GDHB Micro-computer Protection Simulation Training System

General Information

GDHB Micro-computer Protection Simulation Training System is a novel experimental device designed and developed by integrating the teaching contents of many professional courses such as relay protection, electrical equipment, automatic device, factory power supply, microcomputer protection of power system in colleges and universities, combining with the actual production application and development. It can carry out experiments on the teaching contents such as relay protection, electrical secondary control circuit and automatic devices commonly used in power plants, substation and factories, and can train students' professional skills in the form of real and intuitive experimental teaching. It has advantages of high usage of components,

systematic experimental teaching, less occupied experimental space, and cost-effective.

The device adopts integrated distribution structure, which can be combined according to the experimental content, and is easy to install and use. The experimental instrument has high precision, digital, intelligent and man-machine dialogue and these functions can be selected as per user demand. The device provides reliable protection for the power supply, instruments and meters involved in the control screen and the measuring parts, and sets up a reliable personal safety protection system to avoid the damage to the experimental system and personal injury caused by students' wrong operation in the experiment.

Standard compliance

- GB/T1208-2006: Current Transformers
- GB/T7064-2008: Specific Requirements for Cylindrical Rotor Synchronous Machines
- GB/T14285-2006: Technical Code For Relaying Protection and Security Automatic Equipment
- DL/T559-2007: Setting Guide for 220kV~750kV Power System Protection Equipment
- DL/T671--2010: General Specifications for Generator-transformer Unit Protection Equipment

Features

- Comprehensive and strong integration of the test items in electric power automation and relay protection in various domestic colleges and universities.

- It has strong adaptability and can meet the experimental teaching requirements of courses related to electric power automation and relay protection in various colleges and universities. The depth and breadth of the experiment can be flexibly adjusted according to the actual needs.
- The device adopts integrated distribution structure, which is convenient to replace. If expand functions or new experiments is required, it only needs to add different protection devices.
- Strong integration. The device is fully quipped with instrument, special power supply, relay, micro-computer comprehensive protection device and connection lines for experimental purpose.
- Each part of the experiment adopts integrated structure, simple structure, powerful function, clear in drawing, convenient in operation and maintenance.
- Scientific configuration. The equipment covers less space, reduces infrastructure investment; The relays and related equipment are field equipment applied in the power system automation and relay protection device, which is specially designed and more authentic. The device is neat and beautiful, which can improve the experimental environment. Experimental content is rich and design is reasonable, not only theoretical knowledge is strengthened, but also a solid foundation is laid for the students to be engaged in power plants, substation, industrial and mining enterprises power supply and distribution work, relay protection system design, installation, debugging and maintenance. The measuring instrument adopts the combination of digital, intelligent and man-machine dialogue, which can meet the needs of experimental teaching and realize the modernization of measuring means. A timer alarm recorder (service manager) is provided to provide a unified standard for the assessment of students' experimental skills.

- High security. Control panel power supply isolation (floating ground design), and equipped with internal and external voltage leakage protection device, to ensure the safety of the operator; Each power output has the function of monitoring and short circuit protection, easy to use; Each measuring instrument has protection function. The whole set of equipment has been carefully designed, together with reliable component and reliable process, the product performance is excellent. All of these functions create conditions for open experiments, which are conducive to improving students' ability to analyze and solve problems.

- Strong openness, convenient for teachers and students to develop new programs.

- Flexible combination of standard 12 phase voltage and current output, 6 phase current and 6 phase voltage output. It can be arbitrarily combined to achieve 4 phase voltage + 3 phase current, 6 phase voltage type, 6 phase current type, and 12 phase output mode. It can be compatible with traditional test method as well as three-phase differential experiment, auxiliary power fast switching and standby power supply automatic switching test.

- Easy to operate single machine, built-in high-performance IPC, 8.4-inch large screen TFT LCD display, device panel is equipped with trackball, optimized operation keyboard, built-in operating software based on WINDOWS platform. Easy to operate.

- Dual operation mode including single machine operation and operation via external-connected desktop or laptop computer. Two operation modes are identical in functions.

- The output end of the new high-fidelity linear amplifier adopts high-fidelity and high-reliability modular linear amplifier, instead of switching amplifier, with excellent performance. It will not interfere with the middle and high

frequency on the test site, and the waveform from large current to small current is guaranteed to be smooth, with good precision.

- The core part of the high-performance host adopts DSP control, with fast computation speed, strong real-time digital signal processing capacity, wide transmission frequency band, and control of high-resolution D/A conversion. High precision output waveform, small distortion, good linearity .

- Powerful function to complete the test of differential, auxiliary power fast switching and standby power supply automatic switching, synchronization, harmonic, fault playback, system oscillation and other functions. It can complete a variety of high degree of automation of large complex calibration work, can easily test and scan a variety of protection setting value, fault playback, real-time storage of test data, vector display, online printing reports. The 6 phase current can be used for the 3 phase differential protection test conveniently, and the 12 phase output can be used for standby power supply automatic switching test.

- Standby power supply automatic switching test and fast switching function. 10 channel binary inputs and 8 pairs binary outputs, it can be used for various automatic switch-over devices and quick switching devices. Intuitive testing interface displays various main wiring diagrams directly. Contact status, current and voltage amplitude of every switch facilitate tests, records and display of the action process of the whole automatic switch-over device.

- Rich in contact. 10 channel contact input and 8 pairs of idle contact output. Input contacts are idle contacts and compatible with 0~250V potential contacts, which can be automatically recognized intelligently. I/o contacts can be extended according to user needs.

