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Appendix

Fig.1------------- FIG01-CONTROLLER: wire diagram of controller
Fig.3------------- FIG03-TRANSFORMER: wire diagram of transformer
Fig.4------------- FIG04-CIRCUIT_PANEL: wire diagram of auto-control panel
Fig.5------------- FIG05-WCUT_AWT: wire diagram of auto threading (wire cut & pull) PCB
Fig.6------------- FIG06-WIO: wire diagram of WIO PCB
Fig.7------------- FIG07-UPS&MOTION: wire diagram of MOTION PCB
Fig.8------------- FIG08-SWITCH POWER1: wire diagram 1 of power supply
Fig.9------------- FIG09-SWITCH POWER2: wire diagram 2 of power supply
Fig.10----------- FIG10-DRIVER: wire diagram of motor driver
Fig.11----------- FIG11-EDM POWER: wire diagram of electric discharge crystal box
Fig.12----------- FIG12-CONNECTOR: wire diagram of lateral plate connector of the control box
Fig.13----------- FIG13-FAN&MAIN_SWITCH: wire diagram of electric fan and main power switch
Fig.14----------- FIG14-MACHINE_CIRCUIT1: wire diagram 1 of machine
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FLUSHING WATER_SYSTEM:
Fig.16----------- FIG16-WATER_SYSTEM1: wire diagram 1 of water system
Fig.17----------- FIG17-WATER_SYSTEM2: wire diagram 2 of water system
Fig.18----------- FIG18-WATER_SYSTEM3: wire diagram 3 of water system

SUBMERGE WATER_SYSTEM:
Fig.16----------- FIG16-WATER_SYSTEM4: wire diagram 4 of water system
Fig.17----------- FIG17-WATER_SYSTEM5: wire diagram 5 of water system
Fig.18----------- FIG18-WATER_SYSTEM6: wire diagram 6 of water system
Fig.19----------- FIG19-WATER_SYSTEM7: wire diagram 7 of water system
Brief Introduction
1 BRIEF INTRODUCTION

Wire EDM service manual consists of following items:
(1) Define and describe each part of the system structure.
(2) Explain the function of each part of the system structure.
(3) Troubles with the system structure and the troubleshooting

Using this manual requires following basic knowledge -
(1) Very familiar with the operation of this wire EDM.
(2) With basic concepts on basic electricity and computer related knowledge.
(3) With rough idea about mechanical structure.
(4) Know how to use a multimeter.

1.1 HINTS FOR SERVICE

This service manual uses following symbols -

<table>
<thead>
<tr>
<th>Symbols</th>
<th>DESCRIPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Warning</td>
<td>Improper measuring may cause danger to the service men.</td>
</tr>
<tr>
<td>✓ Note</td>
<td>Error wiring or incorrect installation with electronic /mechanical components may cause damage to the machine.</td>
</tr>
<tr>
<td>✓ Hint</td>
<td>Provide useful information for service.</td>
</tr>
</tbody>
</table>

✓ Warning

1. A service man always inspects the machine while the machine is switched on. It is very easy to cause shock danger if he is slightly careless.
2. For inspecting the machine while the machine is working, do not touch the cutting wire because the cutting wire has a very high voltage. Touching it may cause electric shock.
3. For inspecting mechanical structure, if any part of the machine is moved for inspecting convenience, do not stretch hands into the machine structure, or the hands may be jammed.

✓ Note

* Please keep one backup file of system parameter setting. For service, if the system parameter must be altered, please backup one file containing this parameter setting. After altering the parameter, if the machine still can’t work well, you can restore the original parameter.
1.2 Necessary tools for service

(1) Multi-meter: It is often used for repairing wire EDM. There are digital type meter (suggested) and needle type meter.

Basic functions required for a meter -
① Be able to measure ACV 0~750V
② Be able to measure DCV 0~250V
③ Be able to measure Ω file 0~1MΩ
(2) Screwdriver: It is a necessary tool to remove screws or connect circuit terminals.

(3) Solder iron and solder tin: They are used to solder the circuit and slip-off electronic components.
(4) Hex wrench and adjustable wrench: They are used to remove the mechanical parts and the shape-forming plates.

![Image of a hex wrench and adjustable wrench]

(5) Long nose pliers and side cutting pliers: They are used to strip or cut the power cords.

![Image of long nose pliers and side cutting pliers]

1.3 Example of service

When the machine works abnormally, you may follow the instructions of this service manual to shoot the troubles.

For example, if the manual threading action cannot be started, you'll find "manual threading function invalid" shown in § 6.5 of Catalogue of Service Examples. It reads as follows -
Manual threading function is invalid while high pressure PUMP works normally.

※ If high pressure PUMP is abnormal, refer you to the chapter of Inspection Steps on high pressure PUMP.

**Referential Circuit**

![Referential Circuit Diagram]

**Inspection Steps**

1. Check if the manual threading button functions normally with input and output under WIO_I/O status.
   - (YES) Press manual threading button. Measure according to the referential circuit diagram if any of the connecting points of JP7.1 and JP7.2 on water system PCB is short.
   - (YES) Measure according to the referential circuit if the connecting points of JP25.6 and JP25.13 on water system PCB output AC110V.
   - (YES) Replace solenoid valve (AUTO_GATE). Verify if threading is normal.
   - (NO) Replace PCB: WIO in order. Use WIO I/O to check input and output till WIO_I/O is correct.
   - (NO) Check the circuit according to the referential circuit. Verify if any of the connecting points JP7.1 and JP7.2 of water system PCB is short.
   - (NO) Replace water system PCB (JC-2H073B). Verify that the connecting points of JP25.6 and JP25.13 output AC110V.

**FINISH**

※ After above steps, if the machine still can’t feed thread, please check if the thread winding system is normal. Then, check if the thread feeding mechanism inside the machine works normally.
The referential circuit diagram of above components is explained as follows -

FIG12-CONNECTOR: The connector circuit of the side plate of the electric control box.
FIG19-WATER_SYSTEM7: Circuit 7 of water system

(2) Circuit Diagrams
1. FIG01-CONTROLLER: Wiring diagram of controller
2. FIG03-TRANSFORMER: wiring diagram of transformer
3. FIG04-CIRCUIT_PANEL: wiring diagram of auto control panel
4. FIG05-WCUT_AWT: wiring diagram of auto threading (cut and pull) PCB
5. FIG06-WIO: wiring diagram of WIO PCB
6. FIG07-UPS,MOTION: wiring diagram of UPS - MOTION
7. FIG08-SWITCH POWER1: wiring diagram 1 of power supply unit
8. FIG09-SWITCH POWER2: wiring diagram 2 of power supply unit
9. FIG10-DRIVER: wiring diagram of motor driver
10. FIG11-EDM POWER: wiring diagram of electric discharge crystal box
11. FIG12-CONNECTOR: wiring diagram of the connector for the side plate of the electric control box
12. FIG13-FAN&MAIN_SWITCH: wiring diagram of electric fan and main power switch
13. FIG14-MACHINE_CIRCUIT1: wiring diagram 1 of the machine
14. FIG15-MACHINE_CIRCUIT2: wiring diagram 2 of the machine

FLUSHING WATER_SYSTEM:
15. FIG16-WATER_SYSTEM4: wiring diagram 1 of water system
16. FIG17-WATER_SYSTEM5: wiring diagram 2 of water system
17. FIG18-WATER_SYSTEM6: wiring diagram 3 of water system

SUBMERGE WATER_SYSTEM:
18. FIG16-WATER_SYSTEM4: wiring diagram 4 of water system
19. FIG17-WATER_SYSTEM5: wiring diagram 5 of water system
20. FIG18-WATER_SYSTEM6: wiring diagram 6 of water system
21. FIG19-WATER_SYSTEM7: wiring diagram 7 of water system
Freamwork of Wire EDM
2 FRAMEWORK OF WIRE EDM

2.1 FRAMEWORK OF THE SYSTEM

Different from the traditional DOS System, WINDOWS XP Embedded (XPe) processing system developed by JSEDM provides multiple functions and modeling platform. In addition, the system can be reliable based on the high process efficiency.

The controller platform is a 32 –bit industrial computer with a touch screen. It has functions of data processing, NC program simulation, movement control, Signal logic processing and Discharge power control and etc.

Our system utilized AC based servo motor as six axis control. Variable frequency drive can be one of the options to control the water system. For the wire system, it controls the speed and tension of the wire. The EDM system structure is shown below in figure 2.1.

![Diagram of WIN System Framework of Wire EDM](image)

Fig. 2.1 WIN System Framework of Wire EDM
The machine, water system and wire system framework are as the following Fig. 2.2 shown.

![Diagram of machine, water system and wire system framework]

### 2.1.1 CONTROL SYSTEM

#### MOTIONboard

MOTION Board is a control card that is developed for the CNC controlling system. The control card controls all the motion of the CNC machine which contains six axis motional server control. To learn more, please refer to Chapter 3 Motion board.

#### WIO Board

WIO provides a unique in/output function and server signal conversion and transmission. To learn more please refer to Chapter 3 WIO.

#### WPGF Board

This product detects and controls the shape of the electronic wave and then adjust the Discharge parameter based on the detecting result. To learn more please refer to Chapter 3, WPGF Board.
2.1.2 SYSTEM OF SPARKLE

Fig. 2.3 illustrates the framework of sparkle of wire EDM. This system consists of 3 sets of AC power. The 1st AC power called LOW POWER provides the energy required by gap ignition. The 2nd set AC power called HIGH POWER provides discharge energy. The 3rd set AC power is a protective power for MOSFET of HIGH POWER.

The system of sparkle consists of 6 circuit boards - 1 WPGF board, 1 WAP board and 5WHP boards (WI-20 type 4WHP boards). WPGF board detects and controls the discharge status. WAP board induces the gap to discharge, and uses Power Sink circuit to protect MOSFET of WHP board. WHP board functions to switch high power and high current, and provides the energy required by discharge processing.

In main discharge circuit, except MOSFET of WHP board, there are no other elements in parallel on the circuit. In other words, when MOSFET is ON, almost the whole circuit is under “SHORT” status. At this time only the stray inductance on the circuit can limit the discharge current. In order to get a higher instant current, it is necessary to lower the wiring inductance as much as possible by means of - (1) Increase the number of wiring in parallel, (2) Use co-axial wire to eliminate mutual induction between conducting wires.

For further details on WPGF, WAP and WHP boards, refer you to Chapter 3 “Usage".
2.2 Parts and Part numbers of Wire EDM

Wire EDM is mainly composed of electric control box, machine frame and water system. The above mentioned controls and the servo system are one portion of the electric control box, while wire system is a small portion of the machine structure. This paragraph will introduce each structure, the name and the part number of each small part and each position. Figure 2.4 illustrates the part numbers of 3 major parts of the Wire EDM.

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Fig. 2.4  The position of each part of the Wire EDM
2.2.1 WI Electronic control box, WJS1 parts, Number, Location

In addition to the control system and the discharge system, the electric control box consists of power supply system and the distribution board.

A. Part of Controller Platform location (Floor standing)

A-1. Part of Controller Platform location (Lower arm)
A-2. Part of Controller Platform location (WI-200 USED)

PART (I) : Referential circuit drawing FIG01-CONTROLLER&LCD FIG013-FAN&MAIN SWITCH(WI-200)- consists of following parts -

1. ALARM_BUZZER: buzzer (DC24V)
2. USB-ADAPTER2 : USB port
3. ON_SW: Power ON button
4. OFF_SW: Power OFF button
5. KEYBOARD : KEYBOARD
6. E-STOP_SW: emergency stop button
7. MOUSE : MOUSE
- Touch panel: Touch panel
- RS-232: RS-232 connector
- KEY-CPU: KEY-CPU board
- Power supply: Power supply (NES-15-5)
- RJ-45: NET connector
- CONTROLLER_BAR: grounding copper plate
- CONTROLLER: CONTROLLER
- TB1: Terminal block
- MAIN_SW: MAIN POWER_SW (WI-200)
- CN9: connector 2P 16MM (Controller AC110V power)
- FAN12: FAN 110V 3"

※ Note: Warehouse Number Synopsis of Radial type small electric control box

<table>
<thead>
<tr>
<th>No.</th>
<th>Part Name</th>
<th>Circuit No.</th>
<th>Warehouse No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Buzzer (DC24V)</td>
<td>ALARM_BUZZER</td>
<td>EBZ4-28V</td>
</tr>
<tr>
<td>2</td>
<td>USB-ADAPTER2</td>
<td>USB-ADAPTER2</td>
<td>EPBJC2T051</td>
</tr>
<tr>
<td>3</td>
<td>Power ON button</td>
<td>ON_SW</td>
<td>ESWG1C</td>
</tr>
<tr>
<td>4</td>
<td>Power OFF button</td>
<td>OFF_SW</td>
<td>ESWR1C</td>
</tr>
<tr>
<td>5</td>
<td>KEYBOARD</td>
<td>KEYBOARD</td>
<td>E0LWE178AN</td>
</tr>
<tr>
<td>6</td>
<td>Emergency stop button</td>
<td>E-STOP_SW</td>
<td>ESW401</td>
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<tr>
<td>7</td>
<td>MOUSE</td>
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<td>12</td>
<td>NET connector</td>
<td>RJ-45</td>
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<td>13</td>
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<td>16</td>
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<td>MAIN_SW</td>
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<td>17</td>
<td>connector 2P 16MM</td>
<td>CN9</td>
<td>EHD2R16</td>
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<tr>
<td>18</td>
<td>FAN 110V 3&quot;</td>
<td>FAN12</td>
<td>EFN110V3</td>
</tr>
</tbody>
</table>
B. Main Control Box (front view) ((Floor standing, Lower arm)
PART (I): Referential circuit drawing Fig11-EDM POWER consists of following parts –

1. FNR3: non-induced current limit resistor (25Ω/250W)
2. FNR4: non-induced current limit resistor (25Ω/250W)
3. FNR5: non-induced current limit resistor (25Ω/250W)
4. FNR6: non-induced current limit resistor (25Ω/250W)
5. FNR7: non-induced current limit resistor (25Ω/250W)
6. FNR8: non-induced current limit resistor (18Ω/250W)
2. Framework of Wire EDM

- FNR9: non-induced current limit resistor (18Ω/250W)
- PCD : PCD_PCB
- FNR10: non-induced current limit resistor (80Ω/250W)
- FNR9: non-induced current limit resistor (18Ω/250W)
- FNR9: non-induced current limit resistor (18Ω/250W)
- WRA : WRA PCB
- WRB : WRB PCB
- POWER_C4: Low voltage discharge capacitance (4700µF/200V)
- POWER_C3: POWER SINK capacitance (4700µF/200V)
- POWER_C1: Hi voltage discharge capacitance (4700µF/400V)
- POWER_C2: Hi voltage discharge capacitance (4700µF/400V)
- WRS : WRS PCB
- WPGF : WPGF PCB

PART ( II ): Referential circuit drawing FIG12-CONNECTOR consists of following parts -

- CON1: 37 PIN connector (limit switch, vertical correcting signal, Z-axis brake power, power of wire feeding wheel and AC 110V)
- CON4: 24 PIN connector (water system signal)
- CON2: 24 PIN connector (signal of auto threading )
- CON3: 16 PIN connector (wire system power)
- CON7: connector of RSF liner scale (Y axis)
- CON6: connector of RSF liner scale (X axis)
- CON5: 16 PIN connector (water system signal)
- Electrode Wire port
- Number Tag Wire port
PART (III): Referential circuit drawing FIG08-SWITCH_POWER1 · FIG09- SWITCH_POWER2 · FIG07-UPS&NOTION(WI-200) consists of following parts –

18 SWP6: Power supply (RS-35-24) provides power to WRS PCB.
29 SWP7: Power supply (RS-150-24) provides power to WIO PCB.
30 SWP8: Power supply (RS-150-24) provides power to WIO · MOTION PCB.
31 SWP9: Power supply (RS-35-5) provides power to MOTION PCB.
32 SWP10: Power supply (RS-35-5) provides power to WIO PCB.
33 SWP11: Power supply (RS-35-5) provides power to WPGF PCB.
35 SWP_LF2: power filter (AC110V/10A)
36 SWP_FG_BAR2: grounded copper plate
42 SWP_LF2: power filter (WI-200 AC110V/5A)
43 SWP9: Power supply (D-60B WI-200) provides power to MOTION PCB.
44 SWP5: Power supply (S-35-5) provides power to WHP PCB.
45 SWP4: Power supply (NES-100-15) provides power to WHP PCB.
46 SWP3: Power supply (NET-50A) provides power to WAP PCB.
47 SWP2: Power supply (NET-50A) provides power to WAP PCB.
48 SWP1: Power supply (NET-50A) provides power to WAP PCB.

PART (IV): Referential circuit drawing FIG06-WIO consists of following parts –

34 ALM LIGHT
38 WIO: WIO PCB

PART (V): Referential circuit drawing FIG07- UPS&MOTION consists of following parts –

39 MOTION_CPU: MOTION_CPU PCB
40 MOTION: MOTION DA&IO PCB
41 UPS: UPS, AC110V/650W
PART (VII) : Referential circuit drawing FIG03- TRANSFORMER(WI-200), consists of following parts –

- **49 X-FMR2**: transformer 2 (4.5KVA)
- **50 X-FMR1**: transformer 1 (4.5KVA)
- **51 X-FMR3**: transformer 3 (110W)

<table>
<thead>
<tr>
<th>No.</th>
<th>Part Name</th>
<th>Circuit No.</th>
<th>Warehouse Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Non-induced current limit resistor (250/250W)</td>
<td>FNR3</td>
<td>ERNS0251250</td>
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C. Main Control Box (right view) (Floor standing, Lower arm)
C-1. Generator Overview (WI-200 USED)
PART ( I ): Referential circuit drawing FIG08-SWITCH_POWER1 consists of following

1. SWP FG BAR2: grounding copper plate
2. SWP LF3: power filter (AC110V/5A)
3. SWP5: Power supply (RS-35-5), provides power to WHP PCB.
4. SWP4: Power supply (SE-100-15), provides power to WHP PCB.
5. SWP3: Power supply (NET-50A), provides power to WAP PCB.
6. SWP2: Power supply (NET-50A), provides power to WAP PCB.
7. SWP1: Power supply (NET-50A), provides power to WAP PCB.

PART ( II ): Referential circuit drawing FIG11-EDM POWER consists of following parts

9. WHP: WHP PCB
10. WHP: WHP PCB
11. WAP: WAP PCB
12. WHP: WHP PCB
13. WHP: WHP PCB
14. WHP: WHP PCB
15. WAP: WAP PCB

PART ( III ): Referential circuit drawing FIG10-DRIVER consists of following parts –

12. DRIVER1: servo driver of X axis (1KW, 750W or 400W)
13. DRIVER2: servo driver of Y axis (1KW, 750W or 400W)
14. DRIVER3: servo driver of YZ axis (400W, brake included)
15. DRIVER4: servo driver of U axis (400W)
16. DRIVER5: servo driver of V axis (400W)
17. DRIVER6: servo driver of W axis (400W)
18. DRIVER_TERMINAL: terminal block
19. SWP L3: power filter (AC220V/10A)
20. FUSE1: fuse (10A/30 mm)
PART (IV): Referential circuit drawing FIG03-TRANSFORMER consists of following parts –

○20 X-FMR1: transformer 1 (4.5KVA)
○21 X-FMR3: transformer 3 (110W)
○22 X-FMR2: transformer 2 (4.5KVA)

PART (V): Referential circuit drawing FIG13-FAN&MAIN_SWITCH consists of following parts –

○3 FAN1~ FAN4: fan (AC220V)
○25 MAIN_SW: MAIN POWER_SW
○26 FAN5~ FAN8: fan (AC220V)

PART (VI): Referential circuit drawing FIG05-AWT_CPU&AWT_CUT consists of following parts –

○30 SWP12: Power supply (RS-35-24), provides power to AWT_CPU PCB.
○31 SWP13: Power supply (RS-35-5), provides power to AWT_CPU PCB.
○32 AWT_CUT: Auto threading Control board
○33 AWT_CPU: Auto threading cutting power board
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**C. PARTS OF AUTO CONTROL PANEL**

**PART (I):** Referential circuit drawing FIG04-CIRCUIT_PANEL consists of following

1. PANEL_FUSE4: fuse (10A/30 ㎜)
② PANEL_FUSE3: fuse (10A/30 ㎜)。
③ PANEL_FUSE2: fuse (5A/30 ㎜)。
④ PANEL_K5: RELAY (DC24V)。
⑤ PANEL_K4: RELAY (DC24V)。
⑥ PANEL_K3: RELAY (DC24V)。
⑦ PANEL_K2: RELAY (DC24V)。
⑧ PANEL_K1: RELAY (AC110V)。
⑨ PANEL_FUSE1: Fuse of main power (32A)
⑩ PANEL_TB1: terminal block
⑪ PANEL_TB2: terminal block
⑫ PANEL_TB2: terminal block (60A)
⑬ PANEL_FR1: solenoid valve of main power (AC110V)
⑭ PANEL_BD3: power rectifier of POWER SINK
⑮ PANEL_FR2: solenoid valve of motor power (AC110V)
⑯ PANEL_BD2: power rectifier of low voltage discharge
⑰ SWP_FR_BAR4: grounding copper plate
⑱ PANEL_FR3: solenoid valve of high voltage discharge (AC110V)
⑲ PANEL_FILTER1: power filter of low voltage discharge(10A)
⑳ PANEL_FR4: solenoid valve of low voltage discharge (AC110V)
㉑ PANEL.FR5: solenoid valve of mold calibration discharge(AC110V)
㉒ PANEL_BD1: power rectifier of high voltage discharge (AC110V)
㉓ PANEL_QF1: overload relay of high voltage discharge
㉔ PANEL_R1: current release resistor of high voltage discharge
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D. REMOTE CONTROL PANEL

PART (VII): Referential circuit drawing FIG01-CONTROLLER&LCD consists of following parts:

1. Aluminum plate
2. REMOTE: Keyboard
3. LCD 20*4: LCD monitor
4. KEY-CPU: KEY-CPU Board
5. MPG: Manual rotation wheel

<table>
<thead>
<tr>
<th>Number</th>
<th>Part name</th>
<th>Circuit No.</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Aluminum Plate</td>
<td>Non-Circuit part</td>
<td>E0LWE192BN</td>
</tr>
<tr>
<td>②</td>
<td>Keyboard</td>
<td>REMOTE</td>
<td>EPCJC2S071A</td>
</tr>
<tr>
<td>③</td>
<td>LCD Monitor</td>
<td>LCD 20*4</td>
<td>EMN07</td>
</tr>
<tr>
<td>④</td>
<td>KEY-CPU Board</td>
<td>KEY-CPU</td>
<td>EPCJC2S069B</td>
</tr>
<tr>
<td>⑤</td>
<td>Manual Rotation Wheel</td>
<td>MPG</td>
<td>EHW01</td>
</tr>
</tbody>
</table>
PART (I): Referential circuit drawing FIG04-CIRCUIT_PANEL consists of following parts -

1. PCD_PANEL: RELAY (MY2J/DC24V)
2. PANEL_FUSE4: fuse (10A/30 mm)
3. PANEL_FUSE3: fuse (10A/30 mm)
4. PANEL_FUSE2: fuse (5A/30 mm)
5. PANEL_K7: RELAY (DC24V)
6. PANEL_K6: RELAY (AC110V)
7. PANEL_K5: RELAY (AC110V)
8. PANEL_K4: RELAY (AC110V)
9. PANEL_K3: RELAY (AC110V)
10. PANEL_K1: RELAY (AC110V)
11. PANEL_K2: RELAY (DC24V)
2.2.2 THE ELECTRONIC COMPONENTS OF MACHINE WJS2

Following drawings illustrate the structure of Wire EDM. This machine adopts 5 AC servo motors to control X axis, Y axis, Z axis, U axis, V axis and (W axis, the 6th axis, if auto threading).

