

**MFT Interlock Extended Terminal Board**






**TU002-R1001**

**User manual**

**IM19H47-E**














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Symbol Definition	
	<b>WARNING:</b> Indicates information that a potentially hazardous situation which, if not avoided, could result in serious injury or death.
	<b>RISK OF ELECTRICAL SHOCK:</b> Indicates information that Potential shock hazard where HAZARDOUS LIVE voltages greater than 30V RMS, 42.4V peak, or 60V DC may be accessible.
	<b>ESD HAZARD:</b> Indicates information that Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices
	<b>ATTENTION:</b> Identifies information that requires special consideration.
	<b>TIP:</b> Identifies advice or hints for the user.

## Security& Caution Symbols

The following table lists Security& Caution symbols used on equipments.

No.	Symbol	Description
1		Direct current (DC)
2		Alternating current (AC)
3		Ground (Earth) terminal
4		Protective earth (ground) terminal
5		Reference ground (Earth) terminal
6		Frame or chassis
7		Equipotentiality
8		On (power)
9		Off (power)
10		Caution, risk of electric shock
11		Caution, hot surface
12		Caution, risk of danger
13		Electrostatic sensitive devices (ESD)

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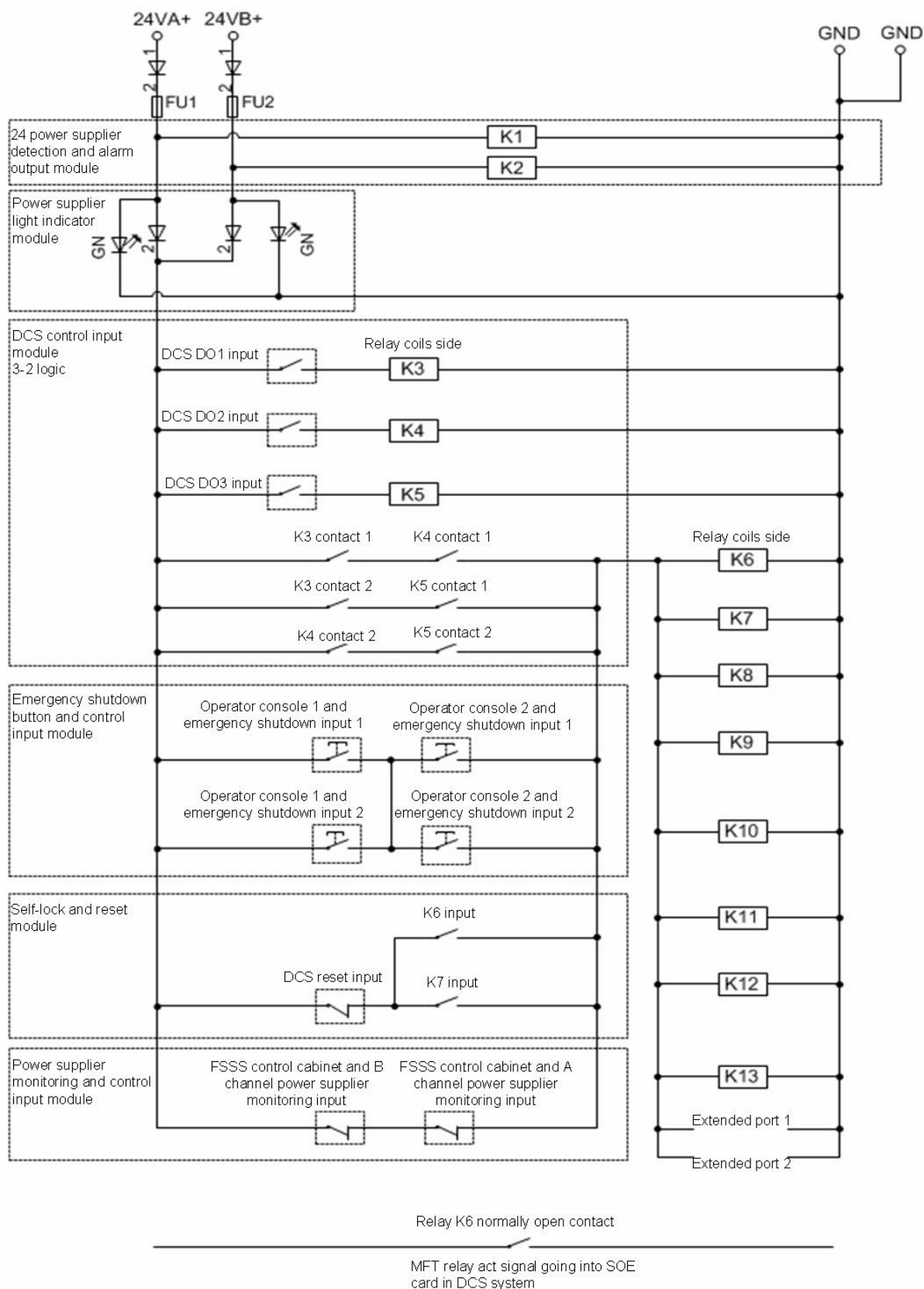
# TU002-R1001

