Ref. No. TTD-99-1014
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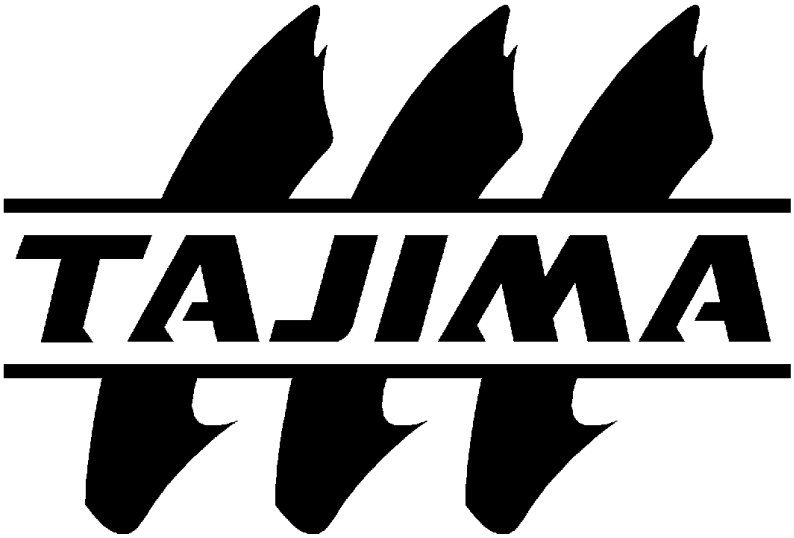
# TMFXII/II-C
# TMFXIII/III-C
# TECHNICAL DOCUMENT
# (ELECTRICAL)

(9906)



## FOREWORD

This technical document is revised on the basis of TTD-94-1012 “TMFX-C Technical Document” in order to accommodate the contents for the TMFX-II/II-C and TMFX-III/III-C Series.

We hope this document will be helpful to you very much in your after-sale and other activities.

## CONTENTS

# TMFXII/II-C, III/III-C, General Machine Construction

## 1.Controller

### 1-1. General Functions of the Controller

Controller takes charge of all the embroidery machine operations and controls of embroidery machine.

#### (1) Major functions of CPU Card [X-CPU]

CPU Card takes charge of all the machine controls in principle.

1) System Memory 256K byte
   Data Memory 256K byte
2) I/F with Head Card and Color Change Card
3) Sensor I/F, including Rotary Encoder
4) I/F for input from UTC Sensor
5) I/F to control X/Y-axes
6) I/F to control Main Shaft Motor
7) PWM [Note*] circuit to control Jump, Color Change, Upper Thread Holding Pulse Motors
8) I/F to control Thread Trimming, Picker Solenoid
9) I/F to control Operation Panel Card, FIP [Note**], Extension Card, Floppy Disk Drive
10) PTR I/F, Communication I/F for serial I/F (RS-232C etc.)
11) Equipped with a P-ROM (IPL) for system program installation

[Note*] PWM: Pulse width modulation
A method to module pulse width, depending on the signal amplitude value (voltage, current)

[Note**] FIP: Fluorescent Indicator Panel (registered trademark of NEC)

#### (2) Major functions of Extension Card [FX2 ADAPTER BOARD]

Extension Card extends the capacity of Data Memory.

Data memory capacity (for extension): 512,000 stitches

### 1-2. Voltage check in the major inner sections

Use a tester in principle for voltage check.

| Voltage value | Application | Measuring points | | Normal range | Measuring range |
|---|---|---|---|---|---|
| | | Plus side | Minus side | | |
| +5V | * To control cards<br>* To drive FDD<br>* To drive FIP | Pin No.1 of CN2 on CPU Card | Pin No. 2 of CN2 CPU Card | +4.95V to +5.2V | DC |
| +12V | * To control cards | Pin No.3 of CN2 on CPU Card | Pin No.4 of CN2 on CPU Card | +11.0V to +12.5V | DC |
| +24V | * To drive PTR | Pin No.5 of CN2 on CPU Card | Pin No.6 of CN2 CPU Card | +25.0V to +27.0V | DC |
| -5V | * To control cards | Pin No.7 of CN2 on CPU Card | Pin No.2 of CN2 on CPU Card | -4.75V to -5.25V | DC |

**<Table 1> Power supply voltage for the Controller**

## 2. Power Supply / Driver Box

### 2-1. General functions of Power Supply / Driver Box

Various types of power supply circuits and motor drive circuits for Main Shaft, X-axis and Y-axis are built-in.

(1) Power Supply Card [X-P, R]

Generates power supply for various sections (common for both single phase and 3 phase)

±5V, 12V, 24V, 50V, 60V

(2) Main Shaft Driver [X-DUB]

Drive circuit to control Main Shaft Motor with inverter and servo functions.

(3) X/Y-axis Driver [X-DUA]

Drive circuit for X-axis or Y-axis motor (pulse motor)

### 2-2. Voltage check at the major inner sections

Use a tester in principle for voltage check.

