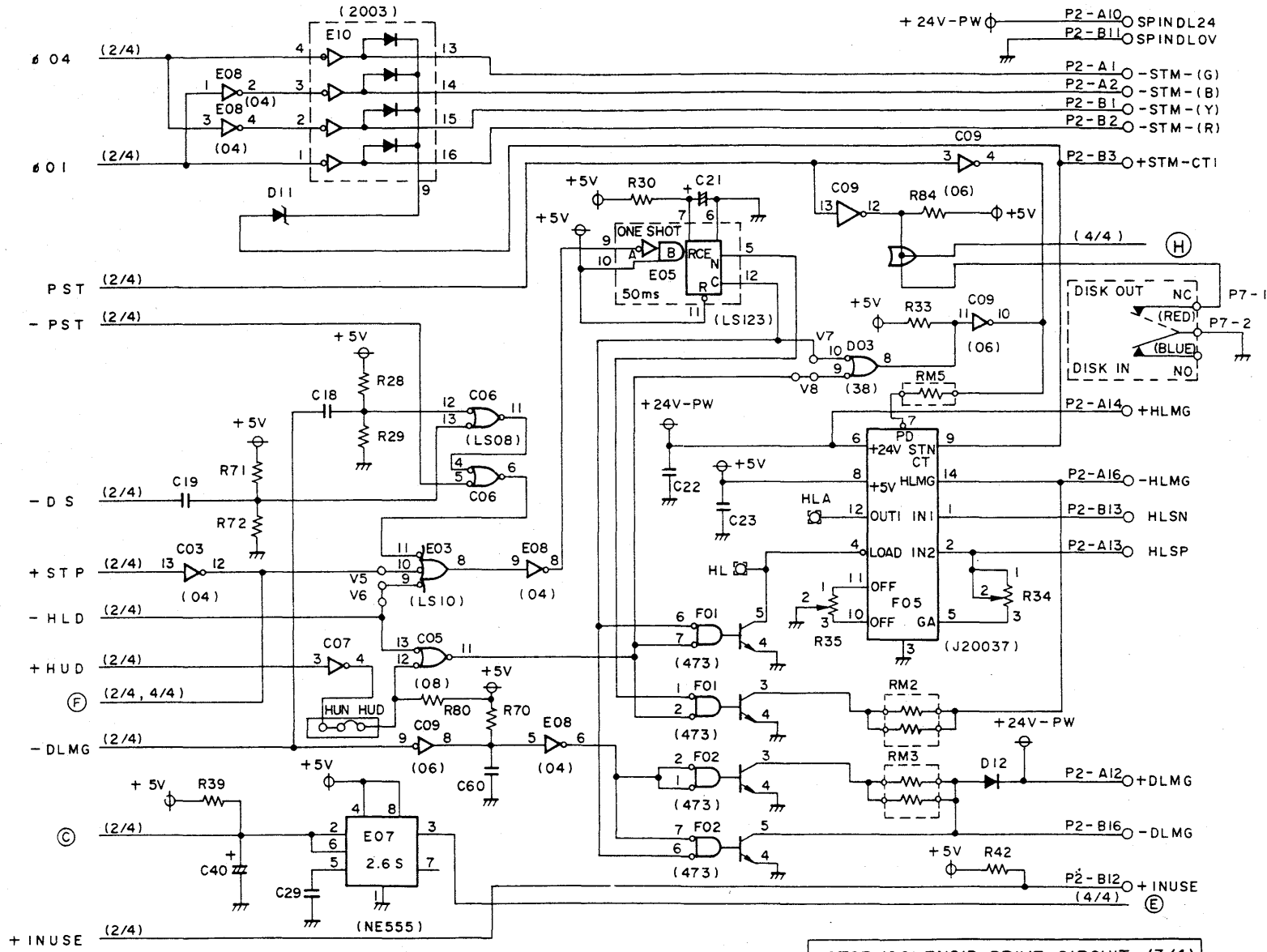




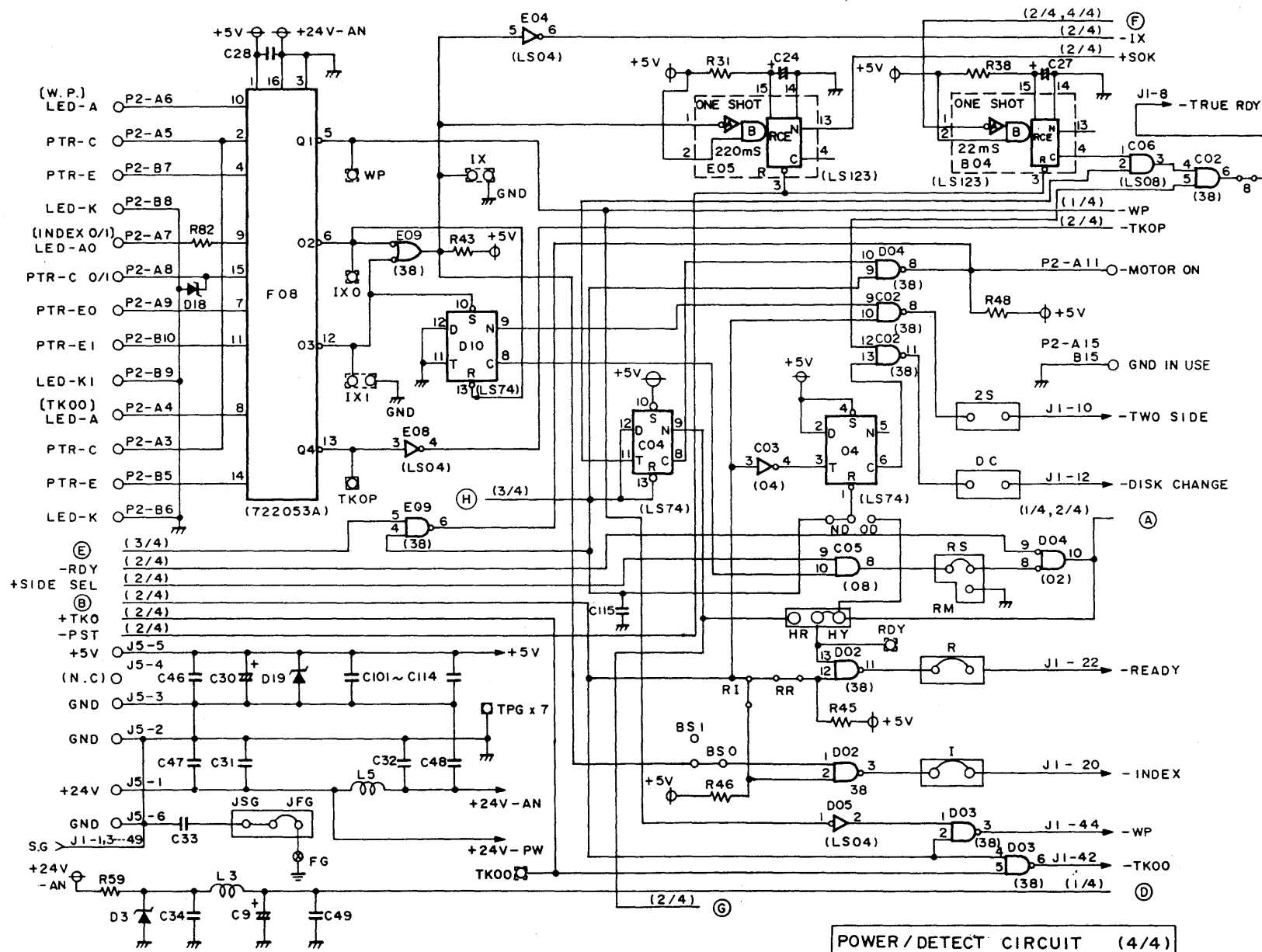
- (2/4, 4/4)
- (3/4)
- + STP (3/4)
- DLMG (3/4)
- + INUSE (3/4)
- (1/4, 4/4)
- (3/4)
- (4/4)
- (1/4)
- + SIDE SEL (3/4)
- + DS (1/4)
- HLD (1/4)
- CDO (1/4)
- CUO (1/4)
- PST (1/4, 3/4)

- PST (1/4)
- ERG (1/4)
- HIS (1/4)

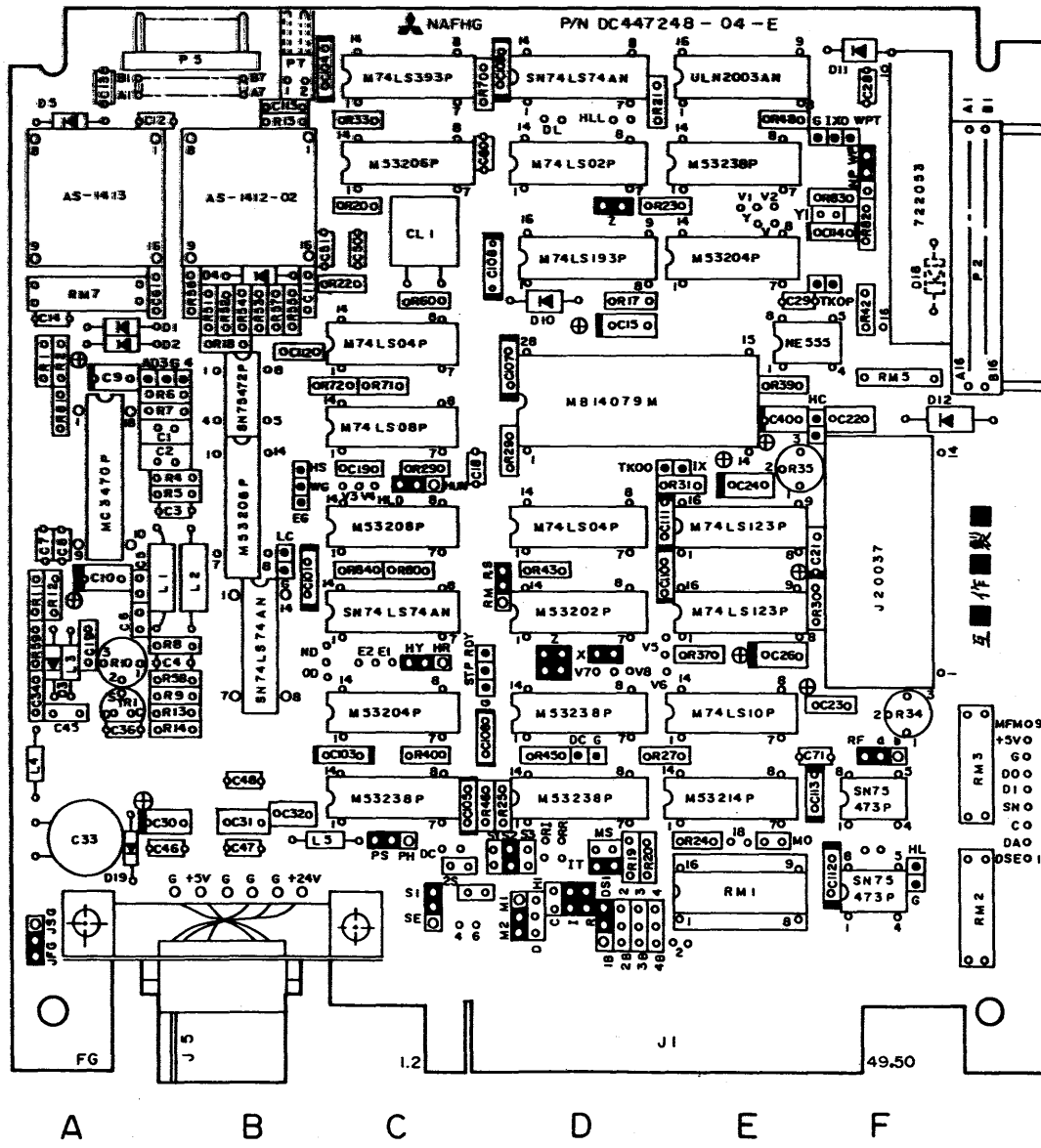
CONTROL CIRCUIT (2/4)



MOTOR/SOLENOID DRIVE CIRCUIT (3/4)



POWER/DETECT CIRCUIT (4/4)



PCB (PCA, NAFHG) COMPONENT LOCATIONS



SPARE PARTS LIST

Introduction

The following is a spare parts list for the M2896-63 8-inch Half-Height FDD. Part numbers given in this list correspond to those in the illustrated parts lists (TJ2-G4308D). Use of the corresponding index number to reference the illustrated parts list permits the user to obtain an idea of the shape and structure of parts.

