# Table of Contents

1. Introduction ........................................................................................................... 1
   1.1 Preface ............................................................................................................. 1
   1.2 Basic Tools for maintenance ..................................................................... 2
   1.3 Maintenance Example ................................................................................... 4

2. KEB EDM Structure Description .................................................................... 7
   2.1 System Structure ......................................................................................... 7
   2.2 KEB EDM Parts structure and ID .............................................................. 9
      2.2.1 Control Box KEB1: Name, ID and Location .................................. 10
      2.2.2 Machine base KEB2: Name, ID and Location ................................. 15

3. Wiring Description ............................................................................................ 17
   3.1 Power Controller (KEB-H) : Wiring Description .................................... 17
   3.2 RIO Board (KEB-C7) : Wiring Description ........................................... 20
   3.3 Wiring of Side Board Connector in Control Box ..................................... 22
   3.4 Wiring of Electrical Box on Machine Base ............................................. 24
   3.5 Wing of terminal on Machine Base ......................................................... 25

4. Input/ Output (I/O) Description ...................................................................... 26
   4.1 I/O Displace ................................................................................................ 26
   4.2 I/O Definition .............................................................................................. 28
   4.3 I/O Application (Using I/O for Trouble Shooting) ............................. 30

5. Controller Setting and Reference data ........................................................... 31
   5.1 System Parameters Displace .................................................................... 31
   5.2 System Parameters Description .............................................................. 33
   5.3 Servo Adjustment ...................................................................................... 34

6. KEB Series EDM Trouble Shooting ............................................................... 35
   6.1 System unit functions Description ............................................................ 35
   6.2 Troubleshooting and Maintenance Flow Chart ..................................... 37
      6.2.1 Maintenance Flow Chart: Abnormal Machine Boot up .............. 38
      6.2.2 Z axis movement by themselves after machine shut down .......... 41
      6.2.3 Z axis can not move ................................................................. 43
# Table of Contents

6.2.4 W axis can not move.................................44
6.2.5 Front Panel and Remote control box malfunction .........................45
6.2.6 Pump can not turn on........................................48
6.2.7 Spark System malfunction...................................50
6.2.8 Polarity reverse switch malfunction................................55
6.2.9 Z axes won’t stop while electrode touches workpiece..................56
6.2.10 Synchronize flush malfunction..................................57
6.2.11 Oil Level Switch Malfunction..................................58
6.2.12 Work light is not ON..........................................59
6.2.13 Buzzer is not ON..............................................60
6.2.14 Fire Alarm is not function......................................61

## Append+

- KEB-A【A Box】Wiring Diagram
- KEB-B【B Box】Wiring Diagram
- KEB-C1【C Box】Wiring Diagram
- KEB-C2【RIO Board】Wiring Diagram
- KEB-C3【RIO Board】Wiring Diagram
- CE Wiring Diagram
- KEB-D【D Box】Wiring Diagram
- KEB-E【E Box】Wiring Diagram
- KEB-F【F Box】Wiring Diagram
- KEB-G【G Box】Wiring Diagram
- KEB-H-1【H Box】Wiring Diagram
- KEB-H-2【I Box】Wiring Diagram
- KEB-I【J Box】Wiring Diagram
- KEB-J【J Box】Wiring Diagram
- KEB-K【K Box】Wiring Diagram
- KEB2- Electrical Box-1Wiring Diagram
- KEB2- Electrical Box-2Wiring Diagram
- Machine Base Wiring Diagram
1 Introduction

1.1 Preface

KENT USA EDM is a PC-BASED KEB EDM Machine. The EDM System Structure combine with:
1. PC-BASED Controller developed by KENT USA manufacture.
2. Spark power supply hardware developed by KENT USA manufacture.

KEB-606 EDM maintenance manual includes:
(1) System structure definition and description.
(2) System structure function and description.
(3) System structure error messages and trouble shooting.

Basic knowledge needed:
(1) Familiar with EDM operation.
(2) Knowledge of basic Electronic and Computer.
(3) Basic Knowledge of mechanical Structure.
(4) Knowledge of using Multi Meter

1.2 Maintenance Note

Symbol used:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>~</td>
<td>Warning</td>
</tr>
<tr>
<td>/ Note</td>
<td>Might cause damage to technician if not proper use</td>
</tr>
<tr>
<td>/</td>
<td>Note</td>
</tr>
<tr>
<td>/ Hint</td>
<td>Might damage the machine if not correct wiring or incorrect installation.</td>
</tr>
<tr>
<td>/</td>
<td>Hint</td>
</tr>
<tr>
<td>* Note</td>
<td>Provide the information for service</td>
</tr>
</tbody>
</table>

/ Note

* * Please back up one copy of system parameter.
* * If there is any system parameters need to be changed, please back up one copy of the original system parameter for future used.
1. Introduction

Warning

1. Usually the machine is power on when technician is trouble shooting. Might cause electrical shot if not work carefully.
2. Do not touch the EDM when the machine is cutting. For the high voltage might cause electrical shot.
3. Do not put your hand in the mechanical structure while table is moving.

Hint

*parameters:
Please set up the proper parameter.*
Wrong parameter might cause the machine operate not properly. Machine parameters are very important setting for correct operation.

*back up:
Parameter back up is important and necessary

1.2 Tools for Malignance

(1) Multi Meter: Multi Meter is used so often while Maintains. Digital Multi meter is suggested.
Minimum Requirement:
① Can Check ACV 0~750V
② Can Check DCV 0~250V
③ Can Check Ω 0~1MΩ
1. Introduction

(2) Screw Driver: Needed when Connect or disconnect wire terminals

(3) Soldering Gun and Solder: Needed when replace electronic elements.

(4) Allen Key and Adjustable Wrench: Needed when assemble machine parts.
1.3 Maintenance Example

When machine is malfunction, please follow the Maintenance manual for trouble shooting.
Example: “Working light is not ON” Function Failure
You can find “Working light is not ON” Trouble shooting in Chapter 6.12,
1. Introduction

(1) Components symbol description:

- **KEB - I2.1**: Power supply, 12 Connector #1 Leg
- **KEB - H1.32**: Power supply, Control Panel #32 point H1Terminal
- **KEB2 - M40CN2**: Small Power supply, CN2 Connector
- **KEB2 - M7**: Machine base, quartz lamp

**Maintenance flow chart**

- Check fuses of KEB-H12 (F4/7A) is ok? (Yes)  (No) Replace fuses (KEB-H12).
- Is there AC12V output from AC12V/2A of KEB-D3 on small transformer? (Yes)  (No) Replace small transformer (KEB-D3).
- Check the out of quartz lamp on small power generator. Is there AC12V output from KEB2-M40CN2? (Yes)  (No) Is there bad contactor on circuit? (Yes) Replace quartz lamp (KEB2-M7).
(2) Appendant Drawing is the schematic of KEB-600 EDM:

1. KEB-A.DSN — A Box schematic, includes the wiring of monitor.
2. KEB-B.DSN — B Box schematic, includes the wiring of servo driver.
3. KEB-C1.DSN — C Box schematic, includes the wiring of controller.
4. KEB-C2.DSN — C Box schematic, includes the wiring of I/O interface.
5. KEB-D.DSN — D Box schematic, includes the wiring of big and small transformers.
6. KEB-E.DSN — E Box schematic, includes the wiring of all switches and press keys on Front panel.
7. KEB-F.DSN — F Box schematic, includes the wiring of Current Limit frame.
8. KEB-G.DSN — G Box schematic, includes the wiring of transistors box.
9. KEB-H1.DSN — H Box schematic, includes the wiring of Controller circuit.
10. KEB-H2.DSN — H Box schematic, includes the wiring of Spark Control circuit.
11. KEB-I.DSN — I Box schematic, includes the wiring of Side Board connectors.
12. KEB2.DSN — Small electrical Box schematic, includes the wiring of terminals and connectors on small electrical box.
13. Machine Base Wiring. DSN — Schematic of machine base, includes the wiring of all components.
2 KEB EDM Structure Description

2.1 System structure

KENT USA KEB EDM machine power generator used PC-BASED controller. The spark system is developed by KENT USA R&D department. The system specification is described as follow:

(I) Controller: Industrial PC, Intel DX4-100 CPU is used for:
① I/O interface Data process.
② NC program compile.
③ Motion control
④ Spark control
⑤ motion control card. (X,Y axis control: optional)
⑥ One PULSE & GAP Board

(II) Servo: One DC SERVO DRIVER is used

(III) Spark POWER: There are 3 different specifications: 60A, 120A, 180A
① 60A→One high voltage board, one low voltage board
② 120A→One high voltage board, two low voltage board
③ 180A→One high voltage board, 3 low voltage board

KEB EDM control system structure is shown as Fig. 2.1:

Fig 2.1 KEB EDM System Structure
KEB EDM Spark power structure is shown as Fig. 2.2.

