EDUCATION EQUIPMENTS

- ◼ **ELECTRICAL TRAINING SYSTEM**
- ◼ **RHEOSTAT**
- ◼ **LAB DECADE BOX**
- ◼ **ULTRASONIC WAVES EXPERIMENT SYSTEM**
- ◼ **MECHANICS PRINCIPLE EXPERIMENT SYSTEM**
  AND MORE...
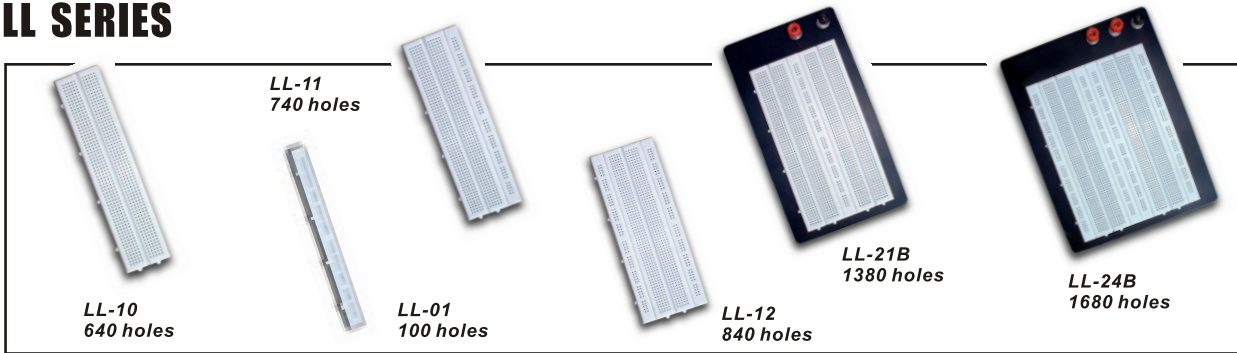
LL SERIES

LL-11
740 holes

LL-10
640 holes

LL-01
100 holes

LL-12
840 holes

LL-21B
1380 holes

LL-24B
1680 holes

Model	Dimension(mm)			Holes	Terminal holes	Terminal strips	Distribution holes	Distribution strips	Binding post
	L	W	H						
LL-01	170	12	8	100	-	-	100	1	-
LL-10	170	38	8	640	640	1	-	-	-
LL-11	170	40	8	740	640	1	100	1	-
LL-12	170	62	8	840	640	1	200	2	-
LL-21B	220	120	9	1380	1280	2	100	1	2
LL-24B	220	165	9	1380	1280	2	400	4	3

ML SERIES
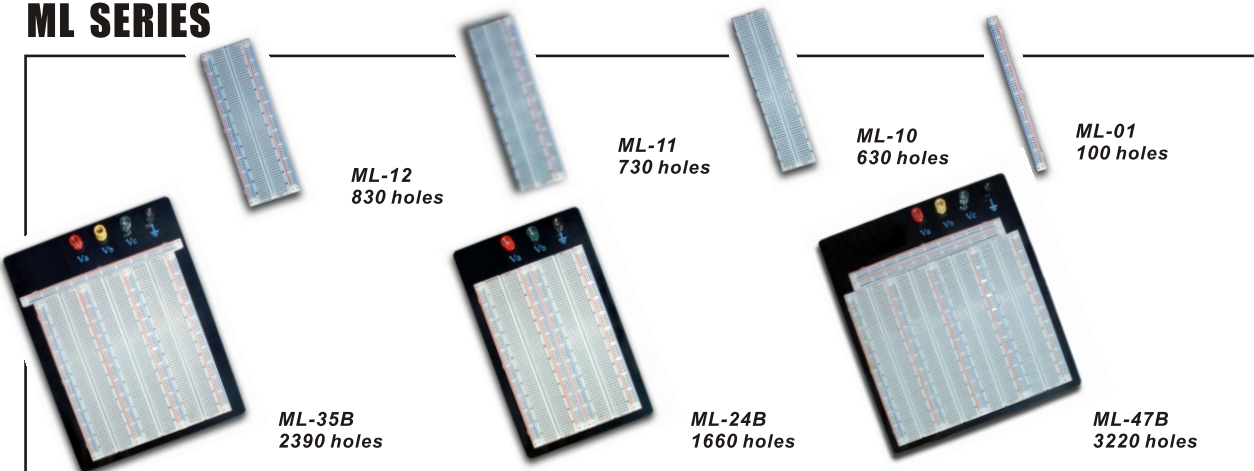
ML-11
730 holes

ML-10
630 holes

ML-01
100 holes

ML-12
830 holes

ML-35B
2390 holes

ML-24B
1660 holes

ML-47B
3220 holes

Model	Dimension(mm)			Holes	Terminal holes	Terminal strips	Distribution holes	Distribution strips	Binding post
	L	W	H						
ML-01	170	12	8	100	-	-	100	1	-
ML-10	170	38	8	630	630	1	-	-	-
ML-11	170	40	8	730	630	1	100	1	-
ML-12	170	62	8	830	630	1	200	2	-
ML-21B	220	120	9	830	630	1	200	2	2
ML-24B	220	165	9	1660	1260	2	400	4	3
ML-35B	220	120	9	2390	1890	3	500	5	4
ML-47B	220	165	9	3220	2520	4	700	7	4

JOINABLE BLOCKS

170 terminal holes, 7 colours, joinable
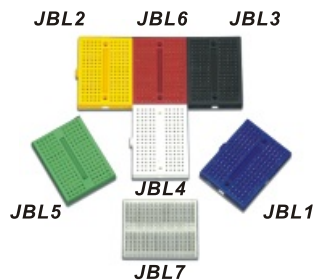
JBL2   JBL6   JBL3

JBL5

JBL4

JBL1

JBL7

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

MCP
lab electronics

PROJECT POWER BOARD

M21-500 $C\epsilon$

Features

.Low cost but ideal tool for breadboard
.With DC power supply for common use

M21-500

Technical Data	M21-500
DC Output Voltage	0~+15VDC/500mA
	0~-15VDC/500mA
	+5VDC/1A
Solderless Breadboard	2390 tie points
Input Voltage	110~127VAC±10% 60Hz, 220~240±10% 50Hz Switchable
Dimensions(W×H×D)	200×80×250mm
Weight	4.5kg

M21-600 $C\epsilon$

Features

.Low cost but ideal tool for breadboard
.With DC, AC power supply for common use

M21-600

Technical Data	M21-600
DC Output Voltage	0~+15VDC/500mA
	0~-15VDC/500mA
	+5VDC/1A
	-5VDC/500mA
AC Output Voltage	12V-6V-0-6V-12V, 300mA
Solderless Breadboard	2820 tie points
Input Voltage	110~127VAC±10% 60Hz, 220~240±10% 50Hz Switchable
Dimensions(W×H×D)	334×95×258mm
Weight	4.5kg

BASIC ELECTRICAL TRAINING SYSTEM

M21-1000 SERIES CE

Features

.Provide available electrical components and interconnect in different configurations.
.Acquire the basic knowledge on electrical engineering, installations and electrical measurements.
.Study the means to check the main laws and principles.
.Component symbols and electrical diagrams are represented on the front panel.
.The symbols and electrical diagrams of each component are clearly represented on the front panel.
.The connections are eased by 4mm terminals and cables of different colors.
.The power supplies are included with extra low safety voltage.

Specifications

Main installed components:

General switch, fuse and signaling lamp
1 Safety single-phase transformer 115-230V / 6-12-24 VAC-1 A
2 Fuse-holder with fuse type 6x30-1A
1 Moving iron ammeter with range: 0.5-1A
1 Moving iron voltmeter with range: 25 V
10 Resistors of different values
(2Ω, 4Ω, 8Ω, 16Ω, 31.5Ω, 63Ω, 250Ω, 500Ω, 1000Ω, 2000Ω)
1 linear rheostat 100 Ω /25W
4 Diodes 6A-100V
2 Lamp-holder with 24-V signaling lamp
1 24-Vac buzzer
1 Electrolytic capacitor, 100μF25Vdc
2 Electrolytic capacitors, 500μF25Vdc
2 Inductances 60 mH 0.5 A
2 Pushbuttons for general use
2 Shunters for general use
1 Inverter for general use
1 Relay, 2 exchange contacts, 24 Vac coil
1 Step-by-step relay, 24-Vac coil (M21-1100)
1 Set of 25mm cables with 4-mm plug
Input Voltage: 110~127VAC$\pm$10% 60Hz, 220~240$\pm$10% 50Hz
Switchable
Dimensions: 258$\times$95$\times$334 mm
Weight: 4.5kg

M21-1000

M21-1100

The main exercises which can be carried out are:

- AC voltage and current measurements
- Diode insertion with different configurations Half-wave rectifier, Full-wave rectifier, Bridge rectifier, Voltage doublers
- DC voltage and current measurements
- Insertion of resistances with different configurations Resistance measurements, Checking the Ohm's law, Series resistors, voltage divider, Parallel resistors, current divider, series and parallel resistors, max. power transfer, Kirchhoff's principle, superimposition principle, Thevenin's theorem
- Power measurements DC power measurement, Joule's law, AC power
- Insertion of capacitors with different configurations Charge and discharge of a DC capacitor, series DC capacitors, parallel DC capacitors
- Electromagnetic phenomena Inductance of a coil, coils in series, coils in parallel, Ohmic/inductive/capacitive circuits, RC circuit, RL circuit, series resonant circuit, parallel resonant circuit, Q-factor, coupled circuits, attenuators
- The transformer
- Leveling filters Inductive circuit, capacitive input, LC filter
- Lighting of a lamp with switch
- Lighting of more lamps with switch
- Lighting of a lamp with shunters
- Lighting of a lamp with shunters and inverter
- Lighting of a hotel room
- Lighting of a file room
- Lighting of one or more lamps with relay
- Lighting of one or more lamps with step-by-step relay (M21-1100)
- Acoustic signaling
- Light signaling
- Acoustic/light signaling
- Pulse remote control of a user with relay
- Remote control with self-holding circuit

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

MCP lab electronics

M21-2000 CE

Feature
. High level, high quality analog trainer
. Combines all essential function of analog experiment
. With analog meters, digital meters, function generator,
  potentiometers, speaker and DC power supply

Specification
1. ANALOG METERS:
A. AC ammeter: 0~1A~5A
B. AC voltmeter: 0~30V
C. DC ammeter: 0~100mA~1A
D. DC voltmeter: 0~30V

2. 3 1/2 DIGITS DIGITAL METERS:
A. DC ammeter: 0~2000μA~2000mA
B. DC voltmeter: 0~2V~200V

3. FUNCTION GENERATOR:
(A)Frequency range: 1Hz－10Hz
                    10Hz－100Hz
                    100Hz－1kHz
                    1kHz－10kHz
                    10kHz－100kHz

(B)Amplitude
    Sine wave output: 0－10 Vpp variable
    Triangle wave output: 0－10 Vpp variable
    Square wave output: 0－10 Vpp variable

4. POTENTIONMETERS:
A. Variable resistor VR1 = 100Ω
B. Variable resistor VR2 = 1kΩ
C. Variable resistor VR3 = 10kΩ
D. Variable resistor VR4 = 100kΩ

5. SPEAKER:
2-1/2 inch diameter, 8 ohm/0.5W to be used for load.

6. POWER SUPPLY:
A. Fixed DC output: +5V, 500mA
B. Fixed DC output: -5V, 500m A.
C. Variable DC output: 0 to +15V, 1 A
D. Variable DC output: 0 to －15V, 1 A
E. Fixed AC output: 12V-6V-0-6V-12V

7. OTHER STANDARD ACCESSORIES:
(1) Power cord
(2) User manual

8. INPUT VOLTAGE: 110~127VAC±10% 60Hz, 220~240±10% 50Hz Switchable

9. DIMENSIONS(W×H×D): 258×95×334mm

10. WEIGHT: 4.5kg

M21-2000

DIGITAL TRAINING SYSTEM

M21-5000 CE

Feature
. **High level, high quality digital trainer**
. Combines all essential function of digital experiment
. With removable breadboard, DC power supply,
  pulse generator, two pulse switches, digital probe,
  TTL/CMOS selector and etc.

Specification
1. SOLDERLESS BREADBOARD:
Interconnected with 2820 tie points nickel plated contact,
fitted all DIP sizes and all components with lead and solid
wire AWG # 22-30 (0.3-0.8mm).It can be changed and
replaced for different purpose and can be connected with
demonstration panel. Therefore, it is very convenient for
both teachers and students.

2. DC POWER SUPPLY:
A. Fixed DC output：+5V, 1A
B. Fixed DC output：-5V, 1 A.
C. Variable DC output：+3V to +15V, 1 A
D. Variable DC output：-3V to －15V, 1 A.

3. MODE SELECTOR SWITCH:
When the switch is put on "TTL" or "CMOS" position, the
input or output of pulse generator, pulser switches, 8 bits
data switches digital probe, 8 bit LED display will meet the
HI or LO level of "TTL" or "CMOS".

4. TWO DIGITS OF 7 SEGMENT LED DISPLAY:

5. PULSE GENERATOR:
   (A) Duty cycle: 50%
   (B) Frequency range: 1Hz ~ 10Hz
                             10Hz ~ 100Hz
                             100Hz ~ 1kHz
                             1kHz ~ 10kHz
                             10kHz ~ 100kHz
                             100kHz ~ 1MHz
   (C) Amplitude: 0 ~ 10Vpp
   (D) TTL/CMOS mode output
        TTL: + 4V
        CMOS: + VDC (depend on the + VDC output)

6. SIXTEEN BITS LED DISPLAY:
   Set mode selector switch to "TTL" position

Logic Level	Input level	Display light up
LO	$<0.8\pm0.2$V	Green
HI	$>2.3\pm0.2$V	Red
Open	0.8 ~ 2.3	No display

   Set mode selector switch to "CMOS" position

Logic Level	Input level	Display light up
LO	$<30\%+$VDC$\pm10\%$	Green
HI	$>70\%+$VDC$\pm10\%$	Red
Open	30% ~ 70% +VDC	No display

7. TWO PULSE SWITCH:
   A,/A,B,/B output
   Output level:
   TTL: HI=4V   LO=0.1V
   CMOS: HI=+VDC   LO=0.1V

8. SIXTEEN DATA SWITCHES:
   TTL: HI=4V   LO=0V
   CMOS: HI=+VDC   LO=0V

9. DIGITAL PROBES:
   Set mode selector switch to "TTL" position

Logic Level	Input level	Display light up
LO	$<0.8\pm0.2$V	L
HI	$>2.3\pm0.2$V	H
Open	0.8 ~ 2.3	O
Transit	LO-->HI	P

   Set mode selector switch to "CMOS" position

Logic Level	Input level	Display light up
LO	$<30\%+$VDC$\pm10\%$	L
HI	$>70\%+$VDC$\pm10\%$	H
Open	30% ~ 70% +VDC	O
Transit	LO-->HI	P

   Memory: the two points of LED beside 7 segment
           LED display will keep lighting when they
            are in "level transition" (LO-->HI or HI-->LO)

10. OTHER STANDARD ACCESSORIES:
    (1) Power cord
    (2) Pin: 10cm 20pcs/20cm 20pcs
    (3).User manual

11. Input Voltage: 110~127VAC$\pm10\%$ 60Hz, 220~240$\pm10\%$ 50Hz
    Switchable

12. DIMENSIONS(W×H×D): 258×95×334mm

13. WEIGHT: 4.5kg

M21-5000

POWER SUPPLY
TEST INSTRUMENT
EDU. INSTRUMENT
METER
MACHINE
ACCESSORY

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

M21-7000 $C\epsilon$

Feature
. **High level, high quality digital-analog trainer**
. Combines all essential function of analog and digital
  experiment
. With removable breadboard, DC power supply,
  function generator, two pulse switches, 2 1/2 inch
  8 ohm 0.5W speaker and etc.

Specification
1. SOLDERLESS BREADBOARD:
Interconnected with 2820 tie points nickel
plated contact, fitted all DIP sizes and all
components with lead and solid wire
AWG # 22-30 (0.3-0.8mm).It can be changed
and replaced for different purpose and can be
connected with demonstration panel.
Therefore, it is very convenient for both teachers
and students.

2. DC POWER SUPPLY:
A. Fixed DC output：+5V, 1A
B. Fixed DC output：-5V, 1 A
C. Variable DC output：0V to +15V, 1 A.
D. Variable DC output：0V to －15V, 1 A.

3. POTENTIOMETERS:
A. Variable resistor VR1 = 1kΩ
B. Variable resistor VR2 = 100kΩ

4. FUNCTION GENERATOR:
(A)Frequency range: 1Hz－10Hz
                    10Hz－100Hz
                    100Hz－1kHz
                    1kHz－10kHz
                    10kHz－100kHz
(B)Amplitude
    Sine wave output：0－10 Vpp variable
    Triangle wave output：0－10 Vpp variable
    Square wave output：0－10 Vpp variable
    TTL mode output：4 Vpp

5. SIXTEEN BITS DATA SWITCHES:
16pcs toggle switches and corresponding output point.
When switch is set at "down" position,the output is
LO level; contrarily, it is to be HI level while setting at
"up" position.

6. TWO PULSE SWITCH:
(WITH 2 SET OF OUTPUT: ($\overline{A}$, A ,$\overline{B}$, B))
2pcs pushbuttons contain switches debouncer for
eliminating the bounce caused by switch from "open"
to "close" or from "close" to "open" position.

7. SPEAKER:
2-1/2 inch diameter, 8 ohm/0.5W to be used for load.

8. FOUR CHANNEL ADAPTOR:
Both of the two banana sockets' and two BNC jacks'
point tips are changeable. It is suitable for M21-7000
to be connected with peripherals.

9. TWO DIGITS OF 7 SEGMENT LED DISPLAY:
(A) Output display
    Numerical designs and resultant displays

M21-7000

(B) Function tables

Decimal Or Function	Inputs				Outputs						
	D	C	B	A	a	b	c	d	e	f	g
0	L	L	L	L	L	L	L	L	L	L	H
1	L	L	L	H	H	L	L	H	H	H	H
2	L	L	H	L	L	L	H	L	L	H	L
3	L	L	H	H	L	L	L	L	H	H	L
4	L	H	L	L	H	L	L	H	H	L	L
5	L	H	L	H	L	H	L	L	H	L	L
6	L	H	H	L	H	H	L	L	L	L	L
7	L	H	H	H	L	L	L	H	H	H	H
8	H	L	L	L	L	L	L	L	L	L	L
9	H	L	L	H	L	L	L	H	H	L	L
10	H	L	H	L	H	H	H	L	L	H	L
11	H	L	H	H	H	H	L	L	H	H	L
12	H	H	L	L	H	L	H	H	H	L	L
13	H	H	L	H	L	H	H	L	H	L	L
14	H	H	H	L	H	H	H	L	L	L	L
15	H	H	H	H	H	H	H	H	H	H	H

10. SIXTEEN BITS LED DISPLAY:
16 red LED's separate input terminals. The LED
will be lighted up when input is at "HI level" ,and
it will be turned off when it is at no input or at "LO level" .