Spare parts are normally replaced only by the OEM customer or dealer.

Table 1 Spare Parts List

No.	Part number	Name	Corresponding index number in illustrated parts list
1	DC242325-001	Panel front (FW)	Figure 1-2 (P1)
2	DC242325-002	Panel front (FB)	Figure 1-2 (P4)
3	DC446630-001	Button (FW)	Figure 1-3
4	DC446630-002	Button (FB)	Figure 1-3
5	DC343258-G02	HLMG assembly	Figure 3-1 (P4)
6	DC343259-G02	STM assembly	Figure 3-2
7	DC343262-G02	DLMG assembly	Figure 3-3
8	DC343261-G01	Guide R assembly	Figure 3-4
9	DC343260-G01	Guide L assembly	Figure 3-5
10	DC343249-G01	Carriage (F) assembly	Figure 3-6
11	DC243281-G02	Bridge assembly	Figure 3-7
12	DC343156-G01	Handle assembly	Figure 3-8 (P4)
13	DC343156-G02	Handle assembly	Figure 3-8
14	DC446807-G02	Spindle motor assembly	Figure 3-9 (P4)
15	DC446806-G02	Indicator LED assembly	Figure 3-10
16	DC446808-G03	TK00 sensor assembly	Figure 3-11
17	DC446808-G04	WP sensor assembly	Figure 3-12
18	DC446809-G02	Index sensor PT assembly	Figure 3-13
19	DC446608-001	Plate, latch, F	Figure 7-4 (P9)
20	DC446610-002	Hinge, plate	Figure 7-5
21	DC446611-001	Ejector, kick	Figure 7-6

Note: The PCB assemblies are listed in table 2 (P3).

P: page

Table 1 Spare Parts List (con.)

No.	Part number	Name	Corresponding index number in illustrated parts list
22	DC446816-G02	Index sensor LED assembly	Figure 7-7
23	DC446817-G01	Collect assembly	Figure 7-8
24	DC342725-G02	Fastener kit	See table 3
25	DC448090-G01	Micro switch assembly	Figure 3-31

Note: The PCB assemblies are listed in table 2 (P3).

P: page

Table 2 PCB Assemblies

No.	Part number	Name	Corresponding index number in illustrated parts list
1	DC447248-00-A	PCB (PCA, NAFHG)	Figure 1-5
2	DC447248-01-B	PCB (PCA, NAFHG)	Figure 1-5
3	DC447248-02-C	PCB (PCA, NAFHG)	Figure 1-5
4	DC447248-03-D	PCB (PCA, NAFHG)	Figure 1-5
5	DC447248-03-E	PCB (PCA, NAFHG)	Figure 1-5
6	DC447248-04-E	PCB (PCA, NAFHG)	Figure 1-5 (P1)

Note: The respective sections of each part number have the following meanings:

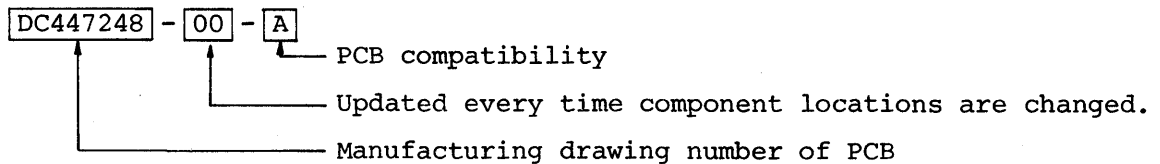


Table 3 Fastener Kit

Part number	Name	Q'ty	Corresponding index number in illustrated parts list
DCPS-112002-006	Screw, pan head, washered M3x0.5x6 BS	20	Figure 1-7 Figure 3-24 Figure 5-3 Figure 7-12
DCPS-112003-001	Screw, pan head, washered M3x0.5x8 FE	20	Figure 1-6 Figure 3-22 Figure 7-13
DCPS-112003-010	Screw, pan head, washered M3x0.5x10 FE	10	Figure 3-23 Figure 4-12
DCPS-112004-002	Screw, pan head M3x0.5x6 FE	10	Figure 3-27 Figure 7-10
DCPS-112004-003	Screw, pan head M3x0.5x8 FE	10	Figure 6-7
DCPS-112004-016	Screw, pan head M2.5x5 FE	10	Figure 4-11
DCPS-112005-009	Screw, pan head M3x0.5x6 BS	10	Figure 3-26
DCPS-112005-014	Screw, pan head M4x0.7x8 BS	10	Figure 3-25
DCPS-112009-001	Bolt, sockets M2x6 FE	10	Figure 3-29
DCPS-112019-008	Nut, hexagonal M3x0.5 BS	10	Figure 4-13
DCPS-132003-002	Washer, plain M3 FE	10	Figure 3-28 Figure 7-11
DCPS-132003-008	Washer, plain M3 BS	10	Figure 4-14
DCPS-132003-009	Washer, plain M4 BS	10	Figure 3-30
DCPS-132004-008	Washer, spring M3 BS	10	Figure 4-15
DC446754-001	Washer C	10	Figure 3-19
3M-PC	Washer	10	Figure 3-21
DCPS-J20002-002	Ring, E, 4 ϕ , SUS	10	Figure 7-9
DCPS-J20003-006	Clamp, wire HP-2N	10	Figure 7-14

Table 3 Fastener Kit (con.)

Part number	Name	Q'ty	Corresponding index number in illustrated parts list
DCPS-J20004-001	Band, wire	10	Figure 8-D
DCPS-172023-001	Clamp MM type	10	Figure 8-B
PS-100	Clamp	10	Figure 8-C



SCHEMATICS AND LOGIC MANUAL

CONTENTS

	PAGE
1. Flexible Disk Drive (Figure 1)	1
PCA-NAFHG (Figure 2)	3
2. Full Mechanism Assembly (Figure 3)	4
STM (Stepping Motor) Assembly (Figure 4)	7
DLMG (Door Lock Magnet) Assembly (Figure 5)	8
Guide R Assembly (Figure 6)	9
Cartridge Guide Assembly (Figure 7)	10
3. Flexible Disk Drive Wiring Diagram (Figure 8)	12

(NOTICE)

The figures in the Illustrated Parts List are above or preceding the parts listings.

The quantity listed is the quantity used in one drive.

The index number is cross referenced to the figure and the corresponding list.

Parts with circled index numbers are provided as maintenance parts.

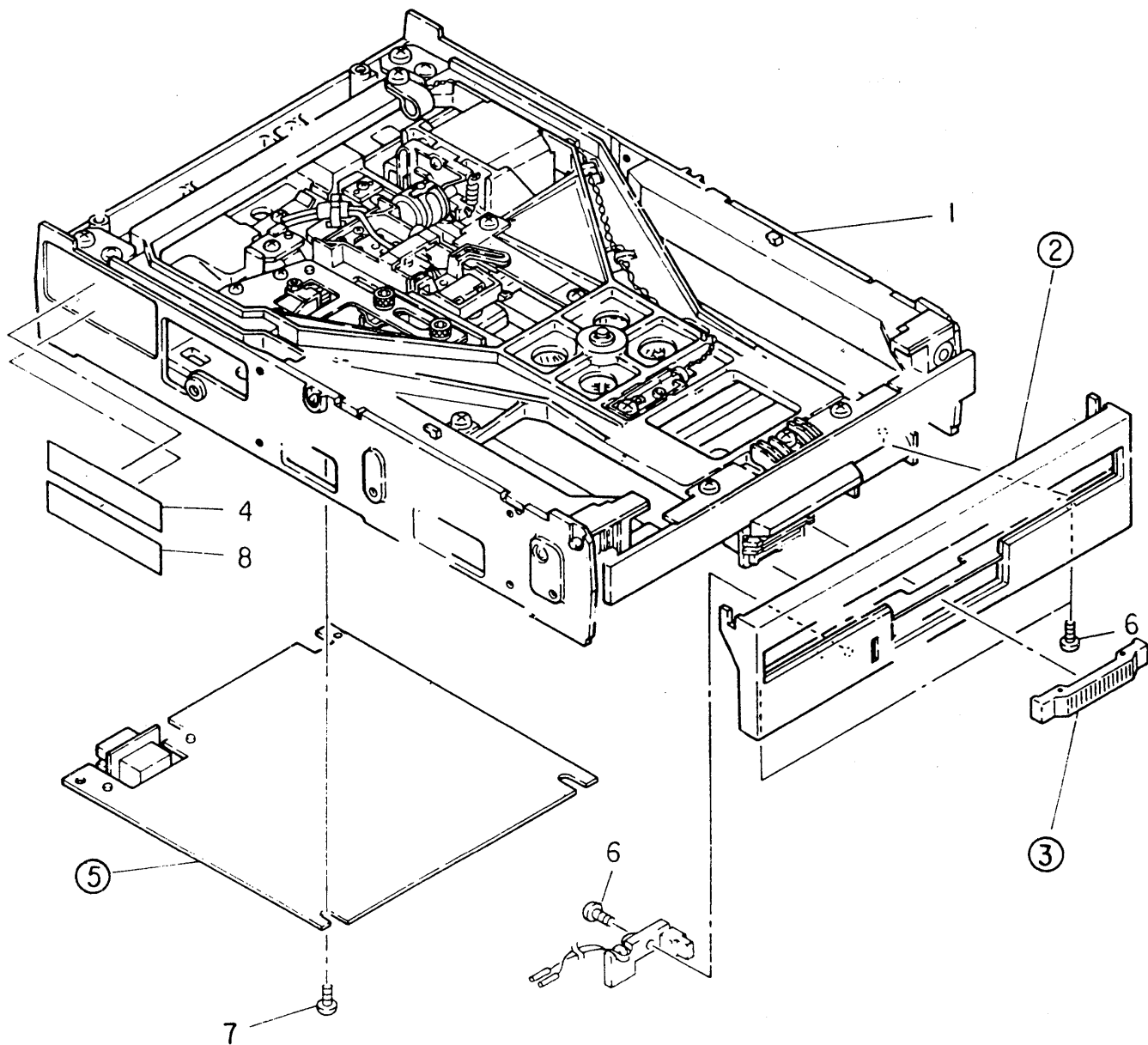


Figure 1 Flexible Disk Drive

Fig. & index number	Part number	Description	Qt'y
Figure 1	DC141400-G01	Flexible disk drive (M2896-63-00M)	
	DC141400-G02	Flexible disk drive (M2896-63-02M)	
	DC141400-G03	Flexible disk drive (M2896-63-00U)	
	DC141400-G04	Flexible disk drive (M2896-63-02U)	
- 1	DC141401-G01	Full mechanism assembly (See figure 3)	1
	DC141401-G02	Full mechanism assembly (See figure 3)	(1)
	DC141401-G03	Full mechanism assembly (See figure 3)	(1)
	DC141401-G04	Full mechanism assembly (See figure 3)	(1)
- ②	DC243225-G01	Panel, front, F (Ivory white)	1
	DC243225-G02	Panel, front, F (Black)	(1)
- ③	DC446630-001	Button (Ivory white)	1
	DC446630-002	Button (Black)	(1)
- 4	DC447255-001	Nameplate (F)	1
- ⑤	DC447278-04-E	PCA-NAFHG	1
- 6	DCPS-112003-001	Screw, pan head, washered M3x0.5x0.8 FE	3
- 7	DCPS-112002-006	Screw, pan head, washered M3x0.5x6 BS	4
- 8	DC447256-001	Revision level (F)	1