## Section 1 Overview

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The FSSS (Furnace Safeguard Supervisory System) of boiler can realize burner control management and ensure fuel safety. MFT (Main Fuel Trip) is its core. Generally, MFT has soft logic judgment control and hard loop interlock control. When the boiler is working, if the inside pressure is extremely high, the blower or the induced draft fan is completely stopped, or the whole furnace fire extinguishes which endangers the boiler safety, the main fuel trip will work by the MFT soft logic judgment or the hard loop interlock control. When the DCS system fails, the MFT hard loop interlock control is used to realize the main fuel trip to ensure the boiler safely shuts down.

MFT interlock extended terminal board TU002-R1001 can realize the function of MFT hard loop interlock control. The input signals of TU002-R1001 include emergency shutdown signal (two emergency shutdown buttons acts simultaneously), DCS MFT DO signal (output signal after MFT soft logic judgment), FSSS cabinet power monitoring signal (monitoring signal of the power supplier of FSSS control cabinet main controller). When one of them meets the MFT condition, an output relay acts at the same time and enters a self-locking state to realize the main fuel trip. When the air purge is completed in the furnace and the MFT condition is eliminated, the self-locking state is released by resetting the MFT terminal board. The function and principle diagram of the terminal board is shown below.



**Figure 1-1 Function and Principle Diagram**

## Section 2 Technical Specifications

**Table 2-1 Technical Specifications**

Parameter		Description
Model		TU002-R1001
Power Distribution		24VDC redundant voltage
Power		Pmax<14W
Temperature	Work temperature	(-20~70) °C
	Storage temperature	(-40~85) °C
Humidity	Working humidity	10%RH~90% RH, no condensation
	Storage humidity	5% RH ~95% RH, no condensation
Active Power	Coil side	24VDC $\pm$ 10%
	Contact side	24VDC $\pm$ 10%, 250VAC $\pm$ 10%
Relay	Nominal working voltage	24VDC
	Act voltage	16.8V
	Release voltage	2.4V
	Nominal working current	16.7mA
	Endurance of contactors	More than 100,000 times
	Output capacity	5A@24VDC , 5A@250VAC
Fuse specifications		2A pluggable fuse
Module size (length*width*height)		328mm $\times$ 87mm $\times$ 68mm



**Tip:**

Different relays may have some slightly differences in terms of these parameters. Please double check before use according to the actual situation.