11. OTHER STANDARD ACCESSORIES:
(1) Power cord
(2) Pin: 10cm 20pcs/20cm 20pcs
(3) User manual

12. INPUT VOLTAGE: 110~127VAC$\pm$10% 60Hz, 220~240$\pm$10% 50Hz
    Switchable

13. DIMENSIONS(W$\times$H$\times$D): 258$\times$95$\times$334mm

14. WEIGHT: 4.5kg

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

segment identification

M21-7000 A CE NEW

Feature
. **High level, high quality digital-analog trainer**
. Combines all essential function of analog and digital experiment
. With removable breadboard, DC power supply, function generator, two pulse switches, 2 1/2 inch 8 ohm 0.5W speaker and etc.
. 100MHz universal counter

Specification
1. SOLDERLESS BREADBOARD:
Interconnected with 2820 tie points nickel plated contact, fitted all DIP sizes and all components with lead and solid wire AWG # 22-30 (0.3-0.8mm).It can be changed and replaced for different purpose and can be connected with demonstration panel. Therefore, it is very convenient for both teachers and students.

2. DC POWER SUPPLY:
A. Fixed DC output：+5V, 1A
B. Fixed DC output：-5V, 1 A
C. Variable DC output：0V to +15V, 1 A.
D. Variable DC output：0V to －15V, 1 A.

3. POTENTIOMETERS:
A. Variable resistor VR1 = 1k Ω
B. Variable resistor VR2 = 100k Ω

4. UNIVERSAL COUNTER
A. Frequency range: 1Hz~99.999999MHz; 10Hz~100.00000MHz
B. Period range TH & TL: 0.01 μs~999999.99 μs; 1 μs~99999999 μs
C. Input signal: TTL or CMOS level or any level (Vmin≥+2.3Vp±10%)
D. Display: 8-digit 7-segment LED
E. Counter switch: External / internal

5. FUNCTION GENERATOR:
(A)Frequency range: 1Hz－2MHz
(B)Amplitude
　Sine wave output：0－10 Vpp variable
　Triangle wave output：0－10 Vpp variable
　Square wave output：0－10 Vpp variable
　TTL mode output：4 Vpp

6. SIXTEEN BITS DATA SWITCHES:
16pcs toggle switches and corresponding output point. When switch is set at "down" position,the output is LO level; contrarily, it is to be HI level while setting at "up" position.

7. TWO PULSE SWITCH:
(WITH 2 SET OF OUTPUT: ($\overline{A}$, A ,$\overline{B}$, B))
2pcs pushbuttons contain switches debouncer for eliminating the bounce caused by switch from "open" to "close" or from "close" to "open" position.

8. SPEAKER:
2-1/2 inch diameter, 8 ohm/0.5W to be used for load.

9. FOUR CHANNEL ADAPTOR:
Both of the two banana sockets' and two BNC jacks' point tips are changeable. It is suitable for M21-7000 to be connected with peripherals.

10. TWO DIGITS OF 7 SEGMENT LED DISPLAY:
(A) Output display
　Numerical designs and resultant displays

```
0 1 2 3 4 5 6 7 8 9 ⊏ ⊐ ⊔ 4 5 ⊔
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
```

segment identification

```
    a
  f   b
    g
  e   c
    d
```

M21-7000A

(B) Function tables

Decimal Or Function	Inputs				Outputs						
	D	C	B	A	a	b	c	d	e	f	g
0	L	L	L	L	L	L	L	L	L	L	H
1	L	L	L	H	H	L	L	H	H	H	H
2	L	L	H	L	L	L	H	L	L	H	L
3	L	L	H	H	L	L	L	L	H	H	L
4	L	H	L	L	H	L	L	H	H	L	L
5	L	H	L	H	L	H	L	L	H	L	L
6	L	H	H	L	H	H	L	L	L	L	L
7	L	H	H	H	L	L	L	H	H	H	H
8	H	L	L	L	L	L	L	L	L	L	L
9	H	L	L	H	L	L	L	H	H	L	L
10	H	L	H	L	H	H	H	L	L	H	L
11	H	L	H	H	H	H	L	L	H	H	L
12	H	H	L	L	H	L	H	H	H	L	L
13	H	H	L	H	L	H	H	L	H	L	L
14	H	H	H	L	H	H	H	L	L	L	L
15	H	H	H	H	H	H	H	H	H	H	H

11. SIXTEEN BITS LED DISPLAY:
16 red LED's separate input terminals. The LED will be lighted up when input is at "HI level",and it will be turned off when it is at no input or at "LO level".

12. OTHER STANDARD ACCESSORIES:
(1) Power cord
(2) Pin: 10cm 20pcs/20cm 20pcs
(3) User manual

13. INPUT VOLTAGE: 110~127VAC±10% 60Hz, 220~240±10% 50Hz Switchable

14. DIMENSIONS(W×H×D): 258×95×334mm

15. WEIGHT: 4.5kg

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

M21-7100 CE NEW

Replaceable 4 pin connector

M21-7100

Feature
. **High level, high quality digital-analog trainer**
. **Replaceable 4 pin connector, easy to maintenance**
. Combines all essential function of analog and digital experiment
. With removable breadboard, DC power supply, function generator, two pulse switches, 2 1/2 inch 8 ohm 0.5W speaker and etc.

Specification
1. SOLDERLESS BREADBOARD:
Interconnected with 2820 tie points nickel plated contact, fitted all DIP sizes and all components with lead and solid wire AWG # 22-30 (0.3-0.8mm).It can be changed and replaced for different purpose and can be connected with demonstration panel. Therefore, it is very convenient for both teachers and students.

2. DC POWER SUPPLY:
A. Fixed DC output：+5V, 1A
B. Fixed DC output：-5V, 1 A
C. Variable DC output：0V to +15V, 1 A.
D. Variable DC output：0V to －15V, 1 A.

3. POTENTIOMETERS:
A. Variable resistor VR1 = 1kΩ
B. Variable resistor VR2 = 100kΩ

4. FUNCTION GENERATOR:
(A)Frequency range: 1Hz－10Hz
            10Hz－100Hz
            100Hz－1kHz
            1kHz－10kHz
            10kHz－100kHz

(B)Amplitude
   Sine wave output：0－10 Vpp variable
   Triangle wave output：0－10 Vpp variable
   Square wave output：0－10 Vpp variable
   TTL mode output：4 Vpp

5. SIXTEEN BITS DATA SWITCHES:
16pcs toggle switches and corresponding output point. When switch is set at "down" position,the output is LO level; contrarily, it is to be HI level while setting at "up" position.

6. TWO PULSE SWITCH:
(WITH 2 SET OF OUTPUT: ($\overline{A}$, A ,$\overline{B}$, B))
2pcs pushbuttons contain switches debouncer for eliminating the bounce caused by switch from "open" to "close" or from "close" to "open" position.

7. SPEAKER:
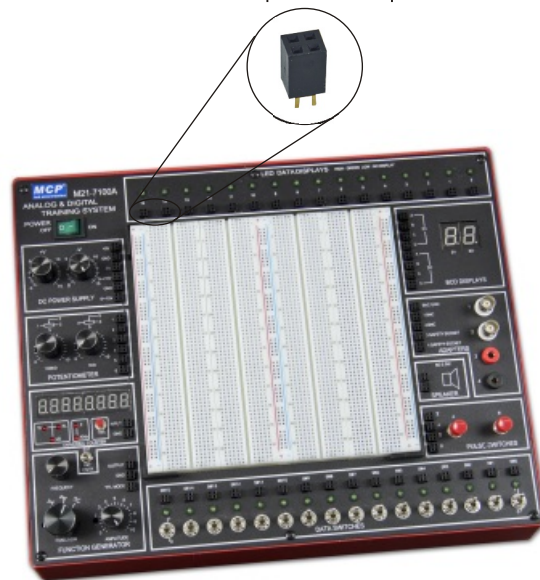2-1/2 inch diameter, 8 ohm/0.5W to be used for load.

8. FOUR CHANNEL ADAPTOR:
Both of the two banana sockets' and two BNC jacks' point tips are changeable. It is suitable for M21-7000 to be connected with peripherals.

9. TWO DIGITS OF 7 SEGMENT LED DISPLAY:
(A) Output display
   Numerical designs and resultant displays

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

segment identification

(B) Function tables

Decimal Or Function	Inputs				Outputs						
	D	C	B	A	a	b	c	d	e	f	g
0	L	L	L	L	L	L	L	L	L	L	H
1	L	L	L	H	H	L	L	H	H	H	H
2	L	L	H	L	L	L	H	L	L	H	L
3	L	L	H	H	L	L	L	L	H	H	L
4	L	H	L	L	H	L	L	H	H	L	L
5	L	H	L	H	L	H	L	L	H	L	L
6	L	H	H	L	H	H	L	L	L	L	L
7	L	H	H	H	L	L	L	H	H	H	H
8	H	L	L	L	L	L	L	L	L	L	L
9	H	L	L	H	L	L	L	H	H	L	L
10	H	L	H	L	H	H	H	L	L	H	L
11	H	L	H	H	H	H	L	L	H	H	L
12	H	H	L	L	H	L	H	H	H	L	L
13	H	H	L	H	L	H	H	L	H	L	L
14	H	H	H	L	H	H	H	L	L	L	L
15	H	H	H	H	H	H	H	H	H	H	H

10. SIXTEEN BITS LED DISPLAY:
16 red LED's separate input terminals. The LED will be lighted up when input is at "HI level" ,and it will be turned off when it is at no input or at "LO level" .

11. OTHER STANDARD ACCESSORIES:
(1) Power cord
(2) Pin: 10cm 20pcs/20cm 20pcs
(3) User manual

12. INPUT VOLTAGE: 110~127VAC±10% 60Hz, 220~240±10% 50Hz Switchable

13. DIMENSIONS(W×H×D): 258×95×334mm

14. WEIGHT: 4.5kg

M21-7100 A ℂℰ ℕ𝔼𝕎

Replaceable 4 pin connector

M21-7100A

Feature
. **High level, high quality digital-analog trainer**
. **Replaceable 4 pin connector, easy to maintenance**
. Combines all essential function of analog and digital experiment
. With removable breadboard, DC power supply, function generator, two pulse switches, 2 1/2 inch 8 ohm 0.5W speaker and etc.
. 100MHz universal counter

Specification

1. SOLDERLESS BREADBOARD:
Interconnected with 2820 tie points nickel plated contact, fitted all DIP sizes and all components with lead and solid wire AWG # 22-30 (0.3-0.8mm).It can be changed and replaced for different purpose and can be connected with demonstration panel. Therefore, it is very convenient for both teachers and students.

2. DC POWER SUPPLY:
A. Fixed DC output：+5V, 1A
B. Fixed DC output：-5V, 1 A
C. Variable DC output：0V to +15V, 1 A.
D. Variable DC output：0V to－15V, 1 A.

3. POTENTIOMETERS:
A. Variable resistor VR1 = 1kΩ
B. Variable resistor VR2 = 100kΩ

4. UNIVERSAL COUNTER
A. Frequency range: 1Hz~99.999999MHz;
　　　　　　10Hz~100.00000MHz
B. Period range TH & TL: 0.01μs~999999.99μs;
　　　　　　1μs~99999999μs
C. Input signal: TTL or CMOS level or any level (Vmin$\geq$+2.3Vp$\pm$10%)
D. Display: 8-digit 7-segment LED
E. Counter switch: External / internal

5. FUNCTION GENERATOR:
(A)Frequency range: 1Hz－2MHz
(B)Amplitude
　Sine wave output：0－10 Vpp variable
　Triangle wave output：0－10 Vpp variable
　Square wave output：0－10 Vpp variable
　TTL mode output：4 Vpp

6. SIXTEEN BITS DATA SWITCHES:
16pcs toggle switches and corresponding output point. When switch is set at "down" position,the output is LO level; contrarily, it is to be HI level while setting at "up" position.

7. TWO PULSE SWITCH:
　(WITH 2 SET OF OUTPUT: ($\overline{A}$, A ,$\overline{B}$, B))
2pcs pushbuttons contain switches debouncer for eliminating the bounce caused by switch from "open" to "close" or from "close" to "open" position.

8. SPEAKER:
2-1/2 inch diameter, 8 ohm/0.5W to be used for load.

9. FOUR CHANNEL ADAPTOR:
Both of the two banana sockets' and two BNC jacks' point tips are changeable. It is suitable for M21-7000 to be connected with peripherals.

10. TWO DIGITS OF 7 SEGMENT LED DISPLAY:
(A) Output display
　Numerical designs and resultant displays

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

segment identification

(B) Function tables

| Decimal Or Function	Inputs				Outputs						
	D	C	B	A	a	b	c	d	e	f	g
0	L	L	L	L	L	L	L	L	L	L	H
1	L	L	L	H	H	L	L	H	H	H	H
2	L	L	H	L	L	L	H	L	L	H	L
3	L	L	H	H	L	L	L	L	H	H	L
4	L	H	L	L	H	L	L	H	H	L	L
5	L	H	L	H	L	H	L	L	H	L	L
6	L	H	H	L	H	H	L	L	L	L	L
7	L	H	H	H	L	L	L	H	H	H	H
8	H	L	L	L	L	L	L	L	L	L	L
9	H	L	L	H	L	L	L	H	H	L	L
10	H	L	H	L	H	H	H	L	L	H	L
11	H	L	H	H	H	H	L	L	H	H	L
12	H	H	L	L	H	L	H	H	H	L	L
13	H	H	L	H	L	H	H	L	H	L	L
14	H	H	H	L	H	H	H	L	L	L	L
15	H	H	H	H	H	H	H	H	H	H	H

11. SIXTEEN BITS LED DISPLAY:
16 red LED's separate input terminals. The LED will be lighted up when input is at "HI level" ,and it will be turned off when it is at no input or at "LO level".

12. OTHER STANDARD ACCESSORIES:
(1) Power cord
(2) Pin: 10cm 20pcs/20cm 20pcs
(3) User manual

13. INPUT VOLTAGE: 110~127VAC$\pm$10% 60Hz, 220~240$\pm$10% 50Hz Switchable

14. DIMENSIONS(W$\times$H$\times$D): 258$\times$95$\times$334mm

15. WEIGHT: 4.5kg

POWER SUPPLY
TEST INSTRUMENT
EDU. INSTRUMENT
METER
MACHINE
ACCESSORY

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

ACL-7000 CE NEW

Feature
.Six circuit boards form 22 experiments.
.Ideal tool for learning the basics of analog circuits.
.Step-by-step exercises and application.
.Integrated training system, with complete <INSTRUCTION>.
.Combination with M21-7000 digital-analog training system
 as main unit.
.Step-by-step exercises and application.
.Expandability and flexibility of experiments greatly
 increased by large breadboard.
.Boards can be changed easily.
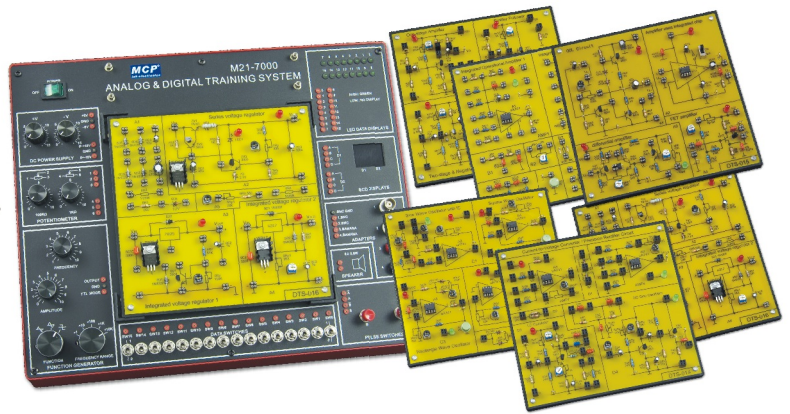
The ACL-7000 analog circuit laboratory is a comprehensive and self-contained system suitable for tuition and experimentation with a range of analog electronics circuits. All necessary equipments such as power supply, signal generator, switches and displays are built-in on the main unit. The 6 circuit boards cover a wide variety of essential topics in the field of analog electronics. It is a time and cost saving device for both students experiment and researchers interested in developing and testing circuit prototypes.

Specification

I.MAIN UNIT M21-7000

1. SOLDERLESS BREADBOARD:
Interconnected with 2820 tie points nickel
plated contact, fitted all DIP sizes and all
components with lead and solid wire
AWG # 22-30 (0.3-0.8mm).It can be changed
and replaced for different purpose and can be
connected with demonstration panel.
Therefore, it is very convenient for both teachers
 and students.

2. DC POWER SUPPLY:
A. Fixed DC output：+5V, 1A
B. Fixed DC output：-5V, 1 A
C. Variable DC output：0V to +15V, 1 A.
D. Variable DC output：0V to －15V, 1 A.

3. POTENTIOMETERS:
A. Variable resistor VR1 = 1kΩ
B. Variable resistor VR2 = 100kΩ

4. FUNCTION GENERATOR:
(A)Frequency range: 1Hz－10Hz
                    10Hz－100Hz
                    100Hz－1kHz
                    1kHz－10kHz
                    10kHz－100kHz
(B)Amplitude
   Sine wave output：0－10 Vpp variable
   Triangle wave output：0－10 Vpp variable
   Square wave output：0－10 Vpp variable
   TTL mode output：4 Vpp

5. SIXTEEN BITS DATA SWITCHES:
16pcs toggle switches and corresponding output point.
 When switch is set at "down" position,the output is
 LO level; contrarily, it is to be HI level while setting at
 "up" position.

6. TWO PULSE SWITCH:
   (WITH 2 SET OF OUTPUT: ($\overline{A}$, A ,$\overline{B}$, B))
2pcs pushbuttons contain switches debouncer for
eliminating the bounce caused by switch from "open"
to "close" or from "close" to "open" position.

7. SPEAKER:
2-1/2 inch diameter, 8 ohm/0.5W to be used for load.

8. FOUR CHANNEL ADAPTOR:
Both of the two banana sockets' and two BNC jacks'
point tips are changeable. It is suitable for M21-7000
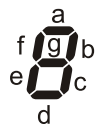to be connected with peripherals.

M21-7000

9. TWO DIGITS OF 7 SEGMENT LED DISPLAY:
(A) Output display
    Numerical designs and resultant displays
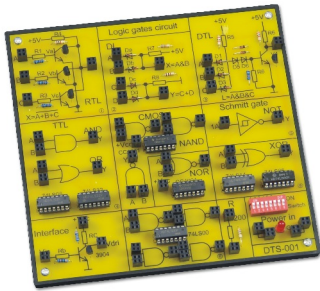
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

10. SIXTEEN BITS LED DISPLAY:
16 red LED's separate input terminals. The LED
will be lighted up when input is at "HI level" ,and
it will be turned off when it is at no input or at "LO level" .