A. Electronic components of the machine (front view)
A-1. Electronic components of the machine (front view) (WI-200 USED)

- Sensor for broken wire
- Sensor motor of U axis
- Sensor motor of X axis
- Limit switch of X axis
- Home switch of X axis
- Limit switch of Z axis
- Home switch of Z axis
- Brake of Z axis
- Servo motor of Z axis
- Servo motor of W axis
- Linear scale of X axis
- Solenoid valve of auto threading

断線検知開關
U軸伺服馬達
X軸伺服馬達
X軸極限開關
X軸HOME開關
Z軸煞車
Z軸伺服馬達
Z軸極限開關
Z軸HOME開關
W軸伺服馬達
自動穿線電磁閥
X軸光學尺

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Property of Kent Industrial USA
B. Electronic components of the machine (side view)
B-1. Electronic components of the machine (side view) (WI-200 USED)

C. Dielectric tank and electronic components of upper post (submerged type)
PART (I): Referential circuit drawing FIG14-MACHINE_CIRCUIT1 consists of following parts -

1. X_LIMIT_SW+: limit switch of X axis (+)
2. X_LIMIT_SW -: limit switch of X axis (−)
3. X_HOME_SW: HOME switch of X axis
4. Y_LIMIT_SW+: limit switch of Y axis (+)
5. Y_LIMIT_SW -: limit switch of Y axis (−)
6. Y_HOME_SW: HOME switch of Y axis
7. Z_LIMIT_SW+: limit switch of Z axis (+)
8. Z_LIMIT_SW -: limit switch of Z axis (−)
9. Z_HOME_SW: HOME switch of Z axis
10. U_LIMIT_SW+: limit switch of U axis (+)
11. U_LIMIT_SW -: limit switch of U axis (−)
12. U_HOME_SW: HOME switch of U axis
13. V_LIMIT_SW+: limit switch of V axis (+)
14. V_LIMIT_SW -: limit switch of V axis (−)
15. V_HOME_SW: HOME switch of V axis
16. WIREBREAK_SW: sensor for broken wire
17. Z_BRAKER: brake of Z axis (WI-200)
18. SEND_WIRE_MOTOR: wire feeding motor

PART (II): Referential circuit drawing FIG15-MACHINE_CIRCUIT2 consists of following parts –

19. AIR_SW10: AIR PRESSURE SENSOR
20. AIR UNITS
21. AIR_SW1~AIR_SW9: solenoid valve of auto threading
22. WORK_LAMP: working lamp
23. OIL_FILLER: oil filler
24. WIRE_FEED_MOTOR: wire feeding motor
25. X_SCALE: linear scale of X axis
26 Y_SCALE: linear scale of Y axis
27 X_MOTOR: servo motor of X axis
28 Y_MOTOR: servo motor of Y axis
29 Z_MOTOR: servo motor of Z axis (brake included)
30 U_MOTOR: servo motor of U axis
31 V_MOTOR: servo motor of V axis
32 W_MOTOR: servo motor of W axis (FOR W axis USED ONLY)

PART (III): Referential circuit drawing FIG16-WATER_SYSTEM4 consists of following parts -
33 Relay gate _KA2: REALY GATE_KA2
34 SL6: Float switch 06

※ NOTE: SYNOPOSIS OF WAREHOUSE PART NUMBERS OF THE MACHINE

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Circuit No.</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Limit switch of X axis (+)</td>
<td>X_LIMIT_SW+</td>
<td>M1SS127AN</td>
</tr>
<tr>
<td>2</td>
<td>Limit switch of X axis (−)</td>
<td>X_LIMIT_SW-</td>
<td>M1SS127AN</td>
</tr>
<tr>
<td>3</td>
<td>HOME switch of X axis</td>
<td>X_HOME_SW</td>
<td>M1SS127AN</td>
</tr>
<tr>
<td>4</td>
<td>Limit switch of Y axis (+)</td>
<td>Y_LIMIT_SW+</td>
<td>M1SS127AN</td>
</tr>
<tr>
<td>5</td>
<td>Limit switch of Y axis (−)</td>
<td>Y_LIMIT_SW-</td>
<td>M1SS127AN</td>
</tr>
<tr>
<td>6</td>
<td>HOME switch of Y axis</td>
<td>ZY_HOME_SW</td>
<td>M1SS127AN</td>
</tr>
<tr>
<td>7</td>
<td>Limit switch of Z axis (+)</td>
<td>ZX_HOME_SW+</td>
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<td>8</td>
<td>Limit switch of Z axis (−)</td>
<td>Z_HOME_SW</td>
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<td>9</td>
<td>HOME switch of Z axis</td>
<td>Z_HOME_SW</td>
<td>M1SS127AN</td>
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<tr>
<td>10</td>
<td>Limit switch of U axis (+)</td>
<td>U_HOME_SW</td>
<td>M1SS127AN</td>
</tr>
<tr>
<td>11</td>
<td>Limit switch of U axis (−)</td>
<td>U_HOME_SW</td>
<td>M1SS127AN</td>
</tr>
<tr>
<td>12</td>
<td>HOME switch of U axis</td>
<td>U_HOME_SW</td>
<td>M1SS127AN</td>
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<tr>
<td>13</td>
<td>Limit switch of V axis (+)</td>
<td>V_HOME_SW</td>
<td>M1SS127AN</td>
</tr>
<tr>
<td>14</td>
<td>Limit switch of V axis (−)</td>
<td>V_HOME_SW</td>
<td>M1SS127AN</td>
</tr>
<tr>
<td>15</td>
<td>HOME switch of V axis</td>
<td>V_HOME_SW</td>
<td>M1SS127AN</td>
</tr>
<tr>
<td>16</td>
<td>Sensor for broken wire</td>
<td>WIRE_BREAK_SW</td>
<td>E0BWG27AN</td>
</tr>
<tr>
<td>17</td>
<td>Brake of Z axis (WI-200)</td>
<td>Z_BRAKER</td>
<td>M1SSJ218AN</td>
</tr>
<tr>
<td>18</td>
<td>Send wire motor</td>
<td>SEND_WIRE_MOTOR</td>
<td>M0BWD61CN</td>
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<tr>
<td>19</td>
<td>Air pressure sensor</td>
<td>AIR_SW10</td>
<td>M1PGA53AN</td>
</tr>
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</table>
## 2. Framework of Wire EDM

<table>
<thead>
<tr>
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<th>Circuit No.</th>
<th>Part No.</th>
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<tbody>
<tr>
<td>20</td>
<td>AIR UNITS</td>
<td>Non-circuit part</td>
<td>M1PGA38AN</td>
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<tr>
<td>21</td>
<td>Solenoid valve of auto threading</td>
<td>AIR_SW1~AIR_SW9</td>
<td>M0LJU72AN</td>
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<tr>
<td>22</td>
<td>Work lamp</td>
<td>WORK_LAMP</td>
<td>M0BWG80BN</td>
</tr>
<tr>
<td>23</td>
<td>Oil filler</td>
<td>OIL_FILLER</td>
<td>M0BWSJ41AN</td>
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<tr>
<td>24</td>
<td>Wire winding motor</td>
<td>WIRE_FEED_MOTOR</td>
<td>M0BD146CN</td>
</tr>
<tr>
<td>25</td>
<td>200 Linear scale of X axis</td>
<td>X_SCALE</td>
<td>M0BSO005AN</td>
</tr>
<tr>
<td>26</td>
<td>430, 30E Linear scale of X axis</td>
<td></td>
<td>M0BF30AN</td>
</tr>
<tr>
<td>27</td>
<td>530, 50E Linear scale of X axis</td>
<td></td>
<td>M0LJF32BN</td>
</tr>
<tr>
<td>28</td>
<td>640, 60E Linear scale of X axis</td>
<td></td>
<td>M0CAF22BN</td>
</tr>
<tr>
<td>29</td>
<td>200 Linear scale of Y axis</td>
<td>Y_SCALE</td>
<td>M0BSO002AN</td>
</tr>
<tr>
<td>30</td>
<td>430, 30E Linear scale of Y axis</td>
<td></td>
<td>M0LJF33BN</td>
</tr>
<tr>
<td>31</td>
<td>530, 50E Linear scale of Y axis</td>
<td></td>
<td>M0LJF33BN</td>
</tr>
<tr>
<td>32</td>
<td>640, 60E Linear scale of Y axis</td>
<td></td>
<td>M0CAF23BN</td>
</tr>
<tr>
<td>33</td>
<td>Servo motor of X axis(400W)</td>
<td>X_MOTOR</td>
<td>M0BWF31BN</td>
</tr>
<tr>
<td>34</td>
<td>Servo motor of X axis(750W)</td>
<td></td>
<td>M0CAF25BN</td>
</tr>
<tr>
<td>35</td>
<td>Servo motor of Y axis(400W)</td>
<td>Y_MOTOR</td>
<td>M0BWF31BN</td>
</tr>
<tr>
<td>36</td>
<td>Servo motor of Y axis(750W)</td>
<td></td>
<td>M0CAF25BN</td>
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<tr>
<td>37</td>
<td>Servo motor of Z axis(400W)</td>
<td>Z_MOTOR</td>
<td>M0BWF22AN</td>
</tr>
<tr>
<td>38</td>
<td>Servo motor of U axis(400W)</td>
<td>U_MOTOR</td>
<td>M0BWF31BN</td>
</tr>
<tr>
<td>39</td>
<td>Servo motor of V axis(400W)</td>
<td>V_MOTOR</td>
<td>M0BWF31BN</td>
</tr>
<tr>
<td>40</td>
<td>Servo motor of W axis(400W)</td>
<td>W_MOTOR</td>
<td>M0LJU106AN</td>
</tr>
<tr>
<td>41</td>
<td>Relay gate KA2</td>
<td>RELAY_GATE_KA2</td>
<td>M0LJU72AN</td>
</tr>
<tr>
<td>42</td>
<td>Float switch 06</td>
<td>SL6</td>
<td>M1SSC27BN</td>
</tr>
</tbody>
</table>

### Part NO. for WI-200

<table>
<thead>
<tr>
<th>No.</th>
<th>Part No.</th>
<th>Circuit No.</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1~15</td>
<td>Limit HOME switch of X~V axis</td>
<td>X~V LIMIT HOME SW</td>
<td>M1SSJ219BN</td>
</tr>
</tbody>
</table>
2.2.3 Electronic Parts of Water System WJS3

Following water system structure shows its circulation and cooling function through high voltage motor, filter motor, ion removing motor and water input motor (Immerse Type). The electric control box of the water system controls the operation of 4 motors (Sprinkling Type: 3 motor).

A. Electronic parts of Sprinkling type (W-A30E) water system (top view)

B. Electronic parts of Sprinkling type (W-A30E) water system (side view)
C. Electronic parts of electric control box of Sprinkling type (W-A30E) water system

※ Note: Water system ‘circuit chart’ and ‘Component number chart’ is the same as Sprinkling type

PART (I): Referential circuit drawing FIG16-WATER_SYSTEM1 consists of following parts –
1. WATER_QUILTY_SENSOR: water quality sensor
2. T1: PT-26 18K transformer
3. LP1: power input indicator of water tank (showing normality)
4. SL1: float switch of polluted water (high level)
5. SL2: float switch of polluted water (low level)
25. PCB: JC-2F107A: PC board of water system
26. LF1: power filter (AC110V/10A)

PART (II): Referential circuit drawing FIG17-WATER_SYSTEM2 consists of following parts –
6. INVERTER: inverter
7. AUTO_GATE: solenoid valve of wire flush
2. Framework of Wire EDM

8. HI_GATE02: solenoid valve of lower nozzle
9. HI_GATE01: solenoid valve of upper nozzle
10. LP2: trouble indicator of inverter
25. PCB: JC-2F107A: PC board of water system

PART (III): Referential circuit drawing FIG18-WATER_SYSTEM3 consists of following parts –

11. K1: high press motor relay
12. K2: filter motor relay
13. K3: ion removing motor relay
14. FR1: overload relay of high voltage motor
15. FR2: overload relay of filter motor
16. FR3: overload relay of ion removing motor
17. LP3: indicator showing water level low
18. LP4: trouble indicator for high press motor
19. LP5: trouble indicator for filter motor
20. M2: high press motor
21. M3: filter motor

<table>
<thead>
<tr>
<th>No.</th>
<th>Part Name</th>
<th>Circuit No.</th>
<th>Warehouse Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WATER_QUILTY_SENSOR</td>
<td>WATER_QUILTY_SENSOR</td>
<td>E0BWJ27BN</td>
</tr>
<tr>
<td>2</td>
<td>PT-26 18K transformer</td>
<td>T1</td>
<td>ETFPT26</td>
</tr>
<tr>
<td>3</td>
<td>PowerInput indicator of water tank (showing normality)</td>
<td>LP1</td>
<td>ELP00</td>
</tr>
<tr>
<td>4</td>
<td>float switch of polluted water (high level)</td>
<td>SL1</td>
<td>M1SSC27AN</td>
</tr>
<tr>
<td>5</td>
<td>float switch of polluted water (low level)</td>
<td>SL2</td>
<td>M1SSC27AN</td>
</tr>
<tr>
<td>6</td>
<td>Inverter - AC220V - AC380V</td>
<td>INVERTER TECO</td>
<td>ECF04/ECF05</td>
</tr>
<tr>
<td>7</td>
<td>solenoid valve of wire flush</td>
<td>AUTO_GATE</td>
<td>M0BWSJ14FN</td>
</tr>
<tr>
<td>8</td>
<td>solenoid valve of lower nozzle</td>
<td>HI_GATE02</td>
<td>M0BWSJ14FN</td>
</tr>
<tr>
<td>9</td>
<td>solenoid valve of upper nozzle</td>
<td>HI_GATE01</td>
<td>M0BWSJ14FN</td>
</tr>
<tr>
<td>10</td>
<td>trouble indicator of inverter</td>
<td>LP2</td>
<td>ELP01</td>
</tr>
<tr>
<td>11</td>
<td>high press motor relay</td>
<td>K1</td>
<td>EESW02-1</td>
</tr>
</tbody>
</table>
### Framework of Wire EDM

<table>
<thead>
<tr>
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<th>Part Name</th>
<th>Circuit No.</th>
<th>Warehouse Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>filter motor relay</td>
<td>K2</td>
<td>EESW14-1</td>
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<tr>
<td>13</td>
<td>ion removing motor relay</td>
<td>K3</td>
<td>EESW14-1</td>
</tr>
<tr>
<td>14</td>
<td>overload relay of high voltage motor</td>
<td>FR1-AC220V</td>
<td>EPRY08-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-AC380V</td>
<td>EPRY07-1</td>
</tr>
<tr>
<td>15</td>
<td>overload relay of filter motor</td>
<td>FR2-AC220V</td>
<td>EPRY05-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-AC380V</td>
<td>EPRY03-1</td>
</tr>
<tr>
<td>16</td>
<td>overload relay of ion removing motor</td>
<td>FR3-AC220V</td>
<td>EPRY02-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-AC380V</td>
<td>EPRY01-1</td>
</tr>
<tr>
<td>17</td>
<td>indicator showing water level low</td>
<td>LP3</td>
<td>ELP01</td>
</tr>
<tr>
<td>18</td>
<td>trouble indicator for high press motor</td>
<td>LP4</td>
<td>ELP01</td>
</tr>
<tr>
<td>19</td>
<td>trouble indicator for filter motor</td>
<td>LP5</td>
<td>ELP01</td>
</tr>
<tr>
<td>20</td>
<td>high press motor</td>
<td>M2</td>
<td>M0BWSJ54CN</td>
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<tr>
<td>21</td>
<td>filter motor</td>
<td>M3</td>
<td>M0BWSJ53AN</td>
</tr>
<tr>
<td>22</td>
<td>ion removing motor</td>
<td>M4</td>
<td>M0BWSJ53AN</td>
</tr>
<tr>
<td>23</td>
<td>PANEL1_TM1: terminal block</td>
<td>PANEL1_TM1</td>
<td>EWD0120</td>
</tr>
<tr>
<td>24</td>
<td>grounding copper plate</td>
<td>FG</td>
<td>E0C10P</td>
</tr>
<tr>
<td>25</td>
<td>water system PCB</td>
<td>PCB : JC-2F107A</td>
<td>EEPCJC2F107A</td>
</tr>
<tr>
<td>26</td>
<td>power filter (AC110V/10A)</td>
<td>LF1</td>
<td>ELF10A</td>
</tr>
</tbody>
</table>
A. Electronic parts of Submerged type water system (top view)

For the electronic parts of electric control box of water system, please see Fig. (C).

Applicable Type of machine: WI-430S, WI-430SA

B. Electronic parts of Submerged type water system (side view)

Applicable Type of machine: WI-430S, WI-430SA
A-1. Electronic parts of Submerged type water system (top view)

Applicable Type of machine: WI-640S, WI-640SA

B-1. Electronic parts of Submerged type water system (side view)

Applicable Type of machine: WI-640S, WI-640SA
A-2. Electronic parts of Submerged type water system (top view)

B-2. Electronic parts of Submerged type water system (side view)
C. Electronic parts of electric control box of Submerged type water system

Applicable Type of machine: WI-430S, WI-430SA, WI-640S, WI-640SA

C-1. Electronic parts of electric control box of Submerged type water system

Applicable Type of machine: WI-200S, WI-200SA
PART (I): Referential circuit drawing FIG16-WATER_SYSTEM4 consists of following parts –

1. WATER_QUALITY_SENSOR: water quality sensor
2. SL1: float switch of polluted water (high level)
3. SL2: float switch of polluted water (low level)
4. PCB_JC-2H073B: PC board of water system
5. SL4: float switch of clean water (low level)
6. SL3: float switch of clean water (high level)
7. SL5: float switch of clean water (lowest level)

PART (II): Referential circuit drawing FIG17-WATER_SYSTEM5 consists of following parts –

3. LP1: power input indicator of water tank (showing normality)
4. INVERTER: inverter
5. LP2: trouble indicator of inverter
6. M2: high press motor
7. PCB_JC-2H073B: PC board of water system
8. LF1: power filter (AC110V/10A)
9. SWITCH01: alarm reset
10. LED01: alarm indicator 1
11. LED02: alarm indicator 2
12. LED03: alarm indicator 3
13. SWP1: power supply (D-60B)
14. M2: high press motor (WI-200 USED)

PART (III): Referential circuit drawing FIG18-WATER_SYSTEM6 consists of following parts –

11. K1: high press motor relay
12. K2: filter motor relay
13 K3: ion removing motor relay
14 FR1: overload relay of high voltage motor
15 FR2: overload relay of filter motor
16 FR3: overload relay of ion removing motor
17 LP4: trouble indicator for high press motor
18 LP5: trouble indicator for filter motor
19 LP6: trouble indicator for ion removing motor
25 PCB_JC-2H073B: PC board of water system
34 LP3: indicator showing water level low
35 LP7: trouble indicator for water input motor
41 K4: water input motor relay
42 FR4: overload relay of water input motor

PART (V): Referential circuit drawing FIG 19-WATER_SYSTEM7 consists of following parts –

7 AUTO_GATE: solenoid valve of wire flush
8 HI_GATE02: solenoid valve of lower nozzle
9 HI_GATE01: solenoid valve of upper nozzle
21 M3: filter motor
22 M4: ion removing motor
23 PANEL1_TM1: terminal block
24 FG: grounding copper plate
25 PCB_JC-2H073B: PC board of water system
27 GUN_GATE: solenoid valve of water gun
28 M5: water input motor
29 DEN_GATE: solenoid valve of ion removing
30 UP-AUTO_GATE: solenoid valve of auto threading
43 WATER_GATE: solenoid valve of water (WI-200 USED)
## SYNOPSIS OF WAREHOUSE PART NUMBERS OF WATER SYSTEM

<table>
<thead>
<tr>
<th>No.</th>
<th>Part Name</th>
<th>Circuit No.</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>water quality sensor</td>
<td>WATER_QUALITY_SENSOR</td>
<td>E0BWJ27BN</td>
</tr>
<tr>
<td>2</td>
<td>power input indicator of water tank</td>
<td>LP1</td>
<td>ELP00</td>
</tr>
<tr>
<td>3</td>
<td>float switch of polluted water (high level)</td>
<td>SL1</td>
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Operation Panel
3 PC BOARD OF ELECTRIC CONTROL BOX

In the electric control box of wire EDM, there are several PC boards. The service men must understand their functions, settings, operational power and the connecting wires on the PC boards. Furthermore, the service men must understand their mutual relationships so as to shoot the troubles quickly.

3.1 IPC Intel® Atom™ High Value Fanless Embedded Box PC

The industrial pure, which adopt CPU with Intel® Atom™ is responsible for platform data processing, NC program interpretive, motion control, in/output signal logic process and discharge power control function. Besides, the storage for this IPC contains CF card with 4G storage and 2G RAM. It supports up to 6 USB 2.0 port, 4 COM terminal, and 2 1G Ethernet, which makes it easy to integrate and maintain.

Fig. 3.1 ARK-3360 Controller port locations
3.2 Motion-DA_IO Board Guide

Motion-DA_IO Board is a control card developed for CNC control system. It controls all movement of 6-axis motion sever, discharge voltage control and water quality detection.

3.2.1 FUNCTIONS

(1) Machine original port and signal input of travel limit
(2) Input of wire broken signal and the input of vertical alignment signal
(3) Z axis brake control (DC24V)
(4) Output voltage of edge search and detect gap voltage.
(5) Detect water resistivity,
(6) Connect the servo system of 6 axes (X, Y, Z, U, V and W.)
(7) Sever drive Servo On output, Alarm Reset output, Servo output and Driver Alarm Output.
(8) X and Y axes provide a linear scale and a receiving mode for shaft encoder.
(9) Z, U, V and W, 4 axes, provide the receiving of shaft encoder.
(10) The signal type of shaft encoder and linear scale is a line driver namely A, A’, B, B’, C and C’.

Fig. 3.1 ARK-2120 Controller port locations
3. PC board of control box

(11) Control motion servo site In control system of servo motion site, there are between CPU and servo drive

A. Mode of velocity control loop: It receives the position command of CUP and the position feedback signal from the motor. The offset difference is converted into velocity command which is sent to the motor driver to form a close loop control.

3.2.2 System connecting diagram

Fig. System connection diagram of 3.3 MOTION
3.2.3 Installation and application of the hardware

1. Install the hardware -

(1) Check if MOTION CPU is steady stabled on MOTION DA_IO board.
(2) Extend 37PIN, 24PIN metal connection to P14, P15 (DB15), P12, P13, P16 and stable it on MOTION board.
(3) Connect the Cable of P5, P6, P7, P8, P9, P10, Sever system (Driver).
(4) Wait till other hardware devices of the system are completely installed.
(5) Switch on the power (start the machine). Thus, the installation is completed.
3.2.4 Set hardware configuration Guide

(1) Connector Number

![Diagram of the PC board of control box](image)

**Fig. 3.4 MOTION**

**External view**

<table>
<thead>
<tr>
<th>Guide Light guide</th>
<th>LED Light</th>
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<tbody>
<tr>
<td>DC+5V Power light</td>
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<tr>
<td>DC+24V Power light</td>
<td>LED4</td>
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<td>DC+3.3V Power light</td>
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<td>Servo ON light</td>
<td>LED10(X), LED11(Y), LED22(U), LED23(V), LED34(Z), LED35(W)</td>
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<td>Servo Alarm light</td>
<td>LED6(X), LED7(Y), LED18(U), LED19(Y), LED30(Z), LED31(W)</td>
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<td>Servo Ready light</td>
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<td>X axis + Limit</td>
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<td>X axis - Limit</td>
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There are two parts that the motion board can be adjust, which is electric conduction adjustment and Offset, Gain adjustment.