## Section 3 Instructions for Use

### 3.1 Terminal Board Appearance

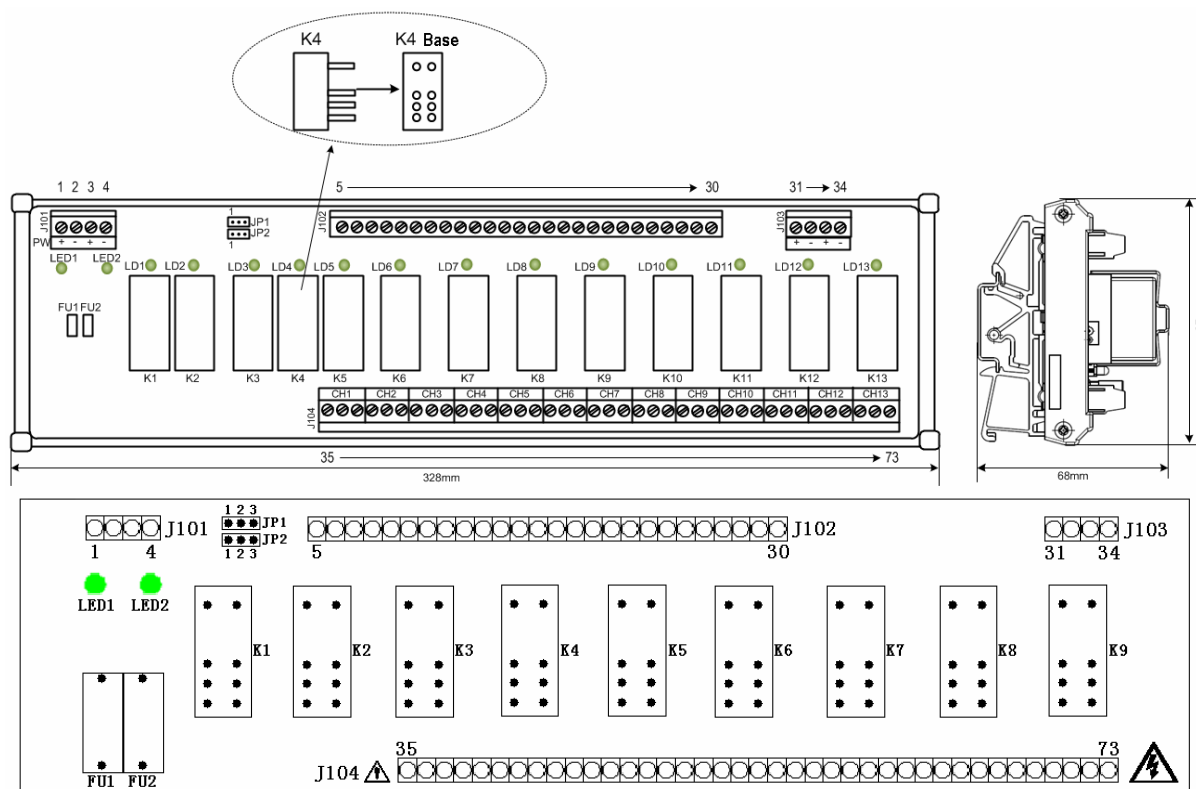


Figure 3-1 Appearance of TU002-R1001

### 3.2 Connectors

Table 3-1 Instruction for connectors on TU001-R

Identifier	Instructions
J101	Distribution power terminals (1~4)
J102	Signal input and output terminals (5~30)
J103	Extended terminals (31~34)
J104	Output terminals of relay contact signal (35~73)
FU1~FU2	Fuses on distribution power (35~73)
K1	Power VA monitoring relay
K2	Power VB monitoring relay
K3、K4、K5	3-2 logic relay
K6~K13	Relays for extending outputs



### 3.3 Instructions for Expansion Terminals

When the number of output channels of a single terminal board cannot meet the number of devices to be controlled on site, it can be extended by using two sets of expansion terminals (31, 32, 33, 34).

The original terminal board is the master terminal board which connects to the expansion terminal board and output control signals; the expansion terminal board is a slave terminal board, which can receive the control signal output by the master terminal board. J101 and J102 terminals of the master terminal board are connected with signals such as 24VDC input, interlock input, SOE and power monitoring output, and are connected to the slave terminal or expansion relay through the expansion terminals (31, 32, 33, 34); J101, J102 terminals on the slave terminal board are not wired.

When the terminal board is extended, its working mode should be set by the jumpers of JP1 and JP2. The jumper description is shown in Table 3-2.

**Table 3-2 Instructions for Jumpers**

Working modes of terminal boards	Jumpers
Master terminal board	JP1、JP2 jump 1-2 simultaneously
Slave terminal board	JP1、JP2 jump 2-3 simultaneously