#### (1) Power Supply Card

| Voltage value | Application | Measuring points | | Normal range | Measuring range |
|---|---|---|---|---|---|
| | | Plus side | Minus side | | |
| +5V | To supply power to control the cards | Pin No.1 of CN1 | Pin No.2 of CN1 | +5.1V to +5.2V | DC |
| +12V | To supply power to control the cards | Pin No.3 Pin of CN1 | Pin No.4 Pin of CN1 | +11.5V to +12.5V | DC |
| +24V | To supply CPU Card with power to drive PTR | Pin No. 5 of CN1 | Pin No.6 Pin of CN1 | +25.0V to +27.0V | DC |
| | To supply Head and Color Change Cards with power to drive small type pulse motors | Pin No.1 Pin of CN2 | Pin No.4 Pin of CN2 | | |
| +20V | To supply X/Y-axis Drivers with power to control cards | Pin No.4 pin of CN3 | Pin No.2 Pin of CN3 | +19.0V to +21.0V | DC |
| +24V (FXII, III/III-C) | To supply Color Change Cards with power to drive ATH and Picker Solenoids | Pin No. 2 of CN2 | Pin No. 4 of CN2 | +25.0V to +27.0V | DC |
| +50V (FXII-C only) | To supply Color Change Cards with power to drive ATH and Picker Solenoids | Pin No.6 of CN2 | Pin No. 4 of CN2 | +52.0V to +58.0V | DC |
| +60V | * To supply Head Cards and Color Change Cards with power for surge absorption circuit to suppress surge voltage, generated when small type pulse motors are operated.<br><br>* To supply Color Change Cards with power to drive Sequin Solenoid. | Pin No.3 of CN2 | Pin No.4 of CN2 | +52.0V to +58.0V | DC |
| -5V | To supply power to control the cards | Pin No.7 of CN1 | Pin No.2 of CN1 | -4.75V to -5.25V | DC |
| AC100V system<br><br>AC200V system | To supply Main Shaft Driver and X/Y axis Drivers with power supply to drive Main Shaft Motor and X/Y axis Pulse Motors | Pin No.5 Pin of CN3 | Pin No.6 Pin of CN3 | AC90V to AC132V<br><br>AC180V to AC264V | AC |

**<Table 2> Power supply voltage inside Power Supply Card**

**(2) X/Y-axis Driver**

| Voltage value | Application | Measuring points | | Normal range | measuring Range |
|---|---|---|---|---|---|
| | | Plus side | Minus side | | |
| +5V | To control cards | Pin No.6 of CN3 | Pin No.7 of CN3 | +5.1V to +5.2V | DC |
| +12V | To control cards | Pin No.5 of CN3 | Pin No.7 of CN3 | +11.5V to +12.5V | DC |
| -5V | To control cards | Pin No.8 of CN3 | Pin No.7 of CN3 | -4.75V to -5.25V | DC |
| AC100V System<br>AC200V System | To drive X/Y-axis pulse motors | Pin No.1 of CN2 | Pin No.4 of CN2 | AC90V to AC132V<br>AC180V to AC264V | AC |

**<Table 3> X/Y-axis Driver - power supply voltage**

**(2) Main Shaft Driver**

| Voltage value | Application | Measuring points | | Normal range | measuring Range |
|---|---|---|---|---|---|
| | | Plus side | Minus side | | |
| +5V | To control cards | Pin No.6 of CN3 | Pin No.7 of CN3 | +5.1V to +5.2V | DC |
| +12V | To control cards | Pin No. 5 of CN3 | Pin No.7 of CN3 | +11.5V to +12.5V | DC |
| -5V | To control cards | Pin No.8 of CN3 | Pin No.7 of CN3 | -4.75V to -5.25V | DC |
| AC100V System<br>AC200V system | To drive Main Shaft Motor | Pin No.1 of CN2 | Pin No.4 of CN2 | AC90V to AC132V<br>AC180V to AC264V | AC |

**<Table4> Main Shaft Driver - power supply voltage**

## 3. Other cards

### 3-1. General functions of other cards

#### (1) Joint Card

Joint Card is a card to divide input/output signal and power supply to the Controller.

#### (2) Color Change Card [X-CHG]

Color Change Card is a circuit to drive needle position detection I/F, Color Change Motor (pulse motor), Thread Trimming Solenoid, Picker Solenoid and Sequin Solenoid.

Needle position detection I/F has a circuit to convert the voltage from potentiometer [Note] into digital signal (A/D converter) and input it as a needle position.

[Note] Potentiometer is a precision variable resistor.

#### (3) Head Card [X-HEAD]

Head Card is a circuit to drive Jump Pulse Motor, Thread Holding Pulse Motor and to detect thread breakage signal I/F from Tension Base.

A signal when Thread Take-up spring contacts with Thread Breakage Detecting Contact Point is transmitted to Tension Base Card → Head Card → CPU Card for thread breakage detection.

#### (4) Tension Base Card

1) Detects thread breakage with Thread Take-up Spring.

2) Has Tension Base Switch and LED.

3) LED is lit in green and red and displays thread breakage and head operation status.