Fig. 2.2 KEB-600 Series. Schematic of Basic Spark Circuit Loop.
2.2 KEB EDM’s structure and numbers for each parts

EB-600 Series: CNC EDM contains of control box and machine base. The controller and servo described above are in control box.

The drawing bellow is the main structure and parts numbers of KEB-600 CNC EDM.
2.2.1 Control box KEB1’s structure and numbers for each parts

In spite of Control System and Spark System, Power Generator includes Power supply System and electrical panel. The structure is shown as follow:

![Diagram of KEB control box]

図 2.3 KEB Front view of control box.
2. KEB EDM Structure Description

A box :
① KEB-A1: Monitor

B box :
① KEB-B1: X Axis motor driver
② KEB-B2: Y Axis motor driver
③ KEB-B3: Z Axis motor driver
④ KEB-B4: C Axis motor driver

C box :
① KEB-C1: IPC
② KEB-C2: Pulse & Gap card
③ KEB-C3: Motion card
④ KEB-C4: Control board
⑤ KEB-C5: Power filter of controller
⑥ KEB-C6: Power supply (110V~220V/250W)
⑦ KEB-C7: RIO board (IO interface board)

D box :
① KEB-D1: Large transformer (4.5KVA)
② KEB-D2: Medium transformer (1.5KVA)
③ KEB-D3: Small transformer (1.2KVA)

E box :
① KEB-E1: Volt Meter (0~300V)
② KEB-E2: Amp Meter (0~200A)
③ KEB-E3: Monitor switch
④ KEB-E4: Emergency Stop (E.STOP)
⑤ KEB-E5: 【ON】
⑥ KEB-E6: 【OFF】
⑦ KEB-E7: Z Axis servo sensitivity adjustment
⑧ KEB-E8: buzzer
⑨ KEB-E9: Function keys PC board
⑩ KEB-E10: Hard-Key board
⑪ KEB-E11: Main Power

KEB-J1: Power source supply (provide power for RIO board)
Following is the rear view of control box:

![Diagram of control box]

Fig2.4 KEB EDM. Rear view of control box.
2. KEB EDM Structure Description

**F box :**
① KEB-F1 : Hi voltage current limit resistor.
② KEB-F2 : Low voltage current limit resistor-1 (30A)
③ KEB-F3 : Low voltage current limit resistor -2 (60A)
④ KEB-F4 : Low voltage current limit resistor -3 (90A)
⑤ KEB-F5 : Low voltage current limit resistor -4 (120A)
⑥ KEB-F6 : Low voltage current limit resistor -5 (180A)

**G box :**
① KEB-G1 : Hi voltage board
② KEB-G2 : Low voltage board -1 (60A)
③ KEB-G3 : Low voltage board -2 (120A)
④ KEB-G4 : Low voltage board -3 (180A)
⑤ KEB-G5 : G box board (transistor box board)

**H box :**
① KEB-H1 : terminal-1 (36 point)
② KEB-H2 : terminal-2 (20 point)
③ KEB-H3 : Fuse-3P/25A (Main Power)
④ KEB-H4 : Relay (Control Main Power)
⑤ KEB-H5 : Relay (Control Pump)
⑥ KEB-H6 : Overload Relay (Control Pump)
⑦ KEB-H7 : Fuse-7A (Power of controller)
⑧ KEB-H8 : Relay (Power of controller)
⑨ KEB-H9 : Fuse-3A (power of Hi/Low power supply)
⑩ KEB-H10 : Fuse-3A (power of fans)
⑪ KEB-H11 : Rectifier
⑫ KEB-H12 : Fuse-2A (Power of quartz lamp)
⑬ KEB-H13 : Relay (polarity switch control)
⑭ KEB-H14 : Relay (Spark Control)
⑮ KEB-H15 : Relay (Spark control. For 90A and above)
⑯ KEB-H16 : Diode
⑰ KEB-H17 : 3 phase rectifier (Low voltage spark rectifier)
⑱ KEB-H18 : 3 phase rectifier (Hi voltage spark rectifier)
⑲ KEB-H19 : Distributor
⑳ KEB-H20 : Rectifier (2nd Hi Voltage spark rectifier)
㉑ KEB-H21 : Capacitor (HiV Spark Filter)
㉒ KEB-H22 : Capacitor (LowV Spark Filter)
㉓ KEB-H23 : Capacitor (LowV Spark Filter. For 90A and above)

**KEB-J2 : Power Supply** (Provide power for High and Low voltage board)
Side View of Control Box:

**I box:**
1. KEB-I1: Remote control connector
2. KEB-I2: Machine base wiring connector-1 (16 PIN)
3. KEB-I3: Machine base wiring connector-2 (24 PIN)
4. KEB-I4: CE connector
5. KEB-I10: Main power connect terminal
6. KEB-I11: Polarity connect terminal

**L box:** Remote control
2.2.2 Machine Base KEB2’s structure and numbers for each parts

Following picture is Machine Base Structure for CNC EDM, This Machine Base has 3 DC servo Motor, Control the motions of X, Y, Z axis.

Machine Base: Components locations, numbers and definition: (Machine Base symbol: M).

Front view of Machine base:

KEB2 : Machine base（M box）-Front View
①KEB2-M1A : terminal-1
②KEB2-M3 : Z axis DC servo motor
③KEB2-M5A : Z axis hardware + limit Switch
④KEB2-M5B : Z axis software + limit Switch
⑤KEB2-M6 : Z axis hardware - limit Switch
⑥KEB2-M7 : Quartz light
⑦KEB2-M8 : Z axis DRO
⑧KEB2-M11 : Fire sensor
⑨KEB2-M14 : X axis DRO
⑩KEB2-M18 : Y axis DRO
⑪KEB2-M24 : synchronize flush
⑫KEB2-M25 : Level Switch
⑬KEB2-M35 : Oil Tank Door Limit Switch (CE Specific)
Machine Rear View:

KEB2: Machine base (M box) - Rear view

- KEB2-M20: W axis AC motor
- KEB2-M22: W axis limit switch-up
- KEB2-M23: W axis limit switch-down
- KEB2-M26: Inlet of Pump
- KEB2-M33: CE Emergency Stop
- KEB2-M34: CE Temp. Control switch

KEB2-M40: Small Control box
CN1: AC110 connector
CN2: Quartz lamp connector
CN3: Synchronize flush and level switch connectors
CN4: Pump connector
TB1-TB4: terminal
3 Wiring Description

In this section, we provide detail description of Control Panel (KEB-H box), RIO board (KEB-C7), Connector of Side Board (KEB-I Box), Small electrical box (KEB-M40) and Terminal on Machine base (KEB-M1).

3.1 Wiring of Control Panel (KEB-H Box)

Control Panel controls and provides power for all electrical Boxes, includes: Controller, Spark, Servo Motor and convert power supply.

For Terminal (KEB-H1): Receives Voltage Output from Transformer, through the control loop of Control Panel, then Output to controller, convert type power supply, etc.

For Terminal (KEB-H2): Power control and Voltage, Current detect while Sparking.