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<td>W axis GAIN</td>
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3.2.5 Output / Input connectors

**P1**: DC Power Input connectors

- **P1**: DC5V Power Input
- 515H3R: 515H3R male connector 90°

- 1 DC+5V
- 2 DC 0V
- 3 FG

**P2**: DC Power Input connectors

- **P2**: DC24V Power Input
- 515H3R: 515H3R male connector 90°

- 1 DC+24V
- 2 DC 0V
- 3 FG

**P3**, **P4**: Input port of linear scale Encoder

- **P3**: Input port of X axis linear scale Encoder
- **P4**: Input port of Y axis linear scale Encoder
- DB9F: 9 PIN D-Type female header 90°

**P3**

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### Wire Cut Maintenance manual

#### 3. PC board of control box

**P5-P10**: DRIVER connection wires

SCSI II: 36 PIN female connector 180°

- **P5**: Connect X axis Driver
- **P6**: Connect Y axis Driver
- **P7**: Connect U axis Driver
- **P8**: Connect V axis Driver
- **P9**: Connect Z axis Driver
- **P10**: Connect W axis Driver

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3. PC board of control box

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<td>14 32</td>
<td>X</td>
<td></td>
<td>W_VCMD</td>
<td>14 32</td>
<td>X</td>
</tr>
<tr>
<td>Z_VCMD_G</td>
<td>15 33</td>
<td>X</td>
<td></td>
<td>W_VCMD_G</td>
<td>15 33</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>16 34</td>
<td>X</td>
<td></td>
<td>X</td>
<td>16 34</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>17 35</td>
<td>X</td>
<td></td>
<td>X</td>
<td>17 35</td>
<td>X</td>
</tr>
<tr>
<td>FG</td>
<td>18 36</td>
<td>X</td>
<td></td>
<td>FG</td>
<td>18 36</td>
<td>X</td>
</tr>
</tbody>
</table>

P14 - P15: LIMIT connection wires
P14: X axis, Y axis, Z axis Input
P15: U axis, V axis, W axis Input
DB15F: 15 PIN D-Type female connector 180°

<table>
<thead>
<tr>
<th>P14</th>
<th>P15</th>
</tr>
</thead>
<tbody>
<tr>
<td>X_LIMIT+</td>
<td>1 9 U_LIMIT+</td>
</tr>
<tr>
<td>X_LIMIT-</td>
<td>2 10 X</td>
</tr>
<tr>
<td>Y_LIMIT+</td>
<td>3 11 Y</td>
</tr>
<tr>
<td>Y_LIMIT-</td>
<td>4 12 X</td>
</tr>
<tr>
<td>Z_LIMIT+</td>
<td>5 13 Z</td>
</tr>
<tr>
<td>Z_LIMIT-</td>
<td>6 14 X</td>
</tr>
<tr>
<td>AUTO_VER_H</td>
<td>7 15 AUTO_VER_L</td>
</tr>
<tr>
<td>AUTO_VER_L</td>
<td></td>
</tr>
<tr>
<td>VER_GND</td>
<td></td>
</tr>
</tbody>
</table>

J11: Connect with Motion (Emergency stop SW, Z axis brake) connector
VH3.96: 4PIN L type male connector 90°

Pin1: Z axis brake (series connection DC24V Input)
Pin2: Z axis brake (series connection DC0 Input)
Pin3: Emergency stop SW (Short Output)
Pin4: Emergency stop SW (Short Output)
### P12: Voltage input connector
VH3.96: 4PIN L type male connector 90°
- Pin1: GAP voltage input (machine-head)
- Pin2: GAP voltage input (machine-body)
- Pin3: Input short circuit detect—voltage input (machine-head)
- Pin4: Input short circuit detect + voltage input (machine-body)

### P13: Water Resistivity input connector
VH3.96: 3PIN L type male connector 90°
- Pin1: Water Resistivity Detector 1
- Pin2: Water Resistivity Detector 2
- Pin3: Ground connection

### P16: Short circuit detect voltage output connector (connected with WIO board)
VH3.96: 2PIN L type male connector 90°
- Pin1: short circuit detect + voltage input (machine-head)
- Pin2: short circuit detect — voltage input (machine-body)

### 3.2.6 User Guide
Hardware adjustment on Motion board is limited; most adjustment can be adjusted on the software. This makes maintenance easier and also increases the range of adjustment. So make sure to be careful while setting the parameter.
3.3 Motion-CPU Board Guide

It can handle digital signal immediately to make the detection or filter wave of analogy signal much easier. Before processing the digital signal, it must first change the signal from analogy to digital through the Analog-to-digital converter (ADC). And the output of the digital signal process then change to analogy signal output through the Digital-to-analog converter (DAC).

3.3.1 Hardware configuration setting and Guide

(1) Panel Guide

(2) Guiding light guide

<table>
<thead>
<tr>
<th>Guide</th>
<th>LED light</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC5V Power light</td>
<td>LED1</td>
</tr>
<tr>
<td>DSP for DC3.3V</td>
<td>LED2</td>
</tr>
<tr>
<td>DC3.3V Power light</td>
<td>LED7</td>
</tr>
<tr>
<td>Status light</td>
<td>LED3, LED4, LED5, LED6</td>
</tr>
</tbody>
</table>

3.3.2 Output / Input connectors

P1: Testing input power connector
VH3.96: 2PIN L type male connector 90°

P2: to controller signal transport USB connector
P3: Reserve (RS-485 transport)
3.4 WIO Board guide

Wired EDM Input/Output Signal Transmission board is abbreviated as WIOboard. This produce provides input and output functions only for Wire EDM. In addition to the input and output signals on the control panel, WIO board processes all the other input and output signals.

3.4.1 FUNCTIONS

(1) Z axis brake control (DC24V)
(2) Switch on the hi/low power of super fine circuit, and the transfer and transmission of discharge power
(3) Input of wire broken signal
(4) Output voltage of wire wheel.
(5) Switch on water system to control 8 steps of water pressure, flow and water level alarm.
(6) Start cycle system and control water system alarm.
(7) Output voltage of edge
(8) Control the wire tension and the output of wire speed.
(9) 4 steps of hi/low voltage control.
(10) AWT function input/output signal process.

3.4.2 SYSTEM CONNECTION DIAGRAM

Fig. 3.6 WIO system connection
3.4.3 Hardware installation and Guide light guide

1. Hardware installation steps
   (1) Set the hardware configuration (refer to hardware configuration setting).
   (2) Turn off the power of the system.
   (3) Stable WIOST board on electrical cabinet.
   (4) Connect P1 to controller USB Cable.
   (5) Connect P2 to WPG board USB Cable.
   (6) If using auto-threading function, connect P3 to AWT_CPU board USB Cable.
   (7) Connect I/O terminal J3, J7, J9, J11, J15.
   (8) Connect wire tension, wire speed control Cable to J12.
   (9) Connect edge detect voltage Cable to J5.
   (10) Connect J14 to Motion Cable.
   (11) Connect J19 to UPS Cable.
   (12) Connect J1, J4, J13, power Cable.
   (13) Connect J10 AC power and VR power Cable.
   (14) Wait until the system finish its hardware setting.
   (15) The installation process will finish after turning on the power.

Fig. 3.7 WIO external view
2. Guide light guide

<table>
<thead>
<tr>
<th>Guide</th>
<th>LED light</th>
<th>Guide</th>
<th>LED light</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC+24V Power light</td>
<td>LED1</td>
<td>DC+3.3V Power light</td>
<td>LED2</td>
</tr>
<tr>
<td>Controller USB Power light</td>
<td>LED3</td>
<td>DC+5V to 3.3V Power light</td>
<td>LED4</td>
</tr>
<tr>
<td>Emergency stop SW</td>
<td>LED11</td>
<td>Air sensor</td>
<td>LED14</td>
</tr>
<tr>
<td>Panel auto-threading switch</td>
<td>LED15</td>
<td>wire broken signal</td>
<td>LED17</td>
</tr>
<tr>
<td>Water system alarm</td>
<td>LED29</td>
<td>main power</td>
<td>LED35</td>
</tr>
<tr>
<td>Edge power(DC12V)</td>
<td>LED36</td>
<td>high voltage power</td>
<td>LED37</td>
</tr>
<tr>
<td>low voltage power</td>
<td>LED38</td>
<td>Spark power</td>
<td>LED39</td>
</tr>
<tr>
<td>Z axis brake</td>
<td>LED41</td>
<td>Water pressure level encode bit0</td>
<td>LED43</td>
</tr>
<tr>
<td>Water pressure level encode bit1</td>
<td>LED44</td>
<td>Water pressure level encode bit2</td>
<td>LED45</td>
</tr>
<tr>
<td>Water system power switch</td>
<td>LED46</td>
<td>HI pump motor switch</td>
<td>LED47</td>
</tr>
<tr>
<td>Ion exchange switch</td>
<td>LED48</td>
<td>Semi-automatic threading</td>
<td>LED49</td>
</tr>
<tr>
<td>Squirt electromagnet valve switch</td>
<td>LED50</td>
<td>Semi-automatic threading spout</td>
<td>LED51</td>
</tr>
<tr>
<td>High speed water inflow</td>
<td>LED52</td>
<td>Water outflow air valve</td>
<td>LED53</td>
</tr>
<tr>
<td>electromagnet valve switch</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.4.4 Output / Input connectors

**J1** : DC Power Input connectors

<table>
<thead>
<tr>
<th>J1</th>
<th>1 DC+5V</th>
<th>2 DC 0V</th>
<th>3 FG</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC5V Power Input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>515H3R</td>
<td>90°</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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**J4 : DC Power Input connectors**

- **J4 : DC24V Power Input**
  - 515H2R : 515H2R male connector 90°

  ![Diagram of J4]

  1. DC+24V
  2. DC 0V

**J6 : AC Fan Power**

- **J6 : AC220V Power Input**
  - 515H4R : 515H4R male connector 90°

  ![Diagram of J6]

  1. AC 220V
  2. AC 0V
  3. AC 220V
  4. AC 0V

**J10 : Coil wire motor power input and power output**

- **J10 : AC220V Fan Power**
  - 515H4R : 515H4R male connector 90°

  ![Diagram of J10]

  1. VR+
  2. VR−
  3. AC 110V
  4. AC 0V

  - Fan Power OUT
  - Fan Power IN
  - Coil wire motor Power OUT
3. PC board of control box

**J13**: DC Power Input connectors
- J13: wire tension, wire speed motor power input
- 515H2R: 515H2R male connector 90°

![J13 connector diagram]

1. **1 DC+24V**
2. **2 DC 0V**

**P1**: to controller signal transport USB connector
**P2**: to WPGF board signal transport USB connector (RS-485 transport)
**P3**: to AWT_CPU board signal transport USB connector (RS-485 transport)
**P4**: Reserve input backup point

**J3**: ATX 12PIN connectors

<table>
<thead>
<tr>
<th>UP_AUTO_WA</th>
<th>WATFIL</th>
<th>WATDRN</th>
<th>X</th>
<th>X</th>
<th>WATALM</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP_AUTO_WA</td>
<td>WATFIL</td>
<td>WATDRN</td>
<td>X</td>
<td>X</td>
<td>WATALM</td>
</tr>
</tbody>
</table>

- **UP_AUTO_WA**: AWT spout
- **WATFIL**: Immerse type high speed water inflow
- **WATDRN**: Immerse type water outflow
- **WATALM**: Water system alarm

**J7**: ATX 16PIN connectors

<table>
<thead>
<tr>
<th>WAT_GUN</th>
<th>AUTO_WAT</th>
<th>DENON</th>
<th>WATON</th>
<th>WATPW</th>
<th>WAT1</th>
<th>WAT2</th>
<th>WAT3</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAT_GUN</td>
<td>AUTO_WAT</td>
<td>DENON</td>
<td>WATON</td>
<td>WATPW</td>
<td>WAT1</td>
<td>WAT2</td>
<td>WAT3</td>
</tr>
</tbody>
</table>

- **WAT_GUN**: Water gun
- **AUTO_WAT**: Auto water
- **DENON**: Ion exchange switch
- **WATON**: HI pump motor switch
- **WATPW**: Water system power switch
- **WAT1**: Water pressure level encode bit0
- **WAT2**: Water pressure level encode bit1
- **WAT3**: Water pressure level encode bit2
J9: ATX 14PIN connectors

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th>EDMPW</th>
<th>HIPW</th>
<th>LOPW</th>
<th>SPKPW</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>EDMPW</td>
<td>HIPW</td>
<td>LOPW</td>
<td>SPKPW</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>EDMPW</td>
<td>HIPW</td>
<td>LOPW</td>
<td>SPKPW</td>
</tr>
</tbody>
</table>

EDMPW: EDM power
HIPW: high voltage power
LOPW: low voltage power
SPKPW: Spark edge

J11: ATX 12PIN connectors

<table>
<thead>
<tr>
<th>SEND_WV_L</th>
<th>M_WIRE_BK+</th>
<th>AIR_SENSOR+</th>
<th>IN_AUTO_WA+</th>
<th>X</th>
<th>Z_BRK+</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEND_WV_N</td>
<td>M_WIRE_BK-</td>
<td>WIRE_BK+</td>
<td>X</td>
<td>I_COM</td>
<td>Z_BRK-</td>
</tr>
</tbody>
</table>

Z_BRK: Z axis brake
I_COM: Wire break signal (WIRE_BK-)
Air sensor (AIR_SENSOR-)
Panel semi-automatic threading button (IN_AUTO_WA-)

WIRE_BK: Wire break signal (WIRE_BK+)
M_WIRE_BK: to Motion Wire broken signal
AIRSENSOR: Air sensor (AIR_SENSOR+)
IN_AUTO_WA: Panel semi-automatic threading button (IN_AUTO_WA+)
SEND_WV: Coil wire motor power output

J15: ATX 10PIN connectors

<table>
<thead>
<tr>
<th>E_STOP+</th>
<th>OFF-SW</th>
<th>ON_SW_B</th>
<th>BUZZER-</th>
<th>BUZZER+</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_COM</td>
<td>X</td>
<td>ON_SW_C</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

BUZZER: BUZZER
ON_SW: ON switch
I_COM: Emergency switch - OFF switch -
OFF-SW: OFF switch +
E_STOP: Emergency switch +

AC 110V output

DC+24V output

Negative terminal

Open/Short output
Wire Cut Maintenance manual

3. PC board of control box

**J2**: WARNING LIGHT・PCD_PCB board connectors

VH3.96: 7PIN  L type male connector 90°

- Fin1: DC+24V (WARNING LIGHT・PCD_PCB DC24V)
- Fin2: PCD_PCB board (DC0V)
- Fin3: Warning light (G DC0V)
- Fin4: Warning light (Y DC0V)
- Fin5: Warning light (R DC0V)
- Fin6: Reserve point
- Fin7: Reserve point

**J5**: Short circuit detect voltage output connector connected with Motion board

VH3.96: 2PIN  L type male connector 90°

- Fin1: Short circuit detect + voltage input machine-head
- Fin2: Short circuit detect - voltage input machine-head

**J12**: connector of wire speed and wire tension output

VH3.96: 6PIN  L type male connector 90°

- Fin1: Frame GND
- Fin2: wire speed output +
- Fin3: wire speed output -
- Fin4: wire tension +
- Fin5: wire tension -
- Fin6: Frame GND

**J19**: UPS input connector

VH3.96: 3PIN  L type male connector 90°

- Fin1: Open/Short Input
- Fin2: DC 0V Output
- Fin3: DC+5V Output

**J14**: Connector connected with Motion (Emergency stop SW・Z axis brake)

VH3.96: 4PIN  L type male connector 90°

- Fin1: Z axis brake (series connection DC24V Input)
- Fin2: Z axis brake (series connection DC0 Input)
### O-BITS(O00~O31)

<table>
<thead>
<tr>
<th>O_BIT</th>
<th>DEFINE</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>O0</td>
<td>Y0</td>
<td>Reserve point SPO0</td>
</tr>
<tr>
<td>O1</td>
<td>Y1</td>
<td>Reserve point SPO1</td>
</tr>
<tr>
<td>O2</td>
<td>Y2</td>
<td>Reserve point SPO2</td>
</tr>
<tr>
<td>O3</td>
<td>Y3</td>
<td>Reserve point SPO3</td>
</tr>
<tr>
<td>O4</td>
<td>Y4</td>
<td>Reserve point SPO4</td>
</tr>
<tr>
<td>O5</td>
<td>Y5</td>
<td>Reserve point SPO5</td>
</tr>
<tr>
<td>O6</td>
<td>Y6</td>
<td>Reserve point SPO6</td>
</tr>
<tr>
<td>O7</td>
<td>Y7</td>
<td>Reserve point SPO7</td>
</tr>
<tr>
<td>O8</td>
<td>UP_WATER</td>
<td>Threading spout</td>
</tr>
<tr>
<td>O9</td>
<td>WATER_FILL</td>
<td>Immerse type high speed water inflow</td>
</tr>
<tr>
<td>O10</td>
<td>WATER_DRAIN</td>
<td>Immerse type water outflow</td>
</tr>
<tr>
<td>O11</td>
<td>PCD</td>
<td>PCD circuit</td>
</tr>
<tr>
<td>O12</td>
<td>WARNING LIGHT(G)</td>
<td>Warning light(G)</td>
</tr>
<tr>
<td>O13</td>
<td>WARNING LIGHT(Y)</td>
<td>Warning light Y)</td>
</tr>
<tr>
<td>O14</td>
<td>WARNING LIGHT(R)</td>
<td>Warning light (R)</td>
</tr>
<tr>
<td>O15</td>
<td>Y15</td>
<td>Reserve point SPO15</td>
</tr>
<tr>
<td>O16</td>
<td>WATER_PRESS3</td>
<td>Water pressure level encode bit0</td>
</tr>
<tr>
<td>O17</td>
<td>WATER_PRESS2</td>
<td>Water pressure level encode bit1</td>
</tr>
<tr>
<td>O18</td>
<td>WATER_PRESS1</td>
<td>Water pressure level encode bit2</td>
</tr>
<tr>
<td>O19</td>
<td>WATER_POWER</td>
<td>Water system power switch</td>
</tr>
<tr>
<td>O20</td>
<td>WATER_ON</td>
<td>Hi pump motor switch</td>
</tr>
<tr>
<td>O21</td>
<td>DEICEN_ON</td>
<td>Ion exchange switch</td>
</tr>
<tr>
<td>O22</td>
<td>AUTO_WATER</td>
<td>Semi-automatic threading</td>
</tr>
<tr>
<td>O23</td>
<td>WATER_GUN</td>
<td>Water gun</td>
</tr>
<tr>
<td>O24</td>
<td>POWER_DOWN</td>
<td>Main power down</td>
</tr>
<tr>
<td>O25</td>
<td>EDGE_SAFE</td>
<td>Edge power(DC12V)</td>
</tr>
<tr>
<td>O26</td>
<td>HIPOWER</td>
<td>Hi power</td>
</tr>
<tr>
<td>O27</td>
<td>LOW_POWER</td>
<td>low power</td>
</tr>
<tr>
<td>O28</td>
<td>SPARK_POWER</td>
<td>Sparkling Mode</td>
</tr>
<tr>
<td>O29</td>
<td>Y29</td>
<td>Reserve point SPO29</td>
</tr>
<tr>
<td>O30</td>
<td>Z_BRAKE</td>
<td>Z axis brake</td>
</tr>
<tr>
<td>O31</td>
<td>LAMP</td>
<td>Working light (Temporary not available)</td>
</tr>
</tbody>
</table>
### I-BITS (I00~I23)

<table>
<thead>
<tr>
<th>I_BIT</th>
<th>DEFINE</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I0</td>
<td>E_STOP</td>
<td>Emergency stop SW</td>
</tr>
<tr>
<td>I1</td>
<td>OFF_SW_B</td>
<td>Power off switch</td>
</tr>
<tr>
<td>I2</td>
<td>UPS_ALARM</td>
<td>UPS unusual signal</td>
</tr>
<tr>
<td>I3</td>
<td>AIR_SENSOR</td>
<td>Air sensor</td>
</tr>
<tr>
<td>I4</td>
<td>IN_AUTO_WA</td>
<td>Panel Semi-Automatic threading button</td>
</tr>
<tr>
<td>I5</td>
<td>X5</td>
<td>Reserve point SPI5</td>
</tr>
<tr>
<td>I6</td>
<td>WIRE_BREAK-</td>
<td>Wire break signal</td>
</tr>
<tr>
<td>I7</td>
<td>RECYCLE_BOX</td>
<td>Receive wire bin inspect (temporary not available)</td>
</tr>
<tr>
<td>I8</td>
<td>X8</td>
<td>Reserve point SPI8</td>
</tr>
<tr>
<td>I9</td>
<td>X9</td>
<td>Reserve point SPI9</td>
</tr>
<tr>
<td>I10</td>
<td>X10</td>
<td>Reserve point SPI10</td>
</tr>
<tr>
<td>I11</td>
<td>X11</td>
<td>Reserve point SPI11</td>
</tr>
<tr>
<td>I12</td>
<td>X12</td>
<td>Reserve point SPI12</td>
</tr>
<tr>
<td>I13</td>
<td>X13</td>
<td>Reserve point SPI13</td>
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<tr>
<td>I14</td>
<td>X14</td>
<td>Reserve point SPI14</td>
</tr>
<tr>
<td>I15</td>
<td>X15</td>
<td>Reserve point SPI15</td>
</tr>
<tr>
<td>I16</td>
<td>WATER_UP_A</td>
<td>Drop sink upper water level examine (Temporary not available)</td>
</tr>
<tr>
<td>I17</td>
<td>WATER_LOW_A</td>
<td>Drop sink lower water level examine (Temporary not available)</td>
</tr>
<tr>
<td>I18</td>
<td>WATER_ALARM</td>
<td>Water alarm</td>
</tr>
</tbody>
</table>
3.5 WPGF Board

Wire EDM Discharge Pulse Generator Function Board is called WPGF board, which provides wire EDM with detection and control function on discharge waveform. Thus, discharge parameter can be adjusted according to the finding of discharge detection.

3.5.1 Functions

WPGF Board is the discharge control signal generator for EDM. The main function is to load the discharge parameter and detect the discharge status from the WIO Board. Next, the WPGF Board will send the signal to WHP Board and WAP Board in order the control the sequence of the discharge.

3.5.2 System connecting diagram

![WPGF System Connecting Diagram](image)
3.5.3 Installation steps and the usage of hardware

1. WPGF Board Installation sequence

(1) Plug in the cable to the Power Port P1
(2) Plug in USB-B Type cable P2
(3) Plug the Signal cable to P4, P5, P6, P7, P8.
(4) Plug in the cable for the Discharge Gap Voltage and Power Sink
(5) Other system hardware installation complete
(6) Turn ON the power to complete the installation

2. Signal Light

<table>
<thead>
<tr>
<th>Description</th>
<th>Signal Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC+5V Power Light</td>
<td>LED1</td>
</tr>
<tr>
<td>DC+3.3 Light</td>
<td>LED2</td>
</tr>
<tr>
<td>Power Ready</td>
<td>LED3</td>
</tr>
<tr>
<td>Discharge ON Signal 2 input</td>
<td>LED4</td>
</tr>
<tr>
<td>WPGF ON Signal Light (Sparkling)</td>
<td>LED5</td>
</tr>
<tr>
<td>Discharge ON Signal 1 input</td>
<td>LED6</td>
</tr>
<tr>
<td>Polish ON Signal Light</td>
<td>LED7</td>
</tr>
<tr>
<td>Retention point</td>
<td>LED8</td>
</tr>
<tr>
<td>Polish control Signal Input</td>
<td>LED9</td>
</tr>
<tr>
<td>AC/ DC Power control signal input</td>
<td>LED10</td>
</tr>
<tr>
<td>AC/ DC Power ON Signal Light</td>
<td>LED11</td>
</tr>
<tr>
<td>Discharge parameter loading control signal (ENABLE)</td>
<td>LED12</td>
</tr>
<tr>
<td>Discharge Machining Signal Light</td>
<td>LED13</td>
</tr>
<tr>
<td>Discharge Parameter Address</td>
<td>LED14, LED16, LED18</td>
</tr>
<tr>
<td>Discharge Parameter Data</td>
<td>LED20, LED22, LED24, LED26, LED28, LED29, LED30, LED31</td>
</tr>
<tr>
<td>Discharge Normal Light</td>
<td>LED15</td>
</tr>
<tr>
<td>Discharge Arc Light</td>
<td>LED17</td>
</tr>
<tr>
<td>Discharge Short circuit Light</td>
<td>LED19</td>
</tr>
<tr>
<td>Discharge SINK Light</td>
<td>LED21</td>
</tr>
<tr>
<td>Discharge GAP &lt; 10V</td>
<td>LED23</td>
</tr>
<tr>
<td>Discharge 10V &lt; GAP &gt; 45V</td>
<td>LED25</td>
</tr>
<tr>
<td>Discharge GAP &gt; 70V</td>
<td>LED27</td>
</tr>
</tbody>
</table>
3. Port No.

