



**BRICS**  
2022 CHINA

# 2022 BRICS Skills Competition

(BRICS Future Skills Challenge)



## TECHNICAL DESCRIPTION

### Maintenance of Railway Signal Equipment

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## 1. Form of entry

Team competition (Double).

## 2. Contest content

The competition consists of three modules, which are completed in sequence. Participants shall be provided with task instructions, circuit diagrams, equipment layout diagrams and equipment operation instructions. The competition consists of the following task modules:

- 1) Maintenance of railway signal equipment
- 2) Installation and debugging of railway signal equipment
- 3) Fault Searching and Solution of Railway Signal Equipment

Changes to competition tasks and scoring criteria can only be made if the competition site cannot be completed and approved by the Lead expert.

Competitors may be disqualified if they fail to comply with occupational health safety environmental requirements or put themselves and other competitors at risk.

After completing the module, the results will be graded

## 3. Project module and time requirements

### 3.1 Project module and Time Requirements

There are three module in Maintenance of Railway Signal Equipment competition , which require contestants to complete within 4.5 hours. Please refer to Table 1 for the name and time requirements of module for specific projects.

Table 1 List of project module and time requirements

<b>Serial number</b>	<b>Name of module</b>	<b>Completion time of competition content</b>
1	Module A: Operation assessment of interlocking system	60 min
2	Module B: Maintenance of railway signal equipment	120 min
3	Module C: Fault Searching and Solution of Railway Signal Equipment	90 min

The competition schedule is shown in Table 2.

Table 2 Competition Schedule

Date	Time	Opening ceremony
C-1	19:00 - 21:00	Opening Ceremony. Introduction of competition rules, evaluation procedures, and scoring scheme.
C-2	19:00 - 19:15	Competitors report through teleconferencing, check their identities and draw lots
	19:15 - 19:30	Announce competition precautions, competition requirements, check competition environment and equipment
	19:30 - 20:30	module A: Interlocking system operation.
	20:30 - 22:30	module B: Maintenance of railway signal equipment
	22:30 - 00:00	module C: Troubleshooting of railway signal equipment
	00:40 - 01:00	Scoring + dining
C-3	19:00 - 21:00	Closing ceremony

### 3.2 Background Introduction

In order to strengthen the construction of high-skilled talents in railway industry, strengthen the foundation capacity building of vocational education and vocational training, and promote the modernization of vocational education and vocational training. In personnel training, according to the development law of BRICS market economy and the development requirements of railway industry, we should reform the internal management system, improve the level of resource utilization efficiency and work running, adjust the professional structure and optimization personnel training mode, improve their ability and level of service for society and economy, establish a sustainable development strategy, take the road of characteristic development, and increase market competitiveness and sustainable innovation ability.

The competition will integrate the talent demand and emerging technology of railway signal industry into the content of the competition, promote the teaching reform of vocational colleges and school-enterprise cooperation, guide the innovation of talent training mode of railway signal specialty, improve the quality of talent training, and promote the integration of vocational education and social actual demand.

To further improve students' professional ability and professional quality, Maintenance of Railway Signal Equipment

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students are required to complete the operation of route arrangement, turnout blockade and Boot master lock on the rail transit computer interlocking operation platform. Complete the maintenance operation and troubleshooting of signal equipment in the virtual scene assessment platform of railway signal equipment; Complete the installation, debugging and fault handling of railway signal equipment on the comprehensive training platform of railway signal equipment.

Please finish the work in module A, B, C within the specified time, with a total time of 4.5h.

### 3.3 Platform for maintenance skills of railway signal equipment

#### 1. Composition of the examination platform for maintenance skills of railway signal equipment

- 1) Examination and management platform of railway signal equipment
- 2) Computer interlocking operation platform for rail transit
- 3) Virtual Scene Examination Platform for Railway Signal Equipment

#### 2. Operation flow of Examination and management platform of railway signal equipment

Administrators log in → create groups → create student accounts (including student names, account numbers, password, schools, countries, groups,) → edit test papers (including interlocking operation test questions, fault types, management items) → Check the online status of students → Check the completion of the test paper → end of test → scores in statistics and inquiry.

#### 3. Operation flow of Computer interlocking operation platform for rail transit

Account login → Receive papers → complete test paper → submit test paper.

#### 4. Operation flow of Virtual Scene Examination Platform for Railway Signal Equipment

Account login → Receive papers → Complete troubleshooting and Maintenance work → Submit papers.

### 3.4 Task content

#### Module A :Computer interlocking operation platform for rail transit

Competitors should complete the computer-based interlocking operation in Computer interlocking operation platform for rail transit (Figure 1 ) according to the requirements of the examination questions. The tasks include the following:

Route permutation, Route release, Modified operation, Boot master lock, Botton close up, Turnout operation, Shunt bad setting...