Hint

 Refer to schematic of KEB-H Box.
 Refer to Chapter 2 KEB-H box’s components location and description

(1) Wiring description of Terminal (KEB-H1):

H1.1 : Connect Main power Switch (KEB-E11) Output-R.
H1.2 : Connect Main power Input (KEB-E11) Output-S.
H1.3 : Connect Main power Input (KEB-E11) Output-T.
H1.4 : Connect Small Transformer (KEB-D3) Input side AC0V.
H1.5 : Connect Small Transformer (KEB-D3) Input side AC220V~AC415V.
H1.6 : Connect RIO Board (KEB-C7) : JP1.1.
H1.7 : Connect RIO Board (KEB-C7) : JP1.2.
H1.8 : Connect Large Transformer (KEB-D1) Input SideR/AC220V~415V.
H1.9 : Connect Large Transformer (KEB-D1) Input Side S/AC220V~415V.
H1.10 : Connect Large Transformer (KEB-D1) Input Side T/AC220V~415V.
H1.11 : Connect RIO Board (KEB-C7) : JP1.9.
H1.12 : Connect RIO Board (KEB-C7) : JP1.10.
H1.13 : Connect Side Board Connector (KEB-I2) PIN3---PUMP Power-R.
H1.14 : Connect Side Board Connector (KEB-I2) PIN4---PUMP power-S.
H1.15: ① Connect Side Board Connector (KEB-I2) PIN5 --- PUMP power-T.
② Connect Medium Transformer (KEB-D2) Input Side AC220V ~ 415V.
H1.16: Connect Small Transformer (KEB-D3) Output Side AC110V/6A (0V).
H1.18: Connect Small Transformer (KEB-D3) Output Side AC110V/2A (0V).
H1.20: Connect RIO Board (KEB-C7) : JP1.19.
H1.21: Connect RIO Board (KEB-C7) : JP1.20.
H1.22: Connect Panel ON Key (KEB-E5) Connect point #3.
H1.23: Connect Panel ON Key (KEB-E5) Connect point #4.
H1.24: Connect Medium Transformer (KEB-D2) Output Side AC220V/1.5A (0V).
H1.25: Connect Medium Transformer (KEB-D2) Output Side AC220V/1.5A (220V).
H1.26: ① Connect Controller Power Filter (KEB-C5) : LINE-1.
② Connect RIO Board Convert type power supply (KEB-J1) : InputAC-1.
③ Connect Side Board KEB-I2.7, AC0V.
H1.27: ① Connect Controller Power Filter (KEB-C5) : LINE-2.
② Connect RIO Board Convert type power supply (KEB-J1) : InputAC-2.
H1.28: Connect L.V & H.V Board Convert type power supply (KEB-J2) : InputAC-1.
H1.29: Connect L.V & H.V Board Convert type power supply (KEB-J2) : InputAC-2.
H1.30: Connect power of Fan (KEB-K box) InputAC-1.
H1.31: Connect power of Fan (KEB-K Box) InputAC-2.
H1.32: Connect Side Board Connector (KEB-I2) PIN1 --- Quartz Light 0V.
H1.33: Connect RIO Board (KEB-C7) : JP5.9.
H1.34: Connect RIO Board (KEB-C7) : JP5.10.
H1.35: Connect Small Transformer (KEB-D3) Output Side AC12V/1.5A (0V).

(2) Wiring description of terminal (KEB-H2):
H2.41: Connect RIO Board (KEB-C7) : JP1.5.
H2.43: Connect RIO Board (KEB-C7): JP1.7
H2.44: Connect RIO Board (KEB-C7): JP1.8
H2.45: Connect RIO Board (KEB-C7): JP1.1
H2.46: Connect RIO Board (KEB-C7): JP1.2
H2.47: Connect Volt meter (KEB-E1): + End
    Connect MOTION card (KEB-C2): JP2.2
H2.48: Connect Volt meter (KEB-E1): - End
    Connect MOTION card (KEB-C2): JP2.3
H2.49: Connect Amp meter (KEB-E2): + End
H2.50: Connect Amp meter (KEB-E2): - End
H2.51: Connect Transistor Board (KEB-G5): S24 point
H2.52: Connect Transistor Board (KEB-G5): S10 point
H2.53: Connect Transistor Board (KEB-G5): S1 point
H2.54: Connect Transistor Board (KEB-G5): S2 point
H2.55: Connect HV Current Limit frame (KEB-F1): S1 point
H2.56: Connect Transistor Board (KEB-G5): S6 point
H2.57: Connect Transistor Board (KEB-G5): S7 point
H2.58: Connect LV Current Limit frame (KEB-F2): S1 point
3.2 Wiring of RIO Board (KEB-C7)

RIO Board provides the Output and Input function for KEB Series EDM machine. In spite of the Input/Output signal of operation Panel, all other Input and Output signals are processed by RIO Board, such as Limit Switch, Polarity switch, Fire Alarm Signal, Short circuit Signal and etc.

Output/Input Signals of RIO Board are connected to the socket (JP1~JP12).

JP1.7 means Pin7 point on socket JP1.

* Refer to schematic of KEB-C7
* Refer to Chapter 2 KEB-C Box components location and description

(1) Wiring description of socket JP1:
- JP1.1: Connect Control Panel KEB-H1.6, Power On Signal
- JP1.3: Connect coil of relay (only CE)
- JP1.4: Connect coil of relay (only CE)
- JP1.5: Connect Control Panel KEB-H1.41, Spark ON Signal
- JP1.6: Connect Control Panel KEB-H1.42, Spark ON Signal
- JP1.7: Connect Control Panel KEB-H1.43, Polarity switch Signal
- JP1.8: Connect Control Panel KEB-H1.44, Polarity switch Signal
- JP1.9: Connect Control Panel KEB-H1.11, PUMP On Signal
- JP1.10: Connect Control Panel KEB-H1.12, PUMP On Signal
- JP1.11: Fast oil PUMP On Signal (Only 707~909)
- JP1.12: Fast oil PUMP On Signal (Only 707~909)
- JP1.13: Connect Side Board KEB-I2.9, W axis UP Signal
- JP1.14: Connect Side Board KEB-I2.8, W axis common point
- JP1.15: Connect Side Board KEB-I2.10, W axis Down Signal
- JP1.16: Open Loop
- JP1.17: Open Loop
- JP1.18: Open Loop
- JP1.20: Connect Control Panel KEB-H1.21, POWER ON Signal

(2) Wiring description of socket JP2:
- JP2.1: Connect Control Panel KEB-H2.45, Short circuit Signal + point
- JP2.2: Connect Control Panel KEB-H2.46, Short circuit Signal - point
3. Wiring description

(3) Wiring description of socket JP5:
   JP5.1: Connect Oil Tank Door Limit Switch (Only CE Specific).
   JP5.2: Connect Oil Tank Door Limit Switch (Only CE Specific).
   JP5.3: Open Loop.
   JP5.4: Connect Side Board KEB-I2.14, Synchronize Flush Signal.
   JP5.5: Open Loop.
   JP5.6: Connect Side Board KEB-I2.13, Level Switch.
   JP5.7: Open Loop.
   JP5.8: Connect Side Board KEB-I2.16, FIRE ALARM.
   JP5.9: Connect Control Panel KEB-H1.33, FIRE ENABLE (+).
   JP5.10: Connect Control Panel KEB-H1.34, FIRE ENABLE (−).
   JP5.11: Open Loop.
   JP5.13 & JP5.14: SHORT.
   JP5.15: Open Loop.
   JP5.16: Open Loop.

(4) Wiring description of socket JP8:
   JP8.1: Connect Side Board KEB-I2.11, DC+24V.
   JP8.2: Connect Side Board KEB-I2.12, GND.

(5) Wiring description of socket JP12:
   JP12.1: ⎕ point for Connecting E. STOP Switch (KEB-E3) on panel.
   JP12.3: Connect Buzzer (KEB-E8) 的 + End.
   JP12.4: Connect Buzzer (KEB-E8) 的 − End.
   JP12.5: ⎕ point for Connecting 【OFF】 Key (KEB-E6) on panel.
   JP12.6: ⎤ point for connecting 【OFF】 Key (KEB-E6) on panel.

