FOREWORD

TMFXIV Series has some different electrical parts from those for TMFXII/II-C and TMFXIII/III-C Series and has similar composition of electrical parts rather to TMLH Series and TMCE (Multi-head) Series.

We will be very pleased if you understand the composition of the cards and other parts, used for the TMFXIV Series, and functions and voltage measuring method, referring to this document, so that you can make good use for your service or other activities after sale.

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1. Controller

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

(1) CPU Card

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

Major specifications and functions

1) System memory 256K byte
   Design data memory 256K byte (128,000 stitches)

   [Note] Total memory capacity will be 640,000 stitches, including the built-in memory on Extension card, 1024K byte (512,000 stitches).

2) A P-ROM is installed for installation of system program.

3) Takes charge of interface with Extension card
   (Controls ATH card and Head card through Extension card and IF card.)

4) Controls Color change motor through Extension card.

5) Reads from and write to floppy disks and controls Floppy disk drive

6) Interface with FIP (Indicator) and Switch card.

7) Controls PTR and Serial interface (RS-232C) communication

8) Controls Power supply/driver box (Main shaft, X-axis, Y-axis) through Joint card

9) Inputs Main shaft encoder signal through Joint card

10) Inputs UTC signal through Joint card

11) Inputs Beam sensor signal through Joint card

12) Inputs Frame limit switch signal through Joint card

13) Inputs Bar switch signal through Joint card
(2) Extension card

Extension card controls communication with ATH card and Head card, drives Color change motor, detects color change and ATH position through I/F card.

**Major specifications and functions**

1) Design data memory: 1024K (1M) byte (512,000 stitches)
2) Controls communication with ATH card and Head card through I/F card.
3) Drives Color change motor.
4) Converts color change position signal from analog to digital.
5) Interface with CPU card

(3) How to check voltage

- The power supply voltage to be checked on the cards are as listed below:
- Please apply a tester to check voltage in principle.
- Measuring points are shown with the Nos. of Connector Pins.

[Note] Do not press Connector pins (crimp style terminals) with tester rods too much when you attempt measuring. Too much force may distort Connector pins and causes poor contact.

1) CPU Card (MP101-4)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Application</th>
<th>Measured points</th>
<th>Normal range</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Plus side</td>
<td>Minus side</td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td>To control cards</td>
<td>CN2-1</td>
<td>CN2-2</td>
<td>+4.9 to +5.3V</td>
</tr>
<tr>
<td></td>
<td>To drive FDD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>To drive RIP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+12V</td>
<td>To control cards</td>
<td>CN2-3</td>
<td>CN2-4</td>
<td>+11.4 to +12.6V</td>
</tr>
<tr>
<td>+24V</td>
<td>To drive PTR</td>
<td>CN2-5</td>
<td>CN2-6</td>
<td>+25.5 to +26.4V</td>
</tr>
<tr>
<td>-5V</td>
<td>To control cards</td>
<td>CN2-7</td>
<td>CN2-2</td>
<td>-4.75 to -5.25V</td>
</tr>
</tbody>
</table>

2) Extension card (MP228-2B)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Application</th>
<th>Measured points</th>
<th>Normal range</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Plus side</td>
<td>Minus side</td>
<td></td>
</tr>
<tr>
<td>+5V</td>
<td>To control cards</td>
<td>CN2-4</td>
<td>CN2-3</td>
<td>+4.9 to +5.3V</td>
</tr>
<tr>
<td></td>
<td>Power supply for Potentiometer</td>
<td>CN7-4</td>
<td>CN7-3</td>
<td></td>
</tr>
<tr>
<td>+24V</td>
<td>To drive Color change motor</td>
<td>CN4-1</td>
<td>CN4-2</td>
<td>+25.5 to +26.4V</td>
</tr>
</tbody>
</table>
2. Power supply box

Power supply box contains Driver card, Driver CPU card, Mother board (inside Power supply box) and controls Main shaft motor, X/Y-axis motors.

**Power supply box – External view (with covers removed):**

- Current control Rotary DSW (Main shaft)
- Excitation SW (Main shaft)
- Current control Rotary DSW (Y-axis)
- Excitation SW (Y-axis)
- Current control Rotary DSW (X-axis)
- Excitation SW (X-axis)
- Driver CPU card
- Mother board
- Main shaft control
- Y-axis control
- X-axis control

**Power supply box, front side**

Input / Output connector

- 24V Power supply
- Fan

**Power supply box, rear side**

From the library of: Diamond Needle Corp
(1) Mother board

Mother board is a card, located in the center of Power supply/driver box.

**Major specifications and functions:**

1) Adjusts motor current with Rotary Dip Switch.
   
   Setting range is in 16 steps from 0 to F.
   
   Motor current is increased when setting value is increased.