### 3.4 Interface Features

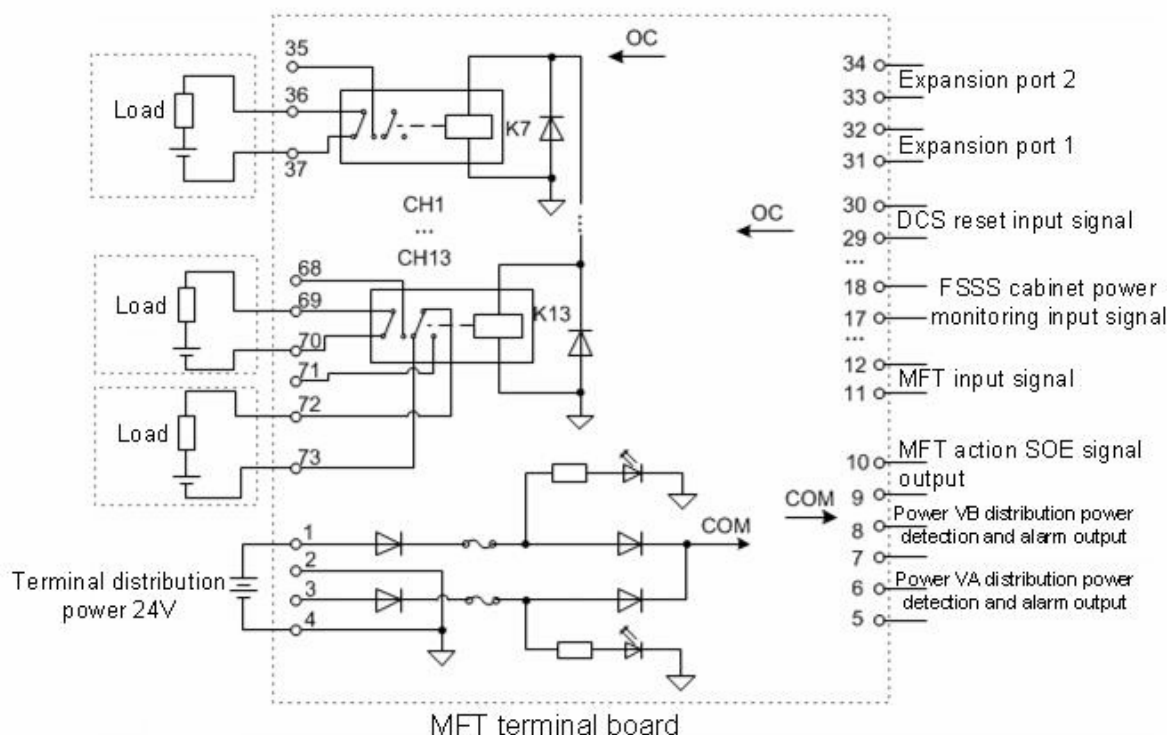


Figure 3-2 Interface Feature Diagram

### 3.5 Wiring Illustrations

This section mainly introduces the definition of each terminal on the terminal board and the wiring instructions. Each terminal can be connected to a hard wire with a cross-sectional area of 2.5 mm<sup>2</sup> or a flexible wire of 1.5 mm<sup>2</sup>.

#### 3.5.1 Instructions for Distribution Power Terminal Wiring

The power distribution of MFT terminal board needs to be independent of the FSSS control system (DCS). The 220VAC power supply of the 24VDC switch power supply of the MFT terminal and the 220VAC power supply of the FSSS system (DCS) come from different 220VAC power supplies.

Table 3-3 Instructions for distribution power wiring terminals

Terminal numbers	Definition	Description
1	Positive	24VA+
2	Negative	GND
3	Positive	24VB+
4	Negative	GND

### 3.5.2 Instructions for Signal Input and Output Terminal Wiring



**Tip:**

- The DCS MFTDO signal of small and medium-sized boilers is interlocked and extended in the hard loop, usually using 3 to 2 logic. 3 MFTDO signals are extended by three relays K3, K4 and K5 on the terminal board TU002-R1001. The wiring is as follows:
  1. 3 MFTDO signal input points are connected to terminals 11, 13, and 15.
  2. Terminals 12, 14, and 16 on the terminal board are respectively connected to the 24V positive terminal to form a loop with the MFTDO signal.
- Two emergency shutdown buttons are installed on the boiler console and connected to the terminal board according to the principle diagram. Please pay attention to the corresponding relationship between the button contacts and the terminals on the terminal board. If there is only one emergency shutdown button, the normally opened contacts of emergency shutdown button connects to 21 and 22, and 23 and 24 terminals need to be shorted.