(6) Wiring description of other sockets:
   JP3: Connect Side Board KEB-I1, Remote Box signal.
   JP4: Connect JP3 of MOTION Board.
   JP11: Extra I/O point.
3.3 Wiring of Side Board Connector:

Side Board (KEB-I Box) is to connect Small Electrical Box on Machine Base to Control Box. Through the Side Board can control the motion of machine base, DRO feedback, pump ON/OFF and I/O Signal of machine base. Side Board Connector is marked as KEB-I.

Example: I2.4 means PIN4 on Connector I2.

I1: connector to remote control box.
I4: Special design for the connector of CE model.
I3 is DRO (X, Y, Z) Connector:

Following is the wiring description of Connector I2 to Small Electrical Box (KEB-M40) on machine base.

**Hint**

* Refer to the schematic of KEB-I Box.
* Refer to Chapter 2 KEB-I box’s components location and description

(1) Wiring description of I2 Connector:

I2.1: Connect to CN2.1 on Small Electrical Box (KEB2-M40), Quartz lamp/AC12V.
I2.2: Connect to CN2.2 Small Electrical Box (KEB2-M40), Quartz lamp/AC0V.
I2.3: Connect to CN4.1 on Small Electrical Box (KEB2-M40), PUMP Power (R).
I2.4: Connect to CN4.2 on Small Electrical Box (KEB2-M40), PUMP Power (S).
I2.5: Connect to CN4.3 on Small Electrical Box (KEB2-M40), PUMP Power (T).
I2.6: Connect to TB1.20 on Small Electrical Box (KEB2-M40), PUMP Ground.
I2.7: Connect to CN1.2 on Small Electrical Box (KEB2-M40), AC110V.
I2.8: ① Connect to CN1.1 on Small Electrical Box (KEB2-M40), AC0V.
       ② Connect to TB1.1 on Small Electrical Box (KEB2-M40), W axis common point.
I2.9: Connect to TB1.2 on Small Electrical Box (KEB2-M40), W axis UP Signal.
I2.10: Connect to TB1.3 on Small Electrical Box (KEB2-M40), W axis Down Signal.
I2.11: Connect to CN3.1 on Small Electrical Box (KEB2-M40), DC24V.
I2.12: ① Connect to CN3.2 on Small Electrical Box (KEB2-M40), DC0V。
② Connect to TB1.4 on Small Electrical Box (KEB2-M40), FIRE ALARM ⊗ END。
I2.13: Connect to CN3.3 on Small Electrical Box (KEB2-M40), Level Switch。
I2.14: Connect to CN3.4 on Small Electrical Box (KEB2-M40), Synchronize Flush Signal。
I2.15: Connect to TB1.5 on Small Electrical Box (KEB2-M40), Z axis ⊗ Limit Signal。
I2.16: Connect to TB1.4 on Small Electrical Box (KEB2-M40), FIRE ALARM ⊗ END。

(2) Wiring description of I3 Connector:
I3.1: Connect to TB1.7 on Small Electrical Box (KEB2-M40), Z axis Motor Power ⊗ End。
I3.2: Connect to TB1.8 on Small Electrical Box (KEB2-M40), Z axis Motor Power ⊗ End。
I3.3: Connect to TB1.9 on Small Electrical Box (KEB2-M40), Z axis TG ⊗ End。
I3.4: Connect to TB1.10 on Small Electrical Box (KEB2-M40), Z axis TG ⊗ End。
I3.5: Connect to TB1.11 on Small Electrical Box (KEB2-M40), Z axis Protect common point。
I3.6: Connect to TB1.12 on Small Electrical Box (KEB2-M40), Z axis ⊗ Protect Signal。
I3.7: Connect to TB1.13 on Small Electrical Box (KEB2-M40), Z axis ⊗ Protect Signal。
3.4 Wiring of Terminal in Small Electrical Box of Machine Base:

The main function of Small Electrical Box (KEB2-M40) is to connect the power source and control signals between Electrical Box (KEB1) and Machine Base (KEB2), and easy for connecting and trouble shooting.

**Hint**

* Refer to schematic of small electrical box
* Refer to Chapter 2 KEB2-M40 box: Component location and description

(1) Wiring description of TB1 terminal:

TB1.1: W axis common point.
TB1.2: W axis UP signal.
TB1.3: W axis DOWN signal.
TB1.4: Fire detector Signal + End.
TB1.5: Z axis + Limit Switch Signal.
TB1.6: Fire detector Signal − End.
TB1.7: Z axis Motor + End.
TB1.8: Z axis Motor − End.
TB1.9: Z axis Motor TG + End.
TB1.10: Z axis Motor TG − End.
TB1.11: Z axis Protect Switch common point.
TB1.12: Z axis + Protect Switch Signal.
TB1.13: Z axis − Protect Switch Signal.
3.5 Wiring of terminal on Machine Base:

Hint

※ Refer to the schematic of Machine base Wiring ※
※ Refer to Chapter 2 KEB2-M Box: Components location and Description ※

The wiring of terminal (KEB2-M1) is described as following:

M1.1 : Z axis Motor + End.
M1.3 : Z axis Motor TG + End.
M1.4 : Z axis Motor TG – End.
M1.5 : Z axis Protect Switch common point.
M1.6 : Z axis + Protect Switch Signal.
M1.7 : Z axis – Protect Switch Signal.
M1.8 : ① Z axis Limit Switch common point.
       ② Fire Detector Signal – End.
M1.9 : Z axis + Limit Switch Signal.
M1.10 : Fire Detector Signal + End.
4 Input/ Output (I/O) Description

The I/O status will show on the screen for trouble shooting.

4.1 I/O Display

I/O Display:

(1) Press 【ESC】 key under Main Screen and Enter to System Screen.

![System Screen Diagram]

Fig 4.1 System Screen
(2) Press 【 F3 I/O 】 key and the I/O status is shown on screen.