- Independent DC power supply is provided with one channel high-power 110V and 220V special DC power output.

- Rich in port. Device panel has its own keyboard and mouse, a single machine can complete operation. It also has a USB slave port and two USB master ports, can communicate with the computer, can connect to the printer, keyboard, mouse and other peripherals, also can read data via USB disk. The device also has a GPS interface for simultaneous testing.

- With GPS control function. Time synchronization at both sides can be tested synchronously, and optical fiber longitudinal differential protection test can be carried out.

- Perfect self-protection function, reasonable heat dissipation structure design, reliable and complete hardware protection measures, with soft start function of power supply, fault self-diagnosis by software and output lockout function.

- Lightweight integrated structure and cost-effective, cross-disciplinary joint design, integrating advanced scientific and technological achievements of various disciplinary.

- In addition to the various relays (such as current, voltage, inverse time, power direction, impedance, differential, low frequency, synchronization, frequency, DC, intermediate, time, etc.) and microcomputer protection verification, and can simulate the single-phase to three-phase transient, permanent, switching fault for the whole group of tests. It can also complete a variety of high automation of large complex calibration work, can easily test and scan a variety of protection setting value, fault playback, real-time storage of test data, vector display, online printing reports. The 6 phase current can be used for the 3 phase differential protection test, and the 12 phase output can be used for standby power supply automatic switching test.

Specification
- **System power supply**

AC current output	6 channel, every channel: 30A/420VA; 3 channel, every channel: 60A/450VA
AC voltage output	6 channel, every channel: 120V/80VA
Accuracy of AC output	<0.2% (within major measurement range)
DC current output: 3 channel, every channel	±10A/200VA
DC voltage output: 3 channel, every channel	±160V/70VA
Accuracy of DC output	<0.2% (within major measurement range)
Phase	0~360°
Phase accuracy	0.2°
Harmonic wave super-position	2~20 times
Output frequency	0~1000Hz
Frequency accuracy	<0.001Hz
Binary input	10 channel (can be extended)
Binary output	8 pairs (can be extended)
Independent DC	DC110V/220V, rated current: 1.5A

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  Differential simulation protection device of transformer

  1) Protection configuration

- Differential quick-break protection;
- Percentage differential protection;
- Over-current protection at HV side and LV side;
- TA line breakage identification

2) Differential protection

- Starting element
- Action time of the whole group

Differential quick-break	<20ms (1.5 times setting value)
Percentage differential protection	<35ms (2 times setting value, no inrush restraint)

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  Starting element of differential current, setting range: 0.3Ie~1.5Ie, stage difference: 0.01Ie (Ie: rated current of transformer under protection)
- Current balance factor of both sides of transformer is adjusted by software. For HV side, Max. Balance factor should be less than 2.3 while for LV side less than 4.
- Setting range of differential quick-break protection: 4~14Ie
- TA line breakage can be selected by setting the control word, choosing locking ratio differential protection outlet or only send an alarm signal.
- Current setting error: <5%
- Braking co-efficient of percentage differential protection: 0.3~0.75 adjustable.
- Braking co-efficient of 2nd order harmonic: 0.1~0.35 adjustable.

3) Back-up protection

Current setting value	0.1In~20In

Setting error	< 2.5%
Time setting error	<1% setting value+35ms

Circuit simulation protection device

    1) Protection configuration

- Three-section over-current protection by compound voltage and directional interlocking
- Over-current protection of three-section zero sequence
- Over-current accelerated protection and zero sequence accelerated protection (zero sequence part can be self supplied or outsourced).
- Over-load function (alarm or tripping)
- Under-frequency load shedding (UFLS) function
- Under-voltage load shedding (UVLS) function
- Three phase single-shot tripping and re-closing.
- Fault line selection of small current grounding (it is compulsory to add zero sequence part).
- Independent operating circuit

    2) Remote test and control

- 15 channel user-defined binary input of remote signals.
- One group of circuit breaker open and close operation by remote control.
- Iam, Icm, I0, Ua, Ub, Uc, Uab, Ubc, Uca, U0, F, P, Q, COSφ, in total of 14 telemetering factors.
- Event SOE record function.

    3) Over-current protection

Current setting range	0.1In~20In
Current setting error	< 5%
Voltage setting error	< 5%

Time setting error	30ms~100s
Error of time	time setting value*1％＋35ms

4) Zero sequence protection

Current setting range	0.02A~12A (when it is external connected.)
Current setting error	< 5%
Time setting range	30ms~100S
Error of time	time setting value*1％＋35ms

5) Low frequency protection

Frequency setting range	45~50Hz
Frequency setting error	0.01Hz
Setting range of slip frequency lockout	0.3~10Hz/S
Time setting range	100ms~100S
Error of time	time setting value*1％＋35ms

6) Low voltage protection

Voltage setting range	0.5~0.9Un
Voltage setting error	< 5%
Setting range of slip frequency lockout	0.1~1.5Un/S

Time setting range	100ms~100S
Error of time	time setting value*1%＋35ms

7) Reclose

Time setting range	0.0~9.9S
Error of time	time setting value* 1%+35ms

8) Binary input of remote signals

Resolution	<1ms
Signal input mode	Passive contact

9) Remote metering class

Current	class 0.2
Others	class 0.5

Packing List

GDHB Micro-computer protection simulation training system	1 set
GDHB system power supply	1 set
Differential simulation protection device	1 set
Circuit simulation protection device	1 set
Power cord	1pc
Connection line	Several
Ground cable	1 set