

LNJBC-II

Single Phase Relay Protection Tester

User Manual

Wuhan Lvnengde Precision Testing Technology Co., Ltd

Dear Client,

Thank you for purchasing our Single Phase Relay Protection Tester. Please read the manual in detail prior to first use, which will help you use the equipment skillfully.



Our aim is to improve and perfect the company's products continually, so there may be slight differences between your purchase equipment and its instruction manual. You can find the changes in the appendix. Sorry for the inconvenience. If you have further questions, welcome to contact with our service department.



The input/output terminals and the test column may bring voltage, when you plug/draw the test wire or power outlet, they will cause electric spark.

PLEASE CAUTION RISK OF ELECTRICAL SHOCK!

◆ **SERIOUS COMMITMENT**

All products of our company carry one year limited warranty from the date of shipment. If any such product proves defective during this warranty period we will maintain it for free. Meanwhile we implement lifetime service. Except otherwise agreed by contract.

◆ **SAFETY REQUIREMENTS**

Please read the following safety precautions carefully to avoid body injury and prevent the product or other relevant subassembly to damage. In order to avoid possible danger, this product can only be used within the prescribed scope.

Only qualified technician can carry out maintenance or repair work.

--To avoid fire and personal injury:

Use Proper Power Cord

Only use the power wire supplied by the product or meet the specification of this produce.

Connect and Disconnect Correctly

When the test wire is connected to the live terminal, please do not connect or disconnect the test wire.

Grounding

The product is grounded through the power wire; besides, the ground pole of the shell must be grounded. To prevent electric shock, the grounding conductor must be connected to the ground.

Make sure the product has been grounded correctly before connecting with the input/output port.

Pay Attention to the Ratings of All Terminals

To prevent the fire hazard or electric shock, please be care of all ratings and labels/marks of this product. Before connecting, please read the instruction manual to acquire information about the ratings.

Do Not Operate without Covers

Do not operate this product when covers or panels removed.

Use Proper Fuse

Only use the fuse with type and rating specified for the product.

Avoid Touching Bare Circuit and Charged Metal

Do not touch the bare connection points and parts of energized equipment.

Do Not Operate with Suspicious Failures

If you encounter operating failure, do not continue. Please contact with our maintenance staff.

Do Not Operate in Wet/Damp Conditions.

Do Not Operate in Explosive Atmospheres.

Ensure Product Surfaces Clean and Dry.

—Security Terms

Warning: indicates that death or severe personal injury may result if proper precautions are not taken

Caution: indicates that property damage may result if proper precautions are not taken.

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I. Introduction

The LNJBC-II Relay Protection Tester is a new generation of verification device developed based on the original JBC. The instrument's internal AC/DC voltage and current sources adopt the latest power technology, providing convenience for field personnel to apply the power instrument technology to other tests. While simplifying operation, this instrument also enhances functionality, allowing for the verification of various common relays. Its panel layout is compact and user-friendly, making it easy to operate and understand, thus earning widespread praise from users.

II. Technical parameter

II.1 Output characteristic

AC current:

0~100A adjustable (200A customized)

0~20A Adjustable

0~5A Adjustable

AC voltage: 0~250V (adjustable)

DC current: 0~20A (adjustable)

DC voltage: 0~250V (adjustable)

Fixed output DC voltage 24V 48V 110V 220V

Time setting: 0-9999.999s

Resolution: 0.1ms

II.2 Power supply AC220V ± 5%, 50Hz ± 5%

II.3 Function

This instrument can calibrate the following types of relays or group protections:

- (1) Measuring relays: including current and voltage type relays, which can measure their starting value, return value, and coefficient.
- (2) Time relay: It can measure its starting value, return value, and action time, with a time measurement error of no more than 0.2ms.

- (3) Intermediate relay: Calibration of various intermediate relays with starting and holding coils, capable of measuring starting value, return value, holding value, and action time.
- (4) Recloser relay: capable of conducting capacitor charging tests, charging time, reclosing time, and testing of intermediate components.
- (5) Differential relay: capable of conducting DC excitation test, braking characteristic test, and volt ampere characteristic test.
- (6) Various other uncommon relays.