Fig 4.2 I/O Screen

Address : I00.3 
Definition : Level switch Signal

Hint

The I/O Screen shown above is:
- : Active
- : Not Active

Address : O01.3 
Definition : Synchronized

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## 4.2 Definition of I/O

### I BIT (Input) Definition and Address

<table>
<thead>
<tr>
<th>BYTE 0</th>
<th>BIT 7</th>
<th>BIT 6</th>
<th>BIT 5</th>
<th>BIT 4</th>
<th>BIT 3</th>
<th>BIT 2</th>
<th>BIT 1</th>
<th>BIT 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED Display</td>
<td>Short Signal</td>
<td>OFF Key</td>
<td>Z- Limit Switch</td>
<td>Z+ Limit Switch</td>
<td>Level Switch</td>
<td>Oil Tank Door Switch</td>
<td>UPS OFF Signal</td>
<td>E.STOP Key</td>
</tr>
<tr>
<td>LED Display</td>
<td>LED31</td>
<td>LED29</td>
<td>LED24</td>
<td>LED21</td>
<td>LED30</td>
<td>LED28</td>
<td>LED26</td>
<td>LED3,23</td>
</tr>
<tr>
<td>BYTE 1</td>
<td>×</td>
<td>×</td>
<td>Fire Alarm Signal</td>
<td>XY Axis motor ON</td>
<td>Reserved Input 4</td>
<td>Reserved Input 3</td>
<td>Reserved Input 2</td>
<td>Reserved Input 1</td>
</tr>
<tr>
<td>LED Display</td>
<td>*</td>
<td>*</td>
<td>LED1</td>
<td>LED33</td>
<td>LED32</td>
<td>LED27</td>
<td>LED25</td>
<td>LED22</td>
</tr>
<tr>
<td>BYTE 2</td>
<td>Front Panel Number 7</td>
<td>Front Panel Number 6</td>
<td>Front Panel Number 5</td>
<td>Front Panel Number 4</td>
<td>Front Panel Number 3</td>
<td>Front Panel Number 2</td>
<td>Front Panel Number 1</td>
<td>Front Panel Number 0</td>
</tr>
<tr>
<td>LED Display</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>BYTE 3</td>
<td>×</td>
<td>+/-</td>
<td>End</td>
<td>PgDn</td>
<td>NO</td>
<td>*</td>
<td>Front Panel Number 9</td>
<td>Front Panel Number 8</td>
</tr>
<tr>
<td>LED Display</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>BYTE 4</td>
<td>×</td>
<td>×</td>
<td>W-</td>
<td>W+</td>
<td>W Axis ON</td>
<td>Z-</td>
<td>Z+</td>
<td>Z axis Fast UP</td>
</tr>
<tr>
<td>LED Display</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>BYTE 5</td>
<td>YES</td>
<td>Home</td>
<td>PgUp</td>
<td>Pump ON</td>
<td>Pump OFF</td>
<td>Spark ON</td>
<td>Spark OFF</td>
<td>F8</td>
</tr>
<tr>
<td>LED Display</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>BYTE 6</td>
<td>ENTER</td>
<td>CLEAR</td>
<td>-</td>
<td>+</td>
<td>RIGHT</td>
<td>LEFT</td>
<td>DOWN</td>
<td>UP</td>
</tr>
<tr>
<td>LED Display</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>BYTE 7</td>
<td>F7</td>
<td>F6</td>
<td>F5</td>
<td>F4</td>
<td>F3</td>
<td>F2</td>
<td>F1</td>
<td>ESC</td>
</tr>
<tr>
<td>LED Display</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>BYTE 8</td>
<td>Remote Control Box Slow Z-</td>
<td>Remote Control Box Slow Z+</td>
<td>Remote Control Box Fast Z-</td>
<td>Remote Control Box Fast Z+</td>
<td>Remote Control Box Pump OFF</td>
<td>Remote Control Box Pump ON</td>
<td>Remote Control Box Spark OFF</td>
<td>Remote Control Box Spark ON</td>
</tr>
<tr>
<td>LED Display</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>
### 4. I/O Description

<table>
<thead>
<tr>
<th>BYTE9</th>
<th>Remote Control Box Y-</th>
<th>Remote Control Box Y+</th>
<th>Remote Control Box X-</th>
<th>Remote Control Box X+</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED Display</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

※Note: 『*』 means no LED Display

### O BIT (Output) Definition and Address

<table>
<thead>
<tr>
<th>BYTE 0</th>
<th>BIT 7</th>
<th>BIT 6</th>
<th>BIT 5</th>
<th>BIT 4</th>
<th>BIT 3</th>
<th>BIT 2</th>
<th>BIT 1</th>
<th>BIT 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED Display</td>
<td>Z Axis Break</td>
<td>H. Pump Motor</td>
<td>Pump</td>
<td>Neg. Polarity Spark</td>
<td>Positive Polarity Spark</td>
<td>Main Spark Power</td>
<td>External Power switch</td>
<td>E.STOP Control</td>
</tr>
<tr>
<td>LED Display</td>
<td>LED15</td>
<td>LED10</td>
<td>LED9</td>
<td>LED7</td>
<td>LED6</td>
<td>LED5</td>
<td>LED4</td>
<td>LED3,23</td>
</tr>
<tr>
<td>LED Display</td>
<td>LED13</td>
<td>LED16</td>
<td>LED12</td>
<td>LED11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED Display</td>
<td>XY Axis Servo Motor lock</td>
<td>Y- axis Motion</td>
<td>Y+ axis Motion</td>
<td>X- axis Motion</td>
<td>X+ axis Motion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED Display</td>
<td>LED19</td>
<td>LED20</td>
<td>LED18</td>
<td>LED17</td>
<td>LED14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED Display</td>
<td>Pump ON LED</td>
<td>Pump OFF LED</td>
<td>Spark ON LED</td>
<td>Spark OFF LED</td>
<td>Z Axis Fast up LED</td>
<td>W Axis ON LED</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

※Note: 『*』 means no LED Display
4.3 Application of I/O (Use I/O to check Circuit)

(1) Example 1: Use INPUT to check Circuit

INPUT Address : I00.4:

Address I00.4 is Z+ Limit. When Z+ axis limit is not trigged, □ is shown in the address I00.4. When Z+ axis limit is trigged, █ is shown in address I00.4. (address I00.4 LED Display from □→█). If Address I00.4 is shown as above, it means the circuit of Z + limit is normal.

If Z+ limit is not trigged and █ is shown in Address I00.4, it means there is short circuit in Z + limit. Please refer to Chapter 2 and find out the Z+ limit switch. Base on the schematic for trouble shooting till □ is shown in address I00.4.

(2) Example 2: Use OUTPUT to check Circuit

OUTPUT Address : O00.5:

Address O00.5 is output Signal of Oil Pump. When █ is shown in Address O00.5, it means there is AC110V output from Point 9(AC110V) of JP1 socket on RIO board (KEB-C7) and Point 10(AC0V) for the relay of oil pump.

While the Pump Button is pressed, the display of Address O00.5 should be changed from □→█.

If the Relay of oil pump is not function properly, please check the wire from JP1.9 and JP1.10 v to Relay or replace RIO Board.
5 Controller Setting and Reference data

KENT USA KEB EDM Controller is a PC_BASE controller. There are some internal parameters need to be preset.

5.1 Display System Parameter

Operation of display System Parameter Screen:
(1) Press 【ESC】 Key under Main screen and enter to system screen.

---

**Fig 5.1 System Screen**

---
(2) Press 【F4 Parameter】 and enter I/O Screen.

![System parameter Screen](image)

**Table: System Parameter Screen**

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameters</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>END_PUMP_DISC</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>END_PUMP_SPEED</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>PUMPING_F1</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>PUMPING_F2</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>TRAVEL_K1_GAIN</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>TRAVEL_KD_GAIN</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>TRAVEL_KP_GAIN</td>
<td>400</td>
</tr>
<tr>
<td>8</td>
<td>TRAVEL_IL_GAIN</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>SLOPE_UP_DOWN</td>
<td>25</td>
</tr>
<tr>
<td>10</td>
<td>TRAVEL_SPEED</td>
<td>25</td>
</tr>
</tbody>
</table>

*Cursor: PgUp/PgDn, Up/Down
Modify: Enter & 0~9
Exit/Save: ESC

---

Fig 5.2 System parameter Screen
5.2 Description of System Parameter

<table>
<thead>
<tr>
<th>ID</th>
<th>Name of Parameter</th>
<th>Default</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>END_PUMP_DISC</td>
<td>40</td>
<td>End distance of Electrode retract to previous position (Unit: pulse)</td>
</tr>
<tr>
<td>2</td>
<td>END_PUMP_SPEED</td>
<td>5</td>
<td>End Speed percentage of Linear PUMPING</td>
</tr>
<tr>
<td>3</td>
<td>PUMPING_F1</td>
<td>100</td>
<td>Electrode retract speed(2nd Step) (Unit: pulse/5ms)</td>
</tr>
<tr>
<td>4</td>
<td>PUMPING_F2</td>
<td>80</td>
<td>Electrode retract speed(3rd Step) (Unit: pulse/5ms)</td>
</tr>
<tr>
<td>5</td>
<td>TRAVEL_KI_GAIN</td>
<td>0</td>
<td>KI Gain of Z axis LM628 while traveling</td>
</tr>
<tr>
<td>6</td>
<td>TRAVEL_KD_GAIN</td>
<td>0</td>
<td>Differential Gain G of Feed Rate</td>
</tr>
<tr>
<td>7</td>
<td>TRAVEL_KP_GAIN</td>
<td>400</td>
<td>KP Gain of Z axis LM628 while traveling</td>
</tr>
<tr>
<td>8</td>
<td>TRAVEL_IL_GAIN</td>
<td>0</td>
<td>Reserved</td>
</tr>
<tr>
<td>9</td>
<td>SLOPE(UP, DOWN)</td>
<td>25</td>
<td>Slope of Z axis when Increase/Decrease Speed</td>
</tr>
<tr>
<td>10</td>
<td>TRAVEL_SPEED</td>
<td>250</td>
<td>Travel Speed of G00</td>
</tr>
<tr>
<td>11</td>
<td>HOME_SPEED</td>
<td>300</td>
<td>Speed of Homing.</td>
</tr>
<tr>
<td>12</td>
<td>EDGE_SPEED</td>
<td>20</td>
<td>Feed Rate of EDGE</td>
</tr>
<tr>
<td>13</td>
<td>LAG_PROTECT_REF</td>
<td>200</td>
<td>Max. LAG Value. Alarm is ON when LAG is greater than this value.</td>
</tr>
<tr>
<td>14</td>
<td>OPTICAL_SCALE</td>
<td>5</td>
<td>DRO Scale Value</td>
</tr>
<tr>
<td>15</td>
<td>MAXIMAL_CURRENT</td>
<td>60</td>
<td>Max. Spark Current</td>
</tr>
<tr>
<td>16</td>
<td>RESERVED4</td>
<td>0</td>
<td>Reserved</td>
</tr>
<tr>
<td>17</td>
<td>RESERVED3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>RESERVED2</td>
<td>0</td>
<td>Reserved</td>
</tr>
<tr>
<td>19</td>
<td>RESERVED1</td>
<td>0</td>
<td>Reserved</td>
</tr>
<tr>
<td>20</td>
<td>RESERVED0</td>
<td>0</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