II.DTS CIRCUIT BOARD

Six circuit boards form 22 experiments detailed in <INSTRUCTION OF DIGITAL CIRCUIT EXPERIMENTATIONS> Each circuit board contains the experiment circuits which are clearly illustrated by a circuit diagram on its top panel. The circuit boards are as follow :
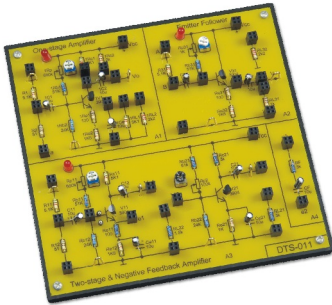
DTS-011 basic amplifier circuit
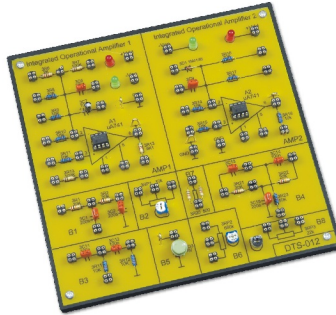
DTS-012 operational amplifier circuit
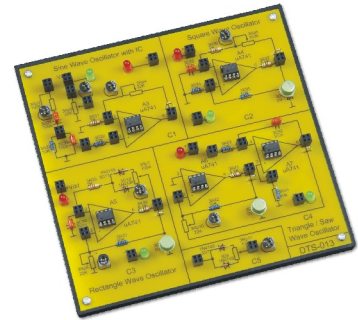
DTS-013 oscillator circuit
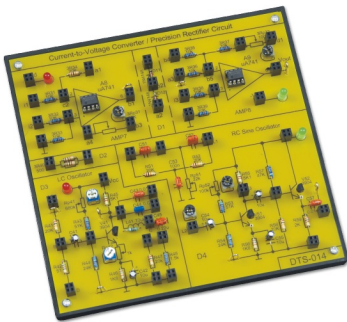
DTS-014 various circuit 1
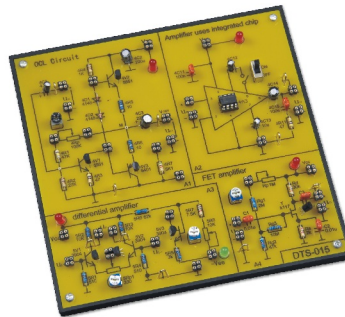
DTS-015 various circuit 2
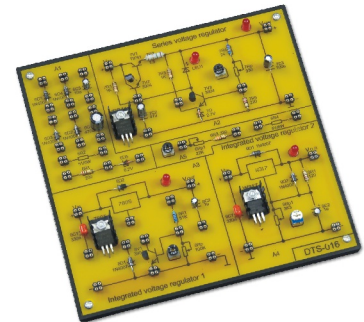
DTS-016 regulator circuit

III.THE FULL LIST OF EXPERIMENTS PERFORMED USING THE ABOVE CIRCUIT BOARDS

Experiment 1   Monopole Amplifying Circuit
Experiment 2   Two Stage Amplifier Circuit
Experiment 3   Negative Feedback Amplifier Circuit
Experiment 4   Emitter Follower
Experiment 5   Differential Amplifier
Experiment 6   Scaling Summing Amplifier
Experiment 7   Integrator and Differentiator Amplifier
Experiment 8   Waveform Generator Circuit
Experiment 9   Active Filter
Experiment 10   Voltage Comparator
Experiment 11   Wien Bridge Oscillator
Experiment 12   Integrated Power Amplifier
Experiment 13   Rectifier Filter and Parallel Regulation Circuit
Experiment 14   Series Regulation Circuit
Experiment 15   Integrated Voltage Regulator
Experiment 16   RC Oscillator
Experiment 17   LC Oscillator and Frequency-selective Amplifier
Experiment 18   Current/voltage Conversion Circuit
Experiment 19   Voltage/frequency Conversion Circuit
Experiment 20   Complementary Symmetry Power Amplifier
Experiment 21   Waveform Conversion Circuit
Experiment 22   FET Amplifier

IV.GENERAL

1. Accessories
(1) Power cord
(2) Pin leads: 10cm 20pcs, 20cm 20pcs
(3) User manual+ instruction of analog circuit experimentations

2. INPUT VOLTAGE: 110~127VAC±10% 60Hz, 220~240VAC±10% 50Hz Switchable

3. DIMENSIONS:
(1) Main unit (W×H×D):258×95×334mm
(2) Circuit board:165×170mm

4. WEIGHT:
(1) Main unit:4.5kg
(2) Circuit board:0.4kg×6

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

DCL-7000   CE   NEW

Feature
.Seven circuit boards form 19 experiments.
.Suitable for combinational logic, sequential logic,
 and microprocessor circuit
  experimentation and design.
.Ideal tool for learning the basics of digital logic circuits.
.Step-by-step exercises and application.
.Integrated training system, with complete<INSTRUCTION>.
.Combination with M21-7000 digital-analog training
 system as main unit.
.Step-by-step exercises and application .
.Expandability and flexibility of experiments greatly
 increased by large breadboard.
.Board can be changed easily.
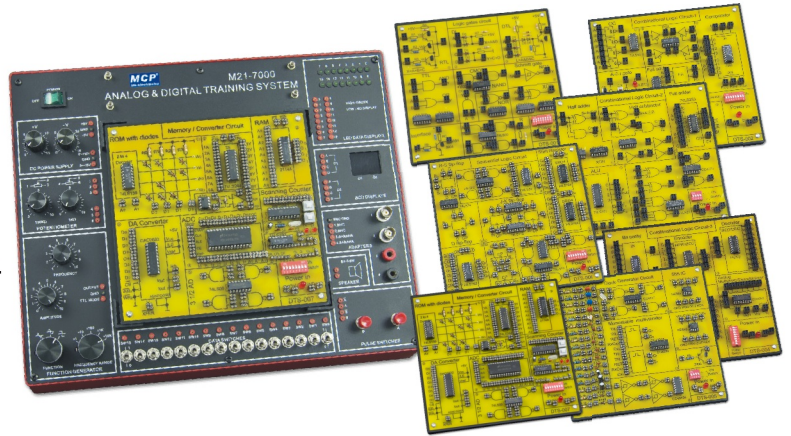
   The DCL-7000 digital circuit laboratory is a comprehensive and self-contained system suitable for tuition and experimentation with a range of digital electronics circuits. All necessary equipments for digital logic experiments such as power supply, signal generator, switches and displays are built-in on the main unit. The 7 circuit boards cover a wide variety of essential topics in the field of digital logic. It is a time and cost saving device for both students experiment and researchers interested in developing and testing circuit prototypes.

Specification

I.MAIN UNIT M21-7000

1. SOLDERLESS BREADBOARD:
Interconnected with 2820 tie points nickel
plated contact, fitted all DIP sizes and all
components with lead and solid wire
AWG # 22-30 (0.3-0.8mm).It can be changed
and replaced for different purpose and can be
connected with demonstration panel.
Therefore, it is very convenient for both teachers
 and students.

2. DC POWER SUPPLY:
A. Fixed DC output：+5V, 1A
B. Fixed DC output：-5V, 1 A
C. Variable DC output：0V to +15V, 1 A.
D. Variable DC output：0V to –15V, 1 A.

3. POTENTIOMETERS:
A. Variable resistor VR1 = 1kΩ
B. Variable resistor VR2 = 100kΩ

4. FUNCTION GENERATOR:
(A)Frequency range: 1Hz－10Hz
                    10Hz－100Hz
                    100Hz－1kHz
                    1kHz－10kHz
                    10kHz－100kHz

(B)Amplitude
   Sine wave output：0－10 Vpp variable
   Triangle wave output：0－10 Vpp variable
   Square wave output：0－10 Vpp variable
   TTL mode output：4 Vpp

5. SIXTEEN BITS DATA SWITCHES:
16pcs toggle switches and corresponding output point.
 When switch is set at "down" position,the output is
 LO level; contrarily, it is to be HI level while setting at
 "up" position.

6. TWO PULSE SWITCH:
   (WITH 2 SET OF OUTPUT: ($\overline{A}$, A ,$\overline{B}$, B))
2pcs pushbuttons contain switches debouncer for
eliminating the bounce caused by switch from "open"
to "close" or from "close" to "open" position.

7. SPEAKER:
2-1/2 inch diameter, 8 ohm/0.5W to be used for load.

8. FOUR CHANNEL ADAPTOR:
Both of the two banana sockets' and two BNC jacks'
point tips are changeable. It is suitable for M21-7000
to be connected with peripherals.

M21-7000

9. TWO DIGITS OF 7 SEGMENT LED DISPLAY:
(A) Output display
    Numerical designs and resultant displays

```
0 1 2 3 4 5 6 7 8 9 c d 4 5 t
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
```

```
   a
 f   b
   g
 e   c
   d
```

10. SIXTEEN BITS LED DISPLAY:
16 red LED's separate input terminals. The LED
will be lighted up when input is at "HI level" ,and
it will be turned off when it is at no input or at "LO level" .

DIGITAL CIRCUIT LABORATORY

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

II.DTS CIRCUIT BOARD
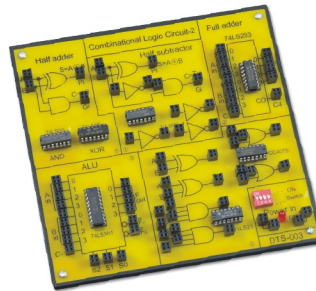
Seven circuit boards form 19 experiments detailed in <INSTRUCTION OF DIGITAL CIRCUIT EXPERIMENTATIONS> Each circuit board contains the experiment circuits which are clearly illustrated by a circuit diagram on its top panel. The circuit boards are as follow :
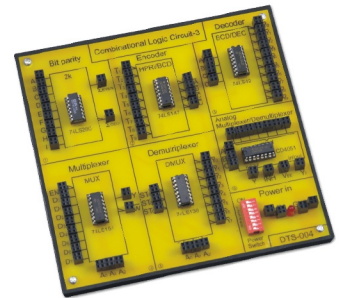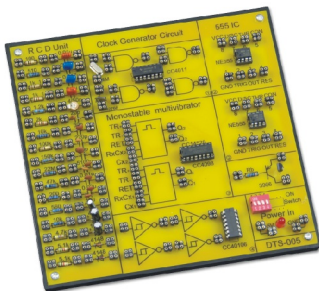

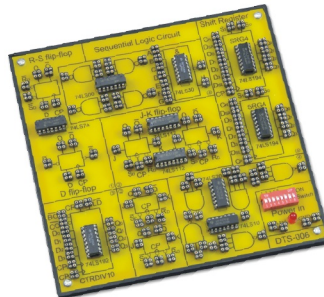DTS-001 logic gates circuit
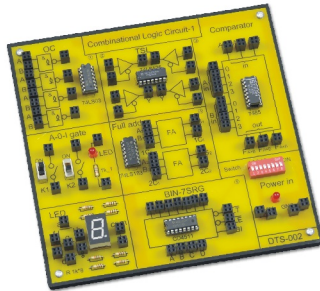
DTS-002
combinational logic circuit-1

DTS-003
combinational logic circuit-2

DTS-004
combinational logic circuit-3

DTS-005 clock generator circuit

DTS-006 sequential logic circuit
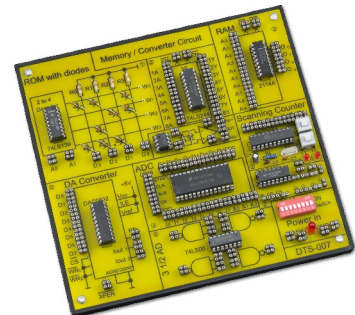
DTS-007 memory / converter circuit

III.THE FULL LIST OF EXPERIMENTS PERFORMED USING THE ABOVE CIRCUIT BOARDS

Experiment 1	Transistor Switching Characteristics
Experiment 2	Logic Function and Parameter test of TTL Integrated Logic Gate
Experiment 3	Logic Functions and Parameter Test of CMOS Logic Gate
Experiment 4	Verify Function of Logic Gate
Experiment 5	Integration Logic Circuit Connection and Drive
Experiment 6	Applications of TTL Gates with Open-collector Outputs and Tri-state Outputs
Experiment 7	Digital Comparator Circuit
Experiment 8	Arithmetic Operation Circuit
Experiment 9	Parity Generator
Experiment 10	Encoder and Decoder
Experiment 11	Data Selector and Distributor
Experiment 12	Use Gate to Produce Pulse Signal (Multivibrator)
Experiment 13	Monostable Trigger and Schmitt Trigger (Pulse Delay and Waveform Shaping Circuit)
Experiment 14	555 Timer and Its Application
Experiment 15	Trigger (flip-flop) and Its Application
Experiment 16	Shift Register IC and Its Application
Experiment 17	IC Counter and Its Application
Experiment 18	Random Access Memory 2114A and Its Application
Experiment 19	D/A and A/D converter

IV.GENERAL

1. Accessories
(1) Power cord
(2) Pin leads: 10cm 20pcs, 20cm 20pcs
(3) User manual+ instruction of analog circuit experimentations

2. INPUT VOLTAGE: 110~127VAC±10% 60Hz, 220~240VAC±10% 50Hz Switchable

3. DIMENSIONS:
(1) Main unit (W×H×D):258×95×334mm
(2) Circuit board:165×170mm

4. WEIGHT:
(1) Main unit:4.5kg
(2) Circuit board:0.4kg×7

BXS SERIES

Feature
. **100 scale division to show the resistance setting**
. Enclose in robust sheet metal cover
. Good linearity
. Sliding contact of coppers graphite

Specifications
. Max. Working Voltage: 380VAC, 400VDC
. Resistance tolerance: ±10%
. Insulation resistance: >3×10^{9}Ω
. Earthing resistance: <0.1Ω
. Rated resistance: see table

BXS 600

Model	Power VA	Resistance (Ω)	Max. Current	Dimensions (W×H×D)	Ceramic Pipe diameter	Weight (kg)
BXS 150	160	10	4A	285×140×95mm	47mm	1.8
		33	2.2A			
		100	1.25A			
		330	0.7A			
		1000	0.4A			
		3300	0.22A			
BXS 300	320	3.3	10A	385×140×95mm	47mm	2.4
		10	5.7A			
		33	3.1A			
		100	1.8A			
		330	1.0A			
		1000	0.57A			
		3300	0.31A			
		10000	0.18A			
BXS 600	640	1.6	20A	485×160×100mm	64mm	3.2
		5	11.4A			
		16.5	6.2A			
		50	3.6A			
		165	2A			
		500	1.1A			
		1650	0.63A			
		5000	0.36A			

RHEOSTAT

BXD SERIES CE

Feature
. **100 scale division to show the resistance setting**
. **Good linearity**
. Fused safety socket of the slide bar
. Enclose in robust sheet metal cover
. Sliding contact of coppers graphite
. More tighter structure
. New appearance design

Specifications
. Max. working voltage: 380VAC, 400VDC
. Resistance tolerance: $\pm$10%
. Insulation resistance: $>3\times10^9\ \Omega$
. Earthing resistance: $<0.1\Omega$
. Rated resistance: see table

BXD160   **BXD300**

Model	Power VA	Resistance (Ω)	Max. Current	Dimensions (W$\times$H$\times$D)	Ceramic Pipe diameter	Weight kg
BXD160	160	3.3	7A	240$\times$180$\times$195mm	64mm	2.2
		10	4A			
		33	2.2A			
		100	1.25A			
		330	0.7A			
		1000	0.4A			
		3300	0.22A			
BXD300	320	3.3	10A	380$\times$180$\times$100mm	64mm	2.8
		10	5.7A			
		33	3.1A			
		100	1.8A			
		330	1.0A			
		1000	0.57A			
		3300	0.31A			
		10000	0.18A			
BXD600	640	1.6	20A	480$\times$180$\times$100mm	64mm	3.5
		5	11.4A			
		16.5	6.2A			
		50	3.6A			
		165	2A			
		500	1.1A			
		1650	0.63A			
		5000	0.36A			

POWER SUPPLY
TEST INSTRUMENT
EDU. INSTRUMENT
METER
MACHINE
ACCESSORY

RXG250 SERIES SOLENOID ℃€

Features

.Simple application allows you to perform
 various manipulations
.Influence of L, I and the number of turns
.Axial guide for teslameter probes

Specifications

.Pipe length: 500mm
.Pipe material: Ceramic
.Pipe diameter: 50mm
.Windings material: Copper wires
.Dimensions: 620(W)×100(H)×120(D)mm
.Weight: 3kg

RXG250

RXG250B

RXG250T

Model	Windings	Windings diameter	I_{max}	Intermediary terminals
RXG250	2×250T	0.92mm	7A(parallel)	×
RXG250B	500T	0.92mm	3.5A	×
RXG250T	250T+250T	1.0mm, 0.77mm	3.5A	√

DIDACTIC VARIABLE INDUCTOR RXI-1

Features

.Inductor equipped with 4mm safety socket and
 the whole unit is double insulated

Specifications

Variable inductance: 0.1~1.4H
No. of turns: 3500 in 16 layers
Resistance: 18Ω
Max. current: 2A
Wire diameter: Φ1.0mm
Core: Soft iron Φ40mm x 180mm
Graduation: Henry and centimeter
Dimension: 290×160×105mm
Weight: 4.2kg

RXI-1

TM206 TESLAMETER ℃€

Features

.Measuring BX and BZ at the same time
.Biaxial probe removable and graduation provided
.Double sensors protection
.2 ranges of measure:20 mT or 200mT
.Analog output

TM206

Specifications

.Range: 20mT
                 200mT
.Display: 2000 digits LCD
.Resolution: 10μT
.Accuracy: 2%Rdg ± 3 digits (20mT)
                 2%Rdg ± 1 digit (100mT)
.Analog: Sensitivity: 10mV/mT(20mT)
                                 1mV/mT(100mT)
                 Impendence: 4.7kΩ
                 Connection: safety socket Φ4mm
.Power supply: 110~127VAC±10% 60Hz, or 220~240VAC±10% 50Hz
.Dimensions: 230(W)×85(H)×240(D)mm
.Weight: 1kg

F8 SERIES CE

AC power supply

F8-A1202

Specifications

.Output voltage: 2V, 6.3V, 9V, 12V
.Output current: 2A
.Protection: Output short(buzzer), over heat
.Input voltage: 110~127VAC±10% 60Hz or
                      220~240VAC±10% 50Hz
.Weight: 2kg

F8-A1202

F8-5801

Symmetric DC power supply

F8-5801

Specifications

.Output voltage: +5V, -5V, +8V, -8V
.Output current: 1A
.Load regulation: 50mV
.Line regulation: 50mV
.Ripple: 10mV
.Protection: Over current, over heat
.Input voltage: 110~127VAC±10% 60Hz or
                      220~240VAC±10% 50Hz
.Weight: 2.5kg

Symmetric DC power supply

F8-1501

Specifications

.Output voltage: ±15V
.Output current: 1A
.Load regulation: 20mV
.Line regulation: 20mV
.Ripple: 10mV
.Input voltage: 110~127VAC±10% 60Hz or
                      220~240VAC±10% 50Hz
.Weight: 2.5kg

F8-1501

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

F8-1201

Regulated DC power supply

F8-1201

Specifications

.Output voltage:	3V, 4.5V, 6V, 7.5V, 9V, 12V
.Output current:	1A
.Load regulation:	10mV
.Line regulation:	10mV
.Ripple:	1mV
.Protection:	Current limit
.Input voltage:	110~127VAC±10% 60Hz or 220~240VAC±10% 50Hz
.Weight:	2kg

AC & DC power supply

F8-1203E

NEW

Specifications

.DC output voltage: 0~12V
.DC output current: 3A
.Load regulation: 10mV
.Line regulation: 10mV
.Ripple: 1mV
.3 digits display for DC voltage

.AC output voltage: 3V, 6V, 9V, 12V
.AC output current: 3A
.AC overload protection

.Input voltage: 110~127VAC±10% 60Hz or
                      220~240VAC±10% 50Hz
.Weight: 2.5kg