1. Discharge Parameter Data
2. Discharge Parameter Address
3. Discharge Parameter Loading Control Signal (ENABLE)
4. AC/DC Power Control Signal , 0:AC, 1:DC
5. Polish Control Signal (0:ON)

1. Start Signal Light (Sparkling)
2. Polish ON Light (0:OFF, 1: ON)
3. AC/DC Power ON Light (0:AC, 1: DC)
4. Discharge ON Light
5. Discharge Voltage Detection Light

6. Discharge Status (Normal · Arc · Short)

Figure 3.9 WPGF Circuit board
**P1**: DC Power Input connectors
- P1: DC5V Power Input
- 515H3R: 515H3R male connector 90°

<table>
<thead>
<tr>
<th>P1</th>
<th>1 DC +5V</th>
<th>2 DC 0V</th>
<th>3 FG</th>
</tr>
</thead>
</table>

**P2**: For WIO signal transmission USB_B Type Port (RS-485 Transmission)

**P3**: For retention

**P4** - **P5**: WPGF sends the control signal to the discharge power of WHP board
- DB9F: 9 PIN D-Type female port 90°

[Diagram of cable connections]
P6: The ignition signal will be send from WPGF board to WAP board

DB15F: 15 PIN D-Type Female port 90°

P7: WPGF will send the signal of the polish loop and low voltage power to WRS Board.
DB26F: 26PIN D-Type female port 180°

J8: Gap Voltage and Recovery power voltage port
VH3.96: 5PIN L type male port 90°
3.6 WHP Board

Wire EDM High Power discharge board is called WHP. This product provides Wire EDM with high power switching capability for discharge, and can quickly switches processing capability required by wire EDM.

3.6.1 Briefly introduce the functions
(1) Receiving method of optical coupler signal
(2) Convert signal for TTL and CMOS.
(3) Push-Pull type PreAmplifier design.
(4) PostAmplifier employs 8 pieces MOSFET in parallel with link balance design.
(5) MOSFET is protected by a turn-off snubber circuit, and has Power Sink circuit.

3.6.2 Specifications
(1) Input control signal.
   A. Receiving method: Differential receiving via Opticoupler (HCPL-2601).
   B. Signal address: TTL level (HI: below 0.8V. LOW: above 2.4V)
   C. Range of signal frequency: 0~110KHz
   D. Width of signal pulse: 50ns~900ns
   E. Fitting type: D-type 9Pin male fitting (DB-9M)
   F. Cable fitting type: D-type 9Pin female fitting (DB-9F)

(2) PostAmplifier switching circuit
   A. Capability of current switching: 125A/us (8 pcs MOSFET in parallel. 4 pcs WHP board in parallel, and can be switched to 500A/us).
   B. External voltage between P+ (SINKP) terminal and P- (TABLE) terminal: DC90V · P+ connects (+).
   C. External voltage between S (VHPN) terminal and P- (TABLE) terminal: DC220V · P- connect (+)
   D. D (WIRE) terminal and P- (TABLE) terminal must connected with coaxial cable.

(3) Others
   A. Power required: +12V/2.5A · -5V/5A
   B. Size: length →300mm, width→180mm
   C. Product name: WHP
3.6.3 Connecting diagram of the system

Fig. 3.10 shows the system connecting diagram of WHP. WHP connects the discharge circuit through P+, P-, D and S. Thus, P1 receives WPGF signal. Fig. 3.11 shows the wiring diagram of WHP board.

Fig. 3.10 system connecting diagram of WHP board

Fig. 3.11 WHP wiring diagram
3.6.4 Installation and usage of hardware

1. Installation steps of hardware

Installation steps of WHP hardware:
(1) Insert WHP board to the port of discharge power box.
(2) Fix the terminals P+ (SINKP), P− (TABLE), D (WIRE) and S (VHPN) of WHP board and the copper bars of the back plate of the discharge power box.
(3) Insert power wire to JP1 terminal.
(4) Insert the signal to the fitting of P1 (HPCN1).
(5) Wait till other hardware equipments of the system is installed.
(6) Switch on power (start the machine). The installation is completed.

2. Panel

LED of WHP panel
- Red LED: +12V lamp
- Green LED: −5V lamp
- Yellow LED: lamp of control signal

(1) No discharge: 3 lamps R G Y keep on lighting.
(2) Discharge: 2 lamps R G keep on lighting. Lamp Y flickers, and its frequency boosts as the discharge frequency boosts.

3. Output / Input connectors

(1) Definition of JP1 Pin of WHP board

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>−5V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>+12V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(2) The connecting terminal of WHP board and discharge circuit

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P+</td>
<td>SINKP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P−</td>
<td>TABLE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>WIRE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>VHPN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Wiring

Connect P+ , P−, D and S to discharge circuit -

Fig. 3.20 illustrates the relationship between WHP board and discharge circuit:

![Diagram of WHP board and discharge circuit]

In Fig. 3.12, L1 and L2 are coaxial cables connected to the wire electrode and the machine (workpiece) respectively. It is necessary to have a gap between the wire electrode and the machine (workpiece), so the coaxial cable from the WHP board is connected to a place near the machine, and then reconnected to the wire electrode and the machine by USB.

![Diagram of coaxial cable wiring]

Fig. 3.13 illustrates the wiring of coaxial cable connected to the machine. Coaxial cable has a length limit. After reconnection, W1 and W2, the shorter the better, should not affect the operation.
5. USAGE

Hints for using WHP board -

(1) When WHP board operates under high frequency (higher than 50KHZ), the radiating vanes will distinctively boost temperature. Therefore, A sufficient installation space added with an electric fan for cooling purpose is necessary. It enhances radiation efficiency.

(2) If processing speed is less than 180mm², operation with 4 WHP boards is suggested. If processing speed is over 180mm², operation with 6 WHP boards is suggested.

(3) Under high speed process, there is a high frequency vibration current of 90A between the high frequency Discharge power (220V) and WHP board. Therefore, the connection between the capacity power and the WHP board should be made by 2 ~ 3 power cords (8 mm² multi-cores) in parallel. Shorter power cords are better because they can avoid weld short caused by overheating.

(4) When the WHP board operates, the fast changes of the voltage and the current will produce huge noises of electric field and magnetic field. Therefore, the signal wire should be twisted wire. Besides, place the electric control box at a proper plate to avoid electromagnetic interferences.
3.7 WAP Board

Wire EDM low voltage Alternative Power ignition board “WAP”. During the process of wire EDM discharge, WAP produces alternative current to induce the gap to discharge electricity. Power Sink circuit on WAP board controls Power Sink voltage so as to protect the transistor of High Power board.

3.7.1 Framework of AC Power Circuit

3.7.2 Functions

(1) This circuit board consists of 2 circuits – AC power generating circuit and Power Sink circuit.

(2) AC power generating circuit consists of 4 switches which can convert DC power into AC output power so as to provide Wire EDM with AC ignition.

(3) Power Sink circuit keeps Power Sink capacity in a certain range so as to protect High Power transistor. Vsk power provides a capacity initial value, and connects the capacitor through a switch-controlled Rsk (resistance). When the capacity voltage of Power Sink is too high, Rsk resistance will release energy to keep the capacity voltage in a certain range.

(4) Each switch has an independent Opticopuler to receive the control signal, and drives MOSFET switch through its own MOSFET drive circuit.
### 3.7.3 System Connecting Diagram

**Power Supply:**

1. **Power VAP:** 90VDC provides energy required by low voltage ignition. During discharge, the maximum voltage should not exceed 105V. Power VAP connects the diode D to ensure one-way current.

2. **Power VPS:** Its voltage value is 90V~105V, and \( \geq \) VAP voltage so as to provide Power Sink with initial power.

3. **3 independent DC Power Supply units with 3 independent ground wires:** They provide the power required to drive 5 switches. Each switch provides +12V/-5V DC voltage as shown below – T (PSK, LP1), B (LP2, AP2) and C (AP1)

#### Specifications of Insulation & high power resistance

1. **RAP1 and RAP2,** total 2 sets required, are the current-limiting resistors with 18Ω/250W. Each should be able to induce 1.6uH (maximum).

2. **RSK (25Ω/250W),** 5 sets in parallel, are the energy release resistors of Power Sink capacitor.
3.7.4 Install hardware

(1) Fix WAP board at the insert port of discharge power box.
(2) Connect the power resistance of RAP and RSK of WAP board according to paragraph 3.7.3 “system connecting diagram”.
(3) Connect VAP and VSK power of WAP board according to paragraph 3.7.3 “system connecting diagram”.
(4) Connect the wire output terminal of WAP board to the wire electrode.
   Connect Table to the machine by coaxial cable.
(5) Insert 3 power plugs, APJ1, APJ2 and APJ3. Each plug should have independent power supply with an independent ground wire.
(6) Insert signal fitting APCN1.
(7) Wait till other hardware of the system are completely installed.
(8) Switch on power (Start the machine). Installation is completed.

3.7.5 LED Lamp signals

This circuit board has 3 kinds of lamp signals – red, green and yellow. Red lamp indicates the voltage of +12V power normal. Green lamp indicates the voltage of –5V power normal. Each power set has one each of red, green and yellow indicating lamps. Yellow lamp indicates the control signal of each switch. When yellow lamp lights, it indicates “no signal”. When yellow lamp slightly lights, or becomes dim, it indicates a signal that the related switch is switching. This circuit has a total of 5 switches (5 yellow lamps).
3.8 Discharge Reducing Module

Discharge reducing module of Wire EDM consists of 3 circuit boards - Wire EDM (WRS) Relay board (WRAB*2) board. This product provides Wire EDM with a switching function of reducing discharge energy, and adjusts discharge energy according to the control signal sent from WPGF.

3.8.1 Functions

WRS board is a switch for reducing discharge energy for Wire EDM. Its major function is to receive the discharge mode sent by WPDF board as well as the parameter signal of discharge energy, and then proceeds with the discharge circuit switching and the regulation of discharge energy according to the parameter received. WRAB board the switching circuit boards of power circuit of Wire EDM.

3.8.2 Panels

A : Panel drawing of WRS circuit board

![Diagram of WRS circuit board]

- WPGF_P7
  1: DC +24V
  2: DC 0V
  3: Not Used

- Not used

- Low Voltage segment control signal
  1: DC +24V
  2: DC 0V
  3: Not Used
  4: Not Used

- WRAB_SC1

- Copper WHP_D Port

- RAP1: 9Ω/500W

- WAP: RAPN
3.8.3 Installation and usage of hardware

1. WRS Hardware HMI setting
   1. Plug the Input Parameter Signal Cable to WRS Board P1.
   2. Plug the power to the power port P3 on the WRS Board.
   3. Based on the circuits on the WRS board and WAP board above, connect the RAPN point on the WAP board with point J1 on the WRS board. (Use low inductance material to connect).
   4. Complete all the wiring on the WRS board including connection J1, J2, J3, J4 and J5.
   5. Plug in the Output control signal to P2 on the WRS Board.
   6. Plug the low voltage segment control signal into P4 on WRS Board.
   7. Put WRAB into the Power Box and then complete the wiring for the.
   8. Wait for other hardware to complete installation.
   9. Turn on the power to complete the program installation.
2. Signal Light

<table>
<thead>
<tr>
<th>Description</th>
<th>Signal Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Used</td>
<td>LED1</td>
</tr>
<tr>
<td>High Voltage/Polish switch signal light</td>
<td>LED2</td>
</tr>
<tr>
<td>DC+24V Power Signal Light</td>
<td>LED3</td>
</tr>
<tr>
<td>Low voltage segment signal light</td>
<td>LED4(DC120V) ·</td>
</tr>
<tr>
<td></td>
<td>LED5(DC100V)</td>
</tr>
<tr>
<td></td>
<td>LED6(DC90V) ·</td>
</tr>
<tr>
<td></td>
<td>LED5(DC80V)</td>
</tr>
<tr>
<td>Not used</td>
<td>LED8~ LED11</td>
</tr>
<tr>
<td>Current constraint and resistance switch signal light</td>
<td>LED12(MORMAL_9Ω)</td>
</tr>
<tr>
<td></td>
<td>LED13(FINE_266Ω)</td>
</tr>
<tr>
<td></td>
<td>LED14(FINE_200Ω)</td>
</tr>
<tr>
<td></td>
<td>LED15(FINE_100Ω)</td>
</tr>
<tr>
<td></td>
<td>LED16(FINE_50Ω)</td>
</tr>
</tbody>
</table>

3. In/Output Connector

**P1**: WPGF control signal will input to WRS board

**DB26F**: 26PIN D-Type female port 90°

**P2**: High voltage/Polish switch

- P2: DC+24 Power output
- 515H4R: 515H4R male port 90°

<table>
<thead>
<tr>
<th>P2</th>
<th>1 DC24V</th>
<th>High Voltage/Polish Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 DC 0V</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>X</td>
<td>Not Used</td>
</tr>
</tbody>
</table>
**P3**: DC Power Input port

P3: Provide DC24V Power Input

515H3R: 515H3R male port 90°

![P3 Pin Diagram]

1. DC + 24V
2. DC 0V
3. FG

**P4**: Low voltage segment control signal output (DC24V)

VH3.96: 5PIN L type male port 90°

- Pin1: DC common point 0V
- Pin2: ※ (Control AC_80V)
- Pin3: ※ (Control AC_90V)
- Pin4: ※ (Control AC_100V)
- Pin5: ※ (Control AC_120V)

PS: Pin2~Pin5 can only individually output DC+24V

**P5**: Not Used

### 3.9 Remote & Key_cpu board operational description

Remote Box includes two parts: Remote control and Key_cpu

#### 3.9.1 Functions

1. Utilize RS485 transmission to read the command from the keys and the light signal.
2. LCD coordinate
3. Can use with the rotating wheel. (Optional)
4. Provide EMERGENCY STOP (Optional)
3.9.2 Specification

(1) Remote control
A. Number of key: 42 Key
B. Key placement: Figure 3.13
C. Total number of key lights: 4 LED
D. Total number of machine status light: 38

(2) Key_cpu
A. Connector:
   A. Power connecting platform: 515H3R green port (P1).
   B. 2.54 6PIN male outlet 90° (P2) MPG.
   C. 2.54 16PIN male outlet 90° (P3) to LCD display screen.
   D. Not use when USB_B type (P4) is connecting to remote control.
   E. 2.54 8PIN male outlet 90° (P5) connected to the remote control.
   F. 2.54 2PIN male outlet 90° (P6) connected to the Emergency Stop.
Figure 3.14 Remote Box
3.9.3 System connecting diagram

The figure below is the wiring connection of the remote box. The motion of the remote box depends on Key_cpu. The motion of the key represents the input signal to the Key_cpu board, and the light on the Key_cpu board is the output signal.

![System connecting diagram](image)

3.9.4 Hardware Installation and Operational Description

1. Hardware Installation Procedure

Remote box hardware installation procedure:
(1) Turn off the system
(2) Connect the remote control with Key_cpu
(3) Fix the main control board and Key_cpu on the top of sheet metal of the remote box.
(4) Connect the LCD display screen with Key_cpu_P3
(5) Connect the extension cord on the wire box with Key_cpu_P
(6) Wait for other hardware to complete the installation
(7) Turn on the power to complete the installation.

2. Key_cpu light · VR

<table>
<thead>
<tr>
<th>Description</th>
<th>Light / VR</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC+5V Power light</td>
<td>LED1</td>
</tr>
<tr>
<td>DC+3.3 Power light</td>
<td>LED2</td>
</tr>
<tr>
<td>USB Power light for remote control</td>
<td>LED3</td>
</tr>
<tr>
<td>Enable light</td>
<td>LED4</td>
</tr>
<tr>
<td>LCD brightness adjustment</td>
<td>VR1</td>
</tr>
</tbody>
</table>
2. Output / Input connectors

P1: DC Power Input connectors
P1: DC5V Power Input
515H3R: 515H3R male port 90°

P1

- 1 DC +5V
- 2 DC 0V
- 3 FG

P2: MPG port

P3: LCD display port

P4: USB_B type message transmission port (Only for Key_cpu1)

P5: Key_cpu → Key_cpu1 message transmission port

P6: Emergency switch port
3.10 AWT_CPU& AWT_CUT Board Operation

There is two parts include in AWT input and output function:
Server drive system control and Cutting wire power adjustment.

3.10.1 Functions
(1) C_MODE switch to multiple modes (Torque · Position Control)
(2) Transmission and adapter function for the server signal
(3) AWT input and output signal process
(4) Power output of the wire preheat and cut

3.10.2 System connecting diagram

1. Hardware installation procedure
(1) Turn off the System
(2) Fix the AWT_CPU& AWT_CUT in the electrical box
(3) Connect USB Cable on the WIO board to AWT_CPU_P3.
(4) Connect CON2 with AWT_CPU_P7.
(5) Connect AWT_CPU with the signal wire of the AWT_CUT board
(5) Connect Cable P1 with Cable P2.
(6) Wait for other hardware to complete the installation.
(7) Turn on the power to complete the installation.
## 2. Signal Light - VR Description (AWT_CPU)

<table>
<thead>
<tr>
<th>Description</th>
<th>Signal Light / VR</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC+5V Power light</td>
<td>LED1</td>
</tr>
<tr>
<td>DC+24V receive wire - Threading motor board (server) Power light</td>
<td>LED2, LED4</td>
</tr>
<tr>
<td>DC+24V Power light</td>
<td>LED3</td>
</tr>
<tr>
<td>DSP only DC+3.3V Power light</td>
<td>LED5</td>
</tr>
<tr>
<td>Status light (For detecting PC board)</td>
<td>LED6, LED7, LED8, LED9</td>
</tr>
<tr>
<td>DC+3.3V Power light</td>
<td>LED10</td>
</tr>
<tr>
<td>DC+5V (Input digital analogy converter) Power light</td>
<td>LED11</td>
</tr>
<tr>
<td>DC+12V (Input digital analogy converter) Power light</td>
<td>LED12</td>
</tr>
<tr>
<td>DC-12V (Input digital analogy converter) Power light</td>
<td>LED13</td>
</tr>
<tr>
<td>Servo Alarm light</td>
<td>LED14</td>
</tr>
<tr>
<td>Servo Ready light</td>
<td>LED15</td>
</tr>
<tr>
<td>Servo ON light</td>
<td>LED16</td>
</tr>
<tr>
<td>Alarm CLR light</td>
<td>LED17</td>
</tr>
<tr>
<td>no speed suppress input</td>
<td>LED18</td>
</tr>
<tr>
<td>Command speed option 1 input</td>
<td>LED19</td>
</tr>
<tr>
<td>Switch Mode Input (C_MODE: Torque, Position control)</td>
<td>LED20</td>
</tr>
<tr>
<td>Second gain setting</td>
<td>LED21</td>
</tr>
<tr>
<td>Cut wire position (I42)</td>
<td>LED22</td>
</tr>
<tr>
<td>Curve wire detection (I43)</td>
<td>LED23</td>
</tr>
<tr>
<td>W axis GAIN</td>
<td>VR1</td>
</tr>
<tr>
<td>W axis OFFSET</td>
<td>VR4</td>
</tr>
<tr>
<td>Send wire Gear GAIN</td>
<td>VR2</td>
</tr>
<tr>
<td>Send wire Gear OFFSET</td>
<td>VR3</td>
</tr>
</tbody>
</table>

### Signal Light Guide (AWT_CUT)

<table>
<thead>
<tr>
<th>Description</th>
<th>Signal Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC+5V Power light</td>
<td>LED1</td>
</tr>
<tr>
<td>DC+18V Power light</td>
<td>LED2, LED4</td>
</tr>
<tr>
<td>DC+24V Power light</td>
<td>LED3</td>
</tr>
</tbody>
</table>
3.10.3 Output / Input connectors

1. (AWT_CPU input and output connector)

**P1** : DC Power Input connectors

- P1 : DC5V Power Input
  - 515H3R : 515H3R male port 90°

![P1 connector diagram]

- Pin 1 : Melting signal +
- Pin 2 : Melting signal −
- Pin 3 : Preheat straighten signal +
- Pin 4 : Preheat straighten signal −
- Pin 5 : DC+24V
- Pin 6 : Switch “Detect” or “Melt”、“Straighten” Power
- Pin 7 : DC+24V
- Pin 8 : Enable “Detect” or “Melt”、“Straighten”

**P2** : DC Power Input connectors

- P2 : DC24V Power Input
  - 515H3R : 515H3R male port 90°

![P2 connector diagram]

- Pin 1 : DC+24V
- Pin 2 : DC 0V
- Pin 3 : FG

**P3** : RS485 transmission port・DRIVER signal port

- P3 : RS485 transmission port (USB_B Type signal transmission port)
- P4 : DRIVER signal port (SCSI II : 36 PIN female port 180°)

**P5** : melt・Preheat and strengthen signal input port

XH2.54/8PIN/male port 90°
3. PC board of control box

**P6**: Melt・Preheat Straighten signal input port
XH2.54/10PIN/male port 90°

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pin1: Arrive cutting sensing point +</td>
</tr>
<tr>
<td>2</td>
<td>Pin2: Arrive cutting sensing point -</td>
</tr>
<tr>
<td>3</td>
<td>Pin3: Wire curve Detection point +</td>
</tr>
<tr>
<td>4</td>
<td>Pin4: Wire curve Detection point -</td>
</tr>
<tr>
<td>5</td>
<td>Pin5: Retention (Temporary not use)</td>
</tr>
<tr>
<td>6</td>
<td>Pin6: Retention (Temporary not use)</td>
</tr>
<tr>
<td>7</td>
<td>Pin7: Retention (Temporary not use)</td>
</tr>
<tr>
<td>8</td>
<td>Pin8: Retention (Temporary not use)</td>
</tr>
<tr>
<td>9</td>
<td>Pin9: Emergency Switch +</td>
</tr>
<tr>
<td>10</td>
<td>Pin10: Emergency Switch -</td>
</tr>
</tbody>
</table>

**P7**: Pressure Valve Power input port
XH2.54/16PIN/male port 90°

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pin1: DC+24V</td>
</tr>
<tr>
<td>2</td>
<td>Pin2: DC+24V</td>
</tr>
<tr>
<td>3</td>
<td>PIN3<del>PIN11: Pressure valve 1</del>9</td>
</tr>
<tr>
<td>4</td>
<td>PIN12~PIN14: Temporary not</td>
</tr>
<tr>
<td>5</td>
<td>Pin15: DC+24V</td>
</tr>
<tr>
<td>6</td>
<td>Pin16: DC+24V</td>
</tr>
</tbody>
</table>

2. (AWT_CUT)Input and output connector

**P1**: AC+24V Power output
VH3.96: 2PIN L type male port 90°

- Fin1: AC+24V/L Voltage input
- Fin2: AC+24V/N Voltage input
**P3**: Detect Sensing • Melting • Preheat and straighten power output
VH3.96 : 5PIN  L type male port 90°

- Pin1 : Wire curve sensing  
- Pin2 : Power for common point detecting and straighten  
- Pin3 : Melting power  
- Pin4 : Arrive sensing decelerate position and melting, straighten power

**P2**: Melt • Preheat Straighten signal input port
XH2.54/8PIN/ male port 90°

1. Pin 1 : Melting signal +  
2. Pin 2 : Melting signal  
3. Pin 3 : Preheat straighten signal +  
4. Pin 4 : Preheat straighten signal –  
5. Pin 5 : DC+24V  
6. Pin 6 : Switch “Detect”or “Melt” • “Straighten”Power  
7. Pin 7 : DC+24V  
8. Pin 8 : Enable “Detect”or “Melt” • “Straighten”

**P4**: Melt • Preheat and straighten signal input port
XH2.54/10PIN/ male port 90°

1. Pin1 : Arrive cutting sensing point +  
2. Pin 2 : Arrive cutting sensing point –  
3. Pin 3 : Wire curve detection point +  
4. Pin 4 : Wire curve detection point –
4. Wiring

Wiring
4. Wiring

Wiring here refers to the wire distributions on the circuit panel (FIG04-CIRCUIT_PANEL), connector from the generator (FIG12-CONNECTOR), WIO board (FIG06-WIO) and the terminal block of the machine (FIG14-MACHINE_CIRCUIT1, FIG15-MACHINE_CIRCUIT2). To learn more, please refer to Chapter 9 “Wiring”

4.1 Wiring of Distribution Panel (FIG04-CIRCUIT_PANEL)

The distribution panel controls and supplies power to the whole electric box. The power includes power of controller, discharge power, servo motor and servo power and the power of convertible type power supply. The voltage output from the transformer inside the electric box is input to the circuit panel through the terminal block (PANEL_TB1). The current goes through the circuit of the distribution panel, and the power is output from the terminal panel (PANEL_TB2) to each part. For explanation on wiring, PANEL_TB1.1 stands for the contact of Terminal ①. The rest can be deducted accordingly.