! Note

* The parameters listed above are default value from manufacture. Change any parameter might effect the performance. If the parameters are changed by accident, please check the Parameter Setting Table.
5.3 Servo Adjustment

Servo Driver is the driver of Servo Motor. If the driver is not tuned well, the KEB Spark performance will be loose.

Method of Adjustment:
(1) Use square wave generator to create a square wave. The voltage and frequency is shown as below:

(2) Add Vim Leg to square wave.
(3) Use oscilloscope: Use CH1 to detect Vin and GND, CH2 to detect TG and GND.
(4) Adjustment steps are shown as below. Use CH2 and having the Wave shown as below:

Adjust GT GAIN and have Wave Height equal to 2.0V
Adjust DC GAIN Knob and have Wave Slope equal to 18~20ms.
Adjust LAG value between 30~40.
6 KEB Series EDM Trouble Shooting

During the process of maintenance, please refer to the schematic of KEB ZNC EDM machine in the maintenance manual. With the schematic in previous chapters can help the technician for trouble shooting.

6.1 System unit functions Description

KEB series Power Controller can be classified base on its function:

① Spark Operation:
② Spark Auto operation:
③ Spark Signal Generate/Control:
④ Spark Servo Action Control:
⑤ Power generator:

Table of the function :

<table>
<thead>
<tr>
<th>System Name</th>
<th>ID</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spark Operation</td>
<td>KEB-E10</td>
<td>Main Key Board</td>
</tr>
<tr>
<td></td>
<td>KEB-E9</td>
<td>Function Key</td>
</tr>
<tr>
<td></td>
<td>KEB-E5/KEB-E6</td>
<td>ON/OFF Key</td>
</tr>
<tr>
<td></td>
<td>KEB-E11</td>
<td>Main power switch</td>
</tr>
<tr>
<td></td>
<td>KEB-C3</td>
<td>I/O Card</td>
</tr>
<tr>
<td></td>
<td>KEB-C7</td>
<td>RIO Interface Board</td>
</tr>
<tr>
<td>Spark Auto operation</td>
<td>KEB-C1</td>
<td>IPC</td>
</tr>
<tr>
<td></td>
<td>KEB-C3</td>
<td>I/O &amp; Motion</td>
</tr>
<tr>
<td></td>
<td>KEB-C7</td>
<td>RIO Interface Board</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) Spark Output Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Polarity Switch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) Main Power/Pump Power</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4) Fire Alarm Circuit Loop</td>
</tr>
<tr>
<td>Spark Signal Generate/Control</td>
<td>KEB-C2</td>
<td>GAP&amp;PULSE Board</td>
</tr>
<tr>
<td></td>
<td>KEB-G1</td>
<td>Spark HV Output Board</td>
</tr>
<tr>
<td></td>
<td>KEB-G2</td>
<td>Spark LV Output Board</td>
</tr>
<tr>
<td></td>
<td>KEB-F1</td>
<td>HV Current Limit Frame</td>
</tr>
<tr>
<td></td>
<td>KEB-F2,F3</td>
<td>LV Current Limit Frame</td>
</tr>
<tr>
<td>Spark Servo Action Control</td>
<td>KEB-C3</td>
<td>Motion card</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>Power Supply Parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KEB-D1</td>
<td>KEBC3</td>
<td>(1) Provide HV/LV AC 3phase Power.</td>
</tr>
<tr>
<td>KEB-D2</td>
<td></td>
<td>(2) Provide Power of Pump</td>
</tr>
<tr>
<td>KEB-D3</td>
<td></td>
<td>(3) Provide AC 110V Power of Servo Controller</td>
</tr>
<tr>
<td>KEB-J1</td>
<td></td>
<td>(4) Provide AC 110V Power of Servo Motor</td>
</tr>
<tr>
<td>KEB-J2</td>
<td></td>
<td>(1) Provide AC 110V Power of Controller</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Provide AC 110V Power of HV/LV Board</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(3) Provide AC 110V Power of Fan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(4) Provide AC 12V Power of quartz Light</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) Provide DC +12V, +5V for RIO Interface Board.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Provide AC 110V Power of RIO Interface Board.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide DC +12V, +5V for HV/LV Board.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DC+5V, DC+12V</td>
</tr>
</tbody>
</table>
6.2 Trouble Shooting and Maintenance Flow Chart

Please refer to operation manual, confirm the function of each key/Signal LCD for trouble shooting. Please check the following item while the machine has problem:

1. Status of problem:
   a. When machine has problem, the function key LED Light on panel will be On or Off and the error message will show on screen.
   b. The status of machine motion.
   c. Position of working head / Status of workpiece / Status of Oil Tank

2. Is operation process correct?

3. Please check each abnormal unit and restart the power.

**Danger**

1. Be aware of electrical shot while the machine is ON during trouble shooting. Please turn off power while replace components and unplug connector.
2. Before restart the power, please make sure each connect point is connected properly.

**Note**

If the customer need the service from manufacturer, Please provides the following information and fax it to KENT USA EDM. Our engineer will reply to you ASAP.

1. Information on Machine Head:
   a. Serial Number:
   b. Date:
   c. Model:

2. Please use the name of component and parts described in the operation manual and fax it to us:
   a. Describe the status of problems
   b. LED Light ON/OFF of each function key and the Error Message on Screen.
   c. Position of working head and status of oil tank.
   d. Damaged component:
      i. Name
      ii. Parts and location
      iii. Status of damage, such as burn out, broken and not function.
   e. Times of problems happen.
6.2.1 Maintenance Flow Chart: Abnormal Machine Boot up

Case 1: when main power is ON, press 【ON】 and can not turn on controller

※Refer to Schematic : KEB-C1.DSN、KEB-H1.DSN、KEB-E.DSN。
Trouble Shooting flow Chart

1. Does fuse 7A (KEB-H7) blown out?
   - (Yes) → Replace Fuse 7A/30 (KEB-H7)
   - (No)

2. Is there AC110V output between KEB-H1.16 and KEB-H1.17?
   - (No) → Replace Fuse 7A (KEB-H7)
   - (Yes)

3. While pressing [ON] button (KEB-E4), is there short circuit between KEB-H1.22 and KEB-H1.23?
   - (No) → Replace [ON] button (KEB-E4)
   - (Yes)

4. Is there AC110V output between KEB-H1.20 and KEB-H1.21?
   - (No) → Replace Small Transformer (EBE-D3)
   - (Yes)

5. Is there AC110V output between KEB-H1.25 and KEB-H1.27?
   - (No) → Replace Relay (KEB-H8)
   - (Yes)

6. Is there AC110V output between Filter (KEB-C6)?
   - (No) → Replace Filter (KEB-C6)
   - (Yes)

7. Does the output of POWER-1, POWER-2 from power generator (KEB-C5) normal?
   - (No) → Replace Power Generator (KEB-C5)
   - (Yes)

If the problem still not removed, please check Case 2.
Case 2: Can not execute KEB program. Enter system screen.