Mission statement: This module is completed on the Computer interlocking operation platform for rail transit provided by the organizing Committee.

Figure 1 Computer interlocking operation platform for rail transit

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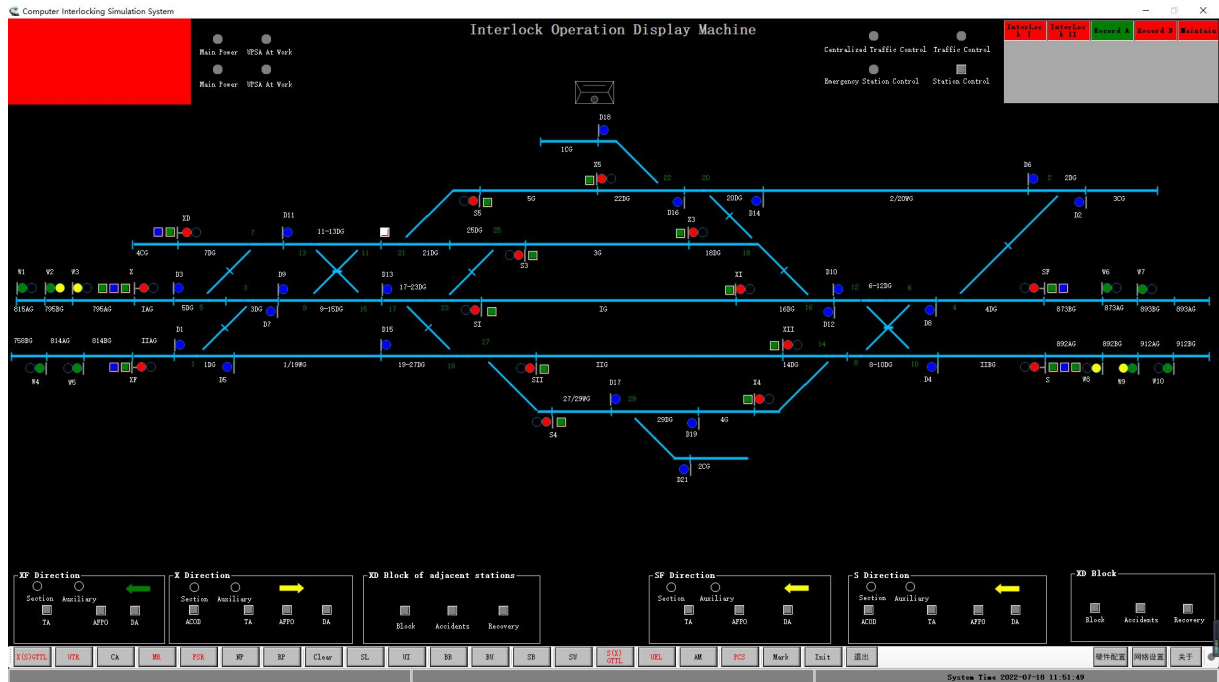


Table 3 Examination questions

Operation assessment of interlocking system		
Serial number	Type of topic	Sample question
1	Establishment of normal operation departure route	departure route of arranging XI-SF
2	Establish a departure route in reverse direction	departure route of arranging SI-S
3	Establish a receiving route in reverse direction	receiving route of arranging SF-XI
4	shunting route	shunting route of arranging SI-D9
5	Reopening of signal	Reopening XI-SF signal
6	Total human solution	Cancel XI-SF route when IG is occupied
7	cancel a route	Cancel the departure route of XI-SF
8	District solution	Use the zone to solve and release the guidance route of XF-SII
9	Boot master lock	locking X Throat All turnout
10	Release the boot master lock	calling-on signal of releasing S boot master lock
11	Guide the route	Open XF calling-on signal with boot master lock
12	turnout reverse position operation	Move 23 turnout to reverse position
13	bottom release	SII signal bottom close up, Rank SII-X route

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14	Modified operation	Change the pick-up alignment of track of "S" from pick-up to departure
15	Poor shunt	Setting IIG shunt Bad

**Module B Maintenance of railway signal equipment**

Competitors should complete maintenance of railway signal equipment operation on the Virtual Scene Examination Platform for Railway Signal Equipment according to the task requirements: maintenance of ZPW-2000A track circuit, maintenance of ZDJ9 switch machine, maintenance of home signal, maintenance of TYJL-III interlocking, maintenance of Dinghan power supply panel

**Specific requirements:**

- 1) Check the job sheet;
- 2) Where selecting needs maintenance;
- 3) record the state of equipment;
- 4) maintenance the faulty equipment
- 5) record the state of maintenance
- 6) Uploaded by operation record.