III. Structure

III.1 Interface

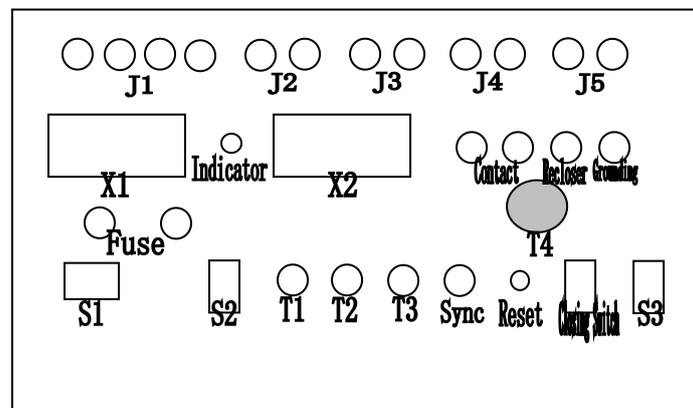


Figure 1

III.2 Function

- (1) J1, J2, J3, J4, J5: They are respectively the AC and DC power supply and fixed value output terminals, as shown on the panel.
- (2) X1: Voltage and current display (action value, return value, rated value), X2 time display (millisecond meter).
- (3) S1: Power socket (with fuse); S2: Power switch; S3: Fixed output switch.
- (4) T1: Power output selection knob; T2: Fixed value output selection knob; T3: Contact state selection knob (where indicates that the action value and return value

can be determined by a light, I represents normally open contact with delayed closing, II represents normally open contact with delayed opening after power-off, III represents normally closed contact with delayed opening after power-off, IV represents normally closed contact with delayed closing after power-off); T4: Power output size adjustment knob.

(5) Contact: The wiring terminal of the verified relay contact.

Attention: When measuring the action time of relay contacts, there should be no external power supply to the relay contacts, and the contacts of this instrument should not be short circuited with J1, J2, J3, J4, J5.

(6) Closing: The terminal that sends the closing signal of the reclosing relay.

(7) Action indication: The indication of the contact action (if connected to a normally open contact, the indicator light will turn from off to on after the action; if connected to a normally closed contact, the indicator light will turn from on to off after the action to indicate the contact action).

(8) Synchronization: Conduct a rated impulse test on the relay based on the on/off state of the voltage or current output from the power supply.

(9) Reset: Clear the millisecond table to zero.

IV. Operation of Output Power Supply

IV.1 AC Voltage (0-250V) Output

Set T1 to UAC (0-250V), switch the synchronizing switch to ON, adjust knob T4, and terminal J2 will output an AC voltage of 0-250V. The current voltage value will be displayed on X1.

IV.2 AC Current Output

(20A for high load impedance, 100A for low load impedance, 5A for small current)

Set T1 to IAC (20A, 100A, or 5A), switch the synchronizing switch to ON, adjust knob T4, and terminal J1 will output an AC current of 0-100A, 0-20A, or 0-5A, depending on the setting. The current value will be displayed on X1 (load connection required).

IV.3 DC Voltage (0-250V) Output

Set T1 to UDC (0-250V), switch the synchronizing switch to ON, adjust knob T4, and terminal J3 will output a DC voltage of 0-250V. The current voltage value will be displayed on X1.

IV.4 DC Current (0-20A) Output

Set T1 to IDC (0-20A), switch the synchronizing switch to ON, adjust knob T4, and terminal J4 will output a DC current of 0-20A. The current value will be displayed on X1 (load connection required).

IV.5 Fixed Voltage Output (affected by the power supply voltage)

- (1) Set T2 to 24V and S3 to the ON position, terminal J5 will output a fixed DC voltage of 24V.
- (2) Set T2 to 48V and S3 to the ON position, terminal J5 will output a fixed DC voltage of 48V.
- (3) Set T2 to 110V and S3 to the ON position, terminal J5 will output a fixed DC voltage of 110V.
- (4) Set T2 to 220V and S3 to the ON position, terminal J5 will output a fixed DC voltage of 220V.

V. Instructions

(This instrument can be used in conjunction with the book "Protection Relay Testing" compiled by the Power Production Department of the Ministry of Water Resources and Electric Power, published by the Water Resources and Electric Power Press).

V.1 Measurement:

This instrument can be used as a standalone voltage or current source. However, attention must be paid to each output power to avoid damaging the instrument (it cannot be used to start motors). The specific operation should follow Section 4.