**Table 3-4 Wiring illustration for input and output terminals**

Terminal Number	Definition	Description	Terminal number	Definition	Description
5	Normally closed passive contact	Terminal board VA distribution power detection and alarm output	19	Passive contact	FSSS cabinet power supplier monitoring input contact 2
6			20		
7	Normally closed passive contact	Terminal board VB distribution power detection and alarm output	21	Passive contact	Emergency shutdown button 1 input signal and normally opened contact 1
8			22		
9	Normally opened passive contact	MFT action SOE output contact	23	Passive contact	Emergency shutdown button 2 input signal and normally opened contact 1
10			24		
11	Passive contact	DCS control output signal 1	25	Passive contact	Emergency shutdown button 1 input signal and normally opened contact 2
12			26		
13	Passive contact	DCS control input signal 2	27	Passive contact	Emergency shutdown button 2 input signal and normally opened contact 2
14			28		
15	Passive contact	DCS control input signal 3	29	Passive contact	DCS reset input normally closed contact
16			30		
17	Passive contact	FSSS cabinet power supplier monitoring input contact 1	-	-	-
18			-	-	-

### 3.5.3 Instructions for Terminal Board Expansion Terminal Wiring

**Table 3-5 Expansion terminal wiring description**

Terminal number	Definition	Description
31	Positive	Expansion port 1
32	Negative	
33	Positive	Expansion port 2
34	Negative	

### 3.5.4 Instructions for Relay Contact Output Terminal Wiring

**Table 3-6 Illustrations for relay contact output wiring terminals**

Terminal number	Definition	Description
35	Normally opened	Output channel 1 (relay K7 contact)
36	Common terminal	
37	Normally closed	
38	Normally opened	Output channel 2 (relay K8 contact)
39	Common terminal	
40	Normally closed	
41	Normally opened	Output channel 3 (relay K8 contact)
42	Common terminal	
43	Normally closed	
44	Normally opened	Output channel 4 (relay K9 contact)
45	Common terminal	
46	Normally closed	
47	Normally opened	Output channel 5 (relay K9 contact)
48	Common terminal	
49	Normally closed	
50	Normally opened	Output channel 6 (relay K10 contact)
51	Common terminal	
52	Normally closed	
53	Normally opened	Output channel 7 (relay K10 contact)
54	Common terminal	
55	Normally closed	
56	Normally opened	Output channel 8 (relay K11 contact)
57	Common terminal	
58	Normally closed	
59	Normally opened	Output channel 9 (relay K11 contact)
60	Common terminal	
61	Normally closed	
62	Normally opened	Output channel 10 (relay K12 contact)
63	Common terminal	
64	Normally closed	
65	Normally opened	Output channel 11 (relay K12 contact)
66	Common terminal	
67	Normally closed	

Terminal number	Definition	Description
68	Normally opened	Output channel 12 (relay K13 contact)
69	Common terminal	
70	Normally closed	
71	Normally opened	Output channel 13 (relay K13 contact)
72	Common terminal	
73	Normally closed	

**Shock Danger:**

J104 output channel may connect to 220V high voltage. Please be aware of it.

**Tip:**

13 output channels are channel-to-channel isolation and controlled by the same tag.

### 3.6 Installation of Terminal Board

The TU002-R1001 terminal board can be installed in the cabinet in the horizontal direction or vertical, and fixed by DIN rails.

## Section 4 Maintenance

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### 4.1 Accessory List

The models and specifications of consumable parts are shown as follows:

*Table 4-1 Illustrations for consumable parts*

Mark	Type	Specification	Model (Standard)
FU1, FU2	Fast-melt fuse	2A/250V	-
K1~K13	Relay	-	RCL424024

### 4.2 Troubleshooting

*Table 4-2 Troubleshooting*

Serial number	Fault symptom	Fault cause	Solution
1	LED 1 off	Redundancy power supplier A channel 24V power supplier fails or fuses burn out.	Check A channel 24V power supplier or fuses.
2	LED 2 off	Redundancy power supplier B channel 24V power supplier fails or fuses burn out.	Check B channel 24V power supplier or fuses.