### 3-2. Voltage check

Use a tester in principle for voltage check.

**(1) Color Change Card**

| Voltage value | Application | Measuring points | | Normal range | Measuring range |
|---|---|---|---|---|---|
| | | Plus side | Minus side | | |
| +5V | * To control cards<br>* To supply power to potentiometer | No. 1 pin of CN7 | No. 2 pin of CN7 | +4.85V to +5.2V | DC |
| +24V | * To drive Color Change Motor | No. 4 pin of CN7 | No. 5 pin of CN7 | +25.0V to +27.0V | DC |
| +24V (FXII, III, III-C) | * To drive Thread Trimming Picker Solenoid | No. 9 pin of CN7 | No. 5 pin of CN7 | +25.0V to +27.0V | DC |
| +50V (FXII-C only) | * To drive Thread Trimming Picker Solenoid | No. 9 pin of CN7 | No. 5 pin of CN7 | +52.0V to +58.0V | DC |
| +60V | *To drive Sequin Solenoid<br>* For surge absorption circuit | No. 3 pin of CN7 | No. 5 pin of CN7 | +52.0V to +58.0V | DC |

**<Table 5> Color Change Card - power supply voltage**

**(2) Head Card**

| Voltage value | Application | Measuring points | | Normal range | Measuring range |
|---|---|---|---|---|---|
| | | Plus side | Minus side | | |
| +5V | * To control cards | Pin No.8 of CN2 | Pin No.5 of CN2 | +4.85V to +5.2V | DC |
| +24V | * To drive Jump Motor and Thread Holding Motor | Pin No.4 of CN7 | Pin No.5 of CN7 | +25.0V to +27.0V | DC |
| +60V | * For surge absorption circuit | Pin No.3 of CN7 | Pin No.5 of CN7 | +52.0V to +58.0V | DC |