V.2 Measurement of the Relay's Operating Value, Return Value, and Return Coefficient:

Output power according to Section 4, set T3 to the appropriate state, switch the synchronizing switch to ON, and slowly adjust knob T4 until the relay operates (this can be determined by the indicator light). X1 will display its operating value, which should be recorded. Continue adjusting T4 to the rated value of the relay, then slowly adjust T4 until the relay returns. X1 will display its return value, which should be recorded. The return coefficient can be calculated by dividing the return value by the operating value and multiplying by 100%.

V.2.1 Measurement of the Relay's Operating Value, Return Value, and Return Coefficient:

Output power according to Section 4, set T3 to the appropriate state, switch the

synchronizing switch to ON, and slowly adjust knob T4 until the relay operates (this can be determined by the indicator light). X1 will display its operating value, which should be recorded. Continue adjusting T4 to the rated value of the relay, then slowly adjust T4 until the relay returns. X1 will display its return value, which should be recorded. The return coefficient can be calculated by dividing the return value by the operating value and multiplying by 100%.

V.2.2 Measurement of the Relay's Timing:

Output power according to Section 4, set T3 to the appropriate state, switch the synchronizing switch to ON, and slowly adjust knob T4 until the relay operates and is adjusted to the rated value. Set T3 to the relay's contact state and, by switching the synchronizing switch, the relay's time can be measured (displayed on X2). Before measuring time, make sure to zero the millisecond timer and ensure the closing switch is in the open state. The relationship between the synchronizing switch and contact state is as follows:

State I and III: Synchronizing switch turns from OFF to ON.

State II and IV: Synchronizing switch turns from ON to OFF.

The contact wiring is as follows:

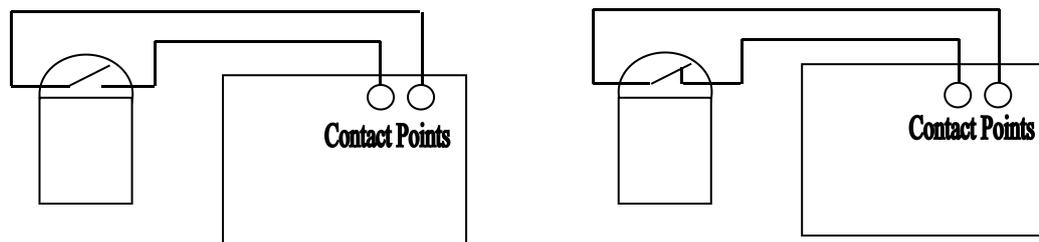


Figure 2

V.3 The measurement method for time relays is the same as the method described above.

V.4 Reclosing Relay (Using DH-3 Type as an Example)

A. DH-3 Type Operation:

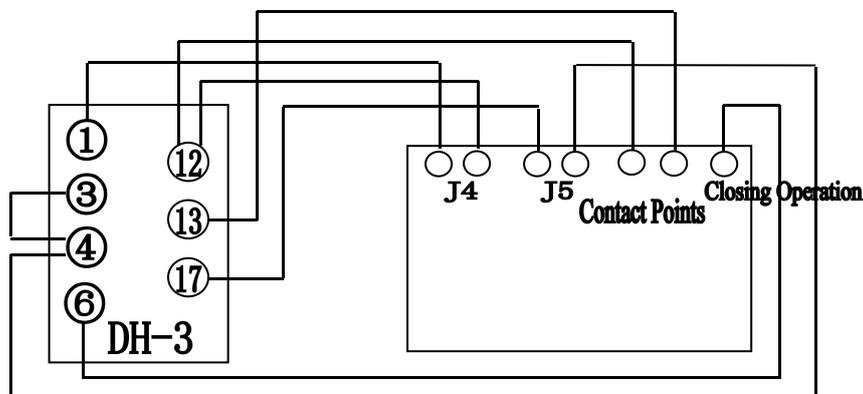


Figure 3

Wire according to the diagram above, connect (3) and (4) to the black terminal of J5 (negative terminal), and (17) to the red terminal of J5 (positive terminal).