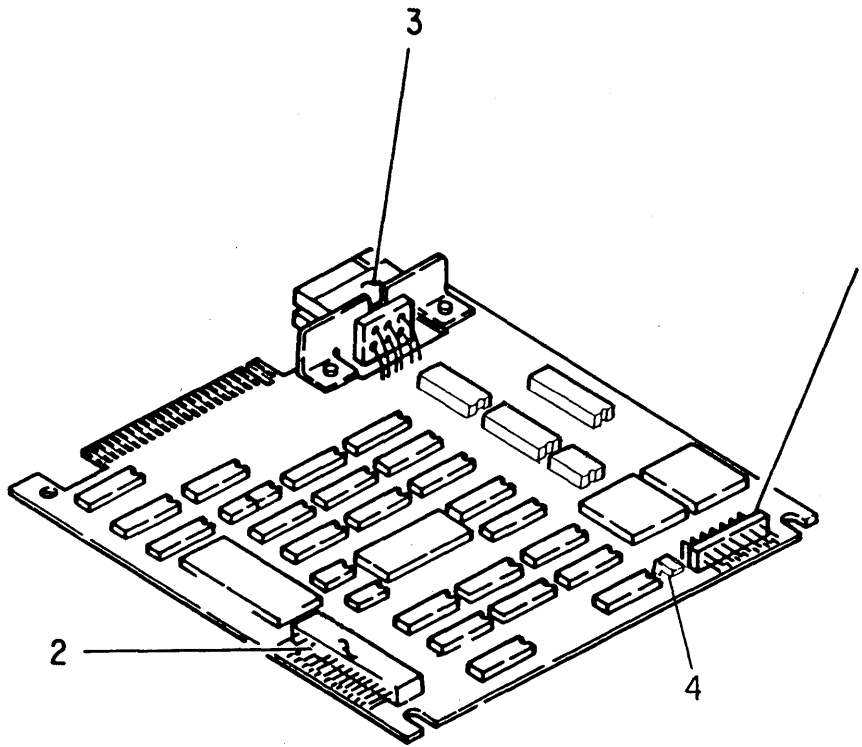


Figure 2 PCA-NAFHG

Fig. & index number	Part number	Description	Q'ty
Figure 2	DC447248-04-E	PCA-NAFHG	
- 1	65625-114 #6	Connector, PWB (P3)	1
- 2	PS-32PA-D4LT1-A1	Connector, PWB (P2)	1
- 3	1-480271-0	Connector, PWB (J5)	1
- 4	IL-2P-S3FP2-1	Connector, PWB (J7)	1

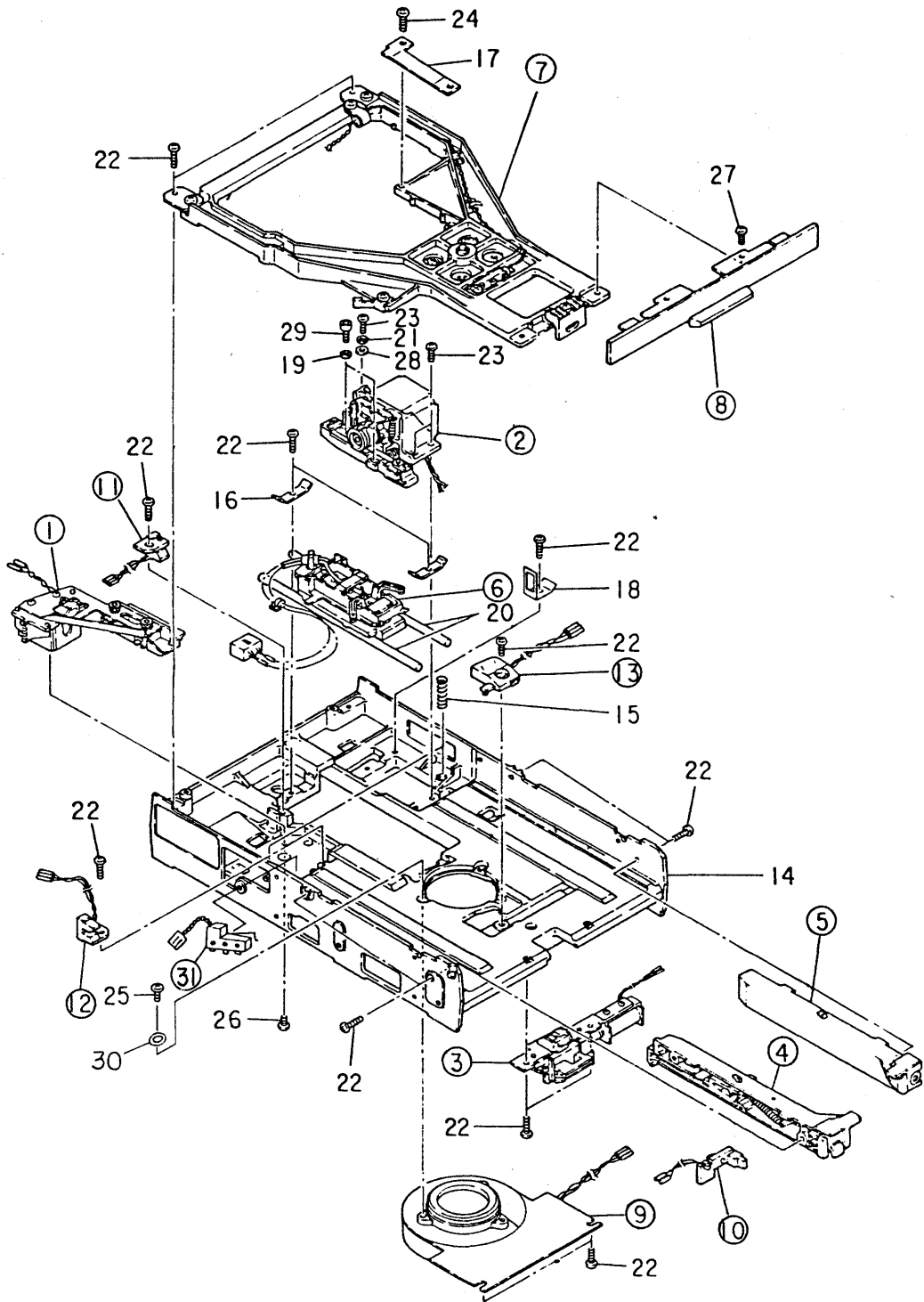


Figure 3 Full Mechanism Assembly

Fig. & index number	Part number	Description	Qt'y	
Figure 3	DC141401-G01	Full mechanism assembly (M2896-00M)		
	DC141401-G02	Full mechanism assembly (M2896-02M)		
	DC141401-G03	Full mechanism assembly (M2896-00U)		
	DC141401-G04	Full mechanism assembly (M2896-02U)		
	- ①	DC343258-G02	HLMG assembly (See figure 4)	1
	- ②	DC343259-G02	STM assembly (See figure 5)	1
	- ③	DC343262-G02	DLMG assembly (See figure 6)	1
	- ④	DC343261-G01	Guide R assembly	1
	- ⑤	DC343260-G01	Guide L assembly	1
	- ⑥	DC343249-G01	Carriage (F) assembly	1
	- ⑦	DC243281-G02	Cartridge guide assembly	1
	- ⑧	DC343156-G01	Handle assembly (Ivory white)	1
		DC343156-G02	Handle assembly (Black)	(1)
	- ⑨	DC446807-G02	Spindle Motor assembly	1
	- ⑩	DC446806-G02	Indicator LED assembly	1
	- ⑪	DC446808-G03	TK00 sensor assembly	1
	- ⑫	DC446808-G04	Write protect sensor assembly	1
	- ⑬	DC446809-G02	Index sensor PT assembly	1
	- 14	DC141389-001	Frame (M2896-M)	1
		DC141389-002	Frame (M2896-U)	(1)
	- 15	DC343150-004	Spring BR	2
	- 16	DC446561-001	Clamp (F)	2
	- 17	DC446607-001	Plate, arm	1
- 18	DC446616-001	Cartridge guide, stopper	1	
- 19	DC446754-001	Washer C	2	
- 20	DC441073-004	Guide, rod	2	
- 21	3M-PC	Washer	1	
- 22	DCPS-112003-001	Screw, pan head, washered M3x0.5x8 FE	16	
- 23	DCPS-112003-010	Screw, pan head, washered M3x0.5x10 FE	3	

(con.)

Fig. & index number	Part number	Description	Q'ty
- 24	DCPS-112002-006	Screw, pan head, washered M3x0.5x6 BS	2
- 25	DCPS-112005-014	Screw, pan head M4x0.7x8 BS	3
- 26	DCPS-112005-009	Screw, pan head M3x0.5x6 BS	2
- 27	DCPS-112004-002	Screw, pan head M3x0.5x6 FE	2
- 28	DCPS-132003-002	Washer, plain M3 FE	1
- 29	DCPS-112009-001	Bolt, socket M2x6 FE	2
- 30	DCPS-132003-009	Washer, plain M4 BS	3
- (31)	DC448090-G01	Micro switch assembly	1

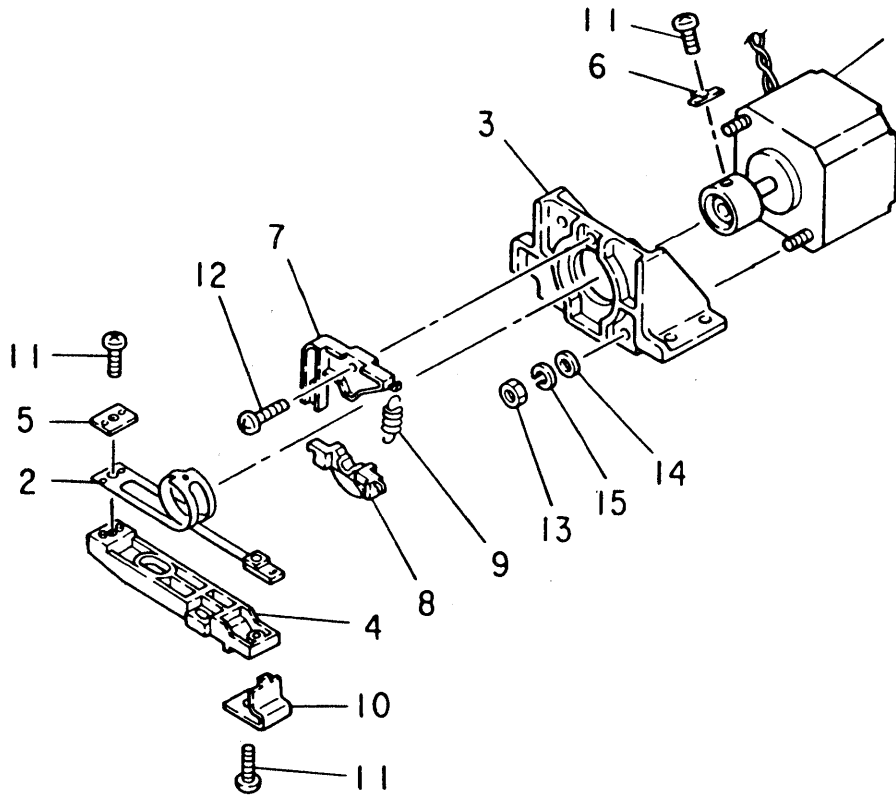


Figure 4 STM (Stepping Motor) Assembly

Fig. & index number	Part number	Description	Q'ty
Figure 4	DC343259-G02	STM assembly	1
- 1	DC446810-G02	STM Subassembly	1
- 2	DC446811-G01	Band assembly	1
- 3	DC343114-001	Sub frame	1
- 4	DC343215-G01	Arm band	1
- 5	DC446562-001	Holder, band (F)	1
- 6	DC446563-001	Clamp, band	1
- 7	DC446858-001	Stopper, capstan	1
- 8	DC446859-001	Dumper, STM	1
- 9	DC446860-001	Spring, S	1
- 10	DC446666-001	Spring, leaf (CR)	1
- 11	DCPS-112004-016	Screw, pan head M2.5x5 FE	3
- 12	DCPS-112003-010	Screw, pan head, washered M3x0.5x1.0 FE	1
- 13	DCPS-112019-008	Nut, hexagonal M3x0.5 BS	2
- 14	DCPS-132003-008	Washer, plain M3 BS	2
- 15	DCPS-132004-008	Washer, spring M3 BS	2