Trouble shooting Flow Chart

Insert "DOS" Disk. Can you enter DOS mode after reboot the controller? (Yes)

(No)

Shut down the power, replace IPC (KEB-C1), turn on the power.

Finish
6.2.2 Z axes movement by themselves after machine turn on

※Reference Schematics：KEB-B.DSN、KEB-C1.DSN、KEB-C2.DSN、KEB-C3.DSN。

Reference Schematics
Trouble Shooting flow chart

Shut down Main power, replace Motion card (KEB-C3). Restart the machine. Does the function normal?

(Yes) → Finish

(No)

Shut down Main power, replace IPC (KEB-C1). Restart the machine. Does the function normal?

(Yes) → Finish

(No)

Check the following connection based on the Reference Schematic above:

1. From CON3 of KEB-C3 to CN1 of KEB1-B1.
3. Z axis DRO to P3 of EBE-C7.

---

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6.2.3 Z axis can not move

There are 4 possibilities:

1. 【Z+】、【Z-】 press key on remote control box damaged.
2. Motion card (KEB-C3) damaged.
3. Z axis DRIVER damaged.

※Reference Schematic: Refer to the schematic in Chapter 6.2.2

Trouble Shooting Flow Chart

Refer to chapter 4.2, I/O definition and enter I/O diagnosis screen. Press 【Z+】、【Z-】 key and check the screen 1 bit ID(1)【Z+】 ID(2)【Z-】. Does the symbol □(1)、□(0) changed?

(Yes) [Remote Control Box (KEB-L) or the connection damaged. Please refer to chapter 6.2.5]

(No)

Press【Z+】、【Z-】 button and check the voltage output of TB1.1 and TB1.2 on Z axis (KEB1-B1) Driver? Does the output correct?

(Yes)

1. Replace Z axis motor and check again.
2. Replace Z axis Driver and check again.
3. Check limit switches and the circuit. Make sure the function is normal.

(NO)

① Replace Motion card (KEB-C2) and check again.
② Replace the 50P Cable from Motion card to RIO board and check again.
6.2.4 W axis function is abnormal.

Reference Schematics: KEB-C7.DSN • KEB-small electrical box. DSN • KEB-Machine Base wiring. DSN •

Reference Schematics

Trouble Shooting Flow Chart

Refer to chapter 4.2, I/O definition and enter I/O diagnosis screen. Then press 【W ON】・【W+】・【W-】keys and check does the status of (1) □ (0) on :1D4.3 (WON) ・1D4.4 (W+) ・1D4.5 (W-) of I bit and O bit之001.0【W UP】・001.1【W DOWN】 changed? (No)

Front panel button (KEB-E10) or its connected wire is damaged. Refer to Chapter 6.25.

(Yes)

Press 【W+】・【W-】. Is there AC110V output from JP1.13及JP1.14 on RIO board (KEB-C7)? (No)

Replace RIO board (KEB-C7) and check again.
② Replace the 25P cable from RIO board to IPC and check again.

(Yes)

① Replace W axis motor and check again.
② Check the limit switch and the wiring.
6.2.5 Front Panel and Remote control box malfunction

FAQ of Front Panel:
(1) Press Key on Panel is not valid.
(2) LED is not ON

FAQ of Remote Control Box:
(1) Press Key on Remote Control Box is not valid.
(2) LED is not ON

※Reference Schematics：KEB-E.DSN、KEB-C1.DSN、KEB-C2.DSN 

Reference Schematics
Trouble shooting Flow Chart

For Front Panel:

Refer to Chapter 4.2 I/O definition and enter I/O diagnosis screen. Press (HARD KEY) and check the LED. Does the symbol □(1)、□(0) for I bit and O bit changed?

Replace RIO board (KEB-C7) and check again.

Replace IPC (KEB-C1).
Trouble Shooting Flow Chart for Remote Control Box:

1. Does the cable between KEB-C7JP3 to KEB-I1 and KEB-LP1 to KEB-I1 loose?
   - Yes: Reconnect or replace the cable.
   - No: Refer to Chapter 4.2, I/O definition and enter I/O diagnosis screen. Press the button of Remote box and check the LED. Does the symbol □(1) → □(0) for I bit and O bit changed?

2. Does the symbol □(1) → □(0) for I bit and O bit changed?
   - Yes: Normal
   - No: Replace RIO board (KEB-C7) and check again.

3. Replace RIO board (KEB-C7) and check again.
   - Yes: Replace IPC board (KEB-C1) of remote control box and check again.
   - No: Replace IPC (KEB-C1).
6.2.6 Pump can not turn on

※Reference Schematics: KEB-H1.DSN, KEB-C2.DSN, KEB-I.DSN.

Reference Schematics
**Trouble Shooting Flow Chart**

1. **Does the voltage input and phase correct? If not, check the big transformer (KEB-D1) and main power input.**
   - **Yes**
   - **No**
     - The press button on panel and remote control box or the connected cable is damaged. Refer to chapter 6.2.5 for detail.

2. **Press Pump button and check the IO diagnosis of I bit05.4, O bit00.5 - O bit03.5. Does the symbol □(1)、□(0) for I bit and O bit changed?**
   - **Yes**
   - **No**
     - Replace or Reset Thermal Relay (KEB-H5) and check again.
     - Replace Relay (KEB-H6) and check again.

3. **Is there AC110 output between KEB-H1.11 and KEB-H1.12?**
   - **Yes**
   - **No**
     - Replace RIO board (KEB-C7) and check again.

4. **Does the replay ON?**
   - **Yes**
   - **No**

**Hint**

1. Check the turning direction of pump is correct. If not, switch the power inlet AC-1 and AC-2.
2. When the pump is dry run:
   - ① Check the pump is full of oil.
   - ② If the pump can not fill the oil, check the pump is leaking or the valve is damaged.
6.2.7 Spark System malfunction

Spark power structure of KEB is shown as bellow:
There are 3 group of DC power in KENT USA EDM system:

Group 1: Provides the energy for Arc Spark and High Voltage spark. Called H.V.
Group 2: Provides the Spark energy. Called L.V.
Group 3: Protection Power for L.V and H.V. Called SINK.

Control Spark System is consist of 3 Circuit Boards:
1. PULSE card (KEB-C3) Detect and Control the Spark Status.
2. HV Board (KEB-G1) HV Board guides the Spark Gap and HV Spark Control. With SINK circuit, machine can protect the MOSFET on HV and LV Board.
3. LV Board (KEB-G2). 【60A: 1 set, 120A: 2 set, 180A: 3 set】
   LV board can select level of High Frequency and High Current. It can select the energy while EDMing.
   In spite of MOSET of LV board in Main Spark Circuit, there are series connected with limit current resistance. Therefore, MOSFET won’t burn out if the Peak Current is too high.
Description of each AC current and circuit:
H.V: Provides the energy for HV Board while guiding the spark gap and HV spark.

L.V: Provides the energy for LV Board while Sparking. The circuit is shown as bellow:

SINK: Provides the protection power for HV and LV board.

FAQ of Spark:
① Cannot enter spark procedure.
② After press Spark button, Z axis moving up and down but with no spark.
③ LV current too low.
④ HV current too low.
⑤ No voltage for LV.
⑥ No voltage for HV.
⑦ Arcing.
Can not enter Spark procedure:

**Trouble Shooting Flow Chart**

1. **Does the short circuit LED ON?**
   - **(Yes)**: Remove the problem of Short Circuit and the LED is not ON. Check again.
   - **(No)**: Proceed to the next step.