Note: *If using the ZJ3 contact to stop the millisecond timer, make sure to disconnect the ZJ3 connection from pin (12) and separate the ZJ3 contacts (see "Protection Relay Testing" page 352). Turn T1 to the IDC 0-20A range, switch on S2, adjust T4 to the relay's rated current, switch off S2, turn the T2 knob to the relay's rated voltage. Set T3 to I (the ZJ3 contact state of the relay). Then switch on S2 and S3 simultaneously, charge for 15-25 seconds, and the charging time can be read from the millisecond timer. Press the reset button on the millisecond timer and then the "close" button to measure the reclosing time. When the reclosing relay operates, X2 will display the reclosing time.*

B. Other reclosing relays can be tested using the same method described above and will not be repeated here.

V.5 Intermediate Relays as Shown:

Intermediate Relays as Shown:

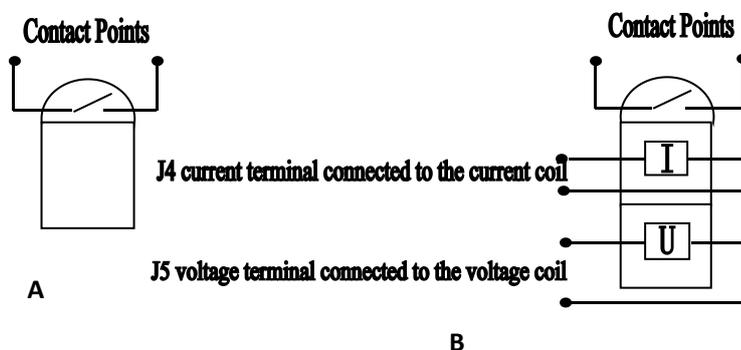


Figure 4

A: The operation for measuring the operating value, return value, operating time, and return time is the same as for over-range and under-range relays.

B: For the current holding relay, first adjust T2 to the relay's rated voltage. Switch on S2 and S3 to apply the rated voltage to the relay's voltage coil. After the relay operates, adjust T4 so that the current at J2 reaches the rated value, then disconnect the voltage (switch off S3). Adjust the protection coil current (T4) to find the minimum current that the relay can hold, which is the relay's minimum holding value. The operating time and return time should be measured as described above (refer to Section 5, item 3 of this manual for details).

V.6 Differential Relay (Example: BCH-1 Type Differential Relay)

According to the regulations (refer to "Protection Relay Testing" page 178), tests 4, 9, and 10 can be performed without external equipment. Test 6 can be performed with an external voltage regulator and current booster. Other tests are not within the scope of this instrument.

A. Inspection of Operating Voltage, Operating Current, and Return Current of the Actuating Element

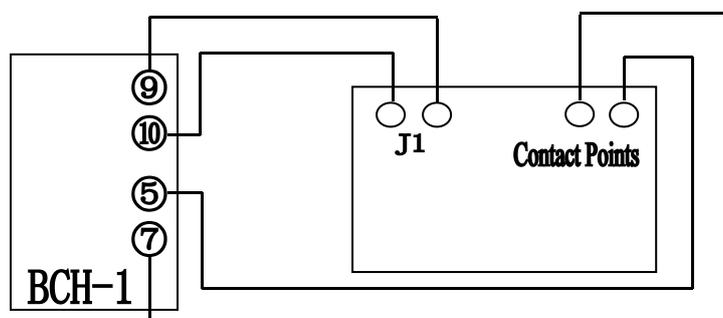


Figure 5

Open the link between terminals (10) and (11). Measure the operating current and return current as you would for a current relay. Then increase the IAC current to the previously measured operating current value and record the voltage at this point. Use a multimeter to measure the voltage across J2.

B. Initial Ampere-Turns Test Without Restraint

This is not a regular periodic inspection item. Engage all 20 turns of the WC working winding. Connect the shorting link at (10) and (11). Inject AC current through (3) and (8), and connect the contact action signal from (5) to (7). Inspect as you would for a current relay.

C. Restraint Characteristic Test

Periodic inspections only measure the operating ampere-turns values at 0° and a restraint ampere-turns of 280 ampere-turns.