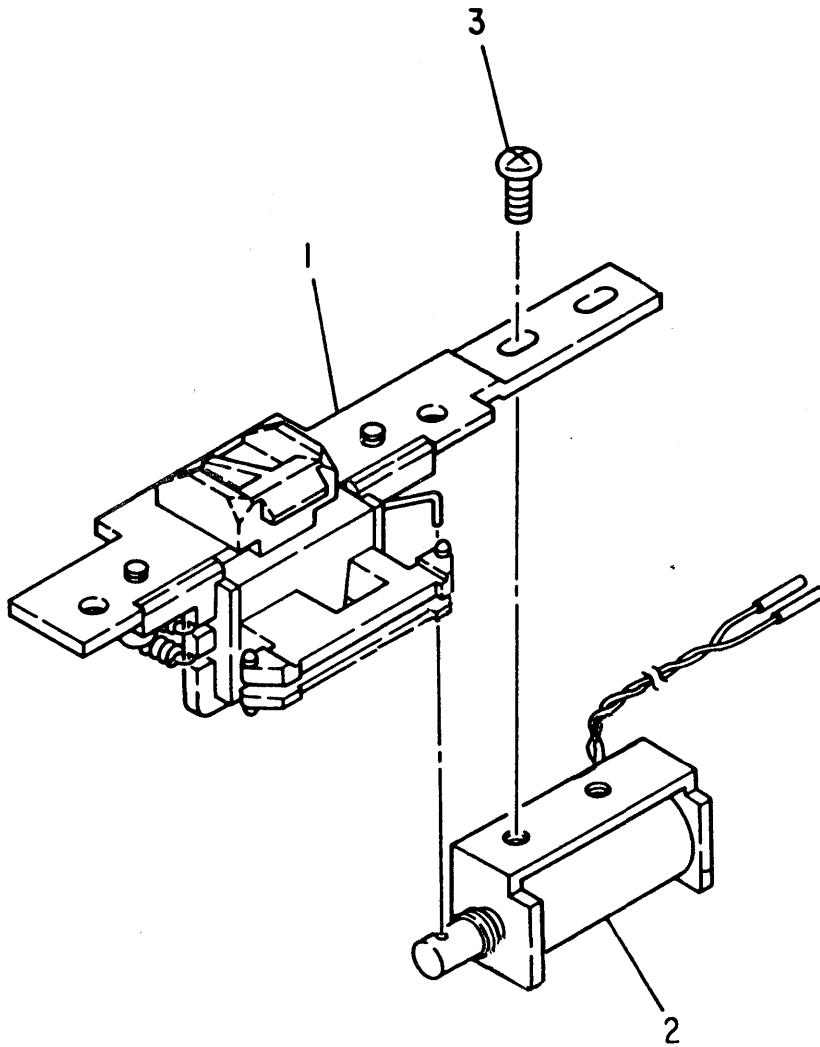


Figure 5 DLMG (Door Lock Magnet) Assembly

Fig. & index number	Part number	Description	Qt'y
Figure 5	DC343262-G02	DLMG assembly	
- 1	DC343337-G01	DLMG subassembly	1
- 2	DC446812-G02	Solenoid DL assembly	1
- 3	DCPS-112002-006	Screw, pan head, washered M3x0.5x6 BS	2

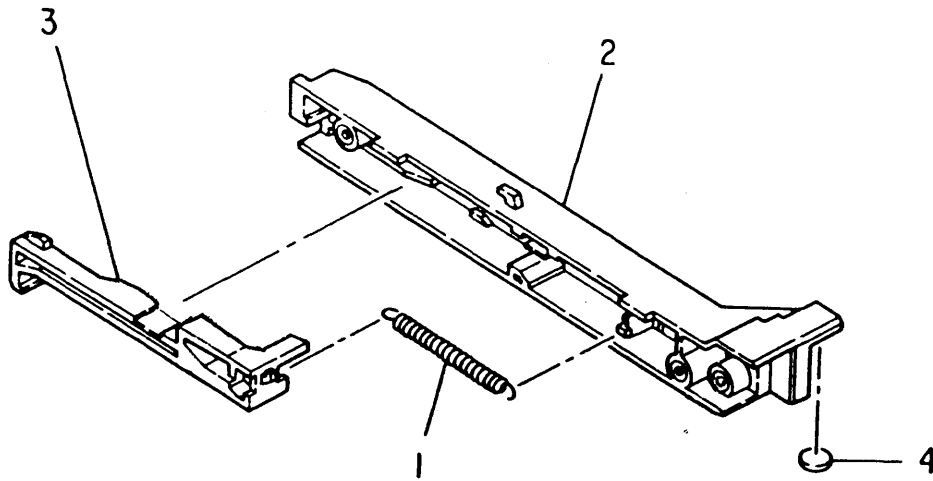


Figure 6 Guide R Assembly

Fig. & index number	Part number	Description	Qt'y
Figure 6	DC343261-G01	Guide R assembly	
- 1	DC343151-003	Spring E	1
- 2	DC343154-G01	Guide R	1
- 3	DC343160-001	Ejector	1
- 4	DC446618-003	Cushion sheet	1

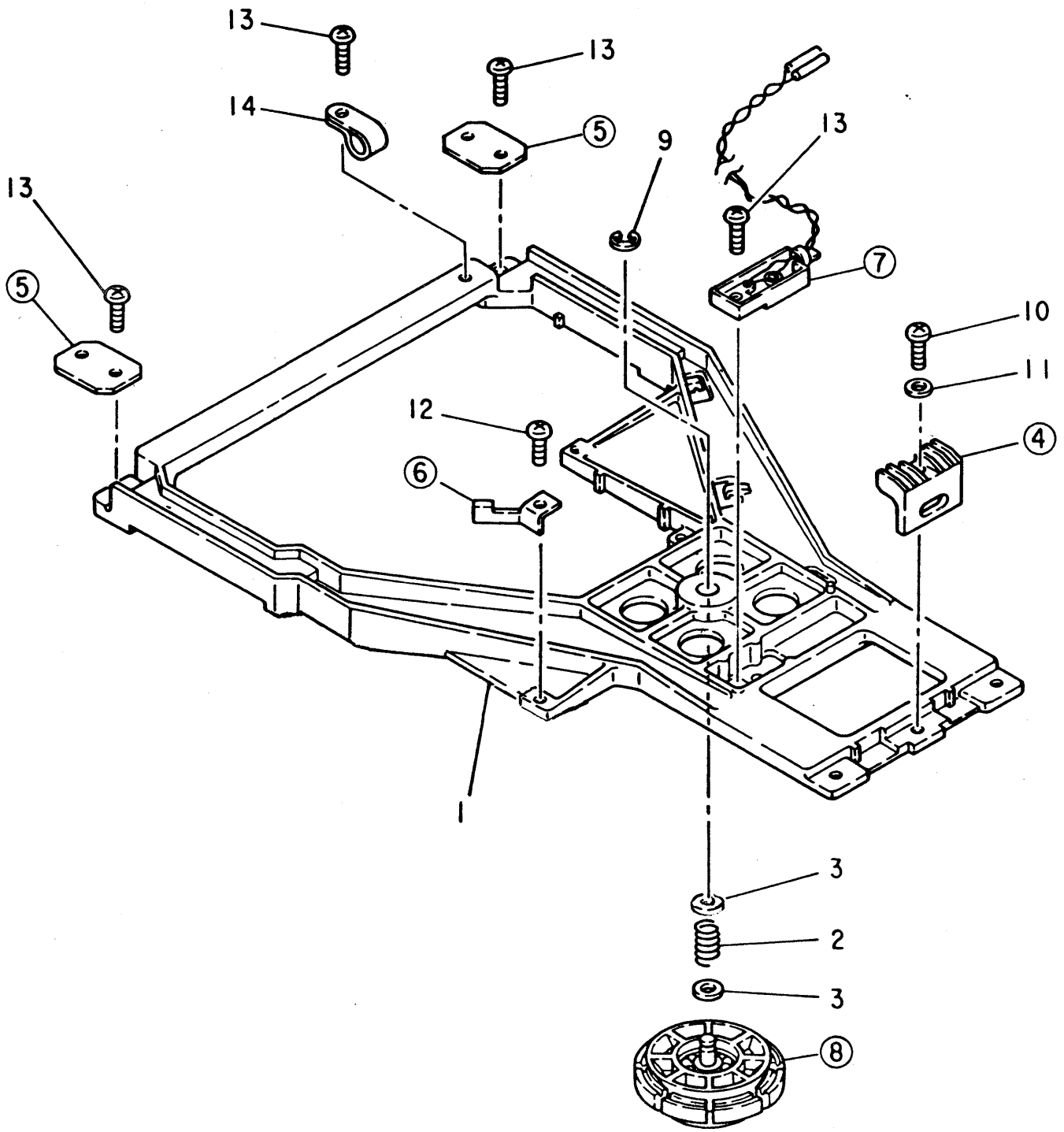
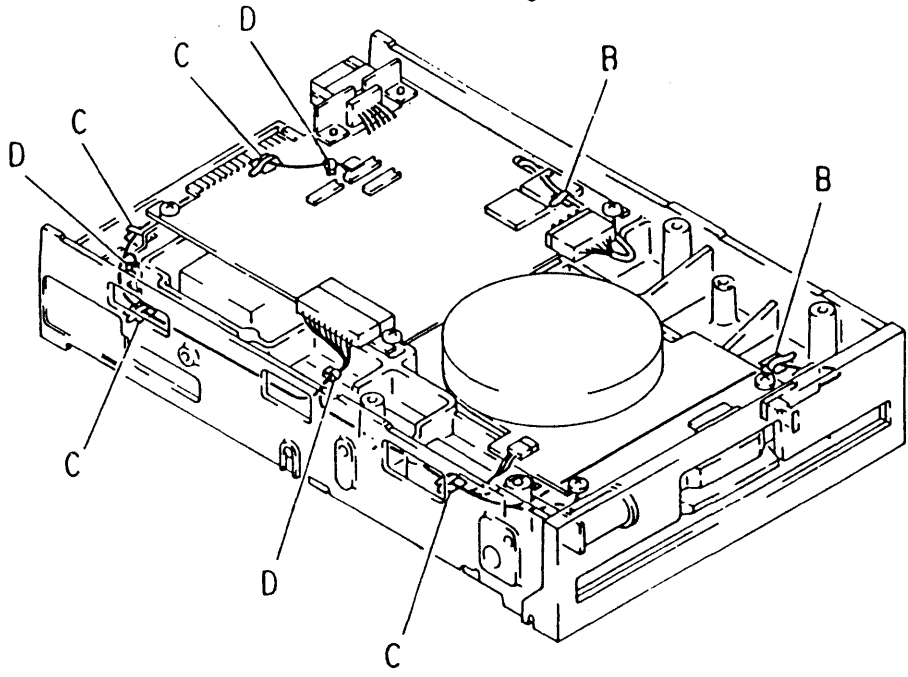
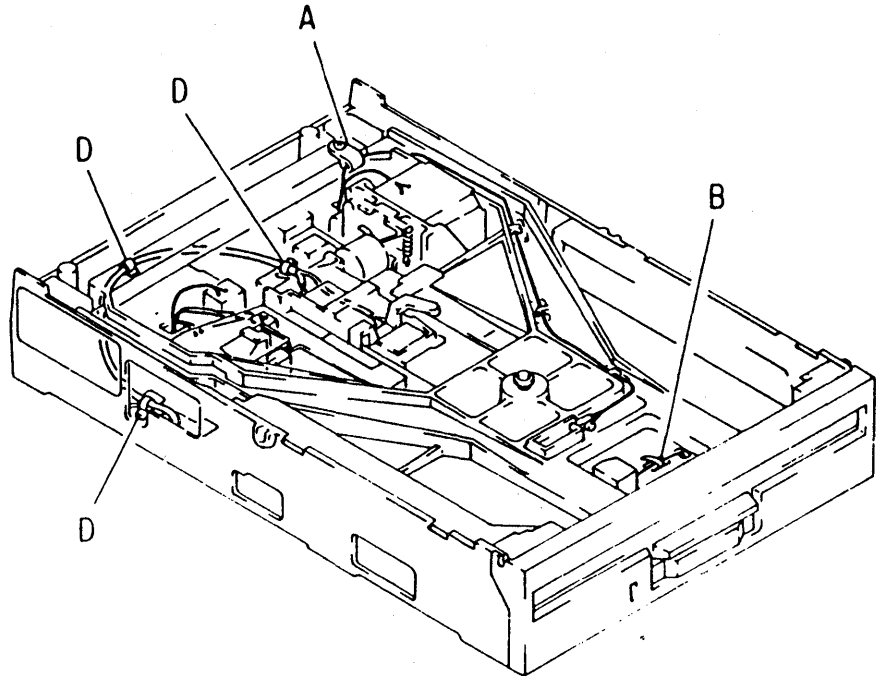