2. **Does the oil level to low while the Level switch is pressed?**
   - **(Yes)**: If EDMing without a submerge workpiece, set the Level Control OFF.
     - **(Yes)**: If EDMing with a submerge workpiece, make sure the oil level is reach to the setting.
   - **(No)**: Proceed to the next step.

3. **Does Z axis touch limit switch?**
   - **(Yes)**: Move the X, Y, Z and leave the limit switch.
   - **(No)**: Proceed to the next step.

4. **Does the working Coordinate exceed the setting?**
   - **(Yes)**: Reset the software limit value.
   - **(No)**: Proceed to the next step.

5. **Is any message shown in Error message Column?**
   - **(Yes)**: Trouble shooting for the Error message. If can’t, reboot the machine and try again.
   - **(No)**: Proceed to the next step.

Press Spark button, Z axis moving up and down but with no spark:

**Trouble Shooting Flow Chart**

1. Press Spark key, Is there DC200V output between JP1.2 and JP1.3 on PULSE board (KEB-C2)?
   - **(Yes)**: Replace PULSE board and check again.
   - **(No)**: Proceed to the next step.

2. Check the cable between JP1 on PULSE board and point 47, 48 on KEB-H2.
LV Current too low

Trouble Shooting Flow Chart

Replace LV board (KEB-G2) and check again. Is current still too low?

(No) → Normal

(Yes) → Replace PULSE board (KEB-C2).

HV current too low

Trouble Shooting Flow Chart

Replace HV board (KEB-G1) and check again. Is current still too low?

(No) → Normal

(Yes) → Replace PULSE board (KEB-C2).

No Voltage in LV

Trouble Shooting Flow Chart

1. There is DC90V output from Bridge Rectifier (KEB-H18) on LV circuit.
2. There is DC90V output from point 56,57 on KEB-H2. Does the output described correct?

(No) → Replace the parts on LV circuit and check again.

(Yes) → Follow the steps of Trouble Shooting Method - LV Current too low.
No voltage in HV

Trouble Shooting Flow Chart

1. There is DC200 V output from Bridge Rectifier (KEB-H19) on HV circuit.
2. There is DC200V output from point 53,54 on KEB-H2
   Does the output described correct?
   (No) → Replace the parts on HV circuit and check again
   (Yes) → Follow the steps of Trouble Shooting Method - HV Current too

Arcing

Trouble Shooting Flow Chart

Unplug the connector on P1 and JP1 of LV board (KEB-G2). Is it Arcing if only EDMing with High Voltage only?
   (No) → Replace LV board
   (Yes) → Unplug the connector on P1 and JP1 of HV board (KEB-G1). Is it Arcing if only EDMing with Low Voltage only?
   (No) → Replace HV board
   (Yes) → Replace PULSE board (EBE-C3).
6.2.8 Polarity reverse switch malfunction

Reference Schematics: KEB-H2.DSN, KEB-C1.DSN

Reference Schematics

Trouble Shooting Flow Chart

Polarity Selection described as follow:
① Relay (KEB-H14) is click when the Spark button is pressed.
② When the polarity is reversed as jump to the next step, the other relay (KEB-H13) is click and EBN-H14 is released.

Does the relay (KEB-H13) acts as described above when the polarity is reversed?
(No) If the relay is click but cannot spark normally, it means relay is bad connection. Replace the relay.
(Yes) If the relay is not click, it means the coil is bad. Replace the relay.

Is there AC110 output from point 43 and 44 on terminal (KEB-H2)?
(No) Replace RIO board (KEB-C7)?
6.2.9 Z axes won’t stop while electrode touches workpiece

※Reference Schematics: KEB-H2.DSN, KEB-C1.DSN

Reference Schematics

Trouble Shooting Flow Chart

When the workpiece touch electrode:
① Buzzer is ON (unless Buzzer function is OFF)
② Short Circuit LED is ON.
③ Z axis is frozen.

Check 1:
Buzzer is not ON and the Short Circuit LED is not ON as workpiece touch electrode.
Check the wire and connector based on Reference Schematic.

Replace RIO board (KEB-C7) and check again.

Check 2:
Replace Motion card if Z still can move while workpiece touch electrode.

Replace IPC (KEB-C1) and check again.
6.2.10 Synchronize flush malfunction

Synchronize flush is ON when the following buttons is pressed.

1. In Spark status, press key

2. Press the function key **[KEY 2]** to synchronize flush ON.

Reference Schematics: KEB-C1.DSN、KEB-I.DSN、KEB-Electrical Box.DSN

Trouble Shooting Flow Chart

1. Press synchronize flush button and check the I/O diagnosis. Does the symbol □ (1)、□ (0) of bit02.2 changed?
   - **(Yes)** The button on front panel or the connection is damaged. Refer to chapter 6.2.5 for detail.
   - **(No)**
     - Is there DC24V output from KEB-C7JP8.1 and EBE-C7JP5.4?
       - **(Yes)** Replace IPC (KEB-C1) and check again.
       - **(No)** Replace RIO board (KEB-C7) and check again.

2. Make sure the connected cable is not loose.

3. Replace the relay of synchronize flush (KEB2-M24).
6.2.11 Oil Level Switch Malfunction

Level Control is ON when the following buttons is pressed.

1. Press function key 【KEY1】 , turn on Oil Level Function
2. Press key under Spark status.

※Reference Schematics: KEB-C1.DSN, KEB-I2.DSN, KEB-small electrical box.DSN.

Reference Schematics

Trouble Shooting Flow Chart

Press Level Control button and check the I/O diagnosis. Does the symbol ▓(1)、□(0) of bit 02.1 change?

(Yes) → \(\) Replace IPC (KEB-C1) and check again.
(No) → \(\) Replace RIO board (KEBC7) and check again.

Is there DC24V output from KEB-C7JP8.1 and KEB-C7JP5.6?

(Yes) → Make sure the connected cable is not loose.
(No) → Replace level switch (KEB2-M25).
6.2.12 Work light is not ON

Reference Schematics: KEB-C2.DSN, KEB-LDSN, KEB-H1.DSN, KEB-D.DSN

Trouble Shooting Flow Chart

- Does the fuse KEB-H12 (F4/7A) ok? (Yes) → Replace fuse (KEB-H12).
  (No) → Replace small transformer (KEB-D3).

- Is there AC12V output from small transformer KEB-D3? (Yes) → Check the circuit loop is in good connection.
  (No) → Replace small transformer (KEB-D3).

- Is there AC12V output from KEB2-M40CN2 for quartz light? (Yes) → Replace quartz light (KEB-M7).
  (No) → Replace quartz light (KEB-M7).
6.2.13 Buzzer is not ON

Even though the buzzer LED is OFF, buzzer still ON while:

(1) Fire Alarm is ON

Reference Schematics:
EBE-C7.DSN, EBE1-E.DSN

Trouble Shooting Flow Chart

Is there DC24V output from Buzzer (KEB-E8) when buzzer is ON?

(Yes) If there is DC24V but the buzzer is not ON, it means the buzzer is damaged. Replace a new buzzer.

(No) Replace the PC board as following order:
① RIO board (KEB-C2)
② IPC (KEB-C1)
6.2.14 Fire Alarm is not function

Cover the photo sensor by hand for couple seconds. Turn the photo sensor toward light source and uncover it. The following fire alarm action should appear:

1. Fire Alarm LED is ON
2. Spark Power off
3. Buzzer is ON with a short interval break.

Turn on (KEB2-M7) and REST fire alarm signal. The machine will back to normal.

※Reference Schematic：KEB-C1.DSN, KEB-small electrical box.DSN

<table>
<thead>
<tr>
<th>Troubleshooting Flow Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace the PC board as following order. Restart the machine and check again.</td>
</tr>
<tr>
<td>1. RIO board (KEB-C7)</td>
</tr>
<tr>
<td>2. IPC (KEB-C1)</td>
</tr>
<tr>
<td>Replace Photo Sensor if the machine still not working normally after replacing the PC board.</td>
</tr>
</tbody>
</table>