HINT

※ See the circuit of FIG04-CIRCUIT_PANEL
※ See the explanation and the position of the parts in the front view of the electric control box

(1) Wiring of the contact of the terminal block (PANEL_TB1):

- PANEL_TB1.1: Input of main power (R)
- PANEL_TB1.2: Input of main power (S)
- PANEL_TB1.3: Input of main power (T)
- PANEL_TB1.4: WIO_J9.11
- PANEL_TB1.5: WIO_J9.4
- PANEL_TB1.6: Transformer X-FMR3 AC0V/1A
- PANEL_TB1.7: Transformer X-FMR3 AC110V/1A
- PANEL_TB1.8: ON_SW_PIN4
- PANEL_TB1.9: ON_SW_PIN3
- PANEL_TB1.10: WIO_J15.8
- PANEL_TB1.11: WIO_J15.3
- PANEL_TB1.12: WIO_J9.10
- PANEL_TB1.13: WIO_J9.3
- PANEL_TB1.14: WIO_J9.9
- PANEL_TB1.15: WIO_J9.2
- PANEL_TB1.16: WIO_J9.8
4. Wiring

PANEL_TB1.17: WIO_J9.1
PANEL_TB1.18: transformer X-FMR1.12_AC_60V/4A
PANEL_TB1.19: transformer X-FMR1.13_AC_70V/4A
PANEL_TB1.20: transformer X-FMR1.13_AC_80V/4A
PANEL_TB1.21: transformer X-FMR1.13_AC_90V/4A
PANEL_TB1.22: WRS_P4.1
PANEL_TB1.23: WRS_P4.2
PANEL_TB1.24: WRS_P4.3
PANEL_TB1.25: WRS_P4.4
PANEL_TB1.26: WRS_P4.5

\{(2) Wire connection of Terminal block (PANEL_TB2)\}

PANEL_TB2.41: transformer (X-FMR2) input R
PANEL_TB2.42: transformer (X-FMR2) input S
PANEL_TB2.43: transformer (X-FMR2) input T
PANEL_TB2.44: transformer (X-FMR3) input R
PANEL_TB2.45: transformer (X-FMR3) input S
PANEL_TB2.46: transformer (X-FMR1) input R
PANEL_TB2.47: transformer (X-FMR1) input S
PANEL_TB2.48: transformer (X-FMR1) input T
PANEL_TB2.49: coil of solenoid valve (Control power input of DRIVER.)
PANEL_TB2.50: coil of solenoid valve (Control power input of DRIVER.)
PANEL_TB2.51: AC160V (R) of transformer (X-FMR1) output, power input of high voltage discharge
PANEL_TB2.52: AC160V (S) of transformer (X-FMR1) output, power input of high voltage discharge
PANEL_TB2.53: AC160V (T) of transformer (X-FMR1) output, power input of high voltage discharge
PANEL_TB2.54: AC0V/4A of transformer (X-FMR1) output, power input of POWER SINK
PANEL_TB2.55: AC90V/4A of transformer (X-FMR1), power input of POWER SINK
PANEL_TB2.56: power output (+) of low voltage discharge
PANEL_TB2.57: power output (-) of low voltage discharge
PANEL_TB2.58: power output (+) of POWER SINK
PANEL_TB2.59: power output (-) of POWER SINK
PANEL_TB2.60: 1. AC0V/4A of transformer (X-FMR1) output, input of spark edge voltage discharge.
2. AC0V/4A of transformer (X-FMR1) output, power input of low voltage discharge.
PANEL_TB2.61: AC35V/4A of transformer (X-FMR1) output. Input of spark edge voltage discharge.

PANEL_TB2.71: power output (+) of high voltage discharge
PANEL_TB2.72: power output (-) of high voltage discharge
4.2 Wire connection of WIO board (FIG06-WIO)

WIO board provides Wire EDM with special input/output functions. Except the input/output signals of the control panel, the rest input and output signals are controlled by WIO board, water pressure segment, Wire feed, wire tension, wire broken sensors, alignment jig. The output/input signals of WIO board are connected to the connectors (J3, J7, J9, J11, J15, J15….). Therefore, J11.1 stands for the contact of header J11. WIO board is connected to the machine and the water system through the connectors (CON1, CON2, CON3, CON4 and CON5). Therefore, most of the output signals of WIO board are connected to the connectors (CON1, CON2, ON3, CON4 and CON5).

**HINT**

* See circuit diagram FIG06-WIO.
* See Chapter 2 Electric Control Box – rear view of parts
* The wire diagram of WIO board just illustrates the output/input signals as J1~J16. For the wire diagram of the connectors, and P1~P5, please see Chapter 3 WIO board.

(1) Wire connection of header (WIO_J3)
- J3.6 : Connect CON5.7, start signal (-) of up auto water.
- J3.12 : Connect CON5.8, start signal (+) of up auto water.
- J3.11 : Connect CON4.13, start signal (+) of water-in motor
- J3.5 : Connect CON4.14, start signal (-) of water-in motor
- J3.10 : Connect CON4.15, start signal (+) of water draining gate
- J3.4 : Connect CON4.16, start signal (-) of water draining gate
- J3.7 : Connect CON4.17, alarm signal (+) of water system
- J3.1 : Connect CON4.18, alarm signal (-) of water system

(2) Wire connection of header (WIO_J7)
- J7.12 : Connect CON4.1, power input signal (+) of water system
- J7.4 : Connect CON4.2, power input signal (-) of water system
- J7.13 : Connect CON4.3, switch-on signal (+) of water system
- J7.5 : Connect CON4.4, switch-on signal (-) of water system
- J7.14 : Connect CON4.5, start signal (+) of deionization motor
- J7.6 : Connect CON4.6, start signal (-) of deionization motor
- J7.11 : Connect CON4.7, BIT1 signal (+) of water stage control
- J7.3 : Connect CON4.8, BIT1 signal (-) of water stage control
- J7.10 : Connect CON4.9, BIT2 signal (+) of water stage control
- J7.2 : Connect CON4.10, BIT2 signal (-) of water stage control
- J7.9 : Connect CON4.11, BIT3 signal (+) of water stage control
- J7.1 : Connect CON4.12, BIT3 signal (-) of water stage control
J7.15: Connect CON5.7, water flush signal (+) of manual threading.
J7.7: Connect CON5.8, water flush signal (-) of manual threading.
J7.16: Connect CON5.9, start signal (+) of water gun.
J7.8: Connect CON5.10, start signal (-) of water gun.

(3) Wire connection of header (WIO_J9)
J9.8: Connect distribution panel PANEL_TB1.16, power control signal of spark mold correction.
J9.1: Connect distribution panel PANEL_TB1.17, power control signal of spark mold correction.
J9.9: Connect distribution panel PANEL_TB1.14, control signal of low voltage power.
J9.2: Connect distribution panel PANEL_TB1.15, control signal of low voltage power.
J9.10: Connect distribution panel PANEL_TB1.12, control signal of high voltage power.
J9.3: Connect distribution panel PANEL_TB1.12, control signal of high voltage power.
J9.11: Connect distribution panel PANEL_TB1.4, discharge input power signal.
J9.4: Connect distribution panel PANEL_TB1.5, discharge input power signal.

(4) Wire connection of header (WIO_J11)
J11.7: Connect CON1.32, Z axis brake (DC24V).
J11.1: Connect CON1.33, Z axis brake (DC0V).
J11.4: Connect CON1.29, wire broken sensor (+).
J11.2: Connect CON1.28, wire broken sensor (−).
J11.11: Connect Motion_P16.1, Notify Motion Board wire broken sensor (+).
J11.5: Connect Motion_P16.2, Notify Motion Board wire broken sensor (−).
J11.10: Connect CON3.7, air sensor (+).
J11.2: Connect CON3.8, air sensor (−).
J11.9: Connect CON3.9, Panel semi-automatic threading button signal (+).
J11.2: Connect CON3.10, Panel semi-automatic threading button signal (−).
J11.12: Connect CON1.35, power of wire feeding wheel.
J11.6: Connect CON1.34, power of wire feeding wheel.

(5) Wire connection of header (WIO_J15)
J15.3: Connect distribution panel PANEL_TB1.10, power maintain signal (+).
J15.8 : Connect distribution panel PANEL TB1.11, power maintain signal (−).
J15.10 : Connect CON8.1.emergency stop (+).
J15.5 : Connect CON8.8.emergency stop (−).
J15.6 : Connect CON8.5·buzz ( + ).
J15.7 : Connect CON8.4·buzz (−).
J15.2 : Connect CON8.2·OFF SW PIN1.

(6) Wire connection of header (WIO J1·J4·J5·J6·J10·J13·J14·J19)
J1 : DC5V input power for WIO Board.
J4 : DC24V input power for WIO Board.
J5 : to Motion_P12·edge find voltage.
J6 : In/output AC220V power for Radiate fan.
J10: Input AC110V power for send wire wheel motor·AC110V input power for WIO Board.
J13 : DC24V input power for receive wire motor.
J14 : Concatenate signal with Motion Board.
J19 : UPS transmission control signal.

(7) Wire connection of header (WIO_J12)
J7.1 : Connect grounding cooper plate.
J7.2 : Connect CON3.1·wire winding motor (DC24V).
J7.3 : Connect CON3.2·reel motor (DC0V).
J7.4 : Connect CON3.3·tension brake (DC24V).
J7.5 : Connect CON3.4·tension brake (DC0V).
J7.6 : Connect grounding cooper plate.

(8) Wire connection of header (P1·P2)
P1 : Transmission signal control.
P2 : WPGF transmission signal.
P3 : AWT_CPU transmission signal.

(9) Wire connection of header (WIO_J2)
J2.1 : ① Connect Warning light (DC24V) *
   ② Connect PCD JP1.1·PCD board (DC24V) *
J2.2 : Connect PCD JP1.2·PCD board (DC0V) *
J2.3 : Connect Warning light (green) *
   J2.4 : Connect Warning light (yellow) *
   J2.5 : Connect Warning light (red) *
4.3 Wire connection of MOTION board (FIG07-UPS&MOTION)

MOTION board is a control card for CNC machine. It controls the six-axis motion server control signal. Besides it also controls other signal such as machine origin, wire break notification, vertical adjustment and limit switch.

**HINT**

* See the circuit of FIG07-UPS&MOTION_PANEL
* See the explanation and the position of the parts in the front view of the electric control box

(1) Wire connection of header (P1~P12)
- P1 : DC5V input power for MOTION Board.
- P2 : DC24V input power for MOTION Board.
- P3 : input signal of X axis linear scale.
- P4 : input signal of Y axis linear scale.
- P5 : X-axis server control signal.
- P6 : Y-axis server control signal.
- P7 : U-axis server control signal.
- P8 : V-axis server control signal.
- P9 : Z-axis server control signal.
- P10 : W-axis server control signal.
- P11 : Series connect signal with WIO board Z-axis brake, emergency Switch.
- P12 : Discharge voltage, edge, voltage.

(2) Wire connection of header (P14)
- P14.1 : Connect CON1.3, signal of X axis limit (+)
- P14.2 : Connect CON1.1, signal of X axis limit (-)
- P14.3 : Connect CON1.7, signal of Y axis limit (+)
- P14.4 : Connect CON1.6, signal of Y axis limit (-)
- P14.5 : Connect CON1.21, signal of Z axis limit (+)
- P14.6 : Connect CON1.19, signal of Z axis limit (-)
- P14.7 : Connect CON1.30, sensor signal of vertical alignment (upper+)
- P14.8 : Connect CON1.20, sensor signal of vertical alignment (-)
- P14.9 : Connect CON1.4, signal (+) of X axis mechanical origin
- P14.10 : Connect CON1.2, signal (-) of X, Y, Z axis mechanical origin
- P14.11 : Connect CON1.8, signal (+) of Y axis mechanical origin
- P14.12 : open circuit
P14.13 : Connect CON1.22, signal (+) of Z axis mechanical origin
P14.14 : open circuit
P14.15 : Connect CON1.31, sensor signal of vertical alignment (lower+)

(3) Wire connection of header  (P15)
P15.1 : Connect CON1.12, signal of U axis limit (+)
P15.2 : Connect CON1.10, signal of U axis limit (-)
P15.3 : Connect CON1.16, signal of V axis limit (+)
P15.4 : Connect CON1.15, signal of V axis limit (-)
P15.5 : open circuit
P15.6 : open circuit
P15.7 : open circuit
P15.8 : open circuit
P15.9 : Connect CON1.13, signal (+) of U axis mechanical origin
P15.10 : Connect CON1.11, signal (-) of U, V axis mechanical origin
P15.11 : Connect CON1.17, signal (+) of V axis mechanical origin
P15.12 : open circuit
P15.13 : open circuit
P15.14 : open circuit
P15.15 : open circuit
4.4 Wire connection of machine to CON1, CON2 and CON3

Terminal block TB1 and terminal block TB2 of the machine are connected to the electric control box (WJS1) through the connectors CON1, CON2 and CON3.

HINTS

* See wire diagram FIG14-MACHINE_CIRCUIT1 and FIG15-MACHINE_CIRCUIT2.
* See Chapter 2, the parts in the side view of electric control box.

(1) Wire connection the machine to CON1 (37PIN)

CON1.1: Connect MACHINE_TB1.1, signal of X axis limit (+)
CON1.2: Connect MACHINE_TB1.2, common point of limit signal of X and Y axes.
CON1.3: Connect MACHINE_TB1.3, signal of X axis limit (-)
CON1.4: Connect MACHINE_TB1.4, signal (+) of X axis mechanical origin
CON1.5: Connect MACHINE_TB1.5, signal (-) of X axis mechanical origin
CON1.6: Connect MACHINE_TB1.6, signal of Y axis limit (+)
CON1.7: Connect MACHINE_TB1.7, signal of Y axis limit (-)
CON1.8: Connect MACHINE_TB1.8, signal (+) of Y axis mechanical origin
CON1.9: Connect MACHINE_TB1.9, signal (-) of X axis mechanical origin
CON1.10: Connect MACHINE_TB1.10, signal of U axis limit (+)
CON1.11: Connect MACHINE_TB1.11, common point of limit signal of U and V axes
CON1.12: Connect MACHINE_TB1.12, signal of U axis limit (-)
CON1.13: Connect MACHINE_TB1.13, signal (+) of U axis mechanical origin
CON1.14: Connect MACHINE_TB1.14, signal (-) of U axis mechanical origin
CON1.15: Connect MACHINE_TB1.15, signal of V axis limit (+)
CON1.16: Connect MACHINE_TB1.16, signal of V axis limit (-)
CON1.17: Connect MACHINE_TB1.17, signal (+) of V axis mechanical origin
CON1.18: Connect MACHINE_TB1.18, signal (-) of V axis mechanical origin
CON1.19: Connect MACHINE_TB1.19, signal of Z axis limit (+)
CON1.20: Connect MACHINE_TB1.20, common point of Z axis limit signal
CON1.21: Connect MACHINE_TB1.21, signal of Z axis limit (-)
CON1.22: Connect MACHINE_TB1.22, signal (+) of Z axis mechanical origin
CON1.23: Connect MACHINE_TB1.23, signal (-) of Z axis mechanical origin
CON1.24~CON1.27: open circuit
CON1.28 : Connect MACHINE_TB2.24, signal (+) of wire broken sensor
CON1.29 : Connect MACHINE_TB2.25, signal (+) of wire broken sensor
CON1.30 : Connect MACHINE_TB2.26, signal of sensor of vertical alignment (upper)
CON1.31 : Connect MACHINE_TB2.27, signal of sensor of vertical alignment (lower)
CON1.32 : Connect MACHINE_TB2.28, brake of Z axis (DC24V)
CON1.33 : Connect MACHINE_TB2.29, brake of Z axis (DC0V)
CON1.34 : Connect MACHINE_TB2.30, power of wire feeding wheel
CON1.35 : Connect MACHINE_TB2.31, power of wire feeding wheel
CON1.36 : Connect MACHINE_TB2.59, power of worktable
CON1.37 : Connect MACHINE_TB2.60, power of worktable

(2) Wire connection of machine to CON2 (24PIN)
CON2.1 : Connect MACHINE_TB2.32, control signal (+) of auto threading valve 01
CON 2.2 : Connect MACHINE_TB2.33, control signal (-) of auto threading valve 01
CON 2.3 : Connect MACHINE_TB2.34, control signal (+) of auto threading valve 02
CON 2.4 : Connect MACHINE_TB2.35, control signal (-) of auto threading valve 02
CON 2.5 : Connect MACHINE_TB2.36, control signal (+) of auto threading valve 03
CON 2.6 : Connect MACHINE_TB2.37, control signal (-) of auto threading valve 03
CON 2.7 : Connect MACHINE_TB2.38, control signal (+) of auto threading valve 04
CON 2.8 : Connect MACHINE_TB2.39, control signal (-) of auto threading valve 04
CON 2.9 : Connect MACHINE_TB2.40, control signal (+) of auto threading valve 05
CON 2.10 : Connect MACHINE_TB2.41, control signal (-) of auto threading valve 05
CON 2.11 : Connect MACHINE_TB2.42, control signal (+) of auto threading valve 06
CON 2.12 : Connect MACHINE_TB2.43, control signal (-) of auto threading valve 06
CON 2.13 : Connect MACHINE_TB2.44, control signal (+) of auto threading valve 07
CON 2.14 : Connect MACHINE_TB2.45 control signal (-) of auto threading valve 07
CON 2.15 : Connect MACHINE_TB2.46, control signal (+) of auto threading valve 08
CON 2.16 : Connect MACHINE_TB2.47 control signal (-) of auto threading valve 08
CON 2.17 : Connect MACHINE_TB2.48, wire curve signal 01 (+)
CON 2.18 : Connect MACHINE_TB2.49, common point of detection signal of auto threading
CON 2.19 : Connect MACHINE_TB2.50, open circuit
CON 2.20 : Connect MACHINE_TB2.51, open circuit
CON 2.22 : Connect MACHINE_TB2.52, power (+) of wire cutting
CON 2.23 : Connect MACHINE_TB2.53, cut wire, pull wire, electric wire common point detection signal 02 (+).
CON 2.24 : Connect MACHINE_TB2.54, wire pulling power (+), common point of detection signal of auto threading

(3) Wire connection of machine to CON3
CON3.1 : Connect MACHINE_TB2.55, wire winding motor (DC24V)
CON3.2 : Connect MACHINE_TB2.56, wire winding motor (DC0V)
CON3.3 : Connect MACHINE_TB2.57, motor of tension (DC24V)
CON3.4 : Connect MACHINE_TB2.58, motor of tension (DC0V)
CON3.5 : Connect MACHINE_TB2.61, control signal (+) of auto threading valve 09
CON3.6 : Connect MACHINE_TB2.62, control signal (-) of auto threading valve 09
CON3.7~ CON3.16 : no connection
4.5 Wire connection of water system to CON4 and CON5

The connectors JP4 and JP5 of the PCB of Water system (WJS3) are connected to electric control box (WJS1) through Connector CON4 and CON5.

**HINT**

* See the circuit diagram FIG16-WATER_SYSTEM4.
* See Chapter 2 “the components in front view of electric control box”.