Mission statement: This module is completed on the Virtual Scene Examination Platform for Railway Signal Equipment provided by the organizing Committee.

**1. Maintenance of ZPW-2000A track circuit**

In the Virtual Scene Examination Platform for Railway Signal Equipment for equipment appearance inspection, electrical characteristics test, Replacement of faulty equipment. Complete maintenance operation and label according to the job sheet (Figure 2)

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Description: 1. If the item is maintenance operation, please judge the condition of each component. If the equipment is normal, mark "✓" in the "Result Judgment" column; if it is abnormal, mark "x"; 2. To mark "x" project for maintenance, record maintenance situation in the "maintenance"; 3. If the item is a measurement item, please fill in the measurement value in the "Result Judgment" column.			
operation item	operation sub-item	Result and Judgeme	Maintenance Status
Track equipment maintenance work order	4DG frequency shift equipment appearance inspection.	The main transmitter has good appearance and normal indicator light <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> The standby transmitter has good appearance and normal indicator light <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> The receiver has good appearance and normal indicator light <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> The attenuator has good appearance and normal indicator light <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	maintenance <input checked="" type="checkbox"/> Not maintenance <input checked="" type="checkbox"/>
	4DG Track circuit parameter measurement	The standby Frequency shift information receiving equipment power supply voltage: <input type="text" value="Enter"/> Output Voltage: <input type="text" value="Enter"/> Carrier frequency value: <input type="text" value="Enter"/> Low frequency value: <input type="text" value="Enter"/> Track input voltage: <input type="text" value="Enter"/> Main track output voltage: <input type="text" value="Enter"/>	/
	Measurement of cable simulative network parameters at 4DG transmitter.	Device side voltage: <input type="text" value="Enter"/> Lightning protection side voltage: <input type="text" value="Enter"/> Cable-side voltage: <input type="text" value="Enter"/>	maintenance <input type="checkbox"/> Not maintenance <input type="checkbox"/>
	873BG design parameters: The transmitter level is level 6, Carrier frequency is 2300-2.	Is the transmitter level wiring correct <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Carrier frequency wiring is correct <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	maintenance <input checked="" type="checkbox"/> Not maintenance <input checked="" type="checkbox"/>
	/	/	/
	/	/	/

date:       Inspection personnel:

Figure 2 Job Sheet

### Specific requirements:

- 1) Open the Job Sheet, maintenance the corresponding equipment;
- 2) record the state of equipment;
- 3) maintenance the failure equipment;
- 4) record the state of maintenance.

### Module C Fault Searching and Solution of Railway Signal Equipment

Competitors should complete Fault Searching of railway signal equipment operation on the Virtual Scene Examination Platform for Railway Signal Equipment according to the task requirements: Troubleshooting the fault of ZPW-2000A track circuit, Troubleshooting the fault of switch control circuit, Troubleshooting the fault of signal control circuit,.

#### Investigate flow

- 1) Check the fault phenomenon in interlocking;
- 2) Check the relevant equipment status;
- 3) Check circuit diagram;
- 4) Electrical measurement by selecting instrument;
- 5) Analysis electrical characteristics;
- 6) Troubleshooting points of failure
- 7) Uploading Operation Records

#### 1. signal red light trouble shooting



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According to rail transportation, operation, computer-based interlocking, system, alarm, information, fault, railway signal, equipment, system, railway signal, equipment, system, fault, fault, fault, fault, fault, fault, fault, fault, fault, fault, fault, fault, fault fault phenomenon can be viewed according to interlocking interface in Figure 5, and signal can be checked according to circuit diagram, electric fault.