## Section 5 Engineering Applications

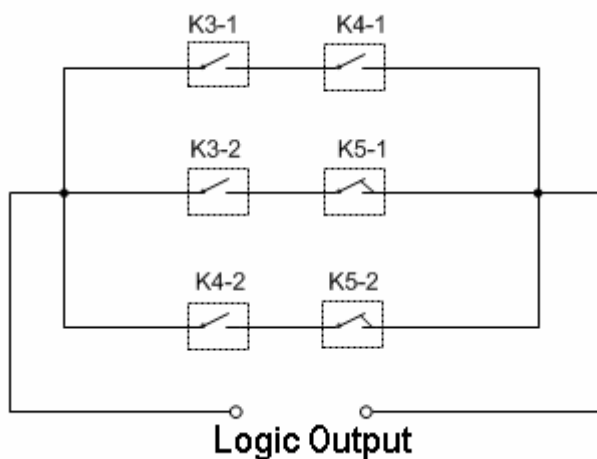
### 5.1 3 to 2 Application Guide

In actual use, if the field cannot access 3-channel DCS DO signals to implement the 3 to 2 logic, then you can use the method described in this section to implement 3 to 2 logic.

For explanation, we define the input channels of DCS DO signals are channel 1 (11, 12 terminals), channel 2 (13, 14 terminals), and channel 3 (15, 16 terminals).

#### Wiring instructions for two-channel DO signal inputs

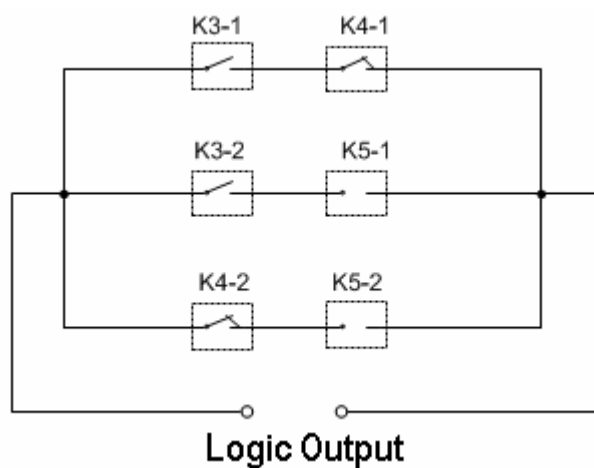
In the 3 channels, select any 2 channels to access the DCS DO signal, and leave 1 channel shorted. Channel 1 and channel 2 are recommended to be connected to the DCS DO signal and channel 3 is shorted. The logic circuit is shown below.



**Figure 5-1 Logic circuit 1**

#### Wiring instructions for one-channel DO signal input

In the 3 channels, select any 1 channel to access the DCS DO signal, leaving 1 channel open circuit and the other 1 channel shorted. It is recommended Channel 1 is connected to the DCS DO signal, channel 2 is shorted, and channel 3 is open. The logic circuit is shown below.



**Figure 5-2 Logic circuit 2**

## 5.2 Application Cases

One MFT terminal board TU002-R1001 outputs signals through 13 channels and the capacity is 220VAC/5A. If it is not enough, it should be expanded. If there is 220VDC control equipment, it should be connected to the DC relay through the expansion port of the terminal board in order to realize the use. The wiring methods are shown in Figure 5-3 and Figure 5-4.