Figure 7 Cartridge Guide Assembly

Fig. & index number	Part number	Description	Qt'y
Figure 7	DC243281-G02	Cartridge guide assembly	
- 1	DC141371-001	Cartridge guide, F	1
- 2	DC446462-001	Spring, cup, A	1
- 3	DC446464-001	Washer	2
- ④	DC446608-001	Plate, latch, F	1
- ⑤	DC446610-001	Hinge plate	2
- ⑥	DC446611-001	Ejector kick	1
- ⑦	DC446816-G02	Index sensor LD assembly	1
- ⑧	DC446817-G01	Collect assembly	1
- 9	DCPS-J20002-002	Ring, E 4 ϕ SUS	1
- 10	DCPS-112004-002	Screw, pan head M3x0.5x6 FE	1
- 11	DCPS-132003-002	Washer, plain M3 FE	1
- 12	DCPS-112002-006	Screw, pan head, washered M3x0.5x6 BS	1
- 13	DCPS-112003-001	Screw, pan head, washered M3x0.5x8 FE	4
- 14	DCPS-J20003-006	Clam, wire HP-2N	1







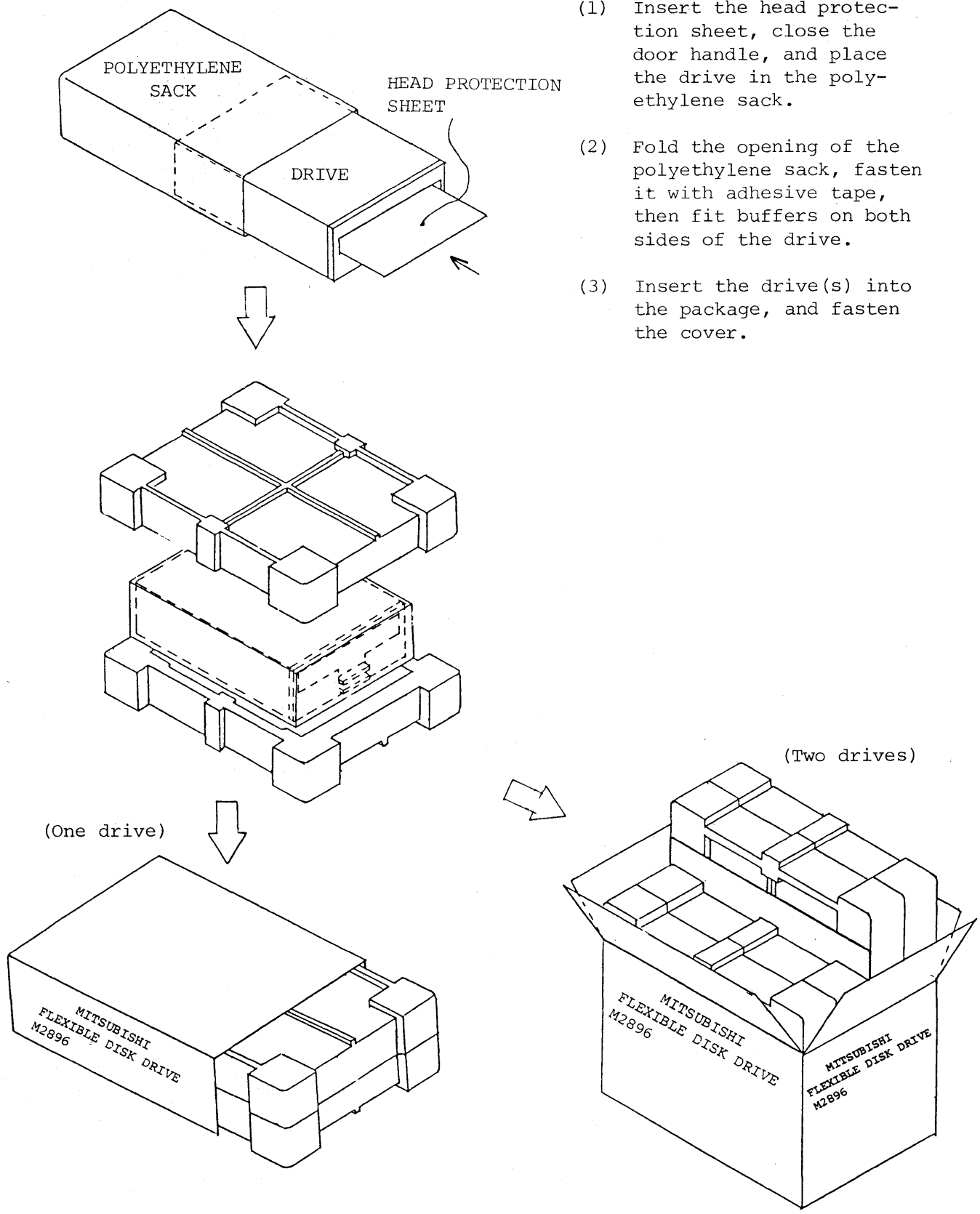
- | | | | |
|---|---|---|---|
| "A" | "B" | "C" | "D" |
|  |  |  |  |
| Clamp, wire
Type HP-2N | Clamp
Type MM | Clamp
Type PS100 | Band, wire
Type SST1M |

Figure 8 Flexible Disk Drive Wiring Diagram

7. **PACKING PROCEDURE**



- (1) Insert the head protection sheet, close the door handle, and place the drive in the polyethylene sack.
- (2) Fold the opening of the polyethylene sack, fasten it with adhesive tape, then fit buffers on both sides of the drive.
- (3) Insert the drive(s) into the package, and fasten the cover.



PACKING PROCEDURE

CONTENTS

	Page
1. OBJECTIVE	1
2. ENVIRONMENTAL CONDITIONS	1
3. HANDLING OF PACKAGED DRIVE	1
4. UNPACKING AND PACKING	1
5. PACKING FOR INCORPORATION IN SYSTEM	2
6. UNPACKING PROCEDURE	3
7. PACKING PROCEDURE	4

1. OBJECTIVE

This procedure describes the packaging of the flexible disk drive in its container and provides handling and unpacking instructions.

2. ENVIRONMENTAL CONDITIONS

- (1) Vibration and shock: Less than 3.0 G
- (2) Temperature: -10 to 50°C (-14 to 122°F)
- (3) Relative humidity: 20 to 80% (noncondensing)
- (4) Temperature gradient: Less than 20°C per hour

3. HANDLING OF PACKAGED DRIVE

- (1) No more than ten drives should be stacked vertically. Observe stacking directions for the drives when stacking.

NOTE: Instructions are given on packing case.

- (2) Handle with care.
 - (a) Do not throw packages.
 - (b) Do not drop packages.
 - (c) Do not store outdoors.

NOTE: Impacts or temperature extremes may seriously damage the drive.

- (3) Be sure the drive does not get wet.

4. UNPACKING AND PACKING

- (1) Unpacking

Follow the unpacking procedure given in section 6.

- (2) Packing

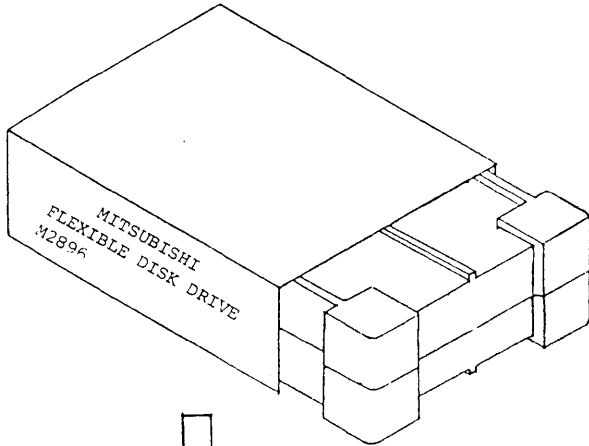
Follow the packing procedure given in section 7.

5. PACKING FOR INCORPORATION IN SYSTEM

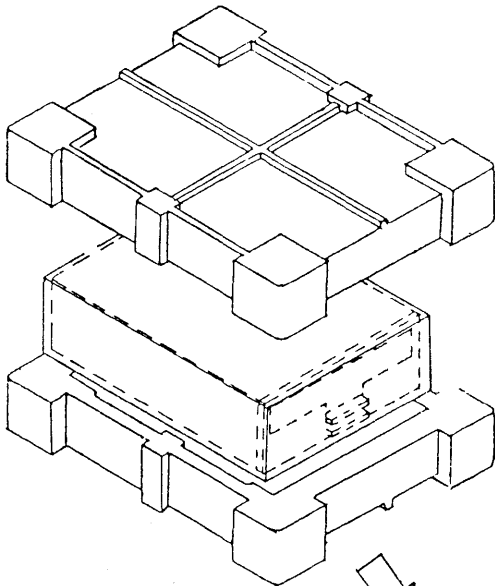
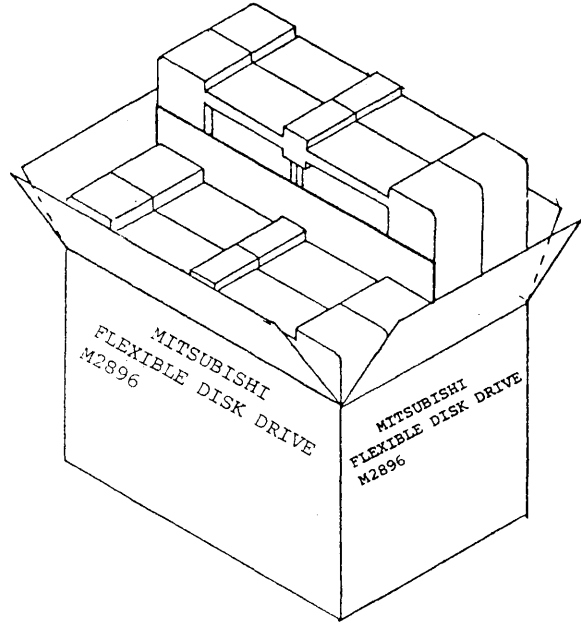
- (1) Pack an entire system so as to satisfy the conditions shown in section 2.
- (2) Insert the head protection sheet provided in the unit, and close the door handle.

6. UNPACKING PROCEDURE

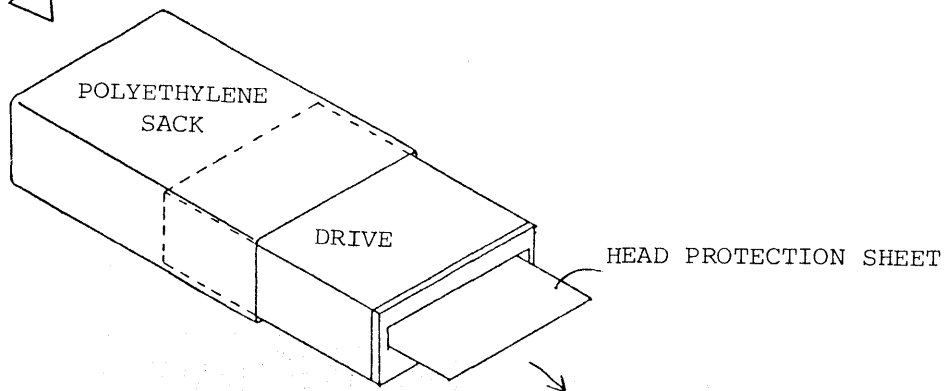
(One drive)



(Two drives)



- (1) Open the lid, and pull out the drive(s).
- (2) Remove buffers.
- (3) Take the drive out of the polyethylene sack, push the release button, and take out the head protection sheet.