**<Table 6> Head Card - power supply voltage**

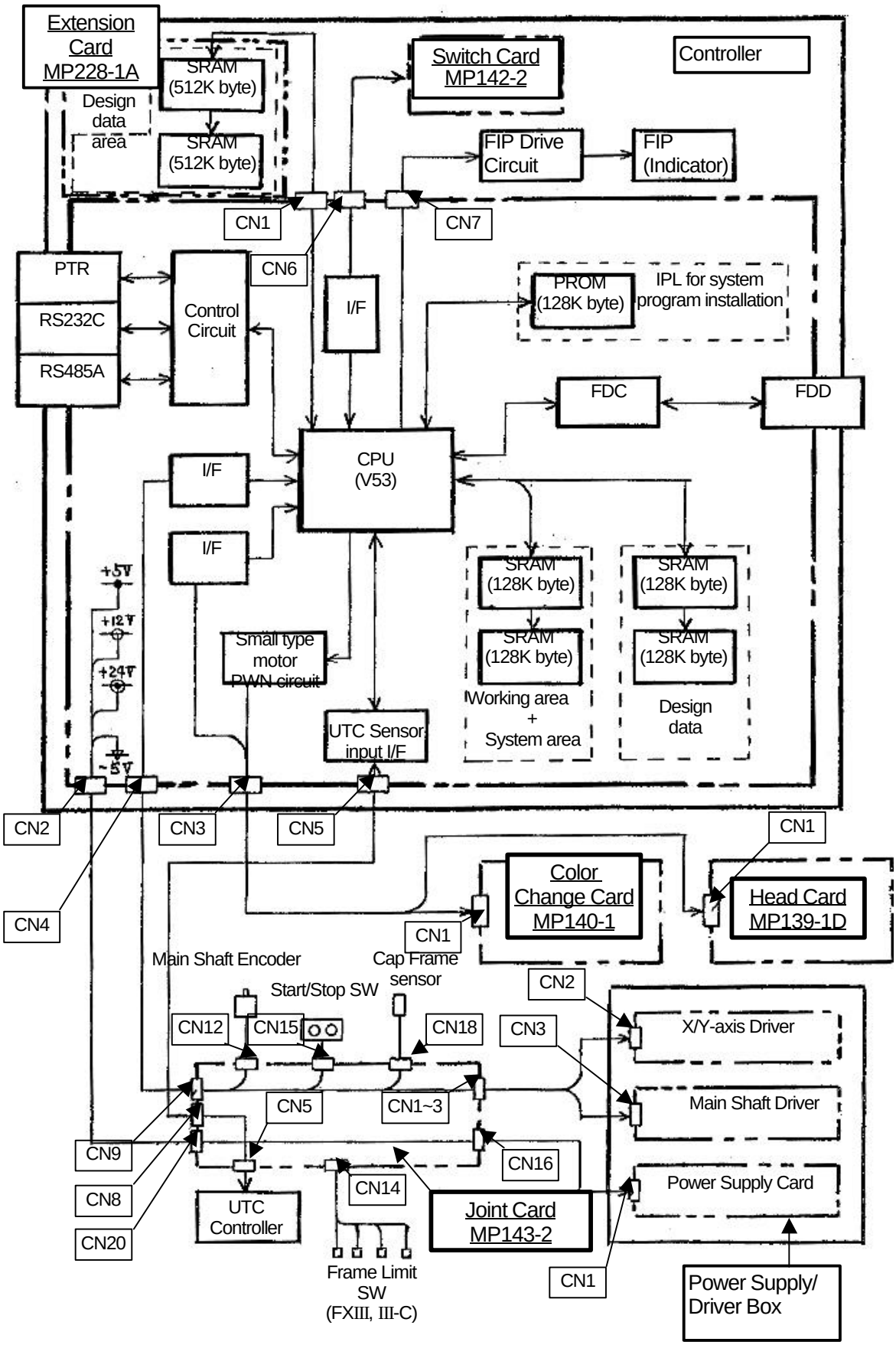
**(3) Tension Base Card**

| Voltage value | Application | Measuring points | | Normal range | Measuring range |
|---|---|---|---|---|---|
| | | Plus side | Minus side | | |
| +5V | * To control cards<br>*To detect upper thread breakage | Pin No.8 of CN2 | Pin No.5 of CN2 | +4.85V to +5.2V | DC |

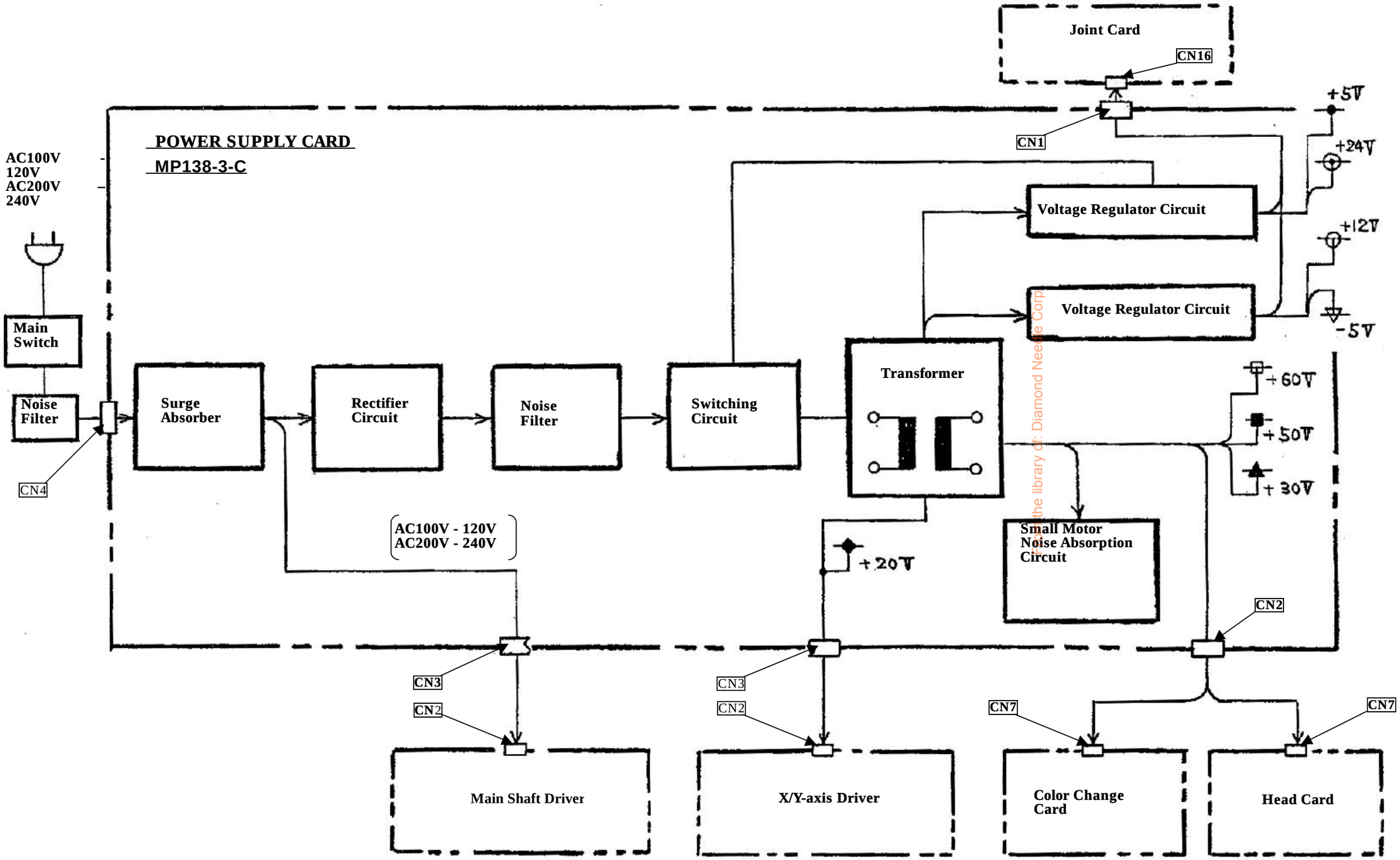
**<Table7> Tension Base Card - power supply voltage**