F8-1203E

F8-1505

AC & DC breadboard power supply

F8-1505

Specifications

.DC output: 0~+15V/500mA
                     0~-15V/500mA
                     +5V/1A
                     -5V/500mA
.AC output: 12V-6V-0-6V-12V, 300mA
.Load regulation: 200mV
.Line regulation: 200mV
.Ripple: 20mV
.Input voltage: 110~127VAC±10% 60Hz or
                     220~240VAC±10% 50Hz
.Weight: 3kg

BXR SERIES RESISTOR BOX CE

Features
.**High accuracy to 1%**
.Economical, high performance high resistance decade
 for all laboratory
.Plastic cabinet for better insulation

BXR-04 Specifications

Decade	Range	Max. Current	Dimension(mm) (L×W×H)	Weight	
1	1Ω~10Ω	700mA			
2	10Ω~100Ω	200mA	190×140×80	0.5kg	
3	100Ω~1kΩ	70mA			
4	1kΩ~10kΩ	20mA			

BXR-04

BXR-05 Specifications

Decade	Range	Max. Current	Dimension(mm) (L×W×H)	Weight	
1	1Ω~10Ω	700mA			
2	10Ω~100Ω	200mA			
3	100Ω~1kΩ	70mA	190×140×80	0.5kg	
4	1kΩ~10kΩ	20mA			
5	10kΩ~100kΩ	7mA			

BXR-05

BXR-06 Specifications

Decade	Range	Max. Current	Dimension(mm) (L×W×H)	Weight	
1	1Ω~10Ω	700mA			
2	10Ω~100Ω	200mA			
3	100Ω~1kΩ	70mA			
4	1kΩ~10kΩ	20mA	170×240×90	0.8kg	
5	10kΩ~100kΩ	7mA			
6	100kΩ~1MΩ	1mA			

BXR-06

BXR-07 Specifications

Decade	Range	Max. Current	Dimension(mm) LxWxH	Weight	
1	1Ω~10Ω	700mA			
2	10Ω~100Ω	200mA			
3	100Ω~1kΩ	70mA			
4	1kΩ~10kΩ	20mA	170x240x90	0.8Kg	
5	10kΩ~100kΩ	7mA			
6	100kΩ~1MΩ	1mA			
7	1MΩ~10MΩ	0.11mA			

BXR-07

POWER SUPPLY
TEST INSTRUMENT
EDU. INSTRUMENT
METER
MACHINE
ACCESSORY

MCP
lab electronics

BXL-07 INDUCTOR BOX

CE

Features
.**High accuracy to 5%(decade 1~6); 10%(decade 7)**
.Economical, high performance high resistance decade
  for all laboratory
.Plastic cabinet for better insulation

BXL-07

BXL-07 Specifications

Decade	Range	Max.DC Current	Dimension(mm) (L×W×H)	Weight
1	$1\mu H$~$10\mu H$	300mA		
2	$10\mu H$~$100\mu H$	200mA		
3	$100\mu H$~1mH	100mA		
4	1mH~10mH	100mA	170×240×90	1.2kg
5	10mH~100mH	70mA		
6	100mH~1H	50mA		
7	1H~10H	40mA		

BXC-05 CAPACITOR BOX

CE

Features
.**High accuracy to 5%**
.Economical, high performance high resistance decade
  for all laboratory
.Plastic cabinet for better insulation

BXC-05

BXC-05 Specifications

Decade	Range	Max.Voltage	Dimension(mm) (L×W×H)	Weight
1	0.1nF~1nF			
2	1nF~10nF			
3	10nF~100nF	$300V_{DC}$/$230V_{AC}$(50Hz)	170×240×90	0.8kg
4	100nF~$1\mu F$			
5	$1\mu F$~$10\mu F$			

MCP
lab electronics

LCR MATRIX BOX

RM-7 RESISTOR MATRIX $C \in$

Features

.New design and convenience operation
.High accuracy to 1%
.Plastic cabinet for better insulation

Specifications

Range:	0~11.111MΩ(1Ω steps) with seven decades
Accuracy:	1%
Wattage:	0.5W
Internal stray resistor:	0.3Ω
Dimensions:	190×140×80 mm
Weight:	400g

RM-7

CM-5 CAPACITOR MATRIX $C \in$

Features

.New design and convenience operation
.High accuracy to 5%
.Plastic cabinet for better insulation

Specifications

Range:	0~11.111μF(100pF steps) with five decades
Accuracy:	5%
Voltage limit:	50VDC (non-polarized capacitor)
Internal residual capacitor:	50pF
Dimensions:	190×140×80 mm
Weight:	350g

CM-5

IM-4 INDUCTOR MATRIX $C \in$

Features

.New design and convenience operation
.High accuracy to 5%
.Plastic cabinet for better insulation

Specifications

Range:	0~111.1mH (10μH steps) with four decades
Accuracy:	5%
Current limit:	100mA
Internal stray inductor:	0.6μH
Dimensions:	190×140×80 mm
Weight:	450g

IM-4

POWER SUPPLY
TEST INSTRUMENT
EDU. INSTRUMENT
METER
MACHINE
ACCESSORY

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

DBR SERIES RESISTOR BOX $C\epsilon$

Features
.High accuracy to 1‰

DBR-06 Specifications

Decade	Range	Max. Current	Dimension(mm) (W×H×D)	Weight
1	0.1Ω ×10	700mA		
2	1Ω ×10	700mA		
3	10Ω ×10	200mA		
4	100Ω ×10	70mA	285×140×215	2.2kg
5	1000Ω ×10	20mA		
6	10000Ω ×10	7mA		

DBR-06

DBR-07 Specifications

Decade	Range	Max. Current	Dimension(mm) (W×H×D)	Weight
1	0.01Ω ×10	700mA		
2	0.1Ω ×10	700mA		
3	1Ω ×10	700mA		
4	10Ω ×10	200mA	285×140×215	2.2kg
5	100Ω ×10	70mA		
6	1000Ω ×10	20mA		
7	10000Ω ×10	7mA		

DBR-07

DBC-05 CAPACITOR BOX $C\epsilon$

Features
.High accuracy to 2%

DBC-05 Specifications

Decade	Range	Max. Voltage	Dimension(mm) (W×H×D)	Weight
1	0.1nF×10			
2	1nF×10			
3	10nF×10	$300V_{DC}/230V_{AC}$(50Hz)	285×140×215	2.2kg
4	100nF×10			
5	1μF×10			

DBC-05

DBL-06 INDUCTOR BOX $C\epsilon$

Features
.High accuracy to 2%

DBL-06 Specifications

Decade	Range	Max. Current	Dimension(mm) (W×H×D)	Weight
1	0.01mH×10	200mA		
2	0.1mH×10	100mA		
3	1mH×10	100mA		
4	10mH×10	70mA	285×140×215	2.2kg
5	100mH×10	50mA		
6	1H×10	40mA		

DBL-06

DWB-01 WHEATSTONE BRIDGE $C\epsilon$

Features

.Wide measuring range 1Ω to 10MΩ
.Built in galvanometer and bridge power source
.Null measuring method
.One multiplier and four measuring arms
.Guarding and shielding with a portable metal case

DWB-01

Electrical characteristics:

Measuring range: 1Ω~11.11MΩ
Measuring armfour decade: 1000Ω×10 + 100Ω×10 + 10Ω×10 + 1Ω×10

Multiplier	Measuring range	Accuracy	Bridge power source
×0.001	1~11.11Ω	0.5%*/0.5%**	
×0.01	10~111.1Ω	0.2%*/0.2%**	
×0.1	100~1111Ω	0.1%*/0.1%**	Internal battery 3V
×1	1k~5kΩ	0.1%*/0.1%**	External power 4.5V
	5k~11.11kΩ	0.2%*/0.1%**	
×10	10k~50kΩ	0.1%*/0.1%**	
	50k~111.1kΩ	1%*/0.1%**	
×100	100k~500kΩ	2%*/0.2%**	Internal battery 3V
	500k~1111kΩ	5%*/0.2%**	External power 15V
×1000	1M~11.11MΩ	20%*/0.5%**	

*Use internal battery power source
**Use external power source

Galvanometer(built-in)sensitivity:	0.6μA/div., battery: 9V 6F22
Operating temperature:	5~35℃
Humidity range:	85%max., relative
Dimensions:	255×140×210 mm
Weight:	2.5kg

DKB-01 KELVIN BRIDGE CE

Features

.**Wide measuring range 0.0001Ω to 11Ω**
.**Built in standard resistors**
.Built in galvanometer and bridge power source
.Null measuring method
.One multiplier and two measuring dials
.Guarding and shielding with a portable metal case

DKB-01

Electrical characteristics:

Measuring range: 0.0001Ω to 11Ω
Measuring dials: one decade: 0.01×10
one linearity dial:0.001~0.01

Multiplier	Measuring range	Accuracy	Standard resistor	Bridge power source
×100	1~11Ω	0.2%	10Ω	
×10	0.1~1.1Ω	0.2%	1Ω	
×1	0.01~0.11Ω	0.2%	0.1Ω	1.5V×2
×0.1	0.001~0.011Ω	0.5%	0.01Ω	
×0.01	0.0001~0.0011Ω	1%	0.001Ω	

Galvanometer(built-in)sensitivity: 0.6μA/div., battery: 9V 6F22
Operating temperature: 5~35℃
Humidity range: 85%max., relative
Dimensions: 285×140×215 mm
Weight: 2.5kg

DPM-01 DC POTENTIOMETER CE

Features

.Precise measure DC potential or voltage
.Standard DC potential output for thermal
 instrumentation calibration
.Calibrate thermocouple and secondary thermal instrumentation
.Together with standard resistor, it may measure
 DC current and resistance
.Two measuring ranges 0~230mV, 0~46mV
.Null measuring method with built in galvanometer
.One multiplier and two measuring dials
.Guarding and shielding with a portable metal case

DPM-01

Electrical characteristics:

Measuring dials: one stepper: 0~220mV (22 steps)
                  one linearity dial:0~10mV

Measure potential or voltage

Multiplier	Measuring range	Resolution	Working current	Accuracy
×1	0~230mV	50uV	5mA	0.1%
×0.2	0~46mV	10uV	1mA	

Potential output

Multiplier	Measuring range	Resolution	Working current	Accuracy
G1	0~230mV	50uV	5mA	0.1%
G0.2	0~46mV	10uV	1mA	

Working power source:	1.5V DC
Reference voltage source:	9V 6F22
Galvanometer(built-in)sensitivity:	0.6 µA/div., battery: 9V 6F22
Operating temperature:	5~35℃
Humidity range:	85%max., relative
Dimensions:	285×140×215 mm
Weight:	2.5kg

POWER SUPPLY
TEST INSTRUMENT
EDU. INSTRUMENT
METER
MACHINE
ACCESSORY

MCP
lab electronics

M20-101 EXPERIMENT OF VOLTAGE TRANSFORMER

$C\epsilon$

Features
.Φ4mm socket for convenience connecting
.Digital voltage meter for convenience indicating
 primary and secondary voltage

Specifications:

.Primary voltage:	0~300V
.Secondary voltage:	0~30V
.Display of voltage meter 1:	0~1999V (3 1/2 digits)
.Display of voltage meter 2:	0~199.9V (3 1/2 digits)
.Voltage transformer ratio:	10:1
.Power source:	110~127VAC±10% 60Hz or 220~240VAC±10% 50Hz
.Dimensions:	250×80×200mm
.Weight:	2.5kg

M20-101

M20-201 EXPERIMENT OF CURRENT TRANSFORMER

$C\epsilon$

Features:
.Φ4mm socket for convenience connecting
.Digital current meter for convenience indicating
 primary and secondary voltage
.Three bulbs' socket (W27) for lamp connecting

Specifications:

.Primary current:	0~2A
.Secondary current:	0~200mA
.Display of current meter 1:	0~1.999A (3 1/2 digits)
.Display of current meter 2:	0~199.9mA (3 1/2 digits)
.Current transformer ratio:	10:1
.Power source:	110~127VAC±10% 60Hz or 220~240VAC±10% 50Hz
.Dimensions:	250×80×200mm
.Weight:	2.5kg

M20-201

EXPERIMENTS BOX

F5-001 CAPACITOR BOX $C\epsilon$

Features:
.Safety moulded piggy-back jumper to make the series and parallel connections easier
.Non-polar capacitor box

Specifications:
.0 to 15 μF, supplied with 12 jumpers
.Accuracy: 1%
.U_{MAX}: 400V
.Safety sockets:Φ4mm
.C(μF): 0.5-1-2-2-5-5
.Dimensions(W×H×D): 90×100×160mm
.Weight: 0.5kg

F5-001

F20-101 DEMONSTRATION ELECTRIC COUNTER BOX $C\epsilon$

Features:
.Double insulation for safety using
.Terminals for current measuring

Specifications:
.Working voltage: 220V
.Working frequency: 50Hz
.Max. Current: 20A
.1kWh:300r/kWh
.Safety sockets: Φ4mm
.Protection: 20A fuse
.Dimensions(W×H×D): 160×160×130 mm
.Weight: 0.5kg

F20-101

F4 SERIES EXPERIMENTS BOXES $C\epsilon$

Features
. Plastic box can be mounted on other surface
. Φ4mm safety socket connection
. Dimensions (W×H×D): 115×80×130mm

F4-100 series transformer

. 230VAC input and 0-6VAC-12VAC output
. 50VA rated power (Max.)
. Fuse for over current protection

F4-101

F4-200 series current transformer

. 10A/20A input and 5A output
. 720V operating voltage (Max.)
. Working frequency: 50Hz/60Hz
. Accuracy: 1.0%

F4-201

F4-300 series shunt

. 20A input and 100mV output
. Accuracy: 0.5%

F4-301

POWER SUPPLY
TEST INSTRUMENT
EDU. INSTRUMENT
METER
MACHINE
ACCESSORY

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

SAFETY MODULAR TRANSFORMER MDT

Feature
Both primary coil and secondary coil has safety cover
Primary circuit has standard power socket, fuse and switch
Secondary circuit has 4 mm safety socket and double isolation ▢

U/I shape stacking silicon core:

CORE MDT-C
Dimension: H 200mm, L 120mm, 40x50mm section
Weight: 6kg

PRIMARY COIL MDT-P1
.220V power supply
.440T, Max.I 4A
.Power socket, switch, fuse
.Dimension: 110x90x100mm
.Weight: 0.85kg

PRIMARY COIL MDT-P2
.110V power supply
.220T, Max.I 8A
.Power socket, switch, fuse
.Dimension: 110x90x100mm
.Weight: 0.85kg

SECONDARY COIL MDT-S1
.Consists of 5 windings in series
.6T, 12T, 24T, 48T, 96T
.Max.I 25A, 25A, 13A, 6.6A, 3.3A
.4 mm safety socket output
.Double isolation ▢
.Dimension: 110x90x100mm
.Weight: 0.85kg

SECONDARY COIL MDT-S2
.Consists of 2 windings in series
.1000T, 1000T, Max.I 0.8A
.**Warning:** w/o load, the coil
 delivers 1000V
.4 mm safety socket output
.Double isolation ▢
.Dimension: 110x90x100mm
.Weight: 0.85kg

SECONDARY COIL MDT-S3
.Consists of 2 windings in series
.220T, 220T, Max.I 3.6A
.**Warning:** w/o load, the coil
 delivers 220V
.4 mm safety socket output
.Double isolation ▢
.Dimension: 110x90x100mm
.Weight: 0.85kg

SECONDARY COIL MDT-S4
.Consists of 2 separate coils
 and each coil has 2
 symmetrically windings
.12T, 12T, 24T, 24T
.Max.I 25A, 13A
.4 mm safety socket output
.Double isolation ▢
.Dimension: 110x90x100mm
.Weight: 0.85kg

SINGLE & THREE-PHASE RESISTIVE, CAPACITIVE AND INDUCTIVE LOAD $C\epsilon$

Features:
.Steps of 20%
.DC mode or 220V single phase
.Three-phase star 380V and delta 220V

Specifications

Model	Character	Power	Resistor	Dimensions (W×H×D)	Weight(kg)	Phase
SRL-1000	Resistive	200W/400W/600W 800W/1000W	242 Ω /121 Ω /81 Ω 61 Ω /48 Ω	200×250×425	8	Single
TRL-3000	Resistive	(200W/400W/600W 800W/1000W) X 3	(242 Ω /121 Ω /81 Ω 61 Ω /48 Ω) X 3	420×250×425	24	Three

Both SRL-1000 and TRL-3000 have AC cooling fan(s) on back panel

SRL-1000

TRL-3000

Model	Character	Power	Capacitor	Dimensions (W×H×D)	Weight(kg)	Phase
SCL-1000	Capacitive	200W/400W/600W 800W/1000W	13uF/26uF/39uF 53uF/66uF	150×130×185	1.5	Single
TCL-3000	Capacitive	(200W/400W/600W 800W/1000W) X 3	(13uF/26uF/39uF 53uF/66uF) X 3	300×130×185	3	Three

SCL-1000

TCL-3000

Model	Character	Power	Inductor	Dimensions (W×H×D)	Weight(kg)	Phase
SIL-1000	Inductive	200W/400W/600W 800W/1000W	770mH/385mH/257mH 193mH/154mH	190×150×365	10	Single
TIL-3000	Inductive	(200W/400W/600W 800W/1000W) X 3	(770mH/385mH/257mH 193mH/154mH) X 3	380×150×365	30	Three

SIL-1000

TIL-3000

Note: all the three phase load can be used independently as three single phase loads

P228001 $C\epsilon$

Spectrum lamp holder & power supply

Features

.8 pins or E27 lamp socket for choice
 (P228001 & P2281XX series)
.7 kinds of P2281XX series

Specifications

.Maximum output current:	1A
.Lamp housing:	56(W)×190(H)×56(D)mm
.Tripod rod:	295mm
.Lamp socket:	8 pins or E27
.Dimensions(power supply only):	153(W)×115(H)×195(D)mm
.Weight:	3k

P228001

P2281XX SERIES $C\epsilon$

Spectral lamps

Specifications

.Socket: 8 pins or E27

Model	Filling	Current
P228102	He	1A
P228103	Hg	1.2A
P228104	Na	1.2A
P228105	Ne	1.1A
P228106	Zn	1.2A
P228107	Hg-cd	1.1A

P2281XX series

SPECTRUM LAMP

P218001 $C\epsilon$

Spectrum tube power supply

Features
.Spring-contacts in fully insulated fixtures
.Protective window guarantee secure mounting
 and reliable operation
.With safe lock protection: when the safe door opens, the spectrum
 tube power supply will stops working even the power is still on.
.13 kinds of P2181XX series

Specifications

.Voltage: 5000V
.Maximum current: 10mA
.Dimensions: 118(W)×375(H)×120(D)mm
.Weight: 2.8kg

Safe lock protection

P218001

P2181XX SERIES $C\epsilon$

Spectrum tubes

Specifications
.Capillary length: 100mm
.Total length: Approx. 260mm

Model	Filling
P218101	Air
P218102	Argon
P218103	Carbon dioxide
P218104	Helium
P218105	Hydrogen
P218106	Iodine
P218107	Krypton
P218108	Mercury
P218109	Neon
P218110	Nitrogen
P218111	Oxygen
P218112	Water vapor
P218113	Xenon

P2181XXseries

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

TM801 $C\epsilon$

TM801

Features

.Multiple function
.Microprocessor controlled
.Hand hold and rechargeable battery operation

Introduction

This microprocessor controlled LCD display universal counter can be used for measurement of time intervals, simple pendulum periods, velocity, acceleration, revolutions per second, frequency, pulses etc. It measures time intervals from 0.1 millisecond and frequencies to 20 KHz. The counter is provided with a five-digit LCD display, and a compact case making the apparatus highly suitable for student lab exercises. RJ45 inputs are provided for connection of photogate. Memory is provided for storing measured values.