M2896-63 DISK DRIVE
SCHEMATICS AND
LOGIC MANUAL

Sheet Title

Page

Revision

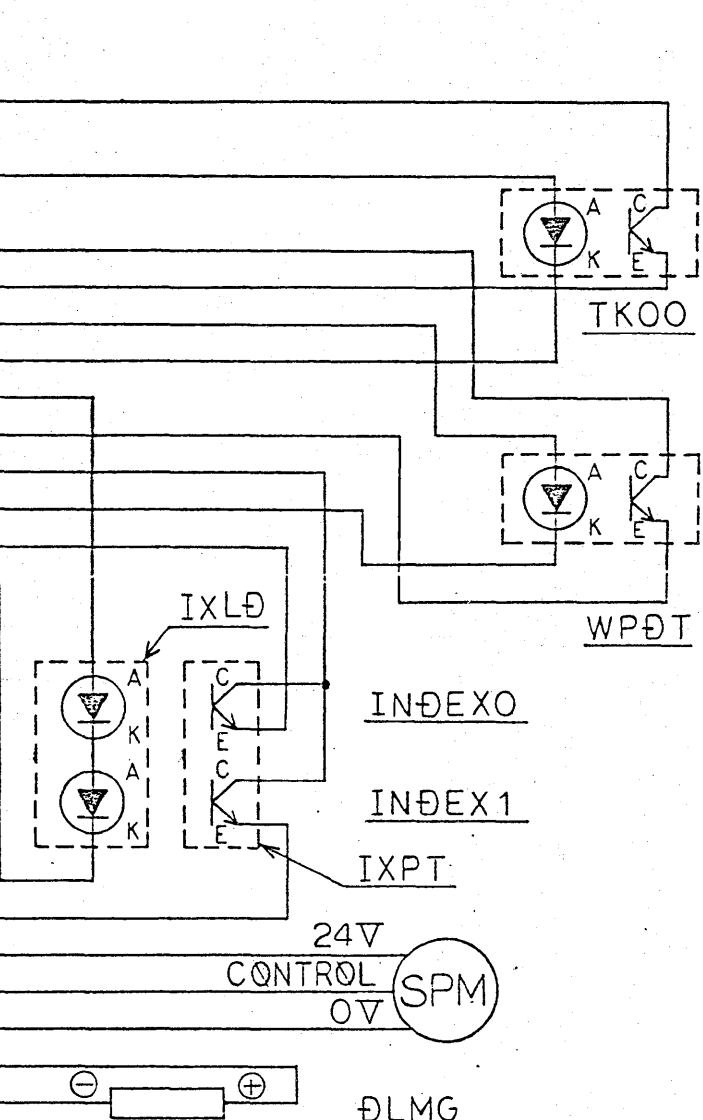
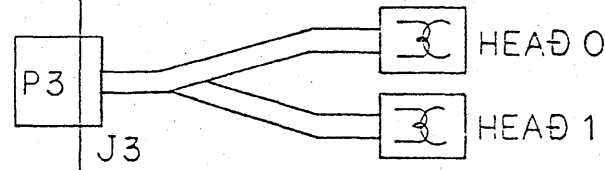
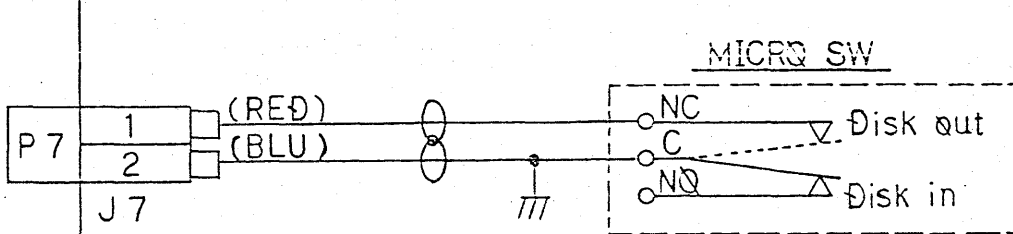
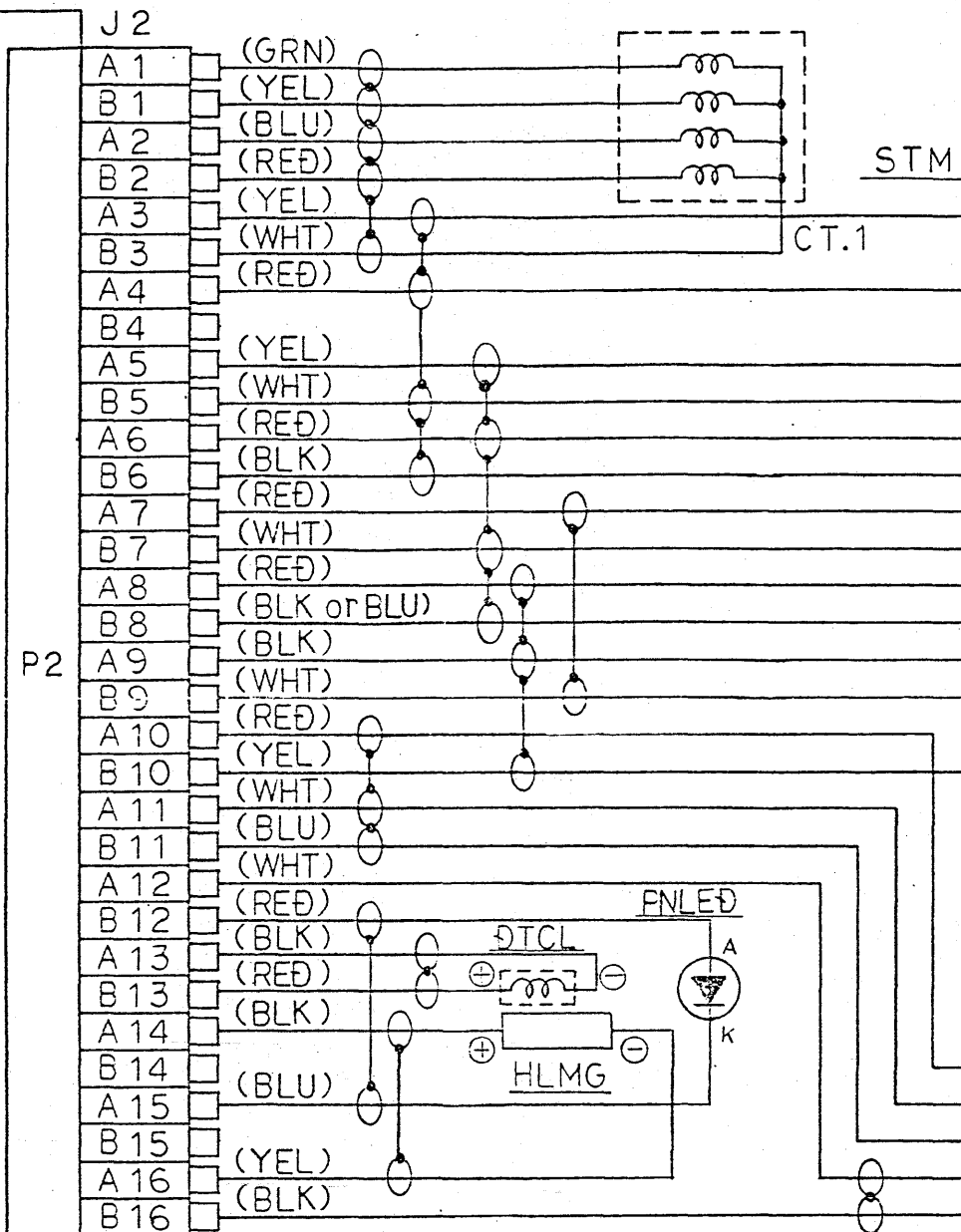
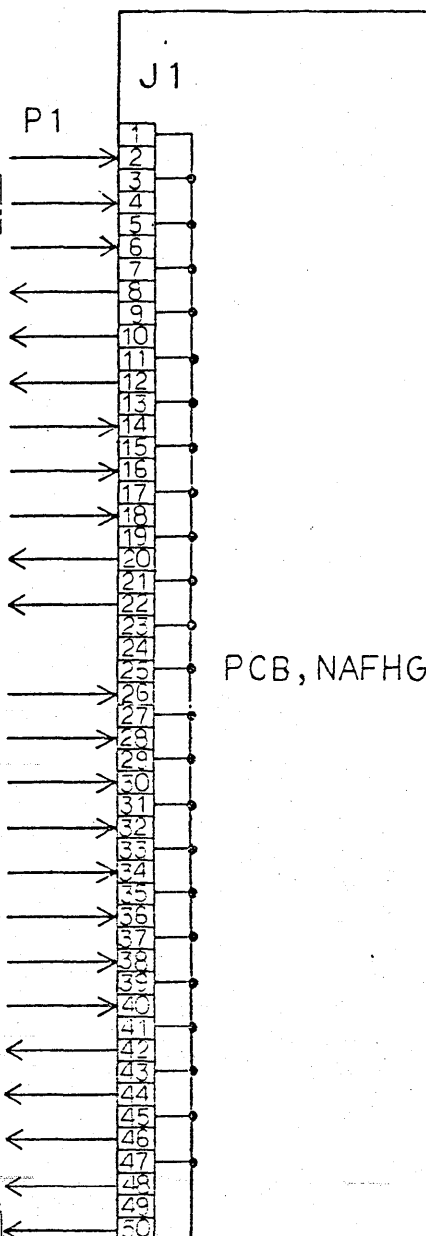
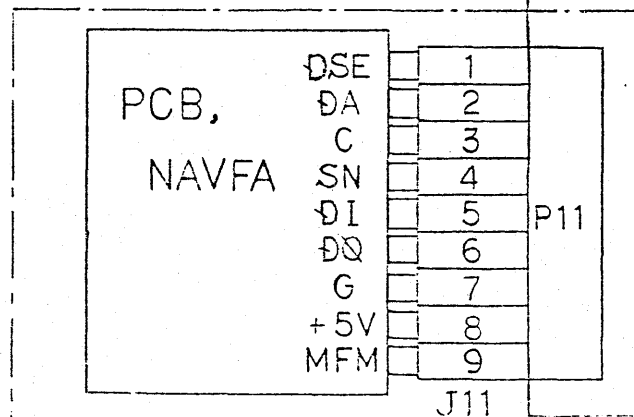
M2896-63 DISK DRIVE WIRING DIAGRAM	2/8	E
M2896-63 PCB NAFHG SCHEMATICS	3/8	E
M2896-63 PCB NAFHG PART LOCATION DIAGRAM	7/8	E
M2896-63 SPINDLE MOTOR ASSY SCHEMATIC	8/8	E

第3角法 3RD ANGLE PROJECTION 	DIM IN mm	尺度 SCALE X NTS	作成日付 DATE 83.8.26	表 題 (20) M2896-63 DISK DRIVE SCHEMATICS AND LOGIC MANUAL
MITSUBISHI ELECTRIC CORPORATION				
作 成 DRAWN <i>m. ota</i>	検 査 APPROVED			
検 査 CHECKED				TJ2-G4302E 1/2

A
B
C
D
E

ALTERNATE I/O
 ALTERNATE I/O MOTOR START
 ALTERNATE I/O MFM
 ALTERNATE I/O
 ALTERNATE I/O
 ALTERNATE I/O
 ALTERNATE I/O
 SIDE SELECT
 ALTERNATE I/O
 ALTERNATE I/O
 INDEX
 READY
 (NOT USED)
 DRIVE SELECT -1
 DRIVE SELECT -2
 DRIVE SELECT -3
 DRIVE SELECT -4
 DIRECTION SELECT
 STEP
 WRITE DATA
 WRITE GATE
 TRACK 00
 WRITE PROTECT
 READ DATA (NOT USED)
 ALTERNATE I/O READ DATA
 ALTERNATE I/O WINDOW

+24V DC
 +24V GND (RETURN)
 DC GND
 (NOT USED)
 +5V DC
 +5V GND (RETURN)



BLK ---- 黒 (BLACK)
 WHT ---- 白 (WHITE)
 RED ---- 赤 (RED)
 BLU ---- 青 (BLUE)
 YEL ---- 黄 (YELLOW)
 GRN ---- 緑 (GREEN)