<table>
<thead>
<tr>
<th>Default setting of motor current</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Main shaft, X/Y-axes)</td>
</tr>
<tr>
<td>Main shaft</td>
</tr>
<tr>
<td>Y-axis</td>
</tr>
<tr>
<td>X-axis</td>
</tr>
</tbody>
</table>

2) Switches ON/OFF of motor drive with Excitation switch.
   
   (1 switch for Main shaft, X-axis and Y-axis respectively)

3) Generates DC Power supply for Motor drive (to convert AC to DC).

(2) Driver CPU card

**Major specifications and functions:**

1) Displays status of Main shaft driver, using LED.

2) Displays driver status, using LED.

<table>
<thead>
<tr>
<th>LED display</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Normal</td>
</tr>
<tr>
<td>Orange</td>
<td>Excitation is switched OFF by Excitation switch or system program</td>
</tr>
<tr>
<td>Red</td>
<td>Driver error</td>
</tr>
</tbody>
</table>

3) Drives Main shaft motor and X/Y-axis motor.

4) Takes charge of feed back control (current adjustment) by detecting motor current.

(3) 24 V Power supply

**Major specifications and functions:**

1) Supplies drive power (mainly related to small type pulse motors).

2) Inputs AC200 to 240V and outputs DC+24V.

   Application: Jump motor, Thread holding motor, Thread trimming motor, Color change motor, 
   ATH knife retract sensor, Picker solenoid, Fan, PTR Drive Power supply
(4) 5V Power supply

**Major specifications and functions:**

1) Supplies power to control the machine.

2) Inputs AC200 to 240V and outputs DC+5V, +15V, -15V.

**Application:**

+5V is a control power supply for the cards and sensors (potentiometer, encoder)

+15V is power supply for UTC sensor and Beam sensor, and control power supply for CPU card (to watch power supply).

-15V is converted to - 5V on Mother board and used to control cards.

(5) How to check voltage

1) **Power supply box** (Driver card (MP221-1), Driver CPU card (MP172-2), Mother board (MP232-2))

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Application</th>
<th>Measuring points</th>
<th>Normal range</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V</td>
<td>To control cards</td>
<td>CPWR-1 CPWR-2</td>
<td>+4.9 to +5.3V</td>
<td>DC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CPWR-7 CPWR-6</td>
<td>-4.75 to -5.25V</td>
<td>DC</td>
</tr>
<tr>
<td>-5V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+15V</td>
<td>Pre Amplifier Power supply</td>
<td>CPWR-3 CPWR-4</td>
<td>+14.25 to +15.75V</td>
<td>DC</td>
</tr>
<tr>
<td>AC200 to 240V</td>
<td>To drive motors for Main shaft, X/Y-axes</td>
<td>AC-1 AC-4</td>
<td>AC180 to 264V</td>
<td></td>
</tr>
</tbody>
</table>

Note 1) [CPWR] is indicated with a symbol [CN17] on Mother board.

Note 2) [AC] is indicated with a symbol [CN13] on Mother board

2) **24V Power supply [LDA150W-24-H-Y/-Y (A)]**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Measuring points</th>
<th>Normal range</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24V</td>
<td>CN2-1 to 6</td>
<td>CN3-1 to 7</td>
<td>+25.5 to +26.4V</td>
</tr>
</tbody>
</table>

3) **5V Power supply [LDC60F-2-Y/-Y(A)]**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Measuring points</th>
<th>Normal range</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V</td>
<td>CN2-7,8</td>
<td>CN2-5, 6</td>
<td>+4.9 to +5.3V</td>
</tr>
<tr>
<td>+15V</td>
<td>CN2-4 CN2-2, 3</td>
<td>+14.25 to +15.75V</td>
<td>DC</td>
</tr>
<tr>
<td>-15V</td>
<td>CN2-1 CN2-2, 3</td>
<td>-14.25 to -15.75V</td>
<td>DC</td>
</tr>
</tbody>
</table>
3. ATH card

ATH card drives Thread trimming motor and Picker solenoid, inputs signal from ATH knife retract sensor and controls communication with Extension card through I/F card.

(1) **Major specifications and functions of ATH card:**
1) Communication with Extension card through I/F card.
2) Drives Thread trimming motor and Picker solenoid.
3) Inputs signal from ATH knife retract sensor.

(2) How to check ATH card (MP219-1-A)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Application</th>
<th>Measuring points</th>
<th>Normal range</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24V</td>
<td>ATH motor</td>
<td>CN4-A1</td>
<td>+25.5 to +26.4V</td>
<td>DC</td>
</tr>
<tr>
<td></td>
<td>Picker solenoid</td>
<td>CN4-A2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Head card

Head card drives the motors at the heads (Jump motors, Thread holding motors), takes charge of interface with Tension base cards, and controls communication with Extension card (through I/F card).