Specification	
Display	5 digits LCD
Input	RJ45
Start / Stop	from 0.01 s to 12000 s, resolution 0.01s/1s
Collision	A and B passage time from 0.1ms to 19999s, resolution 0.1ms
Acceleration	passage time and A to B time from 0.1ms to19999s, resolution 0.1ms
Period	from 0.1ms to 19999s, resolution 0.1ms
Frequency / resolution	from 0.1 Hz to 19999Hz / 0.1 Hz
Counter	from 1 count to 19999 counts
Memory storage	10 values
Rechargeable battery	9V/1800mAh
Accessory	photogate P416001, RJ45 cable, Power adapter
Dimensions	165 x 95 x 45 mm (timer) 300 x 206 x 60 mm (box)
Weight	1.0 kg (with box)

Ultrasonic waves experiment system of reflexion $C\epsilon$

Objects

Demonstrating the principle of an echo sounder. Determining the velocity of sound in air from the transit time of a sound pulse and the distance to the reflecting object.
Determining distance by measuring the transit time of the sound pulse.

Principles

Ultrasonic waves are reflected at the boundary surfaces between media with differing resistances to sound waves. An echo sounder (or sonar) device emits pulsed ultrasonic signals and measures the time in which a signal is reflected from such a boundary surface to the receiver. To simplify the configuration, the transmitter and receiver are in the same location.

The time between transmission and reception can be used to determine the distance to the reflecting object (if the velocity of sound is known), or to determine the velocity of sound over a known distance. This method is commonly used e.g. to determine water depths at sea.
In the experiment, the echo-sounder principle is used to determine the velocity of sound in air, and to determine distances.

Two ultrasonic transducers serve as the transmitter and receiver, depending on their connection.
A piezoelectric body converts electrical to mechanical energy. When the AC voltage is applied to the piezoelectric body, the transducer configured as a transmitter supplies a sufficiently high sound amplitude at a resonance frequencies (approx. 40 kHz). Conversely, sound waves generate mechanical oscillations in the transducer when configured as a receiver. The amplitude of the resulting piezoelectric AC voltage is proportional to the sonic amplitude.

System composition

2 pcs	Ultrasonic transducers 40 kHz	P416000
1 pc	AC amplifier	F16-015
1 pc	Generator 40 kHz	F16-014
1 pc	Digital storage oscilloscope	DQ7202CA
2 pcs	Test leads	PTL927
2 pcs	Stand base, V-shape	P101413
1 pc	Metal scale, 1 m	
1 pc	Reflection plate	

F16-014 Generator 40 kHz

Features
With continuance and spacing square wave generator for operating source, for ultrasonic transducer 40 kHz (P416000) as an emitter. Inner and external frequency counter

Technical Data
Generator
Frequency range: 40 kHz, can be set from 35 kHz to 50 kHz
Pulse operation:
 pulse duration approx. 0.2 ms
 pulse spacing approx. 80 ms
Transducer output voltage: >18 Vpp
Trigger output voltage: >9 Vpp
Counter Frequency range: 1 KHz~150 kHz
Sensitivity: 100 mV
Max. input voltage: 20V
Connection sockets: 4 mm dia.
Dimensions: 19 cm × 13.5 cm × 7 cm

F16-015 AC-amplifier

Features
Sensitive amplifier with microphone input for verifying ultrasonic waves in conjunction with an ultrasonic transducer (P416000) as a receiver, and sound amplification

Technical Data
Gain: 10× to 1000×, continuously adjustable
Frequency range: 10 kHz (100 Hz microphone input) to 50 kHz
Outputs: signal, trigger and level, short-circuit proof
Max. signal output: 4 Vp-p
Trigger output: TTL compatible
Max. DC level output: 4 V
Connection sockets: 4 mm dia.
Dimensions: 19 cm × 13.5 cm × 7 cm
Weight: 0.5 kg

P416000 Ultrasonic transducer 40 kHz

Features
Piezoelectric air ultrasonic transducer for experiments in the areas of geometric and wave-mechanical acoustics. The transducer is used as transmitter and receiver. In housing, on stand rod, with coax. connection cable.

Technical Data
Resonance frequency: 40 kHz
Bandwidth: approx. 6 kHz
Capacitance: 2000 pF
Connection: 1 m coax. cable with 4 mm sockets
Housing: 48 mm × 27 mm dia.
Stand rod: 20 cm × 10 mm dia.

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

FINE BEAM TUBE SYSTEM   new

Objects
Deflection of electrons in a closed circular path inside a magnetic field
Determination of specific change of an electron e/m

Principles
The fine beam tube is used for investigating the deflection of cathode rays in a uniform magnetic field produced by a pair of Helmholtz coils (P338001). In addition, it can also be used for quantitative determination of the specific charge of an electron e/m.
Located inside a glass bulb with a helium residual gas atmosphere is an electron gun, which consists of an indirectly heated oxide cathode, a Wehnelt cylinder and a perforated anode. The gas atoms are ionized along the path of the electrons and a narrow, well-defined, luminescent beam is produced. Incorporated measurement marks facilitate a parallax-free determination of the diameter of the circular path of the beam deflected in the magnetic field.

SYSTEM A
BASIC FINE BEAM TUBE SYSTEM

SYSTEM COMPOSITION

1pc fine beam tube	P318001
1pc fine beam tube base	P328001
1pc Helmholtz pair of coils	P338001
1pc DC power supply	M10-QP500E

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

SYSTEM B
COMPLETE FINE BEAM TUBE SYSTEM

SYSTEM COMPOSITION

1pc fine beam tube	P318001
1pc fine beam tube base+ Helmholtz pair of coils	P328002
1pc DC power supply	M10-SPN300-03C
1pc DC power supply	M10-SPN110-01C
1pc DC power supply	M10-SPM18-3C

Fine beam tube P318001

Gas filling:	Helium
Gas pressure:	1.3hPa
Filament voltage:	4~10V AC/DC
Filament current:	600mA at 6.3V
Focus voltage:-50V	-50V
Anode voltage:	200~300V
Anode current:	<0.3mA
Circular path diameter:	20~100mm
Division spacing:	10mm
Tube diameter:	160mm
Total length:	255mm
Weight:	0.35kg

THOMSON TUBE SYSTEM

NEW

Objects
Thermionic emission of electrons
Deflection of electrons in electron and magnetic field
Estimate of specific change of an electron e/m

Principles
The Thomson tube is intended for investigating the deflection of electron beams in electrical and magnetic fields. It can be used to estimate the specific charge of an electron e/m and to determine the electron velocity v. The Thomson tube comprises an electron gun which emits a narrow, focused ribbon of cathode rays within an evacuated, clear glass bulb. A tungsten filament hot cathode is heated directly and the anode takes the form of a cylinder. The deflection of rays can be achieved electrostatically by means of a built-in platecapacitor formed by the pair of deflection plates or magnetically with the help of the Helmholtz coils (P338002) magnetically.
The cathode rays are intercepted by a flat mica sheet, one side of which is coated with a fluorescent screen and the other side of which is printed with a millimeter graticule so that the path of the electrons can be easily traced. The mica sheet is held at 10 degree to the axis of the tube by the two deflecting plates.

SYSTEM C1
THOMSON TUBE IN MAGNETIC FIELD
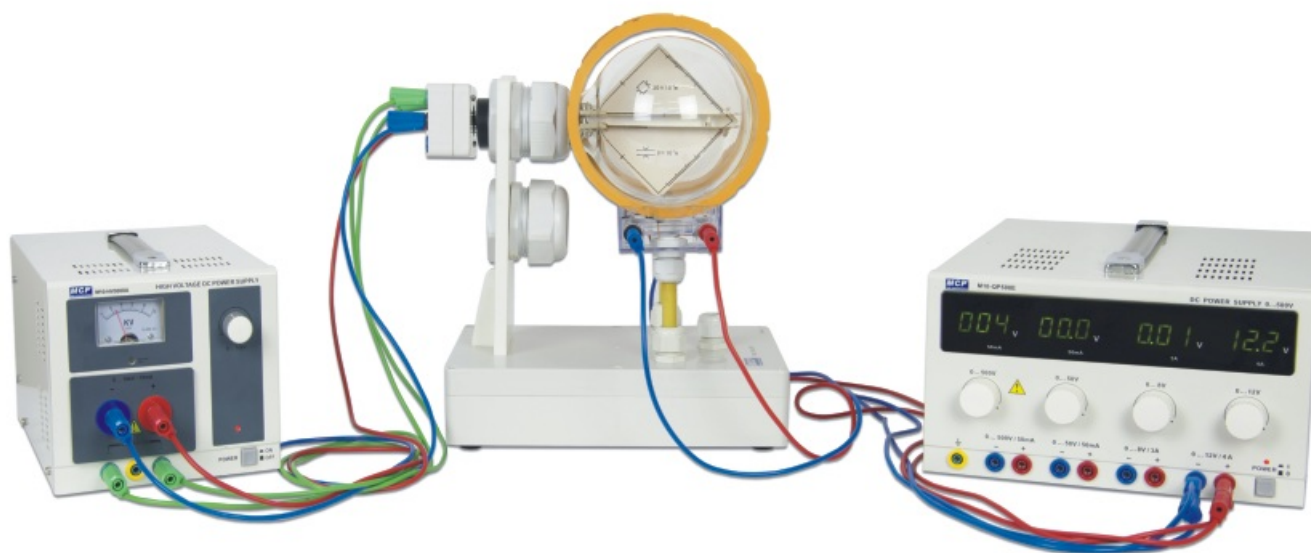
SYSTEM COMPOSITION

1pc Thomson tube	P318002
1pc Helmholtz pair of coils	P338002
1pc tube holder	P348001
1pc tube base	P328003
1pc DC power supply	M10-HV5000A
1pc DC power supply	M10-QP500E

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

SYSTEM C2
THOMSON TUBE IN ELECTRO STATIC FIELD
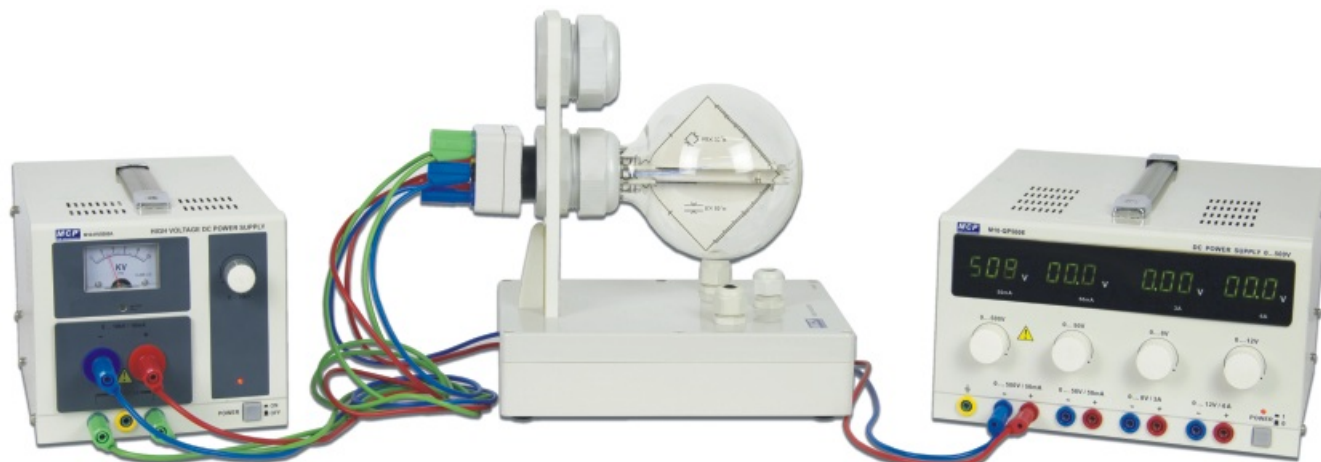
SYSTEM COMPOSITION

1pc Thomson tube	P318002
1pc tube holder	P348001
1pc tube base	P328003
1pc DC power supply	M10-HV5000A
1pc DC power supply	M10-QP500E

Thomson tube P318002

Filament voltage:	6.3V AC
Max. anode voltage:	5000V
Anode current:	approx. 0.1mA at 4000V
Max. capacitor voltage:	500V
Tube diameter:	130mm
Total length:	245mm
Weight:	0.3kg

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

ELECTRON DEFLECTION TUBE SYSTEM   NEW

Objects
Thermionic emission of electrons
Deflection of electrons in electron and magnetic field
Estimate of specific change of an electron e/m

Principles
The electron-beam deflection tube is intended for investigating the deflection of electron beams in electrical and magnetic fields. It can be used to estimate the specific charge of an electron e/m and to determine the electron velocity v. The electron-beam deflection tube comprises an electron gun which emits a narrow, focused ribbon of cathode rays within an evacuated, clear glass bulb. A tungsten filament hot cathode is heated directly and the anode takes the form of a cylinder. The deflection of rays can be achieved electrostatically by means of a built-in plate capacitor formed by the pair of deflection plates or magnetically with the help of the Helmholtz coils (P338002) magnetically. The cathode rays are intercepted by a flat mica sheet, one side of which is coated with a fluorescent screen and the other side of which is printed with a centimeter graticule so that the path of the electrons can be easily traced. The mica sheet is held at 15 degree to the axis of the tube by the two deflecting plates.

SYSTEM D1
ELECTRON DEFLECTION TUBE IN MAGNETIC FIELD
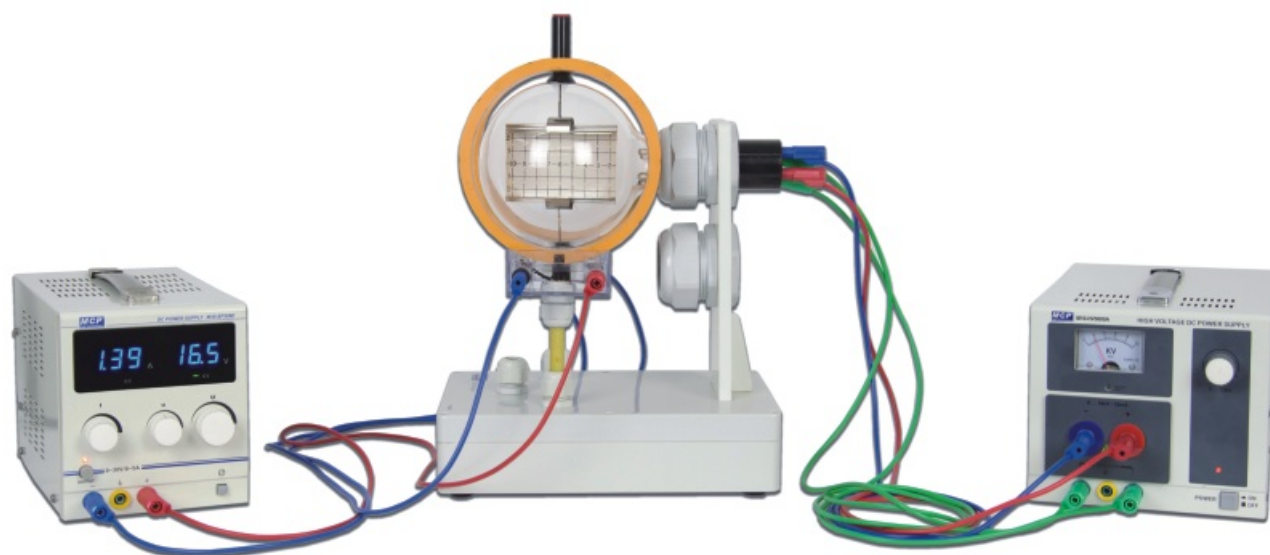
SYSTEM COMPOSITION

1pc electron deflection tube	P318003
1pc Helmholtz pair of coils	P338002
1pc tube holder	P348001
1pcs DC power supply	M10-HV5000A
1pc DC power supply	M30-SP303E

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

SYSTEM D2
ELECTRON DEFLECTION TUBE IN ELECTRO STATIC FIELD
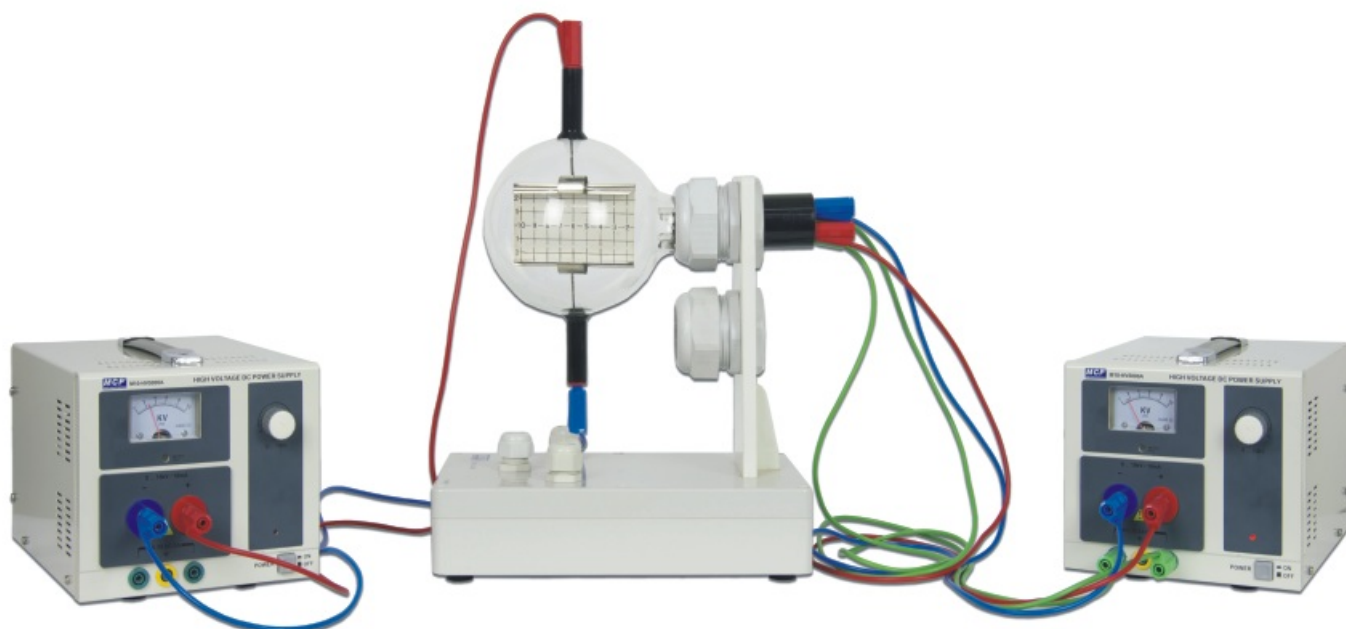
SYSTEM COMPOSITION

1pc electron deflection tube	P318003
1pc tube holder	P348001
2pcs DC power supply	M10-HV5000A

Electron deflection tube P318003

Filament voltage:	6.3V AC
Max. anode voltage:	5000V
Anode current:	approx. 0.1mA at 4000V
Max. capacitor voltage:	5000V
Tube diameter:	130mm
Total length:	240mm
Weight:	0.3kg

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

SYSTEM COMPOSITION UNITS SPECIFICATION

Fine beam tube base P328001

Dimension: 160 x 67 x 41mm
Weight: 150 g

Thomson tube base P328003

Dimension: 83 x 58 x 34mm
Weight: 100 g

Fine beam tube base and Helmholtz pair of coils P328002

Dimension: 300 x 400 x 230mm
Weight: 4.5 kg

Helmholtz pair of coils P338001

Number of turns: 124 each
Max. field: 3.8 mT
Coil diameter: 300mm
Rating current: 5A
Effective resistance: 1.2Ω (2.4Ω in series)
Terminals: 4mm safety sockets
Weight: 4 kg

Helmholtz pair of coils P338002

Number of turns: 320 each
Max. field: 4.5mT
Coil diameter: 136mm
Rating current: 1.5A
Effective resistance: 11Ω
Terminals: 4mm safety sockets
Weight: 1 kg

Tube holder P348001

Dimension: 260 x 180 x 290mm
Weight: 1 kg

DC power supply M10-QP500E

Independent four outputs are primarily intended to supply power for electron tube and Helmholtz coils simultaneously.
Output:0~500VDC/50mA   0~50VDC/50mA
        0~8VDC/3A   0~12VDC/4A
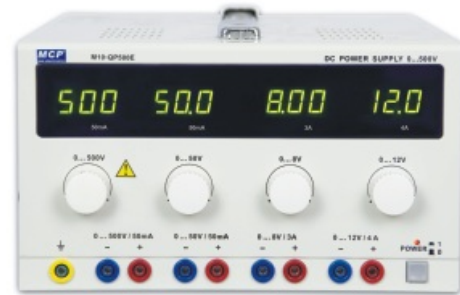
DC power supply M10-HV5000A

5000V high-voltage source and 6.3V for operation of electron tube
Output:0~5000VDC/10mA, 6.3VAC/3A

DC power supply M10-SPN300-03C

300V high-voltage source and 6.3V for operation of electron tube
Output:0~300VDC/300mA, 6.3VAC/3A

DC power supply M10-SPN110-01C

110V voltage source for focus of electron tube
Output:0~110VDC/100mA

DC power supply M10-SPM18-3C

3A current source for operation of Helmholtz coils
Output:0~18VDC/0~3A

DC power supply M30-SP303E

3A current source for operation of Helmholtz coils
Output:0~30VDC/0~3A

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

MCP
lab electronics

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

Objects

The training systems of electronic circuits are designed for educational practice. All components are separated as in transparent plastic boxes with magnetic stand on a grid panel or without magnetic on a rubber matrix. Circuit assemble is made by leads plug. The training systems are used in some certain experiments, it can be completed according to the written experiment manual and also you can design other more experiments with yourself.