(1) Wire connection of water system to CON4 (24PIN)

- **CON4.1**: ConnectJP4.1, power input signal (+) of water system
- **CON4.2**: ConnectJP4.2, power input signal (-) of water system
- **CON4.3**: ConnectJP4.3, switch-on signal (+) of water system
- **CON4.4**: ConnectJP4.4, switch-on signal (-) of water system
- **CON4.5**: ConnectJP4.5, start signal (+) of deionization motor
- **CON4.6**: ConnectJP4.6, start signal (-) of deionization motor
- **CON4.7**: ConnectJP4.7, BIT1 signal (+) of water stage control
- **CON4.8**: ConnectJP4.8, BIT1 signal (-) of water stage control
- **CON4.9**: ConnectJP4.9, BIT2 signal (+) of water stage control
- **CON4.10**: ConnectJP4.10, BIT2 signal (-) of water stage control
- **CON4.11**: ConnectJP5.1, BIT3 signal (+) of water stage control
- **CON4.12**: ConnectJP5.2, BIT3 signal (-) of water stage control
- **CON4.13**: ConnectJP5.3, start signal (+) of water-in motor
- **CON4.14**: ConnectJP5.4, start signal (-) of water-in motor
- **CON4.15**: ConnectJP5.5, start signal (+) of water draining gate
- **CON4.16**: ConnectJP5.6, start signal (+) of water draining gate
- **CON4.17**: ConnectJP5.7, alarm signal (+) of water system
- **CON4.18**: ConnectJP5.8, alarm signal (-) of water system
- **CON4.19**: ConnectJP5.9, detection signal (+) of water quality
- **CON4.20**: ConnectJP4.10, detection signal (-) of water quality
- **CON4.21-22**: open circuit
- **CON4.23**: ConnectLF1.1, power AC0V/3A of water system
- **CON4.24**: ConnectLF1.3, power AC110V/3A of water system

(2) Wire connection of the system to CON5 (16PIN)

- **CON5.1~4**: open circuit
- **CON5.5**: ConnectJP7.1, water flush signal (+) of manual threading
- **CON5.6**: ConnectJP7.2, water flush signal (-) of manual threading
- **CON5.7**: ConnectJP7.3, water flush signal (+) of manual threading (upper)
- **CON5.8**: ConnectJP7.4, water flush signal (-) of manual threading (upper)
- **CON5.9**: ConnectJP7.5, start signal (+) of water gun
- **CON5.10**: ConnectJP7.6, start signal (-) of water gun
4.6 Wire connection of machine terminal block (MACHINE_TB1、MACHINE_TB2)

The components of the machine are connected to the machine terminal block (MACHINETB1 and MACHINE_TB2). Therefore, the circuit of the signals (power) triggered or received by the receiver is shown below:

![Circuit Diagram]

**HINT**

(1) Wire connection of machine terminal block MACHINE_TB1

- TB1.1: Connect X_LIMIT_SW+ (X+ limit switch) <NC> contact
- TB1.2: Connect X_LIMIT_SW+, X_LIMIT_SW-, Y_LIMIT_SW+ and Y_LIMIT_SW- (X and Y limit switches) <COM> contact
- TB1.3: Connect X_LIMIT_SW- (X- limit switch) <NC> contact
- TB1.4: Connect X_HOME_SW (X HOME switch) <COM> contact
- TB1.5: Connect X_HOME_SW (X HOME switch) <NC> contact
- TB1.6: Connect Y_LIMIT_SW+ (Y+ limit switch) <NC> contact
- TB1.7: Connect Y_LIMIT_SW- (Y- limit switch) <NC> contact
- TB1.8: Connect Y_HOME_SW (Y HOME switch) <COM> contact
- TB1.9: Connect Y_HOME_SW (Y HOME switch) <NC> contact
- TB1.10: Connect U_LIMIT_SW+, U_LIMIT_SW-, V_LIMIT_SW+ and V_LIMIT_SW- (U & V limit switches) <COM> contact
- TB1.11: Connect U_LIMIT_SW-, U_HOME_SW (U HOME switch) <NC> contact
- TB1.12: Connect U_HOME_SW (U HOME switch) <COM> contact
- TB1.13: Connect U_HOME_SW (U HOME switch) <NC> contact
- TB1.14: Connect U_HOME_SW (U HOME switch) <NC> contact
- TB1.15: Connect V_HOME_SW (V+ limit switch) <NC> contact
- TB1.16: Connect V_HOME_SW (V HOME switch) <COM> contact
- TB1.17: Connect V_HOME_SW (V HOME switch) <NC> contact
- TB1.18: Connect V_HOME_SW (V HOME switch) <NC> contact
- TB1.19: Connect Z_LIMIT_SW+ (Z+ limit switch) <NC> contact
- TB1.20: Connect Z_LIMIT_SW+、Z_LIMIT_SW- (Z limit switch) <COM> contact
- TB1.21: Connect Z_LIMIT_SW- (Z- limit switch) <NC> contact
- TB1.22: Connect Z_HOME_SW (Z HOME switch) <COM> contact
- TB1.23: Connect Z_HOME_SW (Z HOME switch) <NC> contact
(2) Wire connection of machine terminal block **MACHINE_TB2**

TB2.24: Connect WIRE_BREAK_SW (wire broken sensor) <NO> contact

TB2.25: Connect WIRE_BREAK_SW (wire broken sensor) <COM> contact

TB2.26: Connect VERTICAL_CON (Connector of vertical alignment jig)<①> contact

TB2.27: Connect VERTICAL_CON(Connector of vertical alignment jig)<④> contact

TB2.28: Connect Z_BRAKER (Z axis brake) <+> contact

TB2.29: Connect Z_BRAKER (Z axis brake) <-> contact

TB2.30: Connect R1 (dimmer) contact

TB2.31: Connect SEND_WIRE_MOTOR (wire feeding motor) contact

TB2.32: Connect AIR_SW1 (air valve 01 of auto threading) <+> contact

TB2.33: Connect AIR_SW1 (air valve 01 of auto threading) <-> contact

TB2.34: Connect AIR_SW2 (air valve 02 of auto threading) <+> contact

TB2.35: Connect AIR_SW2 (air valve 02 of auto threading) <-> contact

TB2.36: Connect AIR_SW3 (air valve 03 of auto threading) <+> contact

TB2.37: Connect AIR_SW3 (air valve 03 of auto threading) <-> contact

TB2.38: Connect AIR_SW4 (air valve 04 of auto threading) <+> contact

TB2.39: Connect AIR_SW4 (air valve 04 of auto threading) <-> contact

TB2.40: Connect AIR_SW5 (air valve 05 of auto threading) <+> contact

TB2.41: Connect AIR_SW5 (air valve 05 of auto threading) <-> contact

TB2.42: Connect AIR_SW6 (air valve 06 of auto threading) <+> contact

TB2.43: Connect AIR_SW6 (air valve 06 of auto threading) <-> contact

TB2.44: Connect AIR_SW7 (air valve 07 of auto threading) <+> contact

TB2.45: Connect AIR_SW7 (air valve 07 of auto threading) <-> contact

TB2.46: Connect AIR_SW8 (air valve 08 of auto threading) <+> contact

TB2.47: Connect AIR_SW8 (air valve 08 of auto threading) <-> contact

TB2.48: Connect AUTO_WIRE_PART (auto threading gadget)<A> contact

TB2.49: Connect AUTO_WIRE_PART (auto threading gadget)<B> contact

TB2.50: open circuit

TB2.51: open circuit

TB2.52: Connect AUTO_WIRE_PART (auto threading gadget)<C> contact

TB2.53: Connect AUTO_WIRE_PART (auto threading gadget)<D> contact

TB2.54: Connect AUTO_WIRE_PART (auto threading gadget)<B> contact

TB2.55: Connect WIRE_FEED_MOTOR (wire winding motor) <+> contact

TB2.56: Connect WIRE_FEED_MOTOR (wire winding motor) <-> contact

TB2.57: Connect WIRE_TENSION_BRAKER (wire winding motor) <+> Contact
TB2.58: Connect WIRE_TENSION_BRAKER (wire winding motor) \(<\rightarrow\) contact
TB2.59: 
  1. Connect LP1 (working lamp) contact
  2. Connect OIL_FILLER (oil feeder) contact
TB2.60: 
  1. Connect LP1 (work lamp) contact
  2. Connect OIL_FILLER (oil filler) contact
TB2.61: Connect AIR_SW9 (air valve 09 of auto threading) \(<\rightarrow\) contact
TB2.62: Connect AIR_SW9 (air valve 09 of auto threading) \(<\rightarrow\) contact
4.7 Other wire connections

In addition to above mentioned wire connections, we want to discuss the wire connections of discharge system and servo system. Thus, the service men can quickly find the circuits when they shoot the troubles.

(1) Wire connection of discharge system

**HINT**

* See circuit diagram FIG11-EDM POWER.
* See Chapter 2 “the components of electric control box”.

1. The machine head (upper) has 2 electrode wires – black and white wires. The black wire is connected to the copper bar (piece) P of the discharge box. The white electrode wire is connected to the contact WHP_WIRE on the small PC board of discharge box.
2. The wire connection and the position of the electrode wire of the machine head (lower) are the same as those of the machine head (upper).

Following figure illustrates the electrode wires of the machine heads (upper and lower) connected to the discharge system.
(2) Wire connection of servo driver (circuit diagram FIG10-DRIVER)

In the circuit diagram, DRIVER1_CN2 stands for the connector of X axis Servo Driver CN2 Other servo drivers are expressed in the same way.

**HINT**

* See circuit diagram FIG10-DRIVER.
* See Chapter 2 “The components of electric control box”.

DRIVER1_CN2 : Connect MOTION_P5(X)
DRIVER2_CN2 : Connect MOTION_P6(Y)
DRIVER3_CN2 : Connect MOTION_P9(Z)
DRIVER4_CN2 : Connect MOTION_P7(U)
DRIVER5_CN2 : Connect MOTION_P8(V)
DRIVER6_CNX6 : Connect AWT_CPU_P4(W)

Above connecting wires adopt the connector of SCSI 50-36Pin.

* The wire connection between servo driver and motor is shown below -

The connection between the AC servo driver and the servo motor of wire EDM
Introduction of Input/Output (I/O)
5  INPUT and OUTPUT (I/O)

I/O represents INPUT and OUT. According to the figure below, the information of Input and Out are display under the Message. There are two kinds of detections under Message: Motion Status and I/O Status (WIO).

Hint

I Bits and O Bits are important to the EDM technician because the technician can know the overall status by I and O bits signal.
5.1 Motion Status

Message Display:

(1) Click 《Message》 then select 《MOTION Status》 to enter Status 1 screen. The display screen can be divided into position signal display and Status in real time.

- Processing message is displayed.
- The actual status display.

* Move the mouse to position signal box to know more about the status of the machine.

**vcom direction (vcom_dir):**

<table>
<thead>
<tr>
<th></th>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>01</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>09</td>
<td>08</td>
</tr>
</tbody>
</table>

**G77 IO0 direction (G77_IO0):**

<table>
<thead>
<tr>
<th></th>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>M00</td>
<td>Water</td>
<td>M83/M43 (1:ON)</td>
<td>Wire</td>
<td>M82/M42 (1:ON)</td>
<td>Cutting power</td>
<td>M81/M41 (1:ON)</td>
<td>Corner</td>
<td>M26/M36 (1:ON)</td>
</tr>
</tbody>
</table>
## 5. Input and Output (I/O)

<table>
<thead>
<tr>
<th>15</th>
<th>14</th>
<th>13</th>
<th>12</th>
<th>11</th>
<th>10</th>
<th>09</th>
<th>08</th>
</tr>
</thead>
<tbody>
<tr>
<td>G95 (1:ON)</td>
<td>G92 stop (1:ON)</td>
<td>G00 stop (1:ON)</td>
<td>×</td>
<td>M70 Hold (1:ON)</td>
<td>M30 Hold (1:ON)</td>
<td>M02 Hold (1:ON)</td>
<td>M01 Hold (1:ON)</td>
</tr>
</tbody>
</table>

### G77 IO1 direction (G77_IO1):

<table>
<thead>
<tr>
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<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wait deceleration completed (1:ON)</td>
<td>Arc deceleration Point (1:ON)</td>
<td>Line end Point (1:ON)</td>
<td>Line start Point (1:ON)</td>
<td>Volt too low Hold (1:ON)</td>
<td>Limit protection Hold (1:ON)</td>
<td>Wire broken Hold (1:ON)</td>
<td>Retreat Hold (1:ON)</td>
</tr>
</tbody>
</table>

### G77 IO2 direction (G77_IO2):

<table>
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<tr>
<th>07</th>
<th>06</th>
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<th>04</th>
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<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>×</td>
<td>×</td>
<td>×</td>
<td>M500 Hold (1:ON)</td>
<td>M99 Hold (1:ON)</td>
<td>M98 Hold (1:ON)</td>
<td>M60 Hold (1:ON)</td>
<td>M50 Hold (1:ON)</td>
</tr>
</tbody>
</table>

### Status of find origin:

<table>
<thead>
<tr>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y axis Optical Scale (1:ON)</td>
<td>X axis Optical Scale (1:ON)</td>
<td>W axis Optical Encoder (1:ON)</td>
<td>V axis Optical Encoder (1:ON)</td>
<td>U axis Optical Encoder (1:ON)</td>
<td>Z axis Optical Encoder (1:ON)</td>
<td>Y axis Optical Encoder (1:ON)</td>
<td>X axis Optical Encoder (1:ON)</td>
</tr>
</tbody>
</table>
(2) Click "Message" then select "Status 2" to enter the Status 2 display screen. It can be divided into 2 parts: Machining signal display and Position signal display. The number on the machining message will change while machining.

**Processing message is displayed**

**The address of the display signal**

---

**DSP GPIO A Port status (GPIO_A):**

<table>
<thead>
<tr>
<th></th>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>U axis origin</td>
<td>U axis</td>
<td>Y axis</td>
<td>Y axis</td>
<td>Y axis</td>
<td>X axis</td>
<td>X axis</td>
<td>X axis</td>
<td>X axis</td>
</tr>
<tr>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>14</td>
<td>13</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>09</td>
<td>08</td>
<td></td>
</tr>
<tr>
<td>W axis origin</td>
<td>Z axis</td>
<td>Z axis</td>
<td>Z axis</td>
<td>V axis</td>
<td>V axis</td>
<td>V axis</td>
<td>U axis</td>
<td></td>
</tr>
<tr>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td>(1:ON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td></td>
</tr>
</tbody>
</table>

**DSP GPIO B Port Status (GPIO_B):**

<table>
<thead>
<tr>
<th></th>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.STOP</td>
<td>W axis</td>
<td>W axis</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1:ON)</td>
<td>-Limit</td>
<td>+Limit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>14</td>
<td>13</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>09</td>
<td>08</td>
<td></td>
</tr>
<tr>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td></td>
</tr>
</tbody>
</table>
### DSP GPIO F Port Status (GPIO_F):

<table>
<thead>
<tr>
<th></th>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>W axis Servo Ready (0:ON)</td>
<td>15</td>
<td>14</td>
<td>13</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>09</td>
<td>08</td>
</tr>
<tr>
<td>Z axis Servo Ready (0:ON)</td>
<td>×</td>
<td>×</td>
<td>X axis Servo alarm (1:ON)</td>
<td>×</td>
<td>×</td>
<td>Y axis Servo alarm (1:ON)</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>V axis Servo Ready (0:ON)</td>
<td></td>
<td></td>
<td>U axis Servo Ready (0:ON)</td>
<td></td>
<td></td>
<td>U axis Servo Ready (0:ON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U axis Servo Ready (0:ON)</td>
<td></td>
<td></td>
<td>Y axis Servo Ready (0:ON)</td>
<td></td>
<td></td>
<td>V axis Servo Ready (0:ON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X axis Servo Ready (0:ON)</td>
<td></td>
<td></td>
<td>Z axis Servo alarm (1:ON)</td>
<td></td>
<td></td>
<td>W axis Servo alarm (1:ON)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### DSP EIO Port Status (EIO_DATA1):

<table>
<thead>
<tr>
<th></th>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>Wire break signal (0:ON)</td>
<td>Lower test point of vertical calibrator (0:ON)</td>
<td>Upper test point of vertical calibrator (0:ON)</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>14</td>
<td>13</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>09</td>
<td>08</td>
</tr>
<tr>
<td></td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

### X-W axis status[ID_X-ID_W]:

<table>
<thead>
<tr>
<th></th>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>×</td>
<td>Origin switch trigger (1:ON)</td>
<td>Negative limit trigger (1:ON)</td>
<td>Positive limit trigger (1:ON)</td>
<td>Servo alarm (1:ON)</td>
<td>Servo Ready (0:ON)</td>
<td>-Limit Exchange (1:ON)</td>
<td>Cycle Start (1:ON)</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>14</td>
<td>13</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td>09</td>
<td>08</td>
</tr>
<tr>
<td>Z Axis lower limit protection (1:ON)</td>
<td>Find out the machine origin (1:ON)</td>
<td>Lag (time) trigger (1:ON)</td>
<td>Lag (distance) trigger (1:ON)</td>
<td>Second software limit trigger (1:ON)</td>
<td>First software limit trigger (1:ON)</td>
<td>Negative protection trigger (1:ON)</td>
<td>Positive protection trigger (1:ON)</td>
<td></td>
</tr>
</tbody>
</table>
### 5.2 I/O Status Display (WIO)

**Display screen operation:**

1. Click «Message» then select «I/O Status» to enter I/O Status.

The display screen will show the position of signal I-bits:

<table>
<thead>
<tr>
<th>I-bits</th>
<th>00</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire recycle</td>
<td>×</td>
<td>07</td>
<td>×</td>
<td>06</td>
<td>05</td>
<td>04</td>
<td>03</td>
<td>02</td>
</tr>
<tr>
<td>beam Detection</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>O-bits</th>
<th>00</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire broken</td>
<td>07</td>
<td>06</td>
<td>05</td>
<td>04</td>
<td>03</td>
<td>02</td>
<td>01</td>
<td>00</td>
</tr>
<tr>
<td>signal</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WPGF Register</th>
<th>00</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Status</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

**Temp:** 20.0°C

**WIO Register**

- **Control**
- **Status**

**UPS/Power off switch**

**Panel key switch**

**Air sensor**

**Error Message**

**Panel comp.**

**Water system alarm**

**Error Message**

**Panel comp.**

**Water system alarm**

**Panel comp.**
5.3 Using I/O to check circuit

1. Utilize MOTION I/O status to check the circuit status.
   Take MOTION position DSP GPIO A_00 for example:
   DSP GPIO A_01 position is the input signal of the machine origin on X axis. When the switch of the mechanical origin is not ON the content shows "0". However, When the switch of the mechanical origin is ON, the content shows 1(0→1). If the display screen follows DSP GPIO A_01 describe above that means the switch of the mechanical origin on X axis is regular. When the switch of the mechanical origin is not ON, the content shows "1". This means the switch is short of the mechanical origin on X axis. Please refer to Chapter 2 to find the position of the machine origin on the X axis and then refer to Chapter 4 wiring to check the wiring for the switch of the mechanical origin on X axis. After the problem is solved, the content will display "0".

### O-bits

<table>
<thead>
<tr>
<th>00</th>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>01</th>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>×</td>
<td>Warning light(R)</td>
<td>Warning light(Y)</td>
<td>Warning light(G)</td>
<td>PCD Loop</td>
<td>Sluicing Pressure valve</td>
<td>Electromagnetic Water inflow</td>
<td>AWT water stream (Upward)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>02</th>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water gun</td>
<td>AWT water stream (downward)</td>
<td>Ion removal motor switch</td>
<td>Hi pump motor switch</td>
<td>Electromagnetic water valve</td>
<td>Water pressure NO. bit2</td>
<td>Water pressure NO. bit1</td>
<td>Water pressure NO. bit0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>03</th>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>×</td>
<td>Electric brake (+24V)</td>
<td>wire broken signal</td>
<td>Manual discharge switch</td>
<td>low power</td>
<td>HI power</td>
<td>Edge power</td>
<td>Main Power switch</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>04</th>
<th>07</th>
<th>06</th>
<th>05</th>
<th>04</th>
<th>03</th>
<th>02</th>
<th>01</th>
<th>00</th>
</tr>
</thead>
<tbody>
<tr>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>
Hint

- Utilize MOVEMENT_I/O to check the circuit is one of the solutions when EDM is not able to operate “Find Origin “ on X axis.
- The part No. of the mechanical origin switch on X axis is X_HOME_SW, Please refer to Chapter 2 machine structure.

(2) Utilize WIO_I/O signal to check the circuit.
Take the signal O0306 when turn on the emergency switch for instance: After enter WIO_I/O, position O0306 will show “” At this time the brake of the Z axis should be released. If it is still showing “” this means the brake of Z axis is still not released, in other words the circuit of the brake on Z axis is abnormal for the WIO board in J11.1 and J11.7 or DC +24V is not input on the WIO board. At this time, check the circuit of the brake of Z axis or replace a WIO board.

Hint

- The brake on Z axis is installed on the motor of Z axis. The part No. of the motor is Z_BRAKER, Please refer to Chapter 2 machine structure.

(3) Utilize WIO_I/O signal to check the circuit.
Take the reel system for example:
① Check the switch of the wire break signal (WJS2B4)
In WIO_I, position I0006 is the signal of the wire break detection switch, the display will show “” while wire break. When toggle the switch, the display will show “” at I0006. If the display does not change, please check the circuit of the switch.

Hint

- When the wire is break, the reel system is not able to operate.
- To learn more about the position of the wire break detection switch, please refer to Chapter 2.2 WIR_BREAK_SW Structure.
Breakdown analysis and inspection process
6 Breakdown analysis and inspection process

During the inspection process for the WEDM, you need to refer to the WEDM diagrams attached to the end of this manual; the diagrams on the forward chapters are the detail ones for WEDM. The engineer can solve the machine problems soon if he could read the diagrams carefully and combine them well. The alarm inspection can be divided into five parts:

1. Servo exercise system
2. Water system
3. Wire system.
4. Sparking system
5. Other breakdowns
6.1 The Inspection process and samples of the servo exercise system

Most alarms happen when the servo exercise breakdowns, and the alarms can’t be removed up unless it is eliminated. For this, you should know the relative diagram and PCB of the servo exercise system and refer to the below drawing (Chart 16.1).

Chart 16.1: COMPLETE DIAGRAM OF THR SERVO EXERCISE
6. Breakdown analysis and inspection process

6.1.1 Inspection process

Process 1: Eliminate the servo exercise system breakdown from the cable problem of limited switch and HOME switch.

Check if the cable from limited switch or HOME to the MOTION (FIG07-UPS&MOTION) via the MOTION Status 2 is ok?

(YES) Operate and check if the limited switch and HOME switch work normally? (YES) Finish

(NO) Check if the cable from the limited switch or HOME switch to the MOTION is ok?

(YES)

(NO) Repair the cable from limited switch or HOME switch to the MOTION, and check if it works well via MOTION Status2?

(YES)

(NO) Replace the MOTION (FIG07-UPS&MOTION) and check if the limited switch and HOME switch work ok?

(YES)
Process 2: Eliminate the breakdown you can’t move the machine table from the alarm cause by servo exercise system. Eliminate the breakdown of heavy vibration or speedy movement when moving the machine table. (Take the X axis and Y axis as the example)

1. **Turn the machine off**
   2. **Check if the alarm happens after turning the machine on?**

   (YES)

   1. **Turn the machine off**
   2. **Replace the Motion (FIG07)**
   3. **Check if the alarm happens after turning the machine on?**

   (YES)

   1. **Turn the machine off**
   2. **Replace the connected cable from Motion (FIG07) to Driver**
   3. **Check if the alarm happens after turning the machine on?**

   (YES)

   1. **Turn the machine off**
   2. **Replace the Driver of X or Y axis (FIG10-DRIVER)**
   3. **Check if the alarm happens after turning the machine on?**

   (YES)

   1. **Turn the machine off**
   2. **Replace the connected cable from Driver (FIG10-DRIVER) to motor**
   3. **Check if the alarm happens after turning the machine on?**

   (NO)

   1. **Move the machine in 【JOG】 mode and check if it has the heavy vibration or speedy movement?**

   (NO)

   FINISH

   (YES)

   ※Please inspect the machine as the steps: ①→②→③→④→⑤
NOTE:
1. Please replace the MOTION (FIG07) and its connected cable if the alarm still happens after inspecting as above steps.
2. Please check if the axis connector of AC servomotor and ball screw unwinds after inspecting as above steps and moving the machine in <JOG> mode, and it still vibrates.
3. Please replace the power cable and code cable of motor after inspecting as above steps, and the alarm are still on after turning the machine on.
4. Please contact with JSEDM if the servo exercise system problems still can’t be solved after inspecting as above steps.
6.2 The maintenance example and inspection process of the water system

There are four pumps in the water system: the high-pressure pump, to provide the cool water when cutting; the filter pump, to filter the dirty water from the dirty water tank to the clean water tank; the resin pump, to filter the electric conduction resin from the clean water tank; the poured pump (for submerged type), to provide the cool water when machining for submerged water tank.

The control diagrams of these four pumps are separated, and please refer to the below water system diagram and control process.

The control process and ref. Diagram of high-pressure pump

FIG16-WATER_SYSTEM14~FIG19-WATER_SYSTEM57:

Emergency switch on (E-STOP_SW)→ AC 110V is input from the JP14.2 and JP14.7 of the water system PCB→ magnetic switch (K1) is sucked→ the inverter in standby situation.

Press <WATER>→ HP pump starts→ AC 110V input from JP25.1、JP25.8及JP25.2、JP25.9→ upper and lower value (HI_GATE01、HI_GATE02) turn on→ the upper and lower machine head start to pour the water.

When the inverter is in standby situation, the display of the inverter frequency would change when shifting the water pressure step.

<table>
<thead>
<tr>
<th>STEP</th>
<th>FREQUENCY</th>
<th>STEP</th>
<th>FREQUENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5.0 HZ</td>
<td>4</td>
<td>37.5 HZ</td>
</tr>
<tr>
<td>1</td>
<td>10.0 HZ</td>
<td>5</td>
<td>45.0 HZ</td>
</tr>
<tr>
<td>2</td>
<td>20.0 HZ</td>
<td>6</td>
<td>52.5 HZ</td>
</tr>
<tr>
<td>3</td>
<td>30.0 HZ</td>
<td>7</td>
<td>60.0HZ</td>
</tr>
</tbody>
</table>

PS: Please fix the (WIRE_BREAK_SW) before pressing <WATER> or it doesn't work.

The signal of the water pressure step is provided from the J19.7~J19.12of WIOS, and please replace the WIOST if the inverter frequency doesn’t coordinate to step. You might adjust the water pressure step by pressing the < + >、< - >
6. Breakdown analysis and inspection process

Ref. Diagram is as below:

[Diagram of electrical circuitry with labels and connections, including components such as Hi_Pump, Hi_Pump01, Hi_Pump02, T-VECTOR, T-VERTER, and various connectors labeled with letters and numbers like JP14, JP4, JP5, S1, S2, etc., along with annotations for various points and connections such as WATER_ON+, WATER_ON-, WATER_FILL+, WATER_FILL-, etc.]
Control process and ref. diagram of filter pump:
When the fluid level of the dirty water tank is higher than the water sensor (SL1) and the one of the clean water tank if lower than the water sensor (SL4) → the output from the JP14.5 and JP14.10 from water system PCB is AC 110V → the magnetic switch (K2) is sucked → the filter pump starts.
After running, the fluid level of the dirty water tank starts to go down → when the fluid level of the dirty water tank is lower than the water sensor (SL2) or the one of the clean water tank id higher than the water sensor (SL3), and there is no voltage output from the JP14.5 and JP14.10 from the water system → the magnetic switch (K2) is released → the filter pump stops.