(1) **Major specifications and functions of Head card**
1) Controls communication with Extension card (through I/F card).
2) Drives motors at the heads.
3) Inputs thread breakage signal and Tension base switch signal from Tension base cards
4) Outputs Needle bar information to Tension base cards and outputs information on head operating status (Working / Stopped / Thread broken).

(2) How to check Head card voltage (MP219-1)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Application</th>
<th>Measuring points</th>
<th>Normal range</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>+24V</td>
<td>Thread holding motor</td>
<td>CN4-A1</td>
<td>+25.5 to +26.4V</td>
<td>DC</td>
</tr>
<tr>
<td></td>
<td>Jump motor</td>
<td>CN4-A2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. I/F card

Relays communication signal with Extension card, Head cards and ATH cards.

(1) Major functions of I/F card:

Isolates communication signal with Extension card and Head cards / ATH cards electrically to increase resistance to noise.

(2) How to check I/F card (MP220-2A)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Application</th>
<th>Measuring points</th>
<th>Normal range</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V</td>
<td>To drive cards</td>
<td>CN1-4, CN1-3</td>
<td>+4.9 to +5.3V</td>
<td>DC</td>
</tr>
</tbody>
</table>

6. Tension base card

Tension base card inputs Upper thread breakage detection signal.

(1) Major functions of Tension base card:

1) Outputs Thread take-up spring signal of current Needle bar to head card.

2) Switches head operating status (working or stopped) with Tension base switch and outputs to head card.

3) Inputs head operation status (working or stopped) and thread breakage information from head card and displays it with LED.

<table>
<thead>
<tr>
<th>LED display</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Head working</td>
</tr>
<tr>
<td>Lit in red</td>
<td>Upper thread broken</td>
</tr>
<tr>
<td>Blinking in red</td>
<td>Lower thread broken</td>
</tr>
<tr>
<td>Not lit</td>
<td>Head stopped</td>
</tr>
</tbody>
</table>

(2) How to check Tension base card voltage (MP203-3B)

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Application</th>
<th>Measuring points</th>
<th>Normal range</th>
<th>Measuring range</th>
</tr>
</thead>
<tbody>
<tr>
<td>+5V</td>
<td>To control cards</td>
<td>CN2-8, CN1-13,14</td>
<td>+4.9 to +5.3V</td>
<td>DC</td>
</tr>
</tbody>
</table>
7. Joint card

(1) Major functions of Joint card (MP143-2):
   Relay signal and power with CPU card.

Contents of signals / power to be relayed:
Joint card does not take charge of signal conversion or other processing.
1) Signals / power from CPU card to Mother board (Driver card, Driver CPU card)
2) Signals / power from Main shaft encoder, UTC-GS-2, Frame limit switch and Beam sensor to
   CPU card
8. Block diagram, Electrical connecting diagram

(1) ATH card - Block diagram

Characteristics of Fuses:
Fuses F1, F4 and F5 are Poly Switches and have higher resistance to shut off electric current if the current reaches the value in brackets ( ) or more.

When the power supply is turned OFF, the resistance value is reduced and Poly switches return to the previous status.
(2) Head card - Block Diagram

Characteristics of Fuse:
Fuses F1, F4 and F5 are Poly Switches and have higher resistance to shut off electric current if the current reaches the value brackets ( ) or more. When the power supply is turned OFF, the resistance value is reduced and Poly switches return to the previous status.
(3) Joint card - Block Diagram

CPU card
CN5 - CN4 - CN2

Extension card
CN4

Controller

Power supply box
CPWR

-DRV

CN8 - CN9 - CN20

+24V +15V +5V

-5V E2 E

+15V

UTC

UCC

SCN1

CN5-CN6-CN19-CN18-CN15-CN12-CN4-CN14

P-ENC

Bar Switch

Main shaft encoder

Joint card (MP 143-2)

+15V

+X

-X

+Y

-Y

Frame limit switch

Beam sensor (Emitter)

Beam sensor (Receiver)
(4) Controller - Block Diagram

Controller

Switch card

FIP drive circuit
FIP (Indicator)

+5V

IPL ROM
P ROM
(128Kbyte)
program installation

Floppy disk controller
CN10
FDD

CPU card (MP121-4)

+12V

CPU (V53)

Memory
(128K byte)
Working area

Memory
(128K byte)
System area

Memory
(128K byte)
Design data area

UTC sensor input I/F

Joint card (MP143-2)

+24V

Extension card

Memory
(512K byte)

Gate array

Communication IC

Memory
(512K byte)
Design data area

CPU card (MP121-4)

+5V

Control Circuit

Interface Circuit

Interface Circuit

CN8
CN6
CN7
CN9

RS-232C
RS-485A

D12 and D13 are parallelly mounted Poly Switches and operate with current 3.2A or higher.

Potentiometer

COLOR

Color change motor

Color change

CN5

CN3

CN7

CN2

CN1

CN1

CN3

CN2

CN1

CN2

CN1