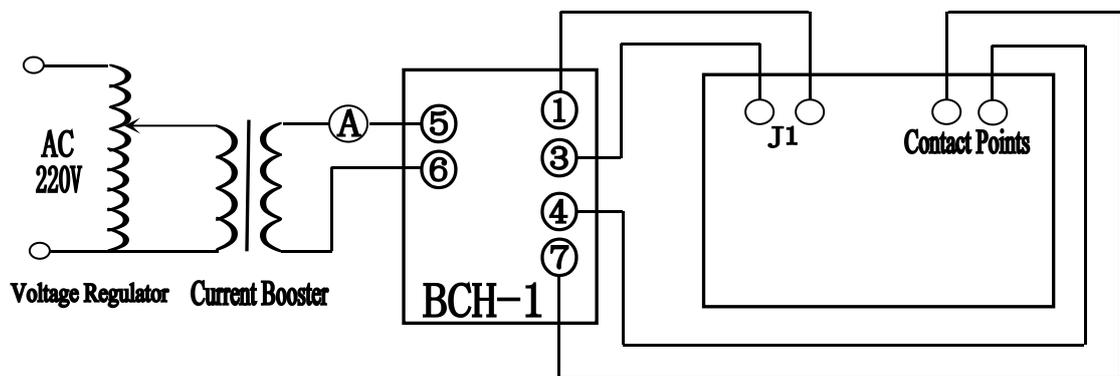


Figure 6

Wire according to the diagram above, disconnect the link between terminals (4) and (6), use 39 turns for the operating circuit, and 14 turns for the restraint circuit. When using the same 220V power source for both the voltage regulator (with a capacity greater than 5KVA) and this instrument, increase the current to the required ampere-turns. Measure the operating current as you would for an AC relay. If the operating ampere-turns are completely incorrect, the phase angle between the restraint current and operating current might be 180 degrees. Reverse the restraint current. If using one phase of a three-phase power supply for this instrument and another phase for the voltage regulator, changing the phase and reversing the current booster connections can achieve a 60° phase angle. Using an external phase shifter can also achieve phase angles of 0°, 30°, 60°, and 90°.

D. Full Set Volt-Ampere Characteristic Test

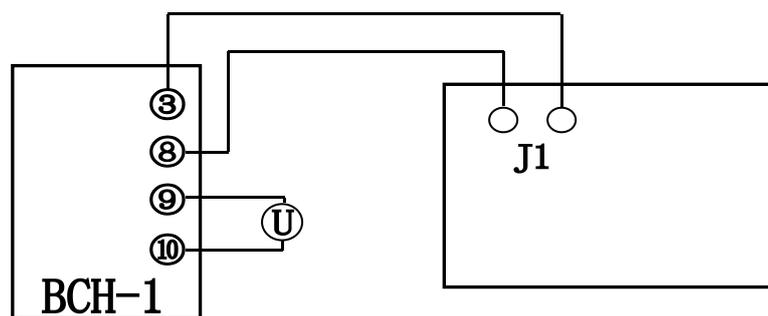


Figure 7

For AC current in the working winding (3)(8), read the voltage of the actuating element with a multimeter connected to (9)(10). Set T1 to the IAC range and increase the current to the required ampere-turns. Read the voltage at the actuating element terminals at 1x, 2x, and 5x ampere-turns. For details, refer to "Protection Relay Testing".

E. Operating Ampere-Turns Test at Set Position

The method is the same as for AC current relays. For details, refer to Section 5, item 2 of this manual.

VI. Matters needing attention

- (1) For safety reasons, Please do not turn on the power when connecting this instrument to the relay. Wait until the wiring is correct before turning it on.
- (2) When measuring the contact action time, the millisecond meter should be reset to zero after adding the rated value.
- (3) When the instrument is not working properly, please check the power socket fuse and each fuse seat on the panel. If it is damaged, replace it with the same model and it will be normal. Do not repair the instrument by yourself for other non fuse issues, please contact customer service in time.
- (4) Each output power supply should not be short circuited, and the contact terminals should not be short circuited with the output power supply to avoid damaging the components.
- (5) When removing the wiring, please turn off the power of this instrument. It should be noted that when performing DC relay calibration, the instrument should be turned off after the discharge is completed (X1 displays) before dismantling.
- (6) Carefully read the user manual before using this instrument.

VII. Packing list

Host	1 SET
Charger	1 PCS
Test Line	1 SET
Fuse	1 PCS
User Manual	1 PCS
Certificate	1 PCS