Ref. diagram is as below:
6. Breakdown analysis and inspection process

Control process and ref. diagram of resin pump

The display and setting of water quality on Main page is as below:

![Water quality display and setting diagram]

Water quality setting: \( \text{WAL} = 70 \cdot \text{WAH} = 90 \)

When the water electric resistance value is lower than \( 70\text{K} \) → the output of the JP14.4 and JP14.9 from the water system PCB is AC 110V → magnetic switch is sucked (K3) → resin pump starts, and the output of the JP25.6, JP25.13 from the water system PCB is AC 110V → turn the resin value (DEN_GATE) on; after running, the value of water electric resistance starts to go up, and when it’s’ higher than 90K, there is no voltage output from the JP14.4 and JP14.9 of the water system PCB → the magnetic switch (K3) is released → resin pump stops.

Ref. diagram is as below:

![Ref. diagram of resin pump control process]

---

Note: Do Not Reproduce

Property of Kent Industrial USA
Control process and ref. diagram of the poured pump:

Press the 【poured water】 on the control panel:

When 【poured water】 is on → the output of the JP14.3 and JP14.8 is AC110V → the magnetic switch is sucked (K4) → the poured pump starts

When 【poured water】 is off → there is no AC110V from the JP14.3 and JP14.8 of the water system PCB → the magnetic switch (K4) is released → the poured pump stops

Ref, diagram is as below:
6. Breakdown analysis and inspection process

6.2.1 Inspection process

**Ins. process 1 : No cool water comes out when cutting**

- Check if the Hp works normally? (YES) (NO)
- Replace the (HI_GATE01, HI_GATE02)

- Check if JP14.2 and JP14.7 is AC 110V? (YES) (NO)
- Replace the (PCB: JC-2H073B)

- Check if the (FR1) jumps over load? (YES) (NO)

- Check if the (K1) works normally? (YES) (NO)
- Replace the (K1)

Reset the inverter parameter (TECO_T_VETER 7300V) or replace it if it still doesn't work

Finish

**HINT**
- Alarm happens when the inverter breakdowns.
- Please replace the HP after inspect as above steps.

**DANGER**
- If the magnetic works, then please measure if there is the power (3Φ, AC220V or AC380V ) input without lack of PH.
- Please turn the machine power off when replacing the PCB, magnetic value, magnetic switch, overload, and etc.
### Ins. process 2 : The breakdown of dirty water can't be filtered from the dirty water tank

Pour the water into the dirty water tank and make the level higher than the water sensor and the one of clean water tank lower than the sensor.

  - (YES)
  - (NO)

- Measure if the output JP14.5, JP14.10 of the water system PCB is AC110V?
  - (YES)
  - (NO)

- Check the (FR2) jumps overload or damages?
  - (YES)
  - (NO)

- Check if the magnetic switch (K2) works normally?
  - (YES)
  - (NO)

Finish

- If the JP10.1, JP10.2 are not short circuit, then please replace the upper water sensor (DIRTY_FS_U) of the dirty water tank.
- If the JP10.3, JP10.4 are not short circuit, then please replace the lower water sensor (DIRTY_FS_D) of the dirty water tank.
- If the JP11.1, JP11.2 are not short circuit, then please replace the upper water sensor (CLEAN_FS_U) of the clean water tank.
- If the JP11.3, JP11.4 are not short circuit, then please replace the lower water sensor (CLEAN_FS_D) of the clean water tank.

- Replace the water system PCB (PCB:JC-2H073B)
- Reset the limited current of the overload (FR2) or replace the overload
- Replace the magnetic switch (K2)

HINT

- If the magnetic switch works, but the filter pump doesn't, then please measure if the input of the magnetic switch is AC220V or AC380V (3PH).
- Please check if there is any block in the poured pipe of the filter pump, then please clean it, replace the sluice or the filter pump.
Ins. process 3: The breakdown of resin pump doesn’t work.

Set the value of WAH higher than Electric water resistance
Ex: Electric water resistance = 20 KΩ

Measure if output of JP14.4, JP1.9 of the water system PCB is 110V?

- (NO) Replace the water system PCB (PCB: JC-2H073B)
- (YES)

Check if the (FR3) jumps overload or damages?

- (YES) Reset limited current of the (FR3) or replace the overload.
- (NO)

Check if the (K3) works normally

- (NO) Replace the magnetic switch (K3).
- (YES)

Finish

1. If the magnetic switch works, but the filter still doesn’t work, then please measure if the input of the magnetic switch is AC220V or AC380V (3PH).
2. Sometimes, the filter pump keeps running because the water quality displays 0KΩ only; that is the short circuit caused by the rust of the water quality sensor, and please clean the rust or replace the water quality sensor.
Ins. process 4: Water quality meter displays 0KΩ only, and can’t go up.

Disconnect the cable of JP15 of the PCB, JC-2H073B, and check if the water quality meter displays over 150KΩ?

(NO) Replace the water system PCB (PCB:JC-2H073B)

(YES) Connect the cable of JP15 of PCB: JC-2H073B, and take the water quality sensor out; clean it with the sand paper and put it back to check if the water quality meter works normally?

(NO) Finish

(YES)

(NO) Refill the resin and check if the water quality meter works after running about 40mins?

(YES)

(NO) Take the water quality sensor out again and check if the connected cable inside the sensor is short circuit because of the leaking water?

(YES)

(NO) Please refill the repellent or sclerotic
6. Breakdown analysis and inspection process

**Ins. process 5: Inspection of special problems for water system**

**Breakdown 1:** Press `<WATER>`; the water pressure of upper and lower is not enough

- Check if the HI_GATE01, HI_GATE02 work normally? (NO) Replace the upper and lower magnetic value
- (YES)
  - Check if the switch of upper and lower nozzle works normally? (NO) Replace the upper and lower water nozzle switch
  - (YES)
    - Check if there is any block in the upper and lower high-pressure water pipe? (YES) Clean the water pipe or replace it
    - (NO)
      - Check if the water is not enough? (YES) Refill the pure water
      - (NO)
        - Please refer to the inspection of HP breakdown

**Breakdown 2:** Press the manual ATW switch, and the upper or lower machine head pours out

- (NO)
  - Check if the HI_GATE01, HI_GATE02 work normally? (NO) Replace the upper and lower magnetic value
  - (YES)
    - Normal
6.2.2 Inspection example

Q1: The shift of the water pressure section is not correct
Ins.: Check if the output of J7.1, J7.9 and J7.2, J7.10 and J7.3, J7.11 on the WIO (FIG06-WIO) is correct, and replace the inverter if it is not.

PS: When shifting the water pressure section, the frequency of inverter displays correctly, but the upper and lower water is not enough; that is because the water in the clean water tank is not enough, and please fill the enough water.

Q2: Lower water pours incorrectly
Ins.: Replace the lower water magnetic value (HI_GATE02).

Q3: HP doesn’t work
Ins.: Replace the overload (FR1).

Q4: The speed of the filter pump is too slow
Ins.: 1. Replace the filter pump.
   2. Clean the block in the resin pump or replace the sluice.

Q5: HP doesn’t work because the inverter jumps overload
Ins.: Replace the inverter.

PS: Please confirm if the input power of the inverter is correct.

Special Ins.: The power HP leak caused by the breakdown of main power fuse (PANEL_FUSE1) on the (FIG04-CIRCUIT_PANEL) of generator, and replace the overload.

Q6: The water quality meter displays 0KΩ only after the resin pump works for long time
Ins.: Replace the resin after confirming the water quality sensor is not short circuit
PS: Replace the water quality sensor if it is short circuit, and replace the resin if it still displays 0 KΩ after running about 3~4 hours.

Q7: The filter pump doesn’t work
Ins.: Clean the block in the upper water level sensor
6.2.3 Alarm indication of water system (submerged type)

The alarm light position of the lower water system (submerged type):

Power input indicator: ON → means the water system has the power
Trouble indicator for filter motor: ON → means the filter pump breakdowns
Trouble indicator for ion removing motor: ON → means the resin pump breakdowns
Trouble indicator for inverter: ON → mean the inverter breakdowns
Trouble indicator for high press motor: ON → means the HP pump breakdowns
Indicator showing water level low: ON → means the water quantity is not enough
Trouble indicator for fill motor: ON → means the poured pump breakdowns

The situations of alarm indicator 1~3 are as follows: (ON : OFF)

<table>
<thead>
<tr>
<th>Alarm situation</th>
<th>Alarm indicator 1</th>
<th>Alarm indicator 2</th>
<th>Alarm indicator 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>02</td>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>03</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>04</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>05</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>06</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>07</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
</tbody>
</table>
The alarm of water system lights on when inspecting the breakdown, and the LED displays its breakdown situation. (LED displays backwards and forwards means ok, and it crashes if not.) The LED indication of the breakdown is as follows,

a. 01 ➔ the water level is too low; the HP breakdowns when its light is on
   Ins.: 1. raise the water up to the lower water level floating SW over 10mins 2. press the RESET 3. press the E.STOP; the error remains after pressing the RESET and E.STOP

b. 02 ➔ the breakdown of floating SW in the dirty water tank (can’t be lowered)
   Ins.: 1. lower the floating SW in the dirty tank 2. press the RESET 3. press E.STOP; the error remains after pressing the RESET and E.STOP

c. 03 ➔ press E.STOP (ALARM light is off)

d. 04 ➔ Auto water level control malfunctioning (Above machine head float sensor ON, Below machine head float sensor OFF, Outlet float sensor OFF “OR” Above machine head float sensor ON, Below machine head float sensor OFF, Outlet float sensor ON overtime error.) Solution: 1. Check Above, below machine head float sensors and outlet sensor, make sure they are working fine. 2. Press RESET 3. Press E. STOP 4. Turn Off Soaking.

e. 05 ➔ Auto water level control malfunctioning (Above machine head float sensor OFF, Below machine head float sensor ON, Outlet float sensor OFF over 40 sec) Solution: 1. Check below machine head and outlet sensors and make sure they are working fine. 2. Press RESET 3. Press E. STOP 4. Turn Off Soaking.

f. 06 ➔ Auto water level control malfunctioning (Above machine head float sensor OFF, Below machine head float sensor, Outlet float sensor OFF error, low water level alarm) Solution: 1. Check Below machine head float sensor, Outlet sensor and filter motor/low water level float sensor and make sure they are working fine. 2. Press RESET 3. Press E. STOP 4. Turn Off Soaking.

07 ➔ Auto water level control malfunctioning (Above machine head float sensor ON, Below machine head float sensor ON, Outlet float sensor OFF over 50 sec) Solution: 1. Check Below machine head float sensor, Outlet sensor and filter motor and make sure they are working fine. 2. Press RESET 3. Press E. STOP 4. Turn Off Soaking.
6.3 Inspection process of wire system

There are two individual diagrams of wire feed speed control and wire feed tension control in wire system, and the diagrams are as follows,

**Wire control speed diagram:**

<table>
<thead>
<tr>
<th>FIG06</th>
<th>FIG012</th>
<th>FIG015</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIO_J12</td>
<td>CN3</td>
<td>MACHINE_TB2</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>55</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>56</td>
</tr>
</tbody>
</table>

**Wire tension control diagram:**

<table>
<thead>
<tr>
<th>FIG06</th>
<th>FIG012</th>
<th>FIG015</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIO_J12</td>
<td>CN3</td>
<td>MACHINE_TB2</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>57</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>58</td>
</tr>
</tbody>
</table>

WIO_J12 : no. J12 connecter in WIO  
CON3 : no. CON3 connecter on the side of generator  
MACHINE_TB2 : no. MACHINE_TB2 terminal seat on the back of the machine body  
WIRE_FEED_MOTOR : the DC motor of wire feed speed control  
WIRE_TENSION_BRAKER : the brakes of wire feed tension control

Movement of wire system : press the `<WIRE>`, and two sets of output +24V from the WIOST would be used for the wire feed motor and wire tension brakes

PS : Before pressing `<WIRE>`, please confirm the (WIRE_BREAK_SW) is fixed well or the `<WIRE>` doesn’t work

The wire feed wheel runs when the wire feed motor runs; the running of the tension brakes is the torsion to make the opposite direction of wire tension wheel and wire feed direction
6.3.1 Inspection process

**Ins. process 1 : The inspection process of the wire feed motor**

1. Fix the (WIRE_BREAK_SW), and press 「AUTO1」, set WT to 15, and press the <WIRE>.

2. Measure if the output of J12.2 and J12.3 from WIO (FIG06-WIO) is DC+24V?
   - (NO) Replace the WIO
   - (YES)

3. Measure if the output of (WIRE_FEED_MOTOR) is +24V?
   - (NO) Recheck the cable from the wire feed motor to the WIOST
   - (YES)

4. Check if the (WIRE_FEED_MOTOR) runs?
   - (NO) Replace the (WIRE_FEED_MOTOR)
   - (YES) Normally

**HINT**
Check if the motor runs from the movement of wire-collected wheel

**NOTE**
When fixing the (WIER_BREAK_SW), please check if the functions of (WIER_BREAK_SW) through the MOTION status 2・I/O status in the meanwhile.
Ins. process 2: Inspection process of wire tension brake (Not use in AWT)

Fix the (WIRE_BREAK_SW), Press 「AUTO1」WT set 15, and press the ＜WIRE＞

Measure if the output of J12.4 and J12.5 from WIO (FIG06-WIO) is DC+24V?

- (NO) Replace the WIO
- (YES)

Measure if the output of (WIER_TENSION_BREAKER) is +24V?

- (NO) Recheck the cable of wire tension brakes to WIO
- (YES)

Check if the (WIER_TENSION_BREAKER) makes the torsion?

- (NO) Replace the (WIER_TENSION_BREAKER)
- (YES)

Normally

Hints:
Check if the wire tension brakes make the torsion through turning the wire tension wheel by hand.
6.3.2 Inspection example

Q1 : Wire tension is not enough  
Ins. : Replace the WIO (FIG06-WIO).

Q2 : The wire feed motor doesn’t run  
Ins. : Replace the (WIRE_FEED_MOTOR).

Q3 : The wire feed motor doesn’t run  
Ins. : Reconnect the connected power cable of wire feed motor.

Q4 : Press the <WIRE>, and the wire feed motor and bearings have the strange sound  
Ins. : Re-maintain the wire-collected wheel and wire-clipped wheel.  
※ Please refer to the maintenance process in the maintenance manual and the note in the repairing manual.

Q5 : Press the <WIRE>, and the wire feed motor doesn’t work  
Ins. : The <WIRE> doesn’t work because of the (WIRE_BREAK_SW) breakdowns, and replace the (WIRE_BREAK_SW).

Q6 : The wire feed motor runs after pressing the <WIRE>, but the brass wire doesn’t run.  
Ins. : Replace the wire-collected wheel and wire-clipped wheel because of the pockmark.

※ If the wire feed motor has the strange sound or the motor runs but the wire can’t be feed when pressing the <WIRE>, then please look into the chapter 2.4.5 in the maintenance manual and maintain or replace the parts according to the instruction.
6.4 Inspection process and example of sparking system

The structure of the WIRE CUT EDM sparking power is as below:

Three are three sets of DC power in this system, the first set, LOW POWER, provides the power for gap sparking, the second one, HIGH POWER, provides the main power for the machine sparking, and the third one, POWER SINK, provides the protection power for the MOSFET of HIGH POWER.

The sparking system is combined with the 6 PCB:
1. (WPGF) *1pc
2. (WAP) *1pc
3. (WHP) *5pcs

WPGF is used for the inspection and control of sparking situation.
WAP is used for guiding the gap voltage and protecting the MOSFET of WHP PCB with the Power Sink circuit.
WHP has the shifting capability of high duty and high current, and shifts the power when machining. There is no other element except the MOSFET of WHP in the sparking circuit; that is the whole circuit is short circuit when it is in MOSFET ON. What it limits is the stray inductance of the circuit only, so you have to lower the assembly line inductance of the whole circuit for the higher blink current as possible as you can.
Indication of every DC current and diagram:

**VAP**: provides the power for WAP when gap sparking, and the diagram is as below:

There are five kinds of output for the VAP power, DC40V, DC80V, DC90V, DC110V, DC120V; the DC40V is used for the mold adjustment when machining, and DC80V ~ DC120V are used when machining. The power process is as follows,

The process of VAP power output,

1. When pressing the <EDM POWER>, the terminal output of J9.2, J9.9 from the WIO is 110V, and guided by the (PANEL_FR4); the current is provided by the TB1_AC60V~TB1_AC90V to (PANEL_FR4), and the output of DC current through the (PANEL_BD2) is about DC80V~DC120V; the output of TB1_AC60V~TB1_AC90V are controlled by the 2~5PIN of WRS.

2. When pressing the <SPARK MODE>, the terminal output of J9.1, J9.8 of WIO is 110V, and guided by the (PANEL_FR5); the output through the (PANEL_BD2) is DC40V.
VHP: provides the power for WHP when machining, and the diagram is as below:

The process of VHP power: when pressing the <EDM POWER>, the terminal output of the J9.3 - J9.10 from the WIO is 110V, and guided by the (PANEL_FR3): the DC power supplied by M1AC160V and through the magnetic switch and (PANEL_BD1) is about DC220V.
VSK: provides the WHP protection power for WAP when machining, and the diagram is as below:

![Diagram](image)

Process of VSK power: when the system is on (press the `<ON>`), the input of TB1AC80V is AC80V, and the output of DV power through the (PANEL_BD3) is DC110V.

The inspection process if the sparking system works well is as follows,
1. Press the `<WIRE>` to start the wire system, and check if the gap voltage is +12V?
2. Under the 【JOG】mode, press the `<WIRE>`、`<WATER>`、`<EDM POWER>`，and press the `<D.POS>`; check if the gap voltage is +90V?
3. Machining the outside of the work piece with the lower power( such as, ON＝2・OFF＝13, A.ON＝1, A.OFF＝15), and then increase the ON TIME to check if the spark becomes bigger?

The common problems for the sparking system:
1. There is no gap voltage +12V between the brass wire polar and work piece when starting the wire system.
2. Under the 【JOG】mode, press the `<WIRE>`、`<WATER>`、`<EDM POWER>`，and press the `<D.POS>`; there is no gap voltage +90C between the brass wire polar and work piece.
3. The brass wire breaks when touching the work piece with the lower sparking power.
4. The spark doesn’t become bigger when increasing the ON TIME.

**HINT**
※There is no gap voltage when starting the system because the brass wire touches the machine body and causes the short circuit; when inspecting the gap voltage +12V, take the brass wire out first，fix the （WIRE_BREAK_SW），and then press the `<WIRE>` to check the output of gap voltage.
6. Breakdown analysis and inspection process

6.4.1 Inspection process

**Ins. process 1 : There is no gap voltage +12V**

1. Disconnect the connected cable of J5 in WIO (FIG06-WIO)
2. Fix the (WIRE_BREAK_SW)
3. Press the <WIRE>

Measure if the output of J5.1 and J5.2 from WIO (FIG06-WIO) is +12V?

- **NO** → Replace WIO
- **YES** → Connect the connected cable of J5 in WIO

Turn the machine off, and take the WPGF; turn it on and press the <WIRE> to check if there is gap voltage +12V?

- **NO** → **NO**
- **YES** → Replace WPGF

Turn the machine off, and take the WAP off; turn it on, and press the <WIRE> to check if there is gap voltage +12V?

- **NO** → **NO**
- **YES** → Replace WAP

Turn the machine off, and take the (WHP_1~WHP_5) off; turn it on, and press the <WIRE> to check if there is gap voltage +12V?

- **NO** → **NO**
- **YES** → Replace WHP

Finish

※When taking the WHP, please take the PCB, in order, and turn the machine on to test.
Ins. process 2 : Under the 【JOG】 mode, press the <D.POS>, and there is no gap voltage +90V

Check if the VAP power is ok according to diagram of VSK power?  (YES)

(NO)

Turn the machine off, and replace the WAP and then turn it on

The measuring steps of VAP power: (ref. VAP diagram)
(1) Press the <EDM POWER> and measure FIG-04 PANEL_TB1.14 and PANEL_TB1.15, and they should have AC110V output.
(2) Measure the terminal output of PANEL_FR4, and it should have AC70V output.
(3) Confirm the PANEL_FUSE3 is not burned.
(4) Measure the terminal output of PANEL_FR4, and it should have the AC70V output.
(5) Measure the two terminal output of PANEL_TB2.56 and PANEL_TB2.57, and they should have the DC100V output.

Replace the damaged parts according to the above steps, and confirm there is the +100V output from the VAP power.

※Before pressing the <D.POS>, press the <WIRE> · <WATER> · <EDM POWER> first, or it doesn’t work when pressing the <D.POS>.
※Replace the WIO if there is no output of AC110V from PANWL_TB1.14 and PANEL_TB1.15 when pressing the <EDM POWER>.
6. Breakdown analysis and inspection process

**Ins. process 3**: The brass wire breaks when touching the work piece with the low sparking power

Check if the VSK power is ok according to diagram of VSK power?  

(YES)  
Turn the machine off, and replace the WPGF; turn it on and test again.

(NO)  

The measuring steps of VSK power: (ref: VSK diagram)  
1. Turn the system on, and measure two terminal output of PANEL_TB2.54 and PANEL_TB2.55; they should have the AC90V output.
2. Measure the two terminal point PANEL_TB2.58 and PANEL_TB2.59; they should have the DC120V output.
3. Confirm the PANEL_FUSE4 is not burned. Replace the damaged parts according to the above steps, and confirm there is the DC120V output from the VSK power.

Finish

※Please replace the WAP first if the (PANEL_FUSE4) is burned as soon as turning the system on; replace it and then turn it on. Replace the (PANEL_BD3) if it is still burned after turning the machine on.
**Ins. process 4 : The sparking power doesn’t go up when the ON TIME goes up**

Check if the VHP power is ok according to diagram of VSK power?  

(YES) Turn the machine off, and replace the WPGF; turn it on

(NO)

The measuring steps of VHP power: (ref. VHP diagram)
1. Press the **<EDM POWER>**, and measure PANEL_TB1.12 and PANEL_TB1.13; they should have AC110V output.
2. Measure the terminal output of PANEL_FR3, and it should have the output AC160V.
3. Confirm the (PANEL_QF1) doesn’t jump overload.
4. Measure the two terminal of PANEL_TM3.70 and PANEL_TM3.71, and they should have the DC230V output.

Replace the damaged parts according to the above steps, and confirm there is the DC230V output from the VHP power.

Finish

※Replace the WIO if the problem is still after replacing the WPGF
※Replace the WIO if there is no output of AC110V from the PANEL_TM1.12 and PANEL_TM1.13 when pressing the **<EDM POWER>**.
6.4.2 Inspection example

Q1: When machining, the sparking power can’t be raised by adjusting the ON TIME
Ins. : No VHP is because of no output; the reason is the DC24V relay controls the VHP of the WIO is burned, and it works after replacing the burned relay.

Q2: The sparking power can’t be raised when machining.
Ins. : No VHP is because of no output; the reason is the POWER_C1 is burned, and it works after replacing (POWER_C1) and its connected cables.

Q3: There is no gap voltage
Ins. : (1) WHP is damaged and causes the short circuit.
(2) It is short circuit because the heat of electric cable connected to (FNR3~FNR7) in VSK makes the part SINK of WAP, WHP, and (PANEL_FUSE4) of VSK are burned; replace the WHP, WAP, fuse, and electric cables.

Q4: The brass wire breaks when touching the work piece
Ins. : It is caused by the breakdown of SWITH POWER T-50A (SWP5) provides the power of SINK in WAP, and the brass wire breaks easily without the protection of SINK.