## 4. Block Diagrams/Connecting Diagrams

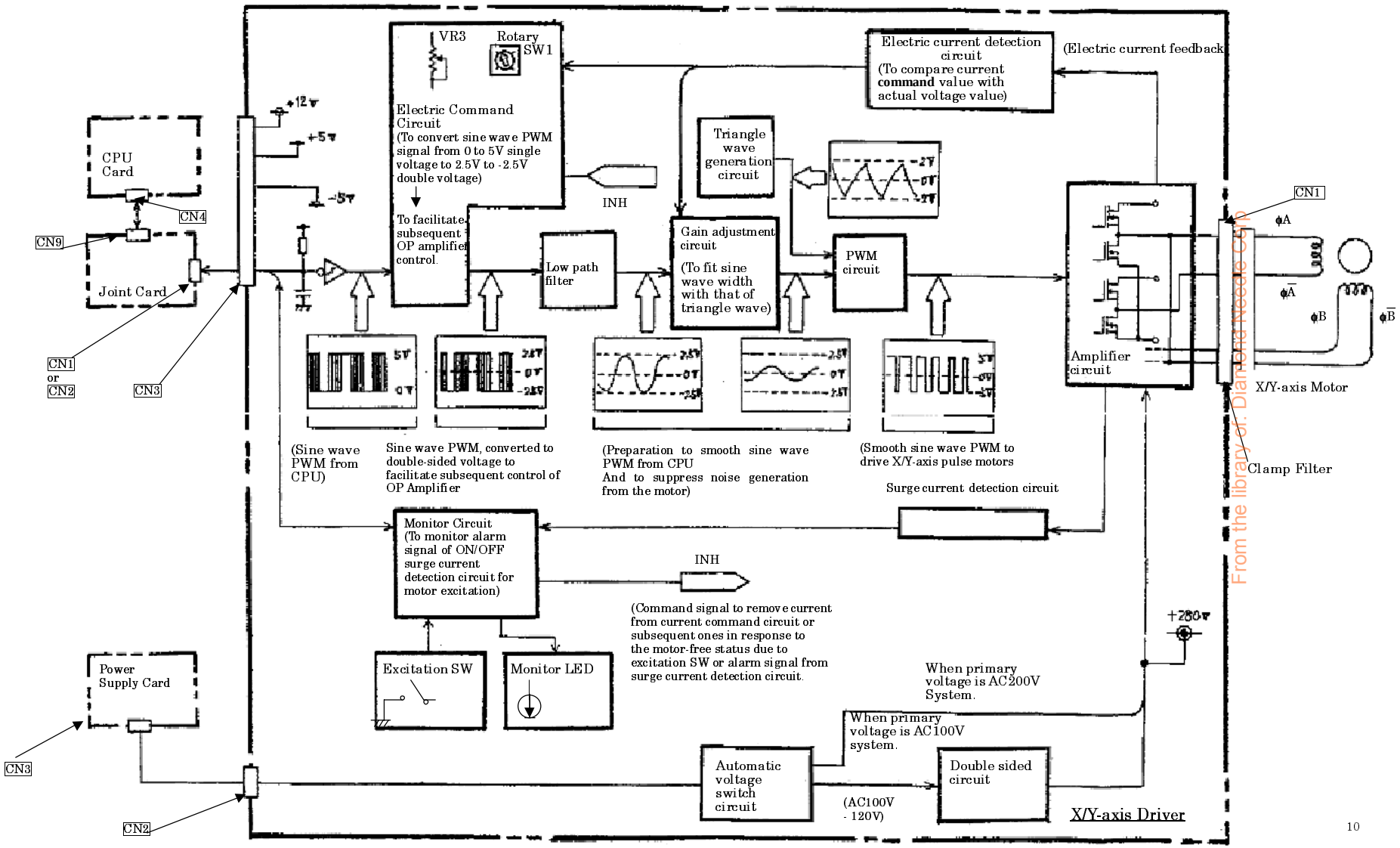
### 4-1. Controller - Block Diagram



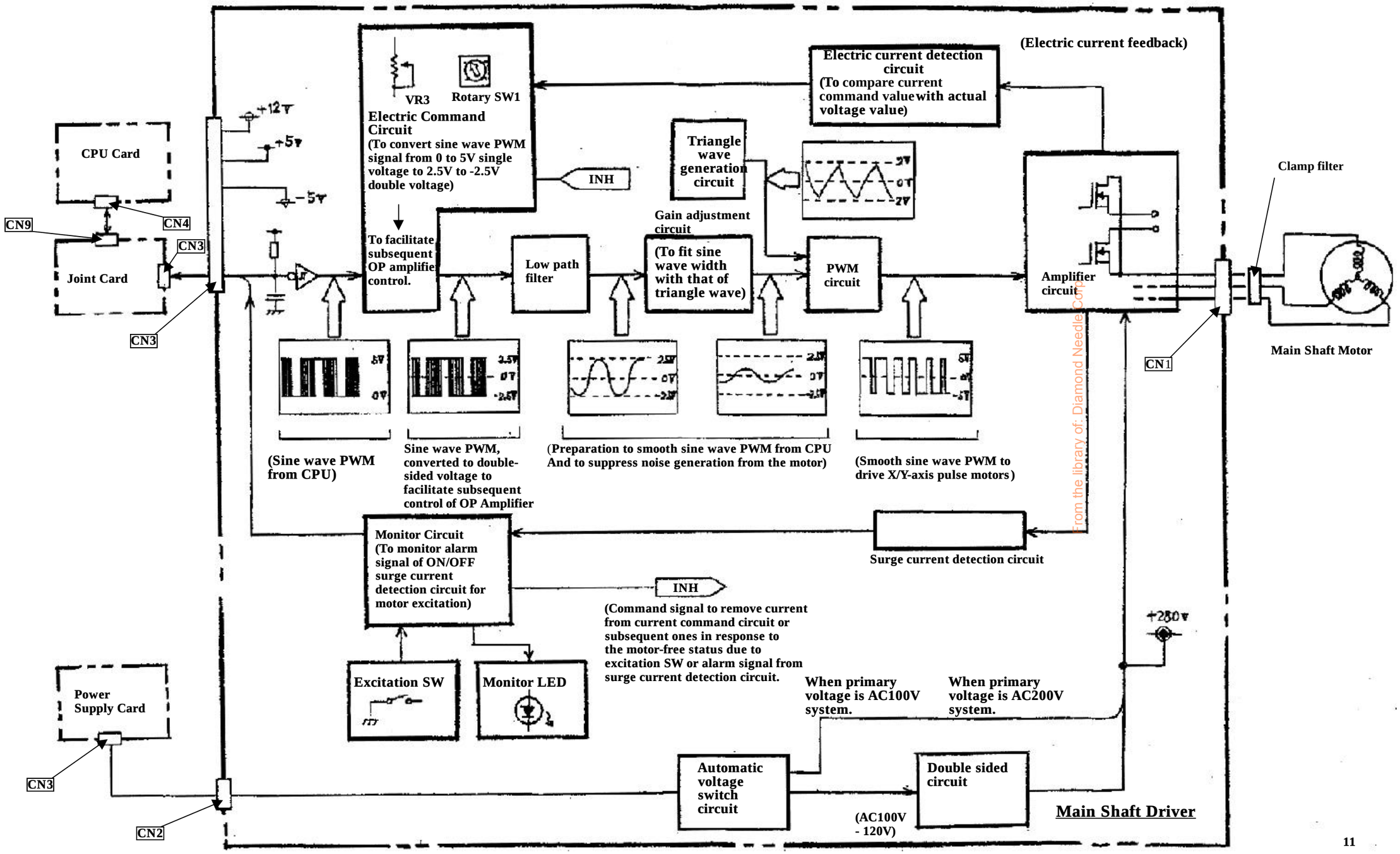