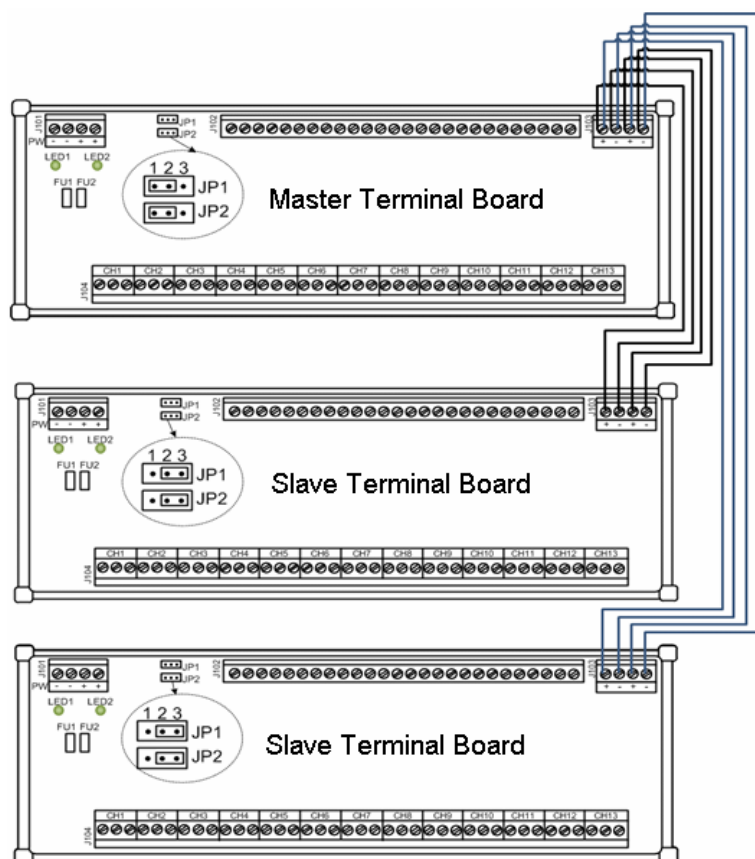


Figure 5-3 Wiring Example 1 for TU002-R1001 Application Case

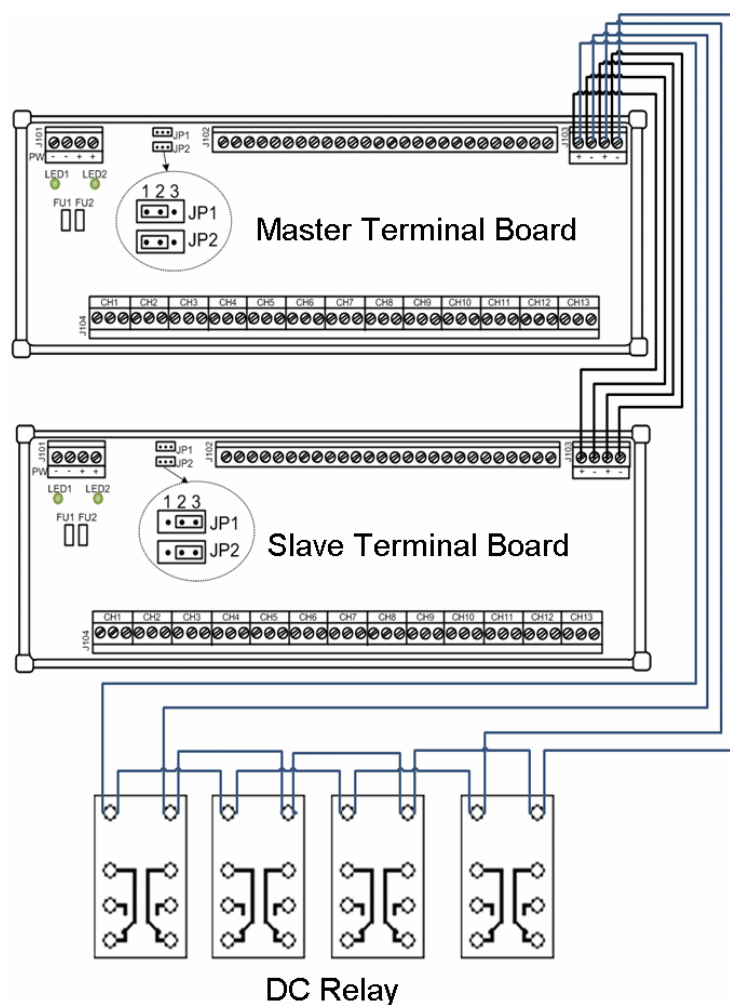


Figure 5-4 Wiring Example 2 for TU002-R1001 Application Case



**Tip:**

- When the terminal board is extended in cascade, the cascade circuit contains up to 3 terminal boards, of which up to 2 are slave terminal boards.
- J101 and J102 on the slave terminal board cannot be wired.

## 5.3 Precautions

- In order to ensure the safe operation of the boiler, the MFT hard loop must be strictly adjusted before boiler starts to run to ensure that each contact of the terminal board can work stably.
- The power supply port (terminal numbers 1, 2, 3, 4) of the slave terminal board cannot be connected to the distribution power. The slave terminal board receives signals from the master terminal board, so J102 cannot be wired either.

- The jumpers of the master slave terminal boards must conform to the principles for jumpers. For details, see the Instructions for Expansion Terminals.

## Section 6 Revision

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### *Retrofit List of the Version*

Manual Version	Applicable Model Version	Remarks
V1.0 (20191018)	TU002-R1001 V10.00.00 and later versions	