Q5: There is no gap voltage when machining.
Ins. : It is short circuit because electric cables from the power box of generator to the machine head are dissolved; replace the electric cables.

Q6: The sparking power is not stable when machining.
Ins. : It is caused by the disconnection of (PANEL_FR3) on VHP controlled by the connected cables of WIO disconnection; connect the cables well.

Q7: The gap voltage is (higher than) 200V when pressing the <EDM POWER>
Ins. : Replace the WHP99
6.5 Inspection of other breakdowns

Q1 : The function of manual wire thread doesn’t work (the HP runs normally.)
※Please refer to the inspection process of HP if it doesn’t run well.

Ref. diagram

![Diagram showing connections and components]

**Inspection process**

- Check if the input and output of the manual ATW button through the 「Message」 work? (check the O22)
  - (YES)
  - (NO)

- Press the manual ATW, and measure if the connectors of JP7.1 · JP7.2 on the water system are short circuit?
  - (YES)
  - (NO)

- Measure if the connectors output of JP25.6 · JP25.13 are AC110V?
  - (YES)
  - (NO)

- Replace the PCB:WIO in order, and check the input and output till the 「Message」 is correct.

- Check the diagram and confirm the connectors of JP7.1 · JP7.2 are short circuit?
  - (YES)

- Replace the (JC-2H073B), and confirm the connectors output of JP25.6 · JP25.13 are AC110V

- Replace the (AUTO_GATE), and confirm the wire threading is correct

Finis

※Please check if the wire feed system runs well first, and then check the whole inner wire system if inspecting as above steps.
Q2: The water gun doesn't work (the resin pump runs well.)
※Please refer to the inspection process of resin pump if doesn’t runs well.

Inspection process

Check if the input and output of the manual ATW button through the 「Message」 work? (check the O22)

After pressing the water gun, measure if the connector of JP7.5 ・ JP7.6 are short circuit?

Measure if the connectors output of JP25.4 ・ JP25.11 are AC110V?

Replace the PCB: WIO in order, and check the output and input till the 「Message」 is correct

Check if the input and output of the manual ATW button through the 「Message」 work? (check the O22)

Replace the (JC-2H073B) , and confirm the connectors output of JP25.4 ・ JP25.11 are AC110V

Replace the (GUN_GATE), and confirm the wire threading is normal

Finish
Q3: The system can’t be turned on after pressing the ON (ON_SW)

Ref. diagram

Ins. process

Turn the UPS on, and measure if the output of UPS is AC110V?

(YES) Replace or repair the UPS refer to the UPS manual

(NO)

Check if the whole circuit falls off, wire breaks, or disconnects refer to the above diagram?

(YES) Replace or repair the whole circuit

(NO)

Check the whole circuit refer to the diagram, and check PANEL_FUSE1, PANEL_FUSE2 in order to confirm the input and output of TB2 is normal

Finish

※If the system still can’t be repaired after inspecting as above steps, please reinstall the system software or replace the control.
Q4: The fan doesn’t runs after pressing the ON (ON_SW)

Ref. diagram

Ins. process

Confirm if the system can be turned on?

(YES)

Check if the whole circuit falls off, wire breaks, or disconnects refer to the above diagram?

(YES)

Replace or repair the whole circuit

(NO)

Check the whole circuit refer to the diagram, and check PANEL_FR1, PANEL_K1, PANEL_FUSE1, PANEL_FUSE2 in order to confirm the input and out of TM2 is normal

Finish

※Replace the fan after inspecting as above steps, and the fan still doesn’t work
Set Auto Threading
7 Set AUTO Threading

7.1 Control panel of auto threading and its test/repair

1. Manual control panel and Tool function button guide

- Wire cutting: Cut off the wire (Auto Threading models only)
- Auto threading: Under wire broken status, the wire will be threaded to the wire collecting wheel. Under wire unbroken status, there is no action. (Auto Threading models only)
- Air-carrying wire/water carrying wire: air-carrying wire (indicator OFF) ➔ Under auto threading mode, there is no water flush between upper and lower machine heads when the wire passes the workpiece. Water-carrying wire (indicator ON) ➔ Under auto threading mode, there is water flush between upper and lower machine heads when the wire passes the workpiece.
- Blowing waste wire: Start the function of blowing waste wire. When a waste wire is jammed, and not blown away, use this function to blow the waste wire out. (auto threading models only)
- Immerse sluicing switch: Immerse/ sluicing function will start while switching on this switch (Immerse type) ✗
f. Switch of water gun: Start the function of water gun (submersing models only)

g. Semi-auto threading: Manually thread the wire to the electrode of lower machine head. Semi-auto threading water carries the wire to the wire collecting wheel.

h. Wire UP: Roll the wire upward. (auto threading models only)
i. Wire DOWN: Under semi-auto threading, use this function to roll down the wire from the tension wheel to the bottom of the upper machine head. Then, manually thread the wire through the workpiece and the electrode of the lower machine head. Start auto-threading function. Thus, the wire can be manually threaded to the wire collecting wheel. (auto threading models only)

2. Inspect and repair the auto functions

2.1 Activate the testing screen:

① Move the mouse to where the arrow is pointed to, then left click till the password input screen occur.
The enter password「JsHide」.

※Note: Case (upper/lower) matters
② Check 「Display “wio” for the hided screen setting」 refer to the picture Below

![Screen with mouse left click point]

③ Click 「WIO Setting」 ➔ 「Detect」 to enter the auto-threading testing pint screen.

![Screen with mouse click on Detect]
Above mentioned buttons can be used to repair the auto threading gadgets. After Start Test button is pressed, each button stands for one pneumatic valve as shown below - Refer you to the following illustrations of auto threading gadget and pneumatic valve.

a. Pneumatic valve 1: “heating & straightening” electric conduction cylinder. Adjustment ➔ Flow rate is “1 second to reach the setting value”. The needle of the pressure meter should not bounce back when the pressure reaches the setting value.

b. Pneumatic valve 2: “wire meltdown” cylinder. Adjustment ➔ Flow rate is “1 second to reach the setting value”. The needle of the pressure meter should not bounce back when the pressure reaches the setting value. Check if the cylinder works properly. If not so, Check if the cylinder is properly installed.

c. Pneumatic valve 3: “melting down, straightening & clamping” cylinder. Adjustment under clamping ➔ Flow rate is “1 second to reach the pressure setting value”. The needle of the pressure meter should not bounced back when the pressure reaches the setting value.

d. Pneumatic valve 4: “wire head detection” cylinder. Adjustment ➔ Flow rate is “1 second to reach the pressure setting value”. The needle of the pressure meter should not bounced back when the pressure reaches the setting value. Check if the cylinder works properly. If not so, Check if the cylinder is properly installed.

e. Pneumatic valve 5: “copper wire off-center” cylinder. Adjustment ➔ Flow rate is “1 second to reach the pressure setting value”. The needle of the pressure meter should not bounced back when the pressure reaches the setting value.

f. Pneumatic valve 6: “Blow waste wire away” cylinder

g. Pneumatic valve 7: The first blowing Adjustment ➔ Thread the 0.15mm wire through the water cover of the upper machine head, and 40mm above the upper machine head. Press Blowing 1 button, and check if the wire swing is within the range of the water nozzle of lower water cover.

h. Pneumatic valve 8: Adjustment ➔ Thread the 0.15mm wire through the water cover of the upper machine head, and 400mm above the upper machine head. Press Blowing 1 button, and check if the wire swing is within the range of the water nozzle of lower water cover.

i. Pneumatic valve 9: While “Wire clamping” cylinder experience high temperature, copper wire remain certain tension. While cutting thin wire, to avoid rebound force and bend occur, copper wire must be steady clipped before the cutting start.
j. Heat experience power · wire cutting power: This is used to check the K1 and K2 switch function on the AWT_CUT board. It is used to detect the main function under K1 and K2 switch on AWT_CUT board which is shown as the figure below.

<table>
<thead>
<tr>
<th>WIO testing</th>
<th>K1</th>
<th>K2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start testing</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Stop testing</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>Heat experience power</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Wire cutting power</td>
<td>OFF</td>
<td>ON/ OFF</td>
</tr>
</tbody>
</table>

k. Wire curve detection: Switch on air pressure valve 1 · air pressure valve 2 · clip the copper wire between control wheel and wire clipping wheel. Contact copper wire to coil wire detection point (as shown in Fig. B: Auto-threading machine), at this time the signal will shine, which shows that the wire curve detect function works fine.

l. Wire receive detection: Switch on air pressure valve 1 · air pressure valve 4 · clip the copper wire between control wheel and wire clipping wheel. Contact copper wire to wire receive detection air pressure vat 4 (as shown in Fig. Auto-threading machine 4), at this time the signal will shine, which shows that the wire detection function works fine.

After switching off “Start testing”, start the cutting wire mode, semi-automatic (start the semi-automatic threading after cutting the wire), receive wire (receive wire motor starts after cutting the wire), check cut off wire (check if tension wheel is turned on or not), water stream aim to AWT (light shines when this function is active), wire cut off (light shines when cut off is processing or when it’s finish). Steps above only shows during regular threading examine, if there’s any irregular process, user can differentiate by these lights.
7.2 Auto-threading function—Variable setting

From **Machining** → **Smart Func.** → **AWT** → **AWT Setting2**

This is auto-parameter variable setting page. While facing threading failure because of setting problems, user can adjust the variable according to this chart.

<table>
<thead>
<tr>
<th>Wire diameter</th>
<th>0.1</th>
<th>0.15</th>
<th>0.2</th>
<th>0.25</th>
<th>0.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire diameter</td>
<td>0.1</td>
<td>0.15</td>
<td>0.2</td>
<td>0.25</td>
<td>0.3</td>
</tr>
<tr>
<td>Warm-up ON Time(ms)</td>
<td>5</td>
<td>5</td>
<td>7</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Warm-up OFF Time(ms)</td>
<td>35</td>
<td>20</td>
<td>15</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Wire-cut ON Time(ms)</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Wire-cut OFF Time(ms)</td>
<td>20</td>
<td>30</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Total Warm-up Time(10ms)</td>
<td>150</td>
<td>170</td>
<td>220</td>
<td>300</td>
<td>350</td>
</tr>
<tr>
<td>Total Wire-cut Time(10ms)</td>
<td>150</td>
<td>200</td>
<td>350</td>
<td>400</td>
<td>440</td>
</tr>
<tr>
<td>Received waste wire time(10ms)</td>
<td>460</td>
<td>470</td>
<td>480</td>
<td>500</td>
<td>520</td>
</tr>
<tr>
<td>The speed of the receive waste wire(servomotor)</td>
<td>210</td>
<td>220</td>
<td>230</td>
<td>240</td>
<td>250</td>
</tr>
<tr>
<td>The rolling velocity of determine the wire is break or not(servomotor)</td>
<td>62</td>
<td>64</td>
<td>66</td>
<td>70</td>
<td>75</td>
</tr>
<tr>
<td>The speed of the receive waste wire(DC motor)</td>
<td>85</td>
<td>90</td>
<td>95</td>
<td>100</td>
<td>105</td>
</tr>
<tr>
<td>The rolling velocity of determine the wire is break or not(DC motor)</td>
<td>42</td>
<td>44</td>
<td>46</td>
<td>50</td>
<td>52</td>
</tr>
<tr>
<td>Water Pressure intensity when wire pass through the upper</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Wire-cut mode : Temporary not used</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Preheat tension</td>
<td>20</td>
<td>35</td>
<td>45</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Trimming tension</td>
<td>60</td>
<td>80</td>
<td>100</td>
<td>120</td>
<td>150</td>
</tr>
<tr>
<td>Distance 1 speed (mm/min)</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
</tr>
<tr>
<td>Distance 2 speed (mm/min)</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td>Distance 3 speed (mm/min)</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
</tr>
<tr>
<td>Distance 4 speed (mm/min)</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td>Distance 5 speed (mm/min)</td>
<td>6000</td>
<td>8000</td>
<td>10000</td>
<td>11200</td>
<td>12000</td>
</tr>
<tr>
<td>Distance 6 speed (mm/min)</td>
<td>6000</td>
<td>8000</td>
<td>10000</td>
<td>12000</td>
<td>12000</td>
</tr>
<tr>
<td>Upward wire withdrawing speed(mm/min)</td>
<td>6000</td>
<td>8000</td>
<td>10000</td>
<td>10000</td>
<td>12000</td>
</tr>
<tr>
<td>Downward wire feeding speed (mm/min)</td>
<td>3000</td>
<td>4000</td>
<td>5000</td>
<td>5000</td>
<td>6000</td>
</tr>
<tr>
<td>Curve wire speed</td>
<td>2000</td>
<td>2500</td>
<td>4000</td>
<td>4000</td>
<td>4000</td>
</tr>
<tr>
<td>Remove waste ON time setting</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Manual threading mode-water pressure default</td>
<td>3</td>
<td>3</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Manual threading mode-wire tension default</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

To enter this setting screen you must enter password: “jsedm”
7.3 Breakdown exclude

AWT description

(1). Problem with the threading process after threading the wire into the guide with a depth of 1 ~ 2 mm.
A : 1. Please check the wire if its rust or not. (The oxide particle that is on the wire will result the wire having a rough surface.)
2. Check the copper wire quality. (Highly recommend not to use the wire that has been produced over 6 months.)
3. Please check the inner surface of upper guide and make sure its clean.
4. Please clean the upper guide and make sure there is no scratch or wire inside the guide.
5. While cutting the wire, if the power connect part (JU120AN) moves speed too fast, it will cause the cooper wire being compressed. The compressed wire will not able to go through the lower guide. Please adjust the airflow from the cylinder.
6. Discharging won’t happen when cutting the wire. If there is, please check the power connect part (JU120AN) and the (JU53CN).

(2). After pressing the AUTO key (Auto threading wire key) the braking wheel (WD48AN) will rotate in clockwise. Please check the part list (JY025-A)

Checking process:
A : 1. Please check JU110BN and make sure there are no chips.
2. Please check the lower guide (WA52AN) and make sure there are no chips.
3. When the cooper wire threads into the low arm , please check machine coordinate from the Z-axis.

(3). When operation the wire treading function, the wire is able to thread through wire sensor (JU110BN), but not able to reach the cut wire point (JU126AN). Please check the JY025-A and JY026-A

Checking process:
A : 1. Please check the conduit (JU99) and make sure there is no wire inside.
   (The different series has different part numbers: WA430A、WA530A type is JU99AN、WA640A type is AU07AN)
2. Make sure JU74B and JU118B are clean.
(4). The copper wire is not fully attached on the braking wheel (WD48AN).
   Please check the part list (JY025-A)

Checking process:
A : 1. Please check the braking wheel (WD48AN).
   2. Please check the creasing wheel (JU16BN) and stable the wheel by adjusting
      the screw

(5). Could not thread through the upper guide. Please check the part list (JY028-A)

Check process:
A : 1. Please check the power connects and upper guide (WA76AN), make sure
   there is no
   scratch or wire inside the guide.
   2. Please check the upper guide make sure there is no chip inside.
   3. When ATW cut the cooper wire, if the following phenomenon happened such
      as
      discharge, wire overheat, or wire apex becomes obtuse, please check the
      attachment

(6). Wire will slip off after being cut. Please check the JY026-A

Check process:
A : 1. Please check the cylinder (JU01).
   2. Make sure (JU91) and (JU41) are fixed.
   3. Make sure (JU91B) and (JU131A) are not damaged.
   4. Please remove the waste wire.

(7). Unable to break the wire. Please check JY025-A

Check process:
A : 1. Please check the cylinder (JU01) is working fine.
   2. Make sure JU53C and JU120A are not damaged.
   3. The temperature of the ATW equipment too low and the wire tension too small.
   4. Please check JU121 and make sure the cables are connected properly.

(8). The braking wheel won’t stop when the wire reaches the wire holder (JU91B).
    Please check the JY025-A
Check process:
A : 1. Make sure the cylinder (JU01) is working fine.
   2. Make sure there is no wear mark on JU107.
   3. Make sure the spring is not elastic fatigue.
   4. Make sure the cable on JU107 is connected properly.
   5. Make sure JU16B is clean and not being insulated.

(9). The flushing water from the upper guide is scattering. Please check the JY028-A

Check process:
A : 1. Control the amount of water being released by adjusting valve (AJ29D).
   2. The upper diamond guide (WA103) is damaged.
   3. The upper diamond guide (WA103) and upper guide are too close to each other.

(10). Copper wire isn’t able to thread through the lower guide.

Check process:
A : 1. Make sure there is no chip in the lower guide.
   2. If there is scratch or wire stock inside the lower guide, this means the lower guide is damaged.

(11). The copper wire are not able to reach the wire recycle system while threading. Please check the JY007-A and AY050-A

Check process:
A : 1. Please check the Z-Axis machine coordinates because it will impact the feeding length on W-Axis.
   2. Make sure the power connect feed (WA76DN) is not damaged.
   3. Please check if there is water come out from the part (WA51EN).
   4. Make sure no chips are in WA51EN.
   5. Make sure the flushing wheel (WA04CN) is working fine, otherwise please change the bearings (WA02).
   6. Make sure no chips are in the space from water flushing wheel (WA04CN), WAT43B to WD70BN and WD71AN.
(12). The copper wire has difficulty passing through the wire break point.

Checking process:
A : 1. The curvation of the wire can be an issue.  
2. After cutting the wire, the cut point not well.  
3. Verticity issue of the upper machine head  
4. The speed of the wire passing through the workpiece is too fast.

(13). The cooper wire have deflection condition to big.

Check process:
A: 1. Please check the Attachment 1.

Environment:
The copper wire needs to be produced within 6 months, the radian can not over 20 mm and with a length of 300 mm. Besides, the room temperature has to control with in 25°C ± 3°C.

Do not randomly change the specification and brand of the wire. Because the quality and material of the wire produced by different companies are different, during auto threading the wire might fail to thread.

Maintain and clean regularly.

(Naturally Droop) (After Burning)

(14) Copper Wire curves irregularly
A: While heating, the color of the wire will turn red and the diameter shrink due to the high temperature. Please go to 【Auto PARM】→ 《Auto Feed》→ （Auto Feed Setting 2 ) to increase the parameter of the heating time based on the wire condition.
(15) Copper Wire isn’t straight
A: While heating, the curvature of the wire is too big is due to the low heating temperature. Please go to 【Auto PARM】 → 《Auto Feed》 → （Auto Feed Setting 2） to decrease the parameter of the heating time based on the wire condition.

(16) The tip of the wire becomes round after being cut.
A: Cutting wire function is turning on too long. Please go to 【Auto PARM】 → 《Auto Feed》 → （Auto Feed Setting 2） to decrease the parameter of the cutting time based on the wire condition.

(17) A cross section is formed on the tip of the wire after being cut.
A: Please go to 【Auto PARM】 → 《Auto Feed》 → （Auto Feed Setting 2） to decrease the parameter of the cutting time based on the wire condition.

1. The diameter of the hole of diamond guide is 0.255mm. Copper Wire cannot thread through if its curve irregularly.
2. The distance between the diamond guide and the workpiece is 10~11mm. Please make sure the copper wire is straight enough to thread through the workpiece.
7. Set Auto Threading
TEST STANDARD OF AUTO THREADING:

<table>
<thead>
<tr>
<th>Wire diameter</th>
<th>Threading height of air-carrying-wire without workpiece</th>
<th>Successful possibility</th>
<th>Threading times without machine shutdown</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Wire broken point</td>
<td>Original point</td>
</tr>
<tr>
<td>0.1</td>
<td>50</td>
<td>85%</td>
<td>90%</td>
</tr>
<tr>
<td>0.15</td>
<td>60</td>
<td>85%</td>
<td>90%</td>
</tr>
<tr>
<td>0.2</td>
<td>90</td>
<td>85%</td>
<td>90%</td>
</tr>
<tr>
<td>0.25</td>
<td>100</td>
<td>85%</td>
<td>90%</td>
</tr>
<tr>
<td>0.30</td>
<td>100</td>
<td>85%</td>
<td>90%</td>
</tr>
</tbody>
</table>

※ Remarks:
1. Preheat time and wire cutting time vary depending on the wire diameters, brand names and the materials. (Japanese wires are more stable. Hitachi wire cutting wire is recommended.) Adjust preheat by increasing or decreasing 0.1 second, and use Wire Cut function to cut off the wire. Cut the wire at the tension wheel by scissors. Then, pull the wire out. Hold one end of the cutoff wire so as to hang the wire vertically in the air. Observe wire verticality. (Place it in front of a white background. Draw a frame of 300mm x 10mm on the white background.) If the wire winds within the 300mm x 10mm frame, it is OK. The wire adjusted by above preheat can thread through 80mm height under no workpiece condition and auto threading function of water-carrying-wire. Its successful possibility is 95%. If 100 mm threading height is required, the wire winding must be within 300mm x 5mm frame. Adjust wire cutting by increasing/decreasing time by 0.1 second each time till the wire can be cut off.
### 7.4 Driver setting

#### 7.4.1 AWT driver setting \( W \) axis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 (Setup of control mode)</td>
<td>5</td>
</tr>
<tr>
<td>03 (Selection of torque limit)</td>
<td>1</td>
</tr>
<tr>
<td>06 ((Selection of ZEROSPD input)</td>
<td>1</td>
</tr>
<tr>
<td>11 (Circuit gain of Speed 1)</td>
<td>300</td>
</tr>
<tr>
<td>12 (Time constant of circuit integration for Speed 1)</td>
<td>300</td>
</tr>
<tr>
<td>13 (Wave filter of Speed 1 sensor)</td>
<td>0</td>
</tr>
<tr>
<td>14 (Time constant of wave filter of Tension 1)</td>
<td>100</td>
</tr>
<tr>
<td>20 (inertia ratio)</td>
<td>600</td>
</tr>
<tr>
<td>44 (No. of output pulse per revolution)</td>
<td>2500</td>
</tr>
<tr>
<td>46 (Reversal of pulse output logic)</td>
<td>0</td>
</tr>
<tr>
<td>50 (Output gain of speed control)</td>
<td>100</td>
</tr>
<tr>
<td>51 (Reversal of speed command input)</td>
<td>1</td>
</tr>
<tr>
<td>52 (Offset of speed control)</td>
<td>0 (controller Motion status 3 screen parameter: LAG X~W)</td>
</tr>
<tr>
<td>5B (Selection of torque command)</td>
<td>1</td>
</tr>
<tr>
<td>5C (Input gain of torsion control)</td>
<td>65</td>
</tr>
<tr>
<td>5D (input reversal of torque command)</td>
<td>0</td>
</tr>
<tr>
<td>5E (Input reverse turn of torsion control)</td>
<td>300</td>
</tr>
</tbody>
</table>
Electric Drawing
WI_(640S,430S)浸水式+自動穿線配線圖
WI_ (640S,430S)Submerge+AWT Electric Drawing

FIG01-CONTROLLER(控制器配線)
FIG03-TRANSFORMER(變壓器配線)
FIG04-CIRCUIT_PANEL(自控盤)
FIG05-WCUT_AWT(自動穿線)
FIG06-WIO(WIO板配線)
FIG07-UPS&MOTION(MOTION板配線)
FIG08-SWITCH POWER1(電源配線1)
FIG09-SWITCH POWER2(電源配線2)
FIG10-DRIVER(伺服器配線)
FIG11-EDM POWER(放電箱配線)
FIG12-CONNECTOR(側板連接頭配線)
FIG13-FAN&MAIN SWITCH(風扇及主電源開關配線)
FIG14-MACHINE_CIRCUIT3(機台配線3)
FIG15-MACHINE_CIRCUIT4(機台配線4)
FIG16-WATER_SYSTEM4(浸水式水系統配線4)
FIG17-WATER_SYSTEM5(浸水式水系統配線5)
FIG18-WATER_SYSTEM6(浸水式水系統配線6)
FIG19-WATER_SYSTEM7(浸水式水系統配線7)
Flushing Water system
Submerge
Water system
FIG19 - WATER SYSTEM7
(Submerge, Submerge+AWT)
Rotary table system