BASIC ELECTRONIC CIRCUIT TRAINING SYSTEM F1-1   NEW

Features
The training system is used in the analog electronic circuits, it can be completed according to the F1-1 experiment manual. Totally 33 recommend experiments are contained in this system with the corresponding components and more experiments can be designed to do by yourself.

System contain:

1. Grid panel and tray	1 pcs	4. Experiment manual	2 pcs
2. Components	49 pcs		
3. Leads	40 pcs		
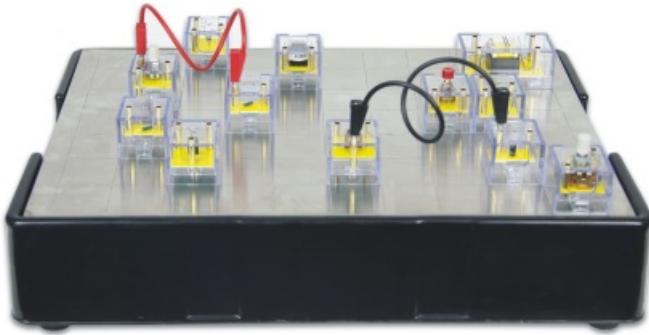
EXPERIMENTS CONTENT

1: Series resistors circuit
2: Parallel resistors circuit
3: Compound resistors circuit
4: Ohm's law I = F (V)
5: Ohm's law I = F (R)
6: Kirchhoff's Laws on voltage
7: Kirchhoff's Laws on current
8: Superposition theorem
9: Thevenin's theorem
10: Norton's theorem
11: Voltage divider circuit
12: Wheatstone bridge circuit
13: R, C series circuit in AC circuit
14: R, L series circuit in AC circuit
15: R, L, C series circuit in AC circuit
16: Characteristics of transistor
17: Common base transistor amplifier circuit
18: Common emitter transistor amplifier circuit

19: Common collector transistor amplifier circuit
20: Constant DC voltage control circuit with transistor
21: Capacitors in series and parallel circuit
22: Characteristics of PTC resistor
23: Characteristics of NTC resistor
24: Characteristics of the transformer on load and no load
25: Half-wave rectifier
26: Full-wave rectifier
27: The function of the relay
28: Inductors in series and parallel circuit
29: Magnetic induction circuit transformer
30: Characteristics of diode in DC circuit
31: Characteristics of diode in AC circuit
32: Rectifier and filter current circuit
33: Characteristics of Zener diode

BASIC LOGIC GATE TRAINING SYSTEM F1-2 *NEW*

Features
The training system is used in the digital electronic circuits, it can be completed according to the F1-2 experiment manual. Totally 16 recommend basic logic gate experiments are contained in this system with the corresponding components and more experiments can be designed to do by yourself.

System contain:

1. Rubber matrix and plastic box   1 pcs
2. Components   15 pcs
3. Leads   20 pcs
4. Experiment manual   1 pcs

EXPERIMENTS CONTENT

I Basic Logic Function

1 OR logic gate
2 INVERT logic gate
3 OR + INVERT = NOR logic gate
4 NOR logic gate
5 2-input NAND logic gate
6 4-input NAND logic gate
7 AND - OR - INVERT logic gate

II Boolean Algebra

1 $A = \overline{\overline{A}}$

2 $A+1=1$, $A+0=A$, $A+A=A$, $A+\overline{A}=1$

3 $A \cdot 1 = A$, $A \cdot 0 = 0$, $A \cdot A = A$, $A \cdot \overline{A} = 0$

4 Logic equation

III De Morgan's Theorem

$\overline{A+B} = \overline{A} \cdot \overline{B}$, $\overline{A}+\overline{B}=\overline{A \cdot B}$, $A \cdot B = \overline{\overline{A}+\overline{B}}$, $\overline{A+B+C} = \overline{A} \cdot \overline{B} \cdot \overline{C}$,

$\overline{A \cdot B \cdot C} = \overline{A}+\overline{B}+\overline{C}$, $A \cdot C + B \cdot C = (A+B) \cdot C$

IV Exclusive-OR and Its Applications

1 Exclusive-OR
2 Half-Adder, Half-Subtractor
3 Binary Comparator
4 Parity Generator

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

BASIC LOGIC CIRCUIT TRAINING SYSTEM F1-3 NEW

Features
The training system is used in the digital electronic circuits, it can be completed according to the F1-3 experiment manual. Totally 26 recommend basic logic circuit experiments are contained in this system with the corresponding components and more experiments can be designed to do by yourself.

System contain:

1. Rubber matrix and plastic box   1 pcs
2. Components   39 pcs
3. Leads   20 pcs
4. Experiment manual   1 pcs
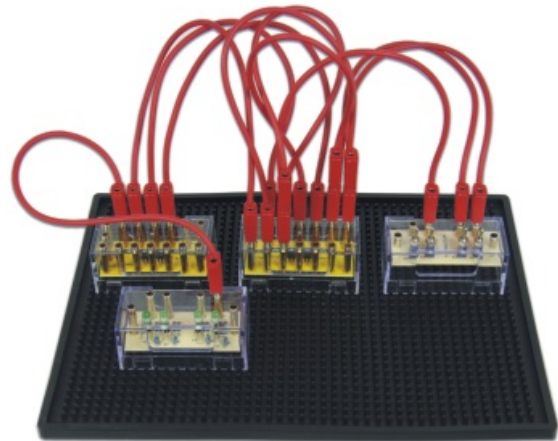
EXPERIMENTS CONTENT

I Adder and Subtractor
1 Half-Adder, Half-Subtractor
2 SUM in Full-Adder and DIFFERENCE
  in Full-Subtractor
3 Co for X+Y+ Ci
4 Full-Adder with Half-Adders
5 2-Bit Parallel Binary Adder
6 4-Bit Binary Full-Adder/2's-complement 4-Bit
  Binary Full-Subtractor

II Bistable or Flip-Flop
1 R-S Flip-Flop with NAND Gates
2 Gated R-S Flip-Flop
3 D Flip-Flop
4 AND-Gated J-K Master-Slave Flip-Flop

III Binary Counters
1 Binary ripple counter
2 Synchronous counter

IV Divide-by-N Counters and Decade Counters
1 Modulus 3 Counter
2 Modulus 6 Counter
3 Decade Counter 2421
4 Decade Counter 8421
5 IC Decade Counter
6 IC Divide-by-10 Counter

V Shift Registers and Ring Counter
1 Shift Register
2 IC Shift Register
3 Quinary ring counter
4 Twisted-ring or Johnson Counter

VI Pulse Forming and Shaping/The Schmitt Trigger
1 Transistor Astable
2 IC Astable
3 Pulse Stretchers
4 Schmitt Trigger

CLASSICAL DIGITAL CIRCUIT TRAINING SYSTEM F1-4   ⊓Ⲉⱳ

Features
The training system is used in the digital electronic circuits, it can be completed according to the F1-4 experiment manual. Totally 57 recommend classical digital circuit experiments are contained in this system with the corresponding components and more experiments can be designed to do by yourself

System contain:

1. Rubber matrix and plastic box   1 pcs
2. Components   77 pcs
3. Leads   30 pcs
4. Experiment manual   1 pcs

EXPERIMENTS CONTENT

I Basic Logic Function

1 OR logic gate
2 INVERT logic gate
3 OR + INVERT = NOR logic gate
4 NOR logic gate
5 2-input NAND logic gate
6 4-input NAND logic gate
7 AND - OR - INVERT logic gate

II Boolean Algebra

1 $A = \overline{\overline{A}}$

2 $A+1=1, A+0=A, A+A=A, A+\overline{A}=1$

3 $A \cdot 1=A, A \cdot 0=0, A \cdot A=A, A \cdot \overline{A}=0$

4 Logic equation

III De Morgan's Theorem

$\overline{A+B}=\overline{A} \cdot \overline{B}, \overline{A+B}=\overline{A} \cdot \overline{B}, \overline{A \cdot B}=\overline{A}+\overline{B}, \overline{A+B+C}=\overline{A} \cdot \overline{B} \cdot \overline{C},$

$\overline{A} \cdot \overline{B} \cdot \overline{C}=A+B+C, \overline{A} \cdot \overline{C+B} \cdot C=(A+B) \cdot C$

IV Exclusive-OR and Its Applications

1 Exclusive-OR
2 Half-Adder, Half-Subtractor
3 Binary Comparator
4 Parity Generator

V Adder and Subtractor
1 Half-Adder, Half-Subtractor
2 SUM in Full-Adder and DIFFERENCE in Full-Subtractor
3 Co for X+Y+ Ci
4 Full-Adder with Half-Adders
5 2-Bit Parallel Binary Adder
6 4-Bit Binary Full-Adder/2's-complement 4-Bit Binary Full-Subtractor

VI Bistable or Flip-Flop
1 R-S Flip-Flop with NAND Gates
2 Gated R-S Flip-Flop
3 D Flip-Flop
4 AND-Gated J-K Master-Slave Flip-Flop

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

EXPERIMENTS CONTENT

VII Binary Counters
1 Binary ripple counter
2 Synchronous counter

XII Decoding and Encoding
1 Decoding
2 Encoding-decimal to excess 3
3 BCD counter with seven-segment LED display

VIII Divide-by-N Counters and Decade Counters
1 Modulus 3 Counter
2 Modulus 6 Counter
3 Decade Counter 2421
4 Decade Counter 8421
5 IC Decade Counter
6 IC Divide-by-10 Counter

XIII Random-Access Memories (RAM)
1 2-bit random-access memory
2 64-bit IC RAM 7489

IX Shift Registers and Ring Counter
1 Shift Register
2 IC Shift Register
3 Quinary ring counter
4 Twisted-ring or Johnson Counter

XIV Operational Amplifier
1 Op-Amp as an analog voltage multiplier
2 Op-Amp as a summer-multiplier
3 Op-Amp as a voltage comparator
4 Intergrator
5 Variable PW generator

X Pulse Forming and Shaping/The Schmitt Trigger
1 Transistor Astable
2 IC Astable
3 Pulse Stretchers
4 Schmitt Trigger

XV D/A and A/D Conversion
1 D/A conversion
2 A/D conversion

XI IC Timer-74122, 74121 and 555
1 74122
2 74121
3 555 Timer

F1 series custom model list:

F1-1000 series
resistor models

F1-4000 series
capacitor models

F1-7000 series
switch and relay

F1-2000 series
potentionmeter models

F1-5000 series
zener and diode models

F1-8000 series
transistor models

F1-3000 series
decade resistor models

F1-6000 series
inductor models

F1-9000 series
transformer models

DYNAMOMETER

Features:
.The spring-type dynamometer can be mounted on a magnetized board for the purpose of demonstration.
.Includes pulley with ball bearing axles and cord groove, cord and hook.
.Large, easily visible round dial as well as zero-point adjustment.

P102420

P102450
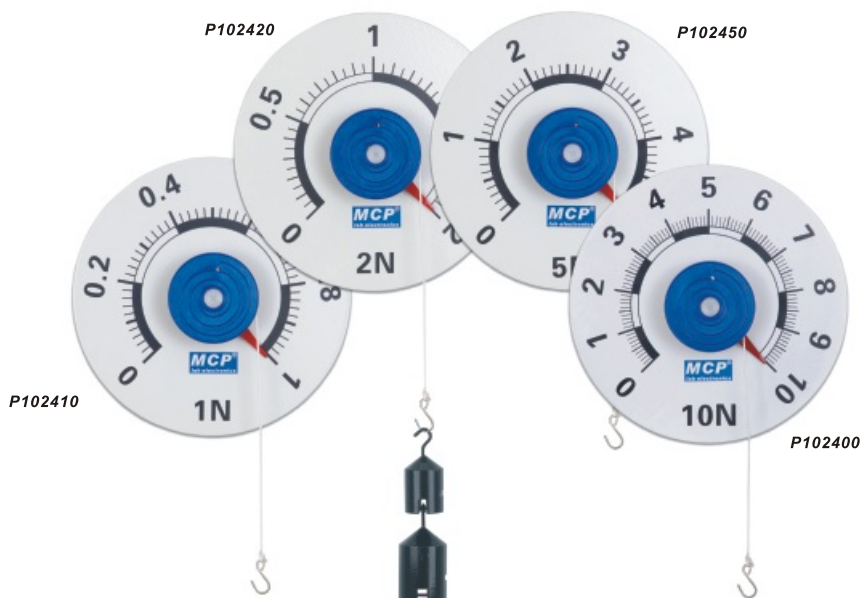
P102410

P102400

Specifications:

Force	No.	Scale division	Measuring precision	Diameter	Magnetic base
1N	P102410	0.02N	2.5%	200mm	Ferrite
2N	P102420	0.05N	2.5%	200mm	Ferrite
5N	P102450	0.1N	2.5%	200mm	NdFeB
10N	P102400	0.1N	2.5%	200mm	NdFeB

$$F'=-F=-(F1+F2) \text{ ("-" means the negative position)}$$
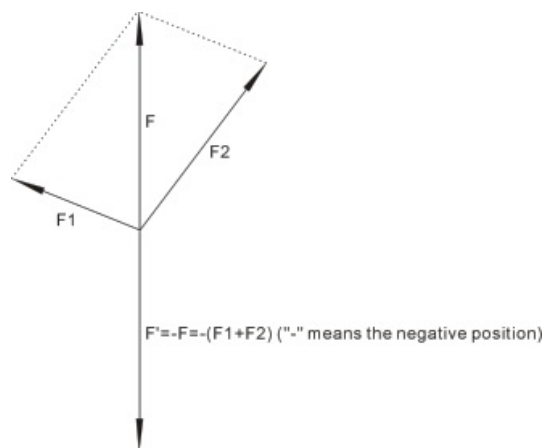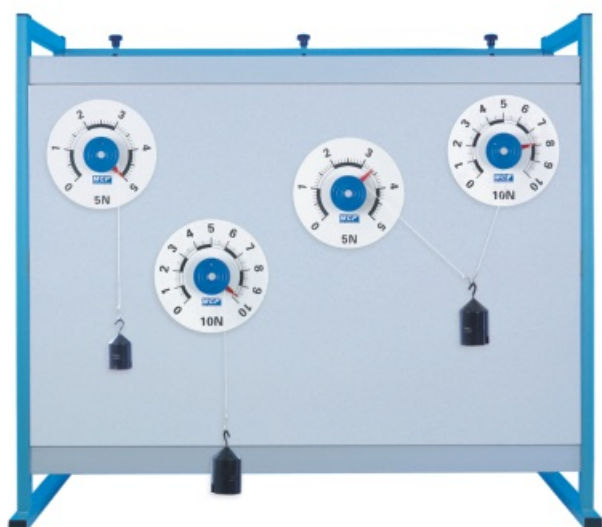
Composition of forces

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

MCP lab electronics

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MSC MODULAR SAFETY CIRCUIT SYSTEM ᴺᴱᵂ

WITH:
SAFETY CIRCUIT BOARD-MSC1
SAFETY VISIBLE COMPONENT MODULE-MSC2
SAFETY SHUNT & LEADS-MSC3
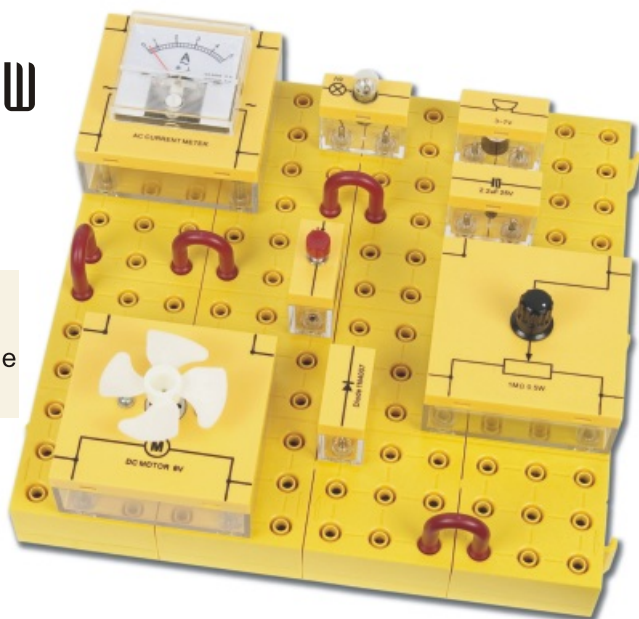
Features
.Safety and easy to creat your circuit quickly
.Over 60 preset modules and custom made module is available
.Standard double IP2X safety Φ4mm socket connection