Figure 3 interlocking interface

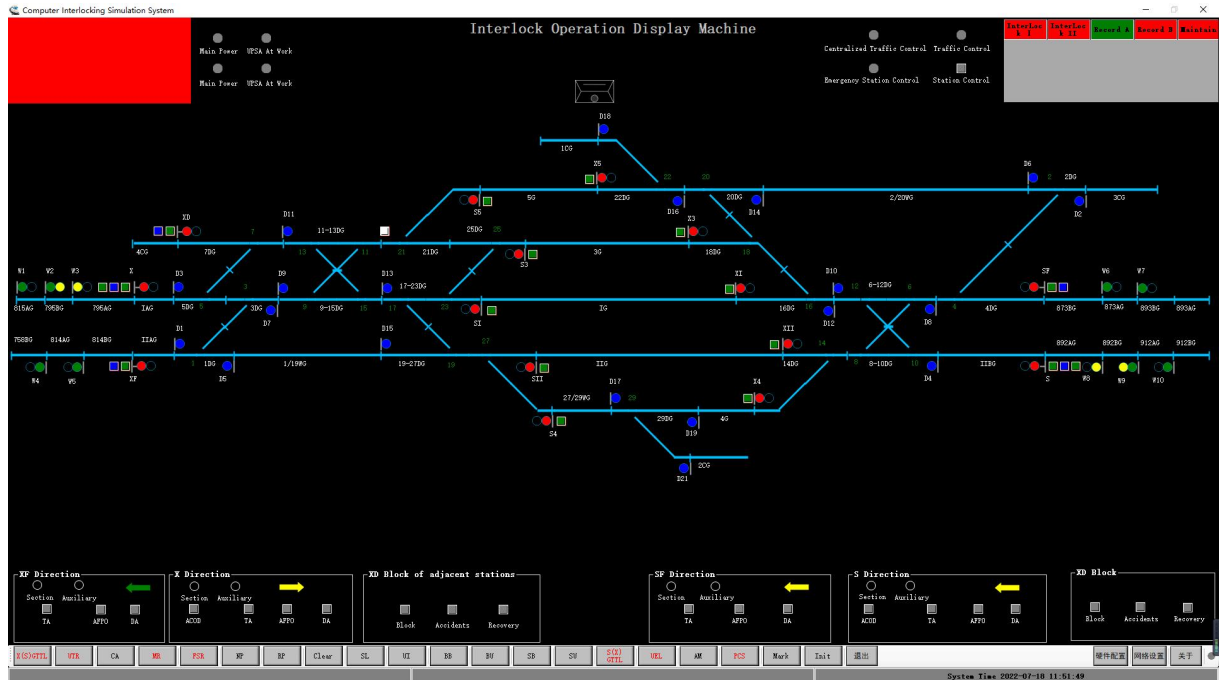
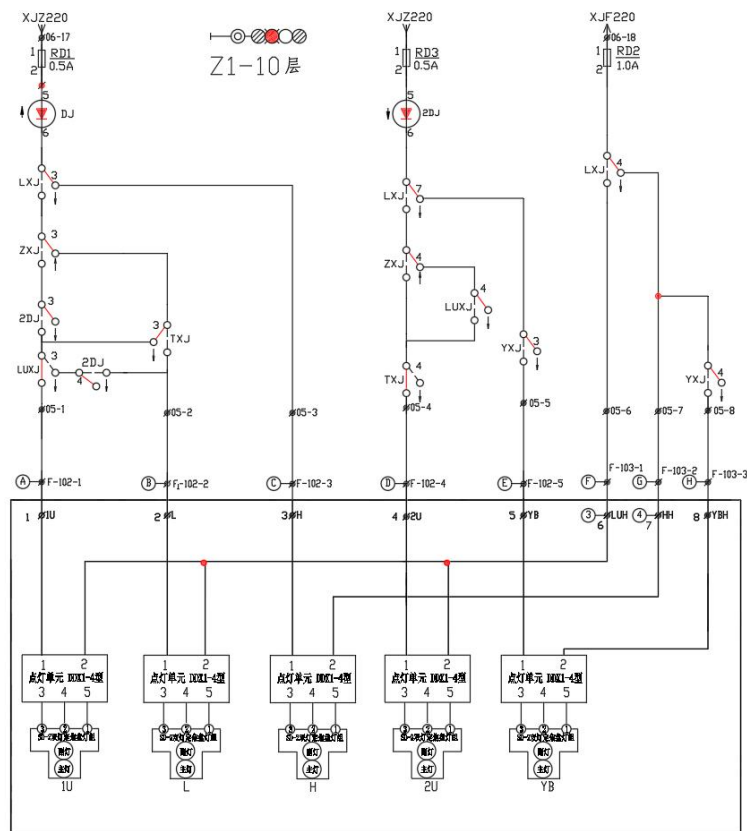


Figure 4 circuit, signal



**Specific requirements:**

- 1) Carry out electrical test according to circuit diagram;
- 2) analysis of data to judge the type of fault;
- 3) label the judgment results (each fault phenomenon can only be label once);

**2. Verify the results**

The fault point is judged correctly,Electrical parameters return to normal,Interlocking system alarm disappears.

**4. Score standard**

Table 5 Scoring standard

module	Detailed rules	Score
A	Interlocking system operation	25.00
B	Maintenance of railway signal equipment	30.00

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C	Troubleshooting of railway signal equipment	40.00
D	Professional quality	5.00
<b>Total</b>		100.00