NOTE: [] SHOWS VFO OPTION

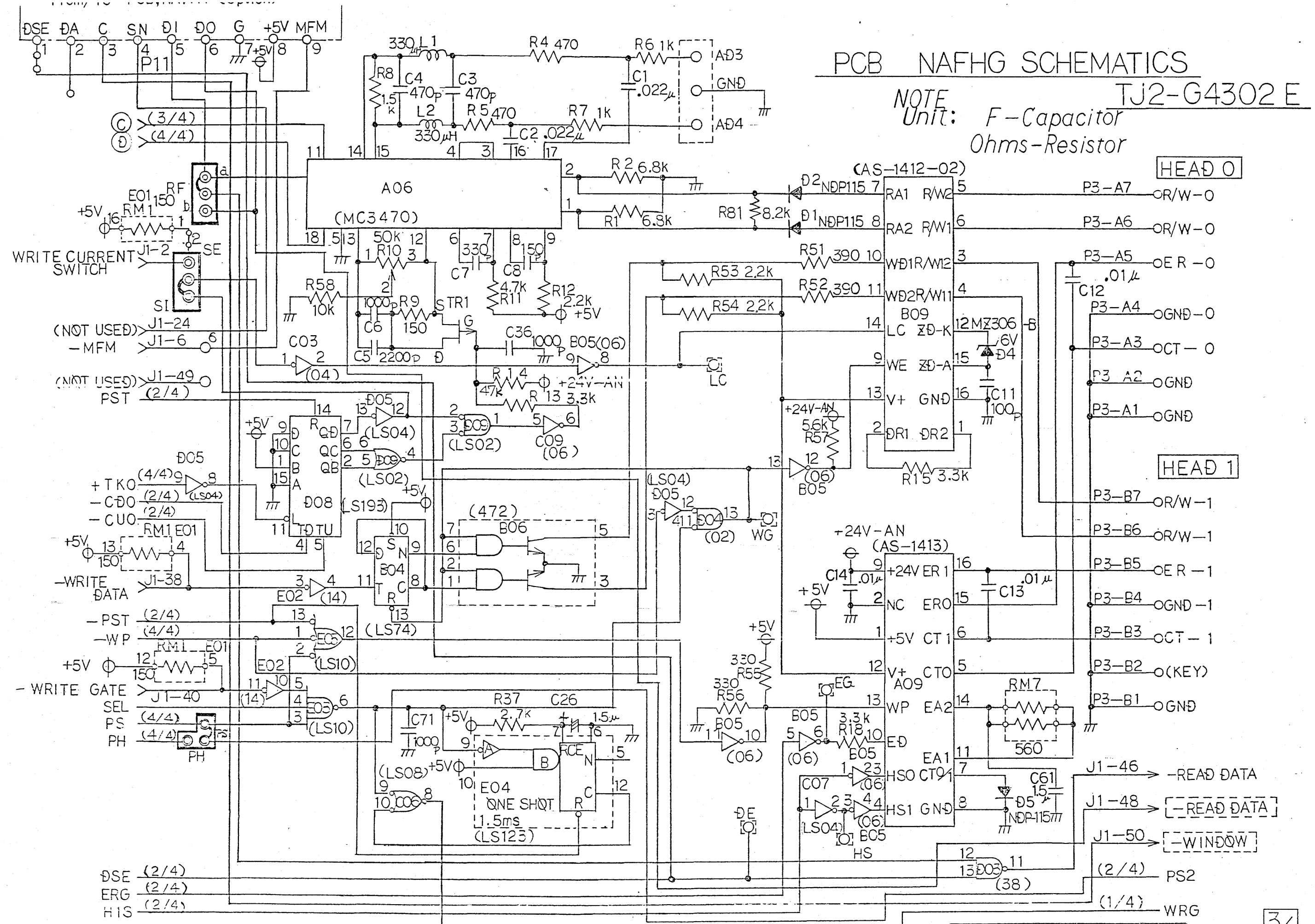
第3角法 3RD ANGLE PROJECTION	DIM IN mm	尺度 SCALE NTS	作成日付 DATE
MITSUBISHI ELECTRIC CORPORATION			
作成 DRAWN	検査 CHECKED		検認 APPROVED