## 4-2. POWER SUPPLY CARD - LOCK DIAGRAM



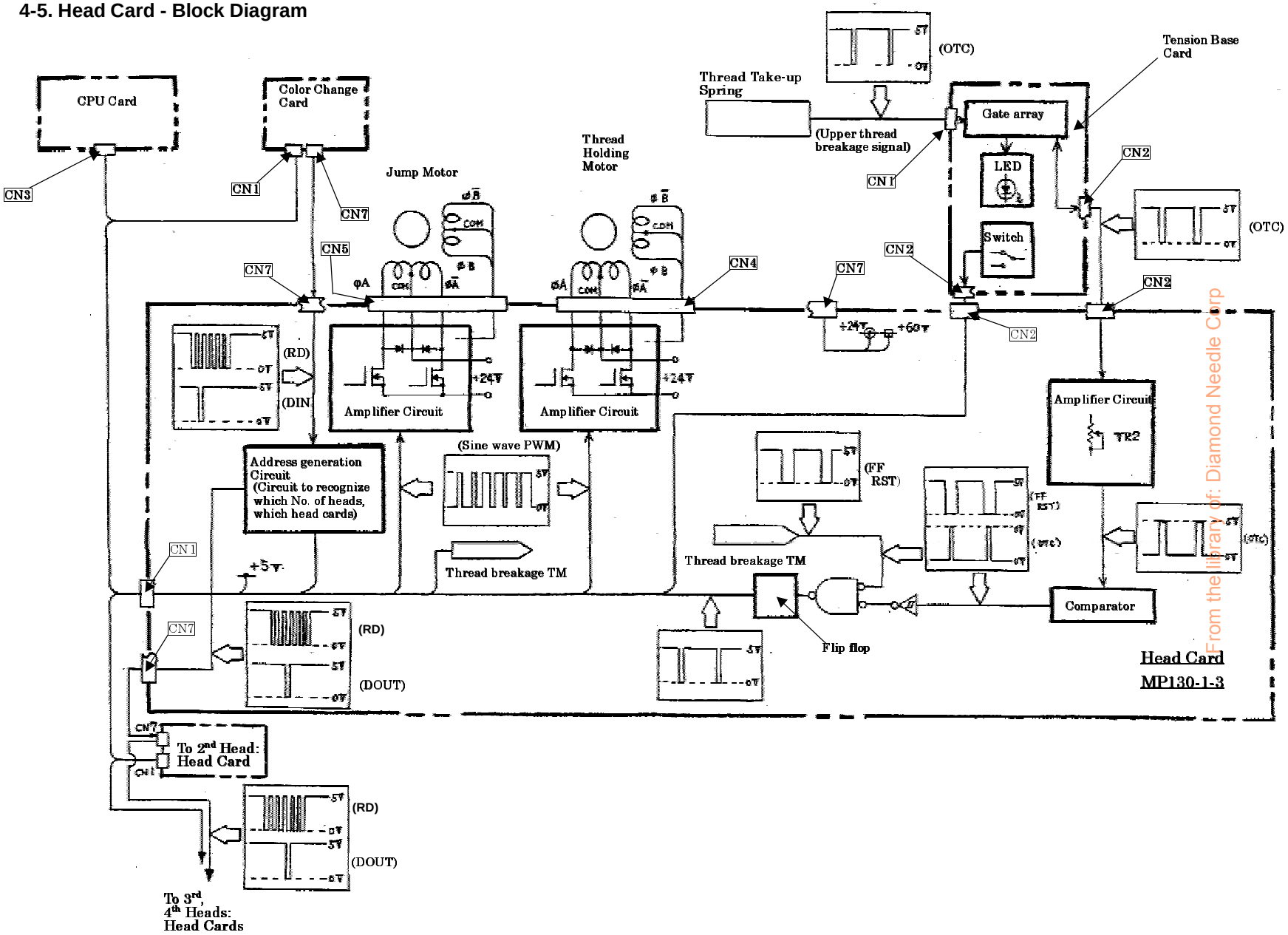
## 4-3. X/Y-axis Drivers - Block Diagram