SAFETY CIRCUIT BOARD-MSC1

Standard double IP2X safety Φ4mm socket

19 mm standard space

Mechanical fastening system allow blocks join to a circuit board

3 X 19 mm standard space
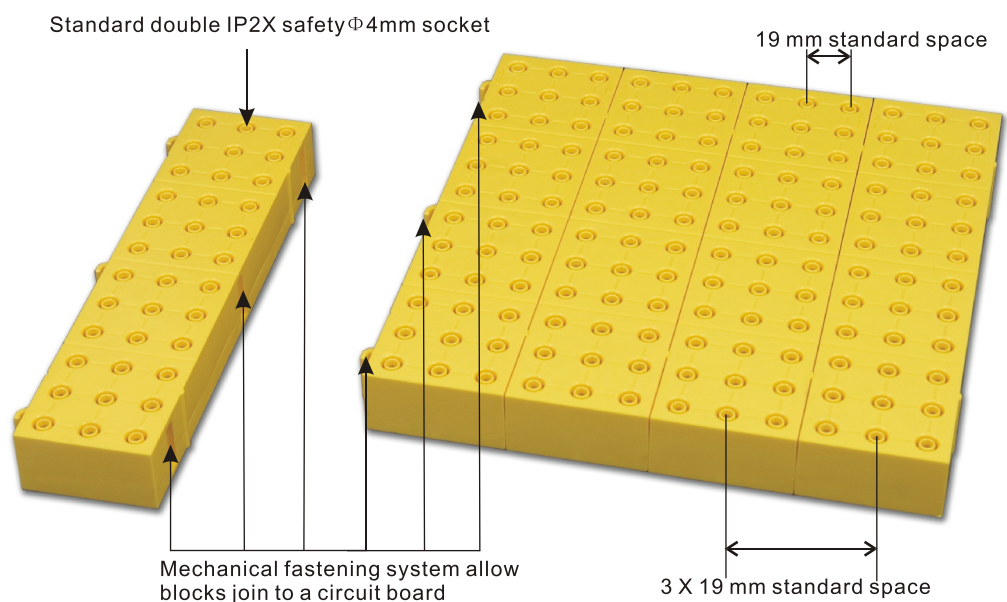
Model	Block	Unit	Socket
MSC1.1	1	4	36
MSC1.2	2	8	72
MSC1.3	3	12	108
MSC1.4	4	16	144

MSC1.1   MSC1.2   MSC1.3   MSC1.4
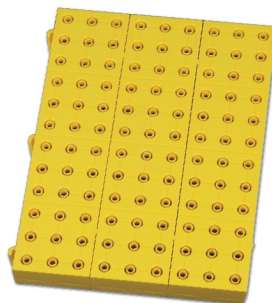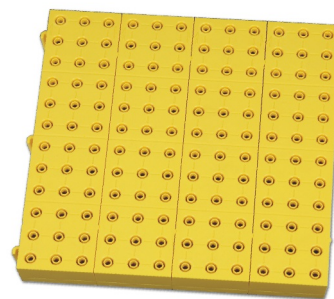
MODULAR SAFETY CIRCUIT SYSTEM

SAFETY VISIBLE COMPONENT MODULE-MSC2

DIPOLES MODULE-MSC2.2

19 mm standard space
Standard double IP2X safety Φ4mm plug
Transparent and marked housing

QUADRIPOLES MODULE-MSC2.4

3 X 19 mm standard space
Standard double IP2X safety Φ4mm plug
Transparent and marked housing

MSC2.2 Series preset modules

Resistor

PTC, NTC, LDR

Capacitor

Push-button switch 1x1

Variable resistor

Toggle switch 1x1

Diode

Universal stand

Inductor

Buzzer

E10 base bulb

Micro USB socket

SC2.4 Series preset modules

Variable resistor

Voltage meter

Variable resistor (decade model)

DC motor

Transistor
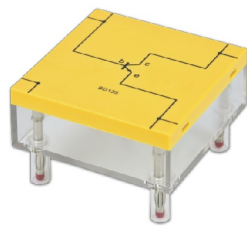
Relay
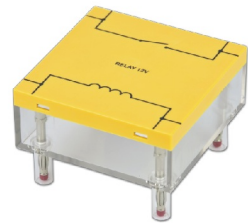
Thyristor

Push-button switch 1x2

Diode bridge
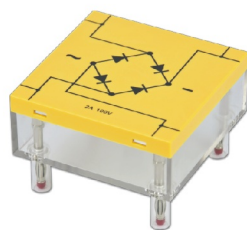
Toggle switch 1x2
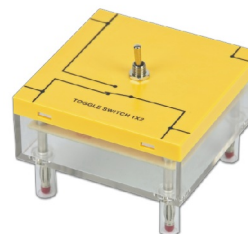
Current meter
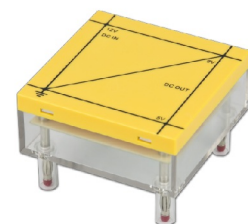
DC power supply

SC2.7 Series preset modules

4-bit data switchs

7 seg led display

4-bit led level display

Pulse generator
0.1Hz~10kHz

SC2.8 Series preset modules

IC module
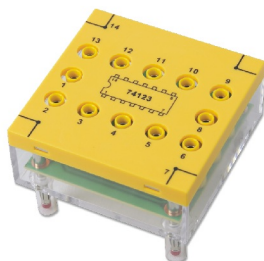
SAFETY SHUNT & LEADS-MSC3

Safety shunt MSC3.1

Standard double IP2X safety Φ4mm plug
and 19mm plug space

MSC3.1

Safety leads MSC3.25

Standard double IP2X safety Φ4mm plug
Length: 250mm

MSC3.25R   *MSC3.25G*   *MSC3.25B*   *MSC3.25Y*   *MSC3.25K*

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

MCP
lab electronics

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MSC DEMONSTRATION TRAINING SET MSC-01   NEW

SET CONTAIN

1. Safety circuit board MSC1
MSC1.1   6pcs

2. Safety visible component module MSC2
MSC2.2.006   1pc   Resistor 680Ω,1/2W,1%
MSC2.2.007   1pc   Resistor 1kΩ,1/2W,1%
MSC2.2.033   1pc   Capacitor 1uF,25V
MSC2.4.004   1pc   Potentiometer 10kΩ,0.5W
MSC2.4.031   1pc   Transistor BC108
MSC2.4.049   1pc   Diode bridge 2A,100V
MSC2.2.101   1pc   E10 base bulb 6V
MSC2.2.102   1pc   Push-button switch 1x1
MSC2.2.103   1pc   Toggle switch 1x1
MSC2.2.104   1pc   Universal stand
MSC2.2.105   1pc   Buzzer 3~7V
MSC2.4.102   1pc   Toggle switch 1x2
MSC2.4.104   1pc   DC motor 6V

3. Safety leads MSC3
MSC3.5R   3pc
MSC3.5K   3pc
MSC3.1   3pc

4.Plastic case
TPC005   1pc

EXPERIMENT CONTAIN

Single lamp control
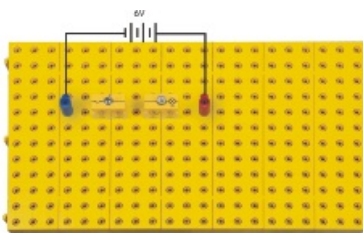
Lamp and fan select
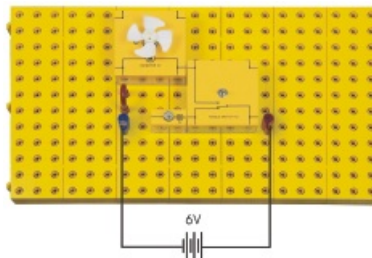
Buzzer control
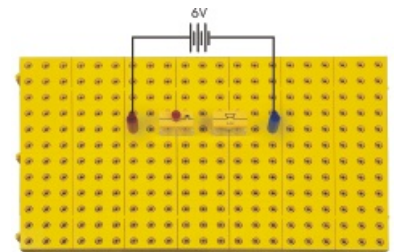
Ohm's law
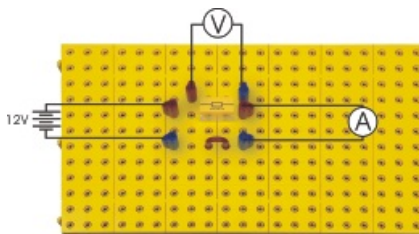
Full-wave rectifier
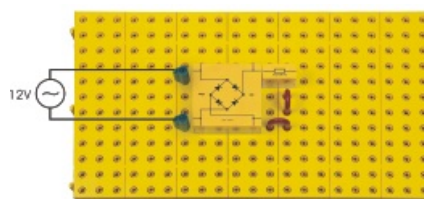
Rectify and filter
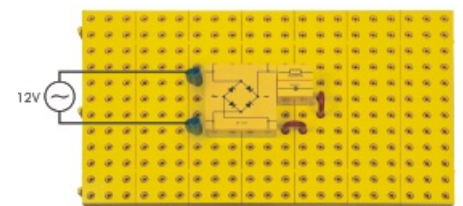
Basic transistor amplifier circuit
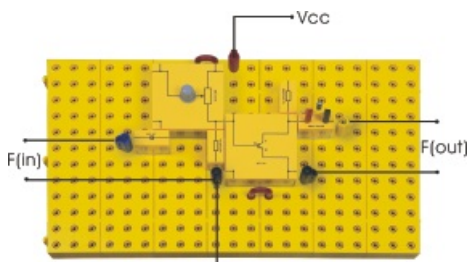
Bridge
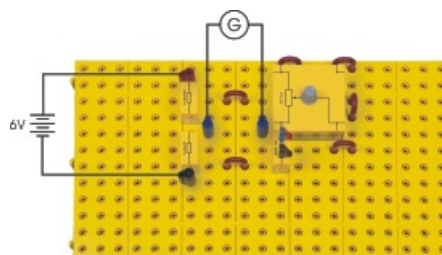
Capacitor charge and discharge
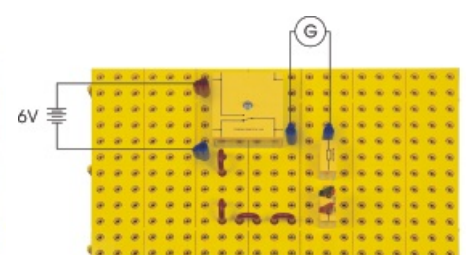
MSC BASIC LOGIC GATE TRAINING SET MSC-02 ⬛NEW

SET CONTAIN

1. Safety circuit board MSC1
MSC1.1   6pcs

2. Safety visible component module MSC2
MSC2.8.001	1pc	Quad 2-input NAND gates 7400
MSC2.8.002	1pc	Quad 2-input NOR gates 7402
MSC2.8.003	1pc	Quad NOT gates 7404
MSC2.8.004	1pc	Quad AND gates 7408
MSC2.8.005	1pc	Quad OR gates 7432
MSC2.8.008	1pc	Quad 2-input EXCLUSIVE OR gates 7486
MSC2.8.010	1pc	Quad EXCLUSIVE NOR gates gates CD4077
MSC2.7.001	1pc	4-digit data switch
MSC2.7.002	1pc	4-digit level display

3. Safety leads MSC3   4.Plastic case
MSC3.25R	1pc	TPC005	1pc
MSC3.25K	1pc		
MSC3.25B	2pc		
MSC3.25G	2pc		
MSC3.25Y	2pc		

EXPERIMENT CONTAIN

NOT logic gate
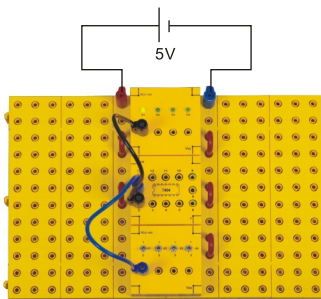
AND logic gate
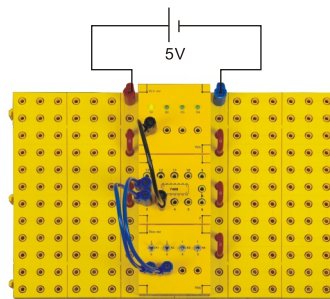
NAND logic gate
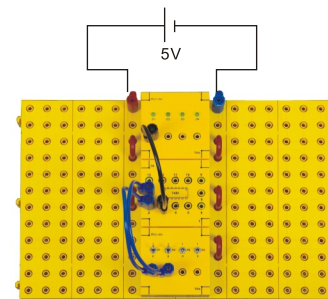
OR logic gate
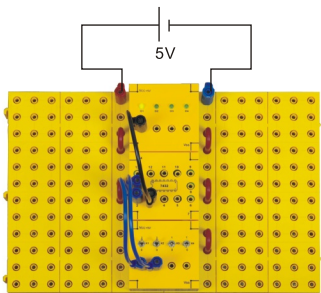
NOR logic gate
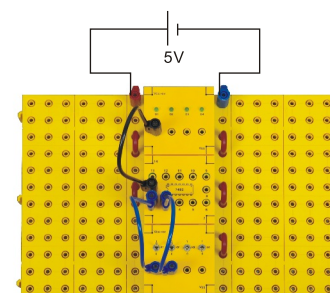
XOR logic gate

XNOR logic gate

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY
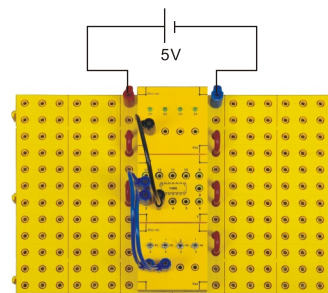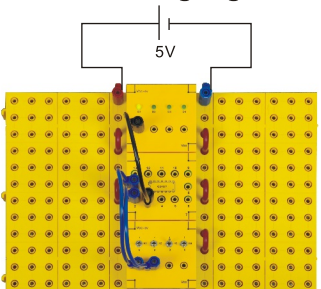
MSC ADCANCED LOGIC GATE TRAINING SET MSC-03   ＮＥＷ

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

SET CONTAIN

1. Safety circuit board MSC1
MSC1.1   6pcs

2. Safety visible component module MSC2
Resistor5.6kΩ, 1/2W, 1%   2pcs
Resistor 1kΩ,1/2W,1%   2pcs
Resistor 27kΩ,1/2W,1%   2pcs
Resistor 820Ω,1/2W,1%   2pcs
Capacitor 0.01uF, 250V   2pcs
Capacitor 0.033uF, 250V   2pcs
Capacitor 0.022uF, 250V   1pc

Diode 1N4007   1pc
Transistor BC108   2pcs
Toggle switch 1 $\times$ 2   1pc
4-digit data switch   2pcs
4-digit level display   2pcs
Pulse generator 0.1Hz~10kHz   1pc

4-digit data switch   2pcs
4-digit level display   2pcs
Pulse generator 0.1Hz~10kHz   1pc

Quad 2-input NAND gates7400   1pc
Quad 2-input NOR gates7402   1pc
Hex NOT gates7404   1pc
Quad 2-input AND gates7408   1pc
Quad 2-input OR gates 7432   1pc
Dual 4-input OR gates7420   1pc
Quad 2-input EXCLUSIVE OR gates7486   1pc
Quad 2-input EXCLUSIVE NOR gatesCD4077   1pc
Dual AND-OR- INVERT gates7451   1pc
Hex NOT gates Open-collector7405   1pc
Dual 4-input NAND gates7420   1pc
Triple 3-input NAND gates7410   1pc
4-bit Binary Adder Carry7483   1pc
AND-gated J-K flip-flop7472   4pcs
Decade/Binary counter 7490   4pcs
Dual J-K **Flip-Flop**7476   3pcs
5-bit S-R **Flip-Flop**7496   1pc
Quad 2-input NAND gates Open-collector7403   1pc
Hex Schmitt trigger inverter7414   1pc

3. Safety leads MSC3
MSC3.25R   4pcs
MSC3.25K   4pcs
MSC3.25R   6pcs
MSC3.25G   6pcs
MSC3.25Y   6pcs
MSC3.1   6pcs

4.Plastic case
TPC006   1pc
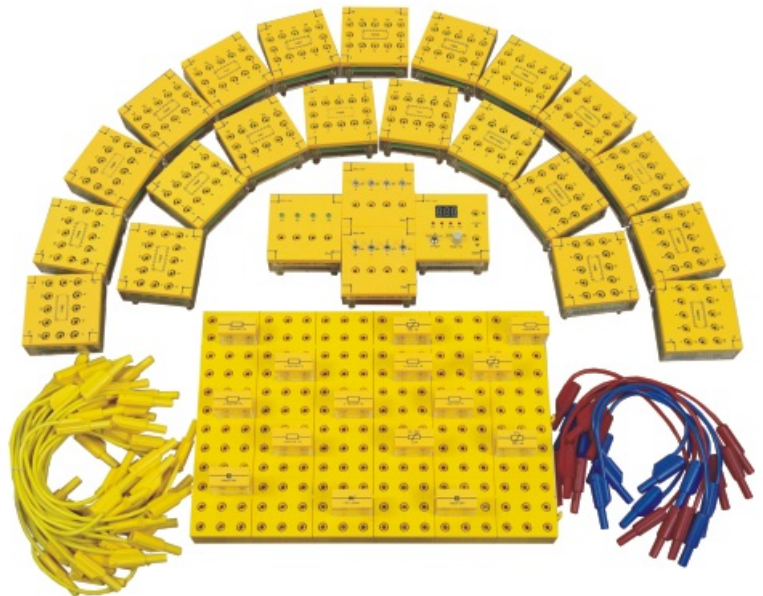
EXPERIMENT CONTAIN

I Basic Logic Function
1 OR logic gate
2 INVERT logic gate
3 OR + INVERT = NOR logic gate
4 NOR logic gate
5 2-input NAND logic gate
6 4-input NAND logic gate
7 AND - OR - INVERT logic gate

II Boolean Algebra

1 $A = \overline{\overline{A}}$

2 $A+1=1, A+0=A, A+A=A, A+\overline{A}=1$

3 $A \cdot 1=A, A \cdot 0=0, A \cdot A=A, A \cdot \overline{A}=0$

4 Logic equation

III De Morgan's Theorem

$\overline{A+B}=\overline{A} \cdot \overline{B}, \overline{A}+\overline{B}=\overline{A \cdot B}, \overline{A \cdot B}=\overline{A}+\overline{B}, \overline{A+B+C}=\overline{A} \cdot \overline{B} \cdot \overline{C}$,

$\overline{A \cdot B \cdot C}=\overline{A}+\overline{B}+\overline{C}, \overline{A} \cdot \overline{C}+\overline{B} \cdot \overline{C}=\overline{(A+B)} \cdot \overline{C}$

IV Exclusive-OR and Its Applications
1 Exclusive-OR
2 Half-Adder, Half-Subtractor
3 Binary Comparator
4 Parity Generator

V Adder and Subtractor
1 Half-Adder, Half-Subtractor
2 SUM in Full-Adder and DIFFERENCE
   in Full-Subtractor
3 Co for X+Y+ Ci
4 Full-Adder with Half-Adders
5 2-Bit Parallel Binary Adder
6 4-Bit Binary Full-Adder/2's-complement
   4-Bit Binary Full-Subtractor

VI Bistable or Flip-Flop
1 R-S Flip-Flop with NAND Gates
2 Gated R-S Flip-Flop
3 D Flip-Flop
4 AND-Gated J-K Master-Slave Flip-Flop