表 題 (20)
 M2896-63 DISK DRIVE
 WIRING DIAGRAM
 T.12-G4302E 2/

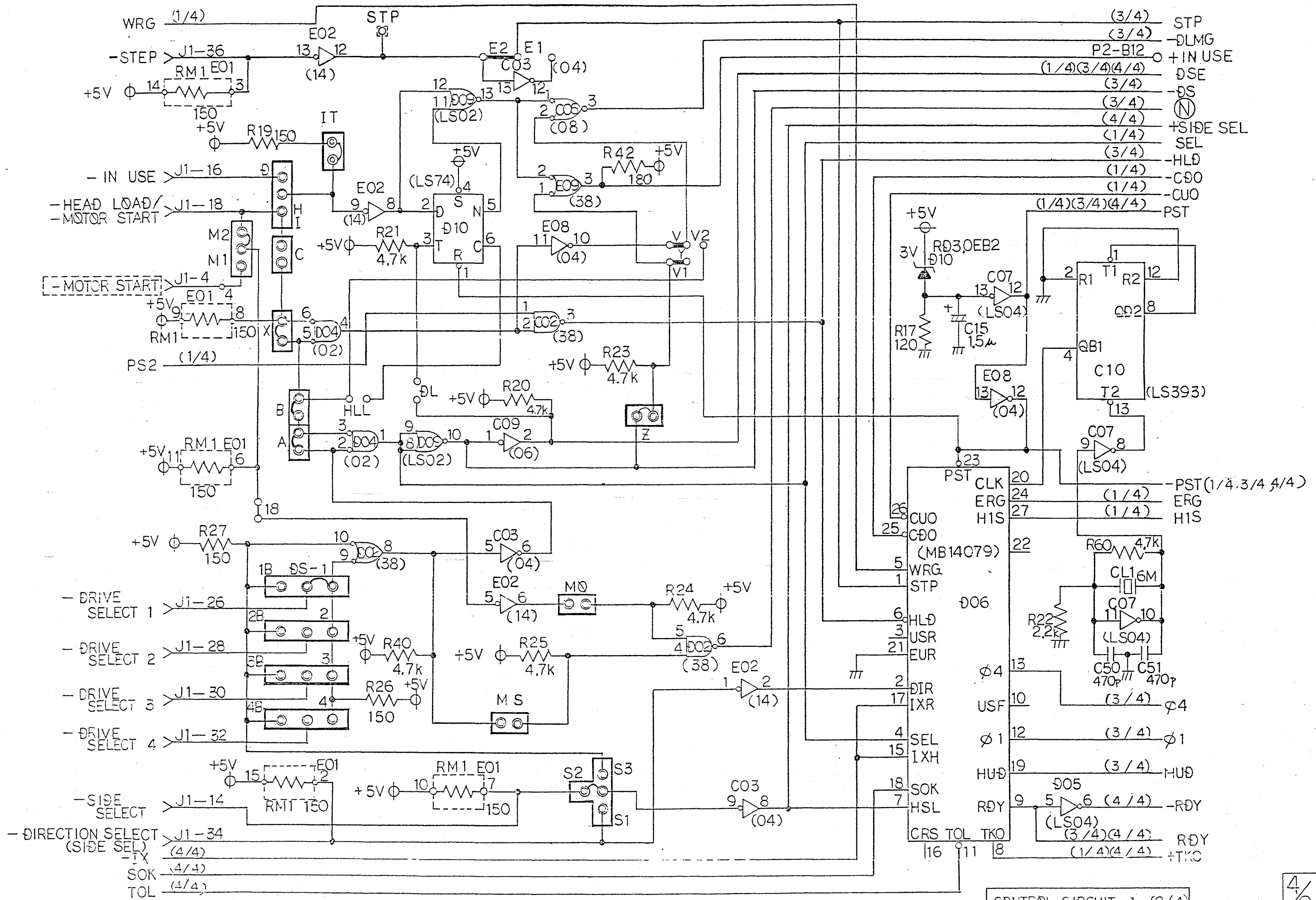
PCB NAFHG SCHEMATICS

TJ2-G4302 E

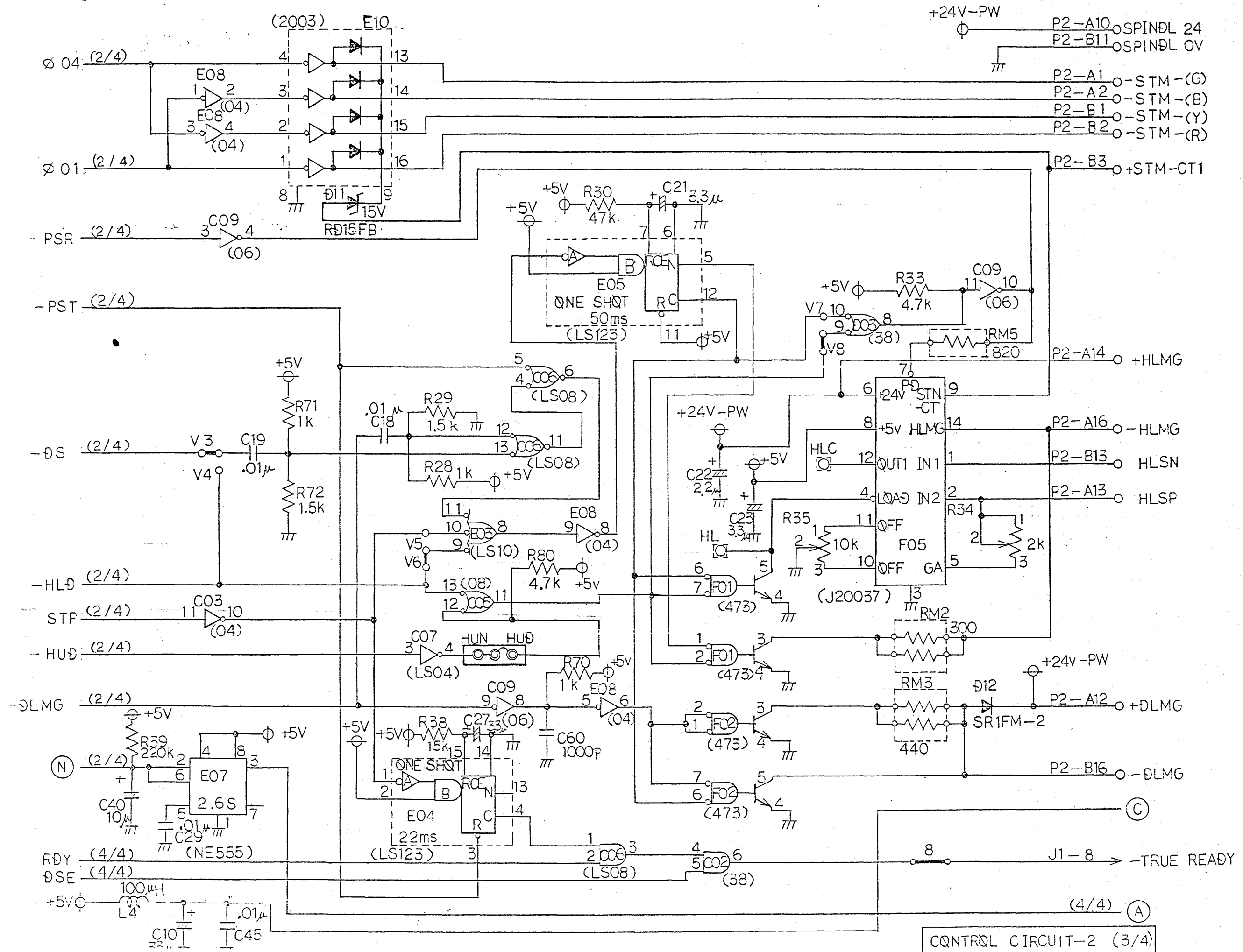
NOTE:
Unit: F-Capacitor
Ohms-Resistor



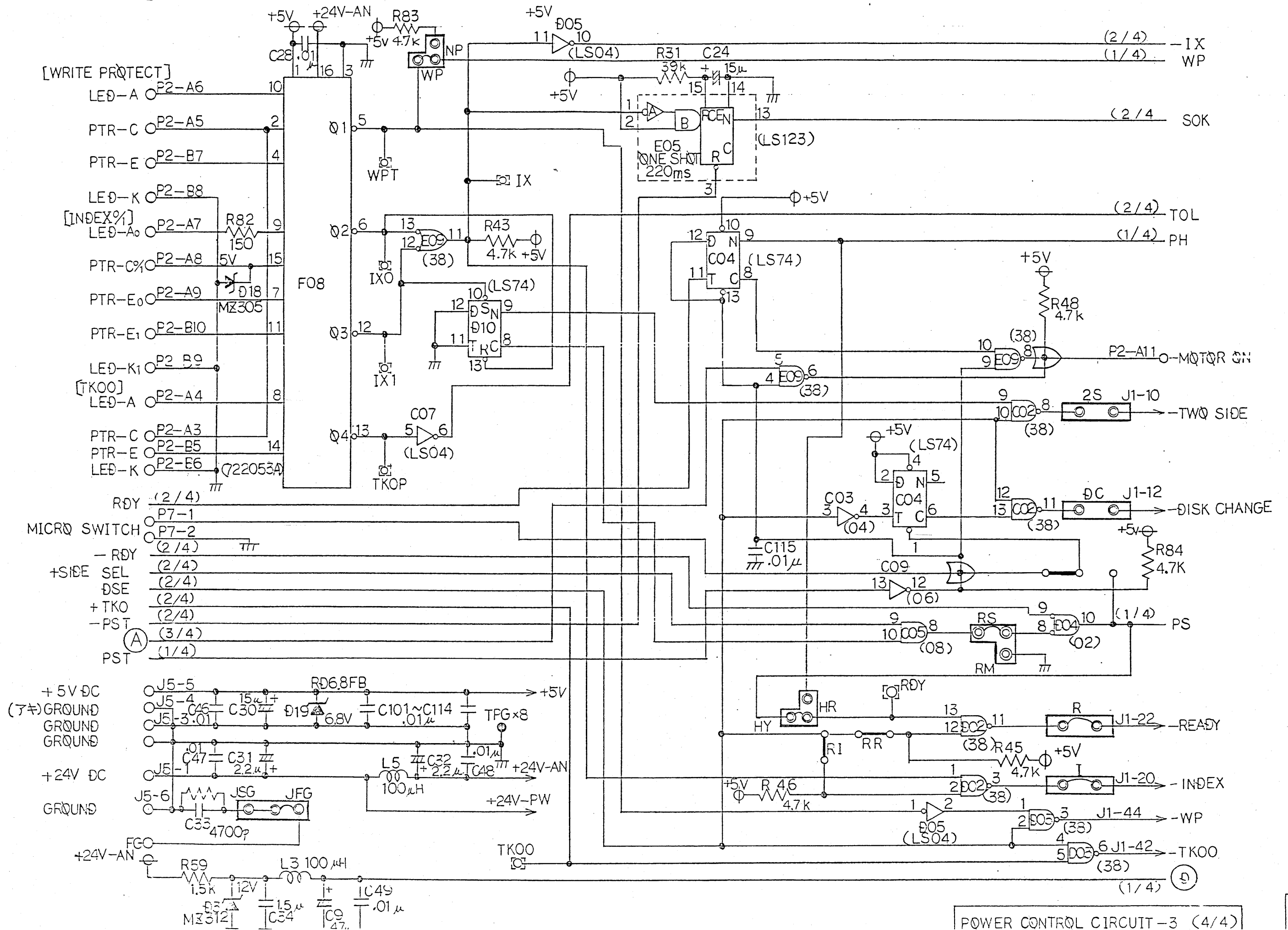
READ/WRITE CIRCUIT (1/4)



CONTROL CIRCUIT-1 (2/4)



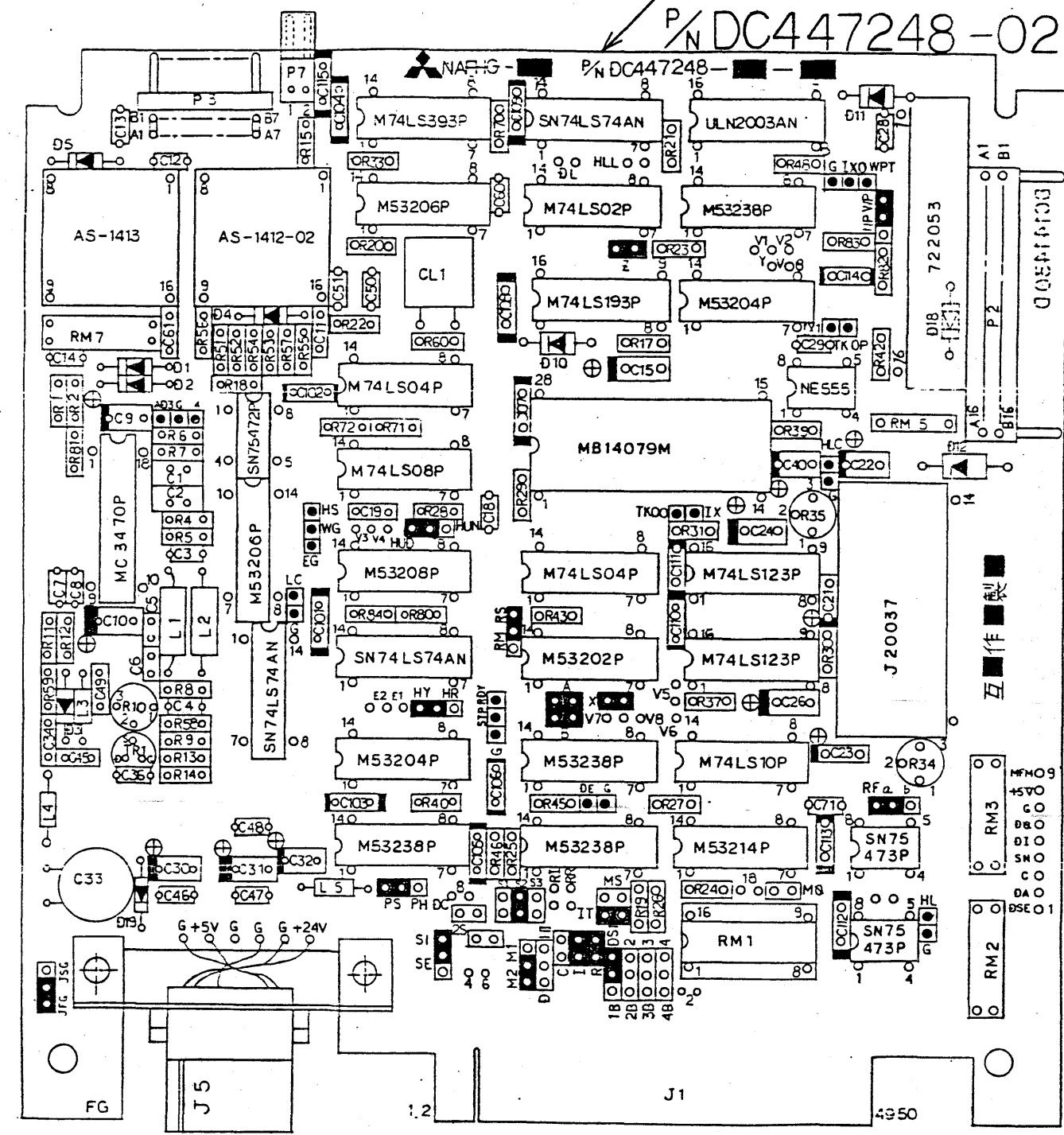
CONTROL CIRCUIT-2 (3/4)



a
b
c
d
e
f

Parts NO.

P/N DC447248-02-C



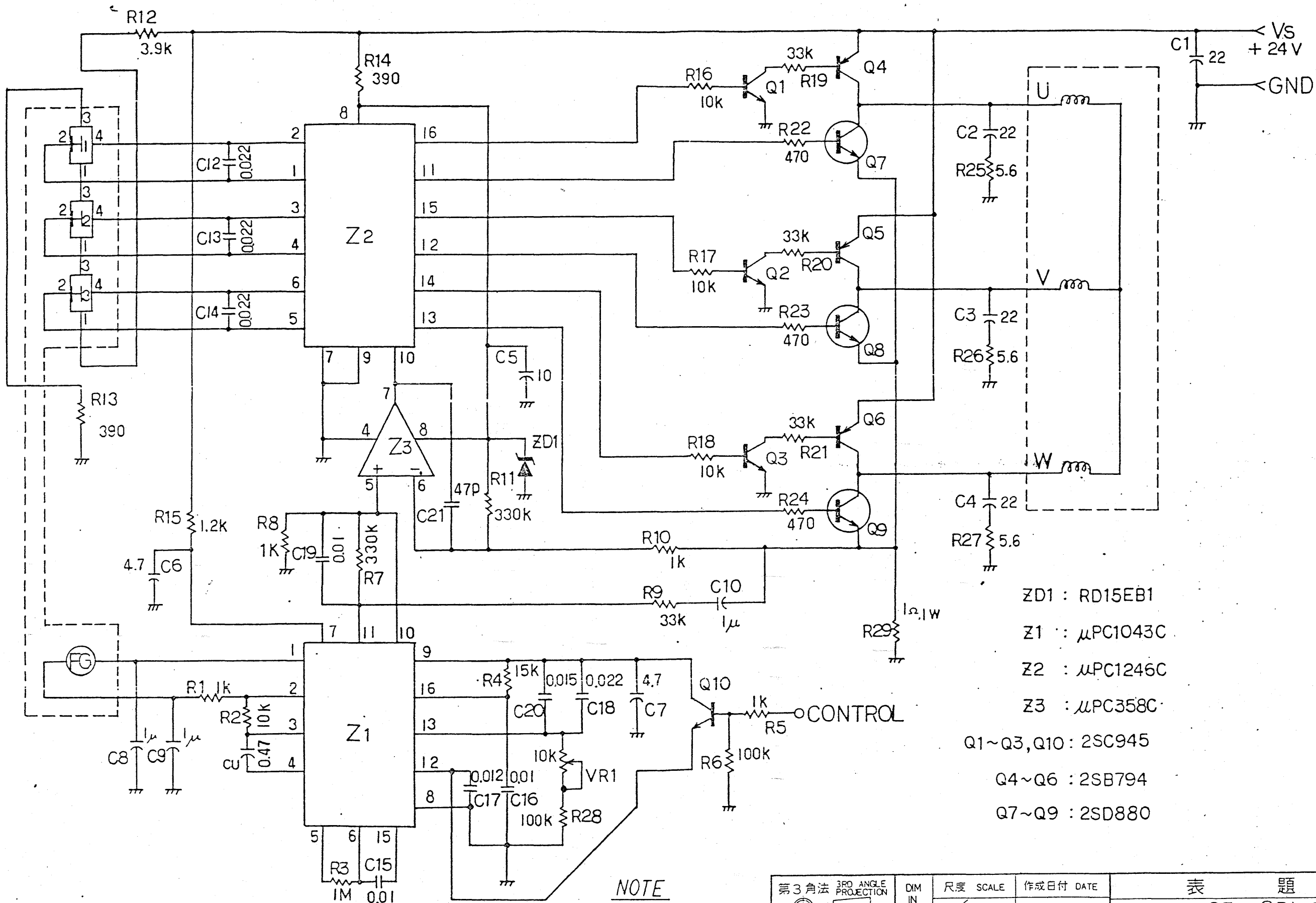
10
9
8
7
6
5
4
3
2
1

A B C D E F

NOTE "●" Indicates plugged
 "■" Indicates test point. (Terminals)
 "○" Indicates option pins.

第3角法 3RD ANGLE PROJECTION	DIM IN mm	尺度 SCALE	作成日付 DATE
		NTS	
MITSUBISHI ELECTRIC CORPORATION			
作成 DRAWN		檢 査 APPROVED	
照 査 CHECKED			
設 計 DESIGNED			

表 題 (20)	
M2896-63 PCB, NAFHG	
PARTS LOCATION DIAGRAM	
TJ2-G4302E	7/8



- ZD1 : RD15EB1
- Z1 : μPC1043C
- Z2 : μPC1246C
- Z3 : μPC358C
- Q1~Q3, Q10 : 2SC945
- Q4~Q6 : 2SB794
- Q7~Q9 : 2SD880

NOTE
 Unit.
 Capacitor : μF
 Resistor : Ohms

第3角法 3RD ANGLE PROJECTION	DIM IN mm	尺度 SCALE NTS	作成日付 DATE	表 題 (20)
MITSUBISHI ELECTRIC CORPORATION				M2896-63 SPINDLE MOTOR ASSY. SCHEMATIC
作 成 DRAWN	検 認 APPROVED			
照 査 CHECKED			TJ2-G4302E	
設 計			8/8	