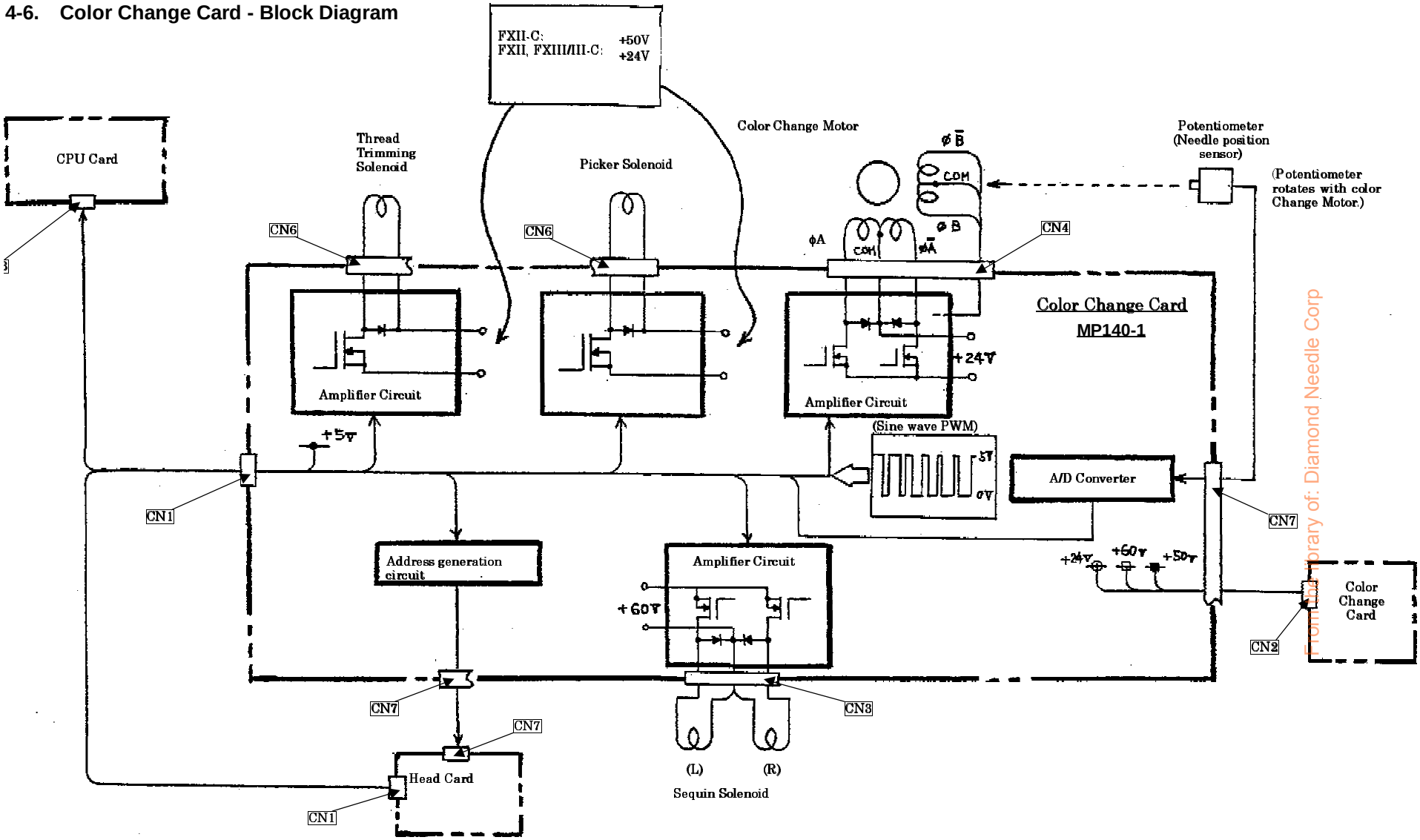
## 4-4. Main Shaft Driver - Block Diagram



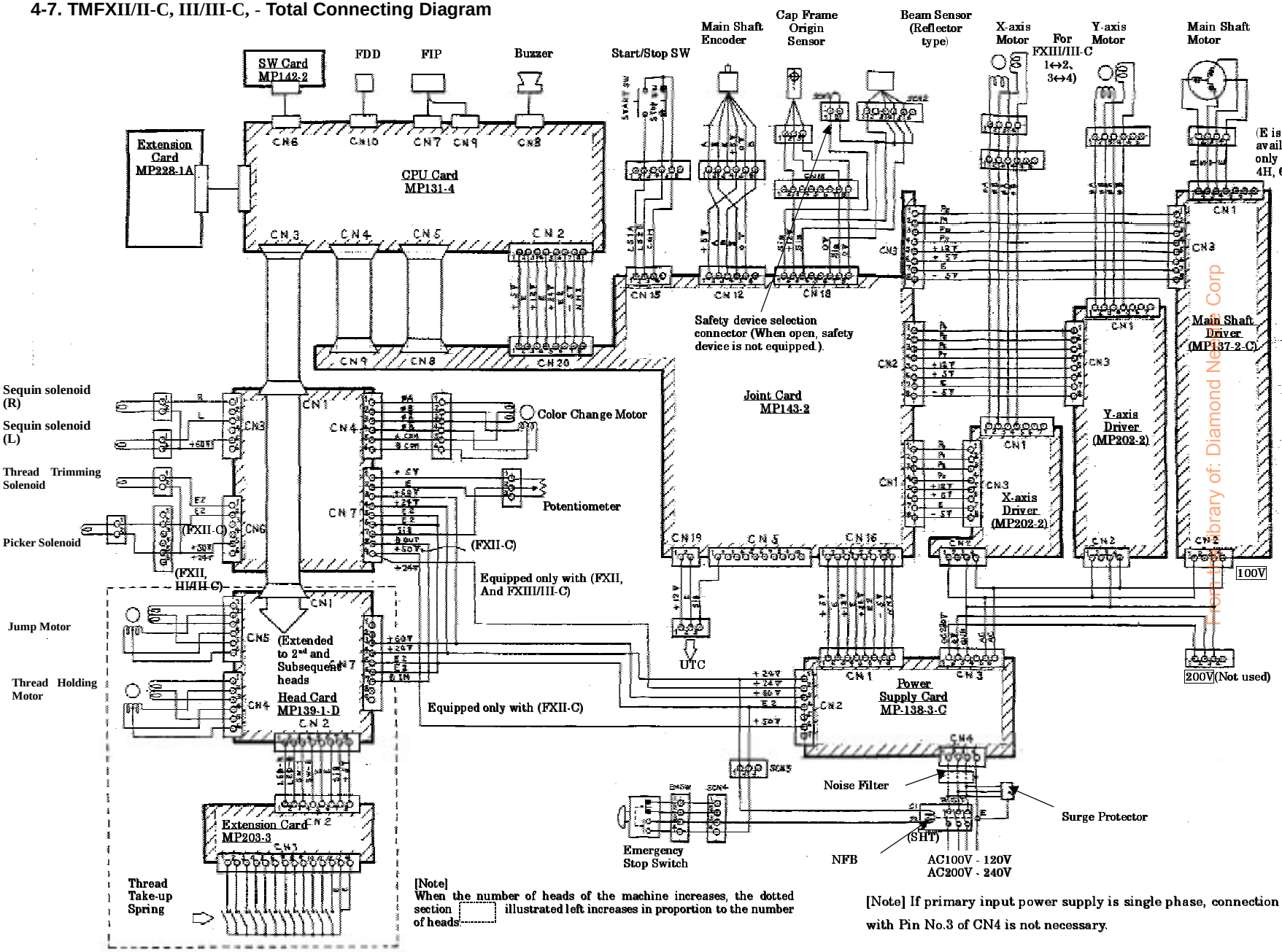
## 4-5. Head Card - Block Diagram



## 4-6. Color Change Card - Block Diagram



## 4-7. TMFXII/II-C, III/III-C, - Total Connecting Diagram




[Note]
When the number of heads of the machine increases, the dotted section [ ] illustrated left increases in proportion to the number of heads.

[Note] If primary input power supply is single phase, connection with Pin No.3 of CN4 is not necessary.