VII Binary Counters
1 Binary ripple counter
2 Synchronous counter

VIII Divide-by-N Counters and Decade Counters
1 Modulus 3 Counter
2 Modulus 6 Counter
3 Decade Counter 2421
4 Decade Counter 8421
5 IC Decade Counter
6 IC Divide-by-10 Counter

IX Shift Registers and Ring Counter
1 Shift Register
2 IC Shift Register
3 Quinary ring counter
4 Twisted-ring or Johnson Counter

X Pulse Forming and Shaping/ Schmitt Trigger
1 Transistor Astable
2 IC Astable
3 Pulse Stretchers
4 Schmitt Trigger

POWER SUPPLY
TEST INSTRUMENT
EDU. INSTRUMENT
METER
MACHINE
ACCESSORY

DEMONSTRATION TRANSPARENT COMPONENTS

F3 SERIES CE

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

Features
. **Light and magnetic fixture**
. Visible components
. 4mm safety socket connection
. Customization allows
. Dimensions (W×H×D):100×68×40mm

F3-008
Fuse

6×20,250V,3A

F3-009
Crocodile clip

24V,3A

F3-010
Spring clip

24V,3A

F3-011
E10 bulb base

6V

F3-012
B10 bulb base

6V

F3-013
B15 bulb base

24V

F3-014
DC Motor

3V,200mA

F3-001
Resistor

4.7Ω,12Ω,39Ω,2W

F3-002
Capacitor
470pF,4700pF
47000pF,63V

F3-003
Capacitor

0.5μF,1μF,2μF,400V

F3-004
Capacitor
220μF,470μF
2200μF,25V

F3-005
Inductor
1mH,10mH
100mH,100mA

F3-006
Push switch

1×2,120V,5A

F3-007
Toggle switch

2×2,120V,5A

F3-008 F3-013 F3-009 F3-014 F3-012 F3-010 F3-011 F3-001 F3-002 F3-006 F3-007 F3-005 F3-003 F3-004

MCP lab electronics
145
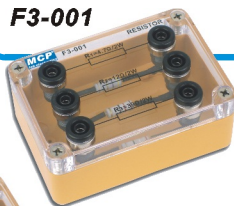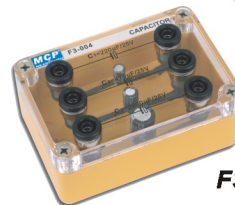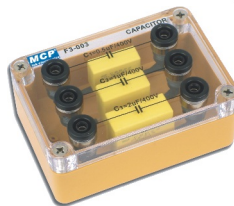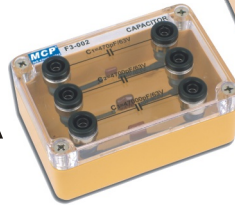
DEMONSTRATION TRANSPARENT COMPONENTS

POWER SUPPLY

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METER

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ACCESSORY

F3-015　　*F3-016*　　*F3-017*　　*F3-018*　　*F3-019*

F3-020　　*F3-021*　　*F3-022*　　*F3-023*

F3-015
Buzzer

3~7V

F3-16
Speaker

8Ω,0.3W

F3-017
Potentiometer

1KΩ,0.5W

F3-018
Diode

1N4004

F3-019
Transistor

2SC1008
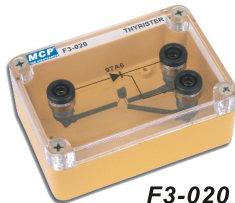
F3-020
Thyristor

97A6

F3-021
LED

6V

F3-022
Rectifier

400V,10A

F3-023
Transformer

220V,6V-0-6V,1A

F3-024　　*F3-027*

F3-025　　*F3-028*

F3-026　　*F3-029*

F3-024
Toggle switch

2X2

F3-025
Toggle switch

1X2

F3-026
DC current meter

0~5A
Accuracy: 2.5%

F3-027
DC voltage meter

0~30V
Accuracy: 2.5%

F3-028
AC current meter

0~5A
Accuracy: 2.5%

F3-029
AC voltage meter

0~30V
Accuracy: 2.5%
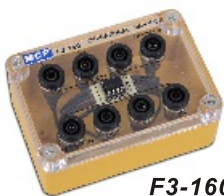
F3-160　　*F3-162*
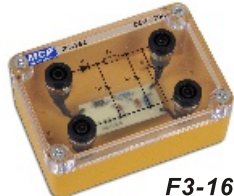
F3-161

F3-161
Amplifier modulation

Analog multiplier

F3-160
Operational amplifier

Amplifier TL081

F3-162
Detector

The circuit for
demodulation

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

F3-301

F3-302

F3-303

F3-304

F3-305

F3-306

Electromagnetism experiment boxes

*Non-magnetic fixture

F3-301
Circle Circuit

25 turns, I_{Max}=1A

F3-302
Solenoid Circuit

10 turns, I_{Max}=3A

F3-303
Straight ladder

I_{Max}=3A

F3-304
Head bow

I_{Max}=3A

F3-305
Straight Circuit

7 turns, I_{Max}=3A

F3-306
The Oersted Needle

I_{Max}=1A

F3-717 SOLAR POWER GENERATION   NEW

Objects
Solar panel, LED lamp and DC fan consist a solar power system

Principles
Solar panel generates the power by illumination and as a source supplies to lamp and fan.
The solar panel can be connected in parallel or series to get higher voltage or current.

SYSTEM CONTAIN

4 pcs solar panel 3V/150mA
3 pcs LED lamp 3V, 6V, 12V
3 pcs DC fan 3V, 6V, 12V
1 pcs light source 220V/150W
1 pcs magnetic base
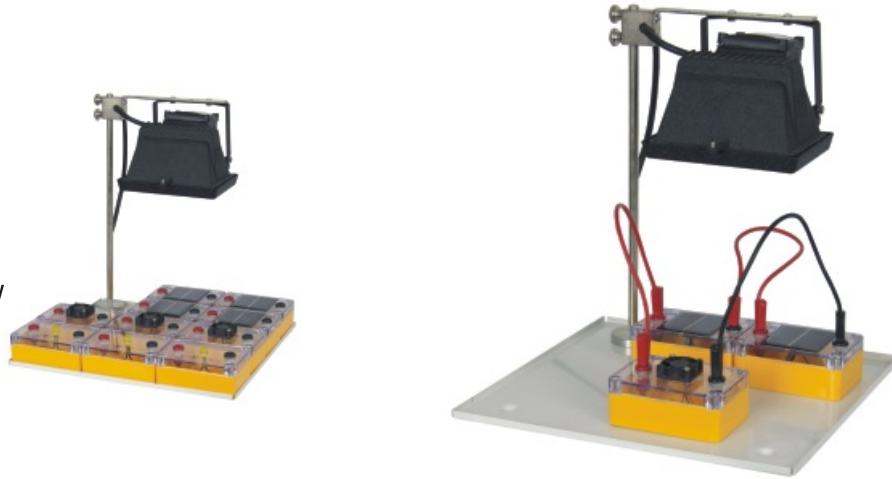
F3-718 WIND POWER GENERATION   NEW

Objects
Wind power generator, LED lamp and DC fan consist a wind power system

Principles
Wind power generator which derived by the power of a fan (wind simulation)
is a source supply to lamp and fan.

SYSTEM CONTAIN

1 pcs wind power generator
1 pcs LED lamp/DC fan 3V
1 pcs wind source 220V/50W
1 pcs magnetic base

TB SERIES

Feature
.The benches are designed for the use of training, developing services, calibration and
 assembling benches

TB 1000

TB 1000
Training bench

.Height:81.5cm
.Width: 157cm
.Depth: 90cm
.4 adjustable stands or 4 wheels

TB 1100

TB1100
Training bench + Top frame

.Training bench (TB1000)
.Top frame

TRAINING BENCH

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

TB1200 $\quad$ CE

Feature
.The benches are designed for the use of training,developing sevices,calibration and
assembling benches

TB1200
Training bench + instrument housing

1. Training bench (TB1000)
2. Instrument housing
   .Oscilloscope: DQ6025 $\quad \times$1
   .DC power supply: M10-TP3003L $\quad \times$1
   .Function generator: SG1638 $\quad \times$1
   .RF generator: HG1500 $\times$1
   .Digital multimeter: MT8145 $\quad \times$1
   . AC power supply: 0~250V, 6V, 12V, 24V
   .Soldering station $\quad \times$1
   . AC outlet $\quad \times$6
   . Test leads holder: PTL2001

TB 1200

Brief technical data of installed instruments

2.1 Oscilloscope: DQ6025
$\quad$ Bandwidth: 25MHz
$\quad$ Sampling rate: 250MSa/s
$\quad$ Vertical sensitivity: 1mV/div~20V/div
$\quad$ Trigger mode: auto, normal, single

2.2 DC power supply: M10-TP3003L
$\quad$ Output voltage: 0~30V $\times$ 2
$\quad\quad\quad\quad\quad\quad\quad$ 5V fixed
$\quad$ Output current: 0~3A $\times$ 2
$\quad\quad\quad\quad\quad\quad\quad$ Max. 3A
$\quad$ Output mode: independent, series, parallel

2.3 Function generator: SG1638
$\quad$ Output frequency: 2MHz
$\quad$ Output amplitude: 20Vp-p
$\quad$ Output waveforms: sine, square, triangle and TTL
$\quad$ Output impedance: 50Ω

2.4 RF generator: HG1500
$\quad$ Output frequency: 100kHz~150MHz
$\quad$ INT. & EXT. modulation: AM, FM
$\quad$ Audio signal generator: 1kHz$\pm$10%
$\quad$ FM stereo signal generator: 88~108MHz

2.5 Digital multimeter: MT8145
$\quad$ DC voltage: 80mV, 800mV, 8V, 80V, 800V, 1000V
$\quad$ AC voltage: 80mV, 800mV, 8V, 80V, 750V
$\quad$ DC current: 80mA, 800mA, 8A, 20A
$\quad$ AC current: 80mA, 800mA, 8A, 20A
$\quad$ Resistance: 800Ω, 8kΩ, 80kΩ, 800kΩ, 8MΩ, 80MΩ
$\quad$ Capacitance: 1nF, 10nF, 100nF, 1μF, 10μF, 100μF
$\quad$ Frequency: 999099Hz~1000.0MHz
$\quad$ hFE: $\checkmark$

TB1300   CE   NEW

Feature
.The benches are suitbale for the use of training, developing, service,calibration and assembling with two seats

TB1300
Training bench + instrument housing

1. Training bench (TB1000)

2. Instrument housing
   . Oscilloscope: DQ6102E   x1
   . Universal measuring center   x2
   . AC power supply: 6V, 12V, 24V/0.5A
   . Solering station   x2
   . AC outlet   x8
   . Test leads holder: PTL2001   x2

TB 1300

Brief technical data of installed instruments

2.1 Oscilloscope: DQ6120E
    Bandwidth: 100MHz
    Sampling rate: 1GSa/s
    Channels: 2
    Vertical sensitivity: 1mV/div~20V/div
    Horizontal range: 2nsdiv~50s/div
    Trigger mode: Auto,Normal, Single
    Math: + ,- , x , /, FFT

2.2 Universal measuring center
Function generator
    Output frequency: 0.2Hz~10MHz in 8 ranges
    Output waveforms: sine, square, triangle, ramp, pluse, TTL, CMOS
    Output amplituude: 200mVp-p~20Vp-p (1MΩ), 100mVp-p~10Vp-p (50Ω)
    VCF input: -5~+5VDC
    Output attenuation: -20dB,-40dB,-60dB
    DC offset: -10V~+10V(1MΩ), -5V~+5V(50Ω)
    Symmetry: 20%~80%
    Modulation: Sweep, FM, AM, FSK
Counter
    Frequency range: 1Hz~2.4GHz
    Period range: 100ns~1s
    Output sensitivity: 35mV(1~20Hz, CHA), 20mV(20Hz~100MHz, CHA), 30mV (CHB)
    Attenuation: -20dB
    Gate time: 1s, 10s
    Input impedance: 1MΩ
    Couple mode: AC
Power supply
    Output voltage: 0~30V Fixed 5V, $\pm$15V
    Output current: 0~3A (0~30V), 2A (Fixed 5V), 1A (Fixed$\pm$15V)
    Ripple and noise: <1mVrms (0~30V), <2mVrms (Fixed 5V, $\pm$15V)
    Load regulation:0.1%$\pm$40mV(0~30V), 0.1%$\pm$70mV(Fixed 5V), 0.1%$\pm$50mV(Fixed$\pm$15V)
    Line regulation: 0.1%$\pm$20mV(0~30V), 0.1%$\pm$30mV(Fixed 5V, $\pm$15V)
Digital multimeter
    DC voltage: 200mV/2V/20V/200V/1000V
    AC voltage: 200mV/2V/20V/200V/750V
    DC current: 20mA/200mA/2A/20A
    AC current: 200mA/2A/20A
    Resistance: 200Ω/2kΩ/20kΩ/200kΩ/2MΩ/20MΩ

TRAINING BENCH

TB1400 CE NEW

Feature
.The benches are suitbale for the use of training, developing, service,calibration and assembling with PC program

TB1400
Training bench + instrument housing
PC controllable with USB interface

1. Training bench (TB1000)
2. Instrument housing
 . Oscilloscope: DQ21005   x1
 . DC power supply: M10-TP3003D   x1
 . Digital multimeter: MT8145   x1
 . DDS function generator: SG32020   x1
 . Solering station   x1
 . AC outlet   x8
 . Test leads holder: PTL2001   x2

Brief technical data of installed instruments

TB 1400

2.1 Oscilloscope: DQ21005
Bandwidth: 100MHz
Samling rate: 500MSa/s
Channels: 2
Vertical sensitivity: 2mV/div~50V/div
Horizontal range: 5nsdiv~50s/div
Trigger mode: Auto,Normal, Single
Math: + ,- , x , /, FFT,DIFF,INT,SFFT
Panel interface: USB

2.2 DC power supply: M10-TP3003D
Output voltage: 0~30V×2, 2.5V, 3.3V, 5V
Output current: 0~3A×2, 3A
Output mode: independent, series, parallel, store & recall
Panel interface: USB

2.3 Digital multimeter: MT8145
DC voltage: 80mV, 800mV, 8V, 80V, 800V, 1000V
AC voltage: 80mV, 800mV, 8V, 80V, 750V
DC current: 80mA, 800mA, 8A, 20A
AC current: 80mA, 800mA, 8A, 20A
Resistance: 800Ω, 8kΩ, 80kΩ, 800kΩ, 8MΩ, 80MΩ
Capacitance: 1nF, 10nF, 100nF, 1μF, 10μF, 100μF
Frequency: 999099Hz~1000.0MHz
hFE: √
Panel interface: USB

2.4 DDS function generator: SG32020
Channels: A, B
Output frequency: 1uHz~20MHz
Output waveform: Sine, Square, Ramp, Pulse, Triangle, arbitrary
Modulation: AM, FM, ASK, FSK, PSK
Panel interface: USB

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

TB1600 CE NEW

Feature
.The benches are suitbale for the use of training, developing, service,calibration and DIY

TB1600
Training bench + instrument housing

1. Training bench (TB1000)
2. Instrument housing
 . Oscilloscope: DQ6102E   x1
 . DC power supply: M10-TP3003L   x1
 . Digital multimeter: MT8145   x1
 . LCR meter: BR4822   x1
 . Transistor tester: TST294   x1
 . AC power supply:
 . Store house   x1
 . AC outlet   x4
 . Test leads holder: PTL2001   x2

TB 1600

Brief technical data of installed instruments

2.1 Oscilloscope: DQ6102E
Bandwidth: 100MHz
Samling rate: 1GSa/s
Channels: 2
Vertical sensitivity: 1mV/div~20V/div
Horizontal range: 2nsdiv~50s/div
Trigger mode: Auto,Normal, Single
Math: + ,- , x , /, FFT

2.2 DC power supply: M10-TP3003L
Output voltage: 0~30V × 2, 5V fixed
Output current: 0~3A × 2, Max. 3A
Output mode: independent, series, parallel

2.3 Digital multimeter: MT8145
DC voltage: 80mV, 800mV, 8V, 80V, 800V, 1000V
AC voltage: 80mV, 800mV, 8V, 80V, 750V
DC current: 80mA, 800mA, 8A, 20A
AC current: 80mA, 800mA, 8A, 20A
Resistance: 800Ω, 8kΩ, 80kΩ, 800kΩ, 8MΩ, 80MΩ
Capacitance: 1nF, 10nF, 100nF, 1μF, 10μF, 100μF
Frequency: 999099Hz~1000.0MHz
hFE:

2.4 LCR meter: BR4822
L: 0.01~9999H
C: 0.5pF~200mF
R: 0.1mΩ~19.99MΩ
Q: 0.01~999
D: 0.01%~999%
Test frequency: 100Hz, 1kHz, 7.8kHz

2.5 Transistor tester: TST294
VBR range: 0~1000V, 0~200V
VCE range: 0~6V
hEF: 0~200, 0~2000
ICEO: 0~2000uA
78 & 79 voltage regulator: 78XX / 79XX

2.6 Store house
Inner dimension (WxHxD): 462 x 86 x 312mm

TRAINING BENCH

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

M21-1800   CE   NEW

Feature
The benches provide a course on the operation and trouble shooting for electrical control circuits. It has unique training capabilities with a fault insertion system which is useful as a teaching aid in fault finding or troubleshooting the electrical control circuits

M21-1800
Training bench + device housing

1. Training bench (TB1000)

2. Device housing
.Main MCB 3 phase 16A (miniature circuit breaker)   x1
.Control MCB 1 phase 6A (miniature circuit breaker)   x1
.ELCB 3phase (earth leakage circuit beaker)   x1
.Control lamp to indicate "On"   x3
.Magnetic contactor+auxiliary contacts (2NO+2NC)   x3
.Push button switch, NO/NC   x4
.Regulated cam switch, I-O-II   x1
.Thermal overload relay 1-1.6A   x2
.Time delay relay 0- 10 sec   x1
.Push button switch for emergency off "Off"   x1
.Illuminated power lamp   x1
.Fault simulator switch   x30
3. Test mater   x1
4. Cable and test leads
.Connection test leads   x1 set
.Power cable   x1

M21-1800

MULTI-PURPOSE WORKSTATION (€

Feature

This multi-purpose workstation is worked with TB-1000 series training bench (Page 92). With the various combination of the control units, you can make a customized workstation that meet your requirement. Our control units can also be customized.

Three phase power input socket

TB150-1

| 311004 | 313003 | 411001 | 313001 | 232002 | 132002 |
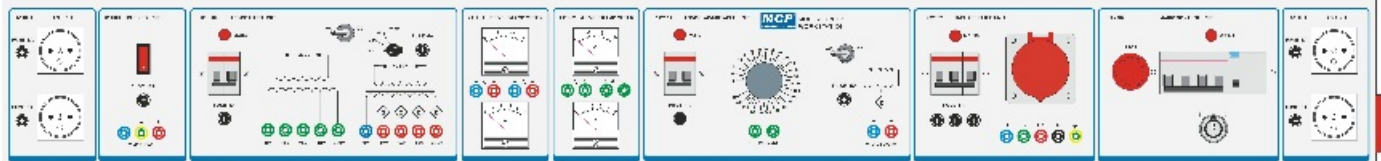
511001   411002   511001

TB150-2

| 312002 | 411001 | 313003 | 313001 | 411001 | 111002 |

511001   411002   411002   511001

TB150-3

| 313003 | 411001 | 334005 | 232002 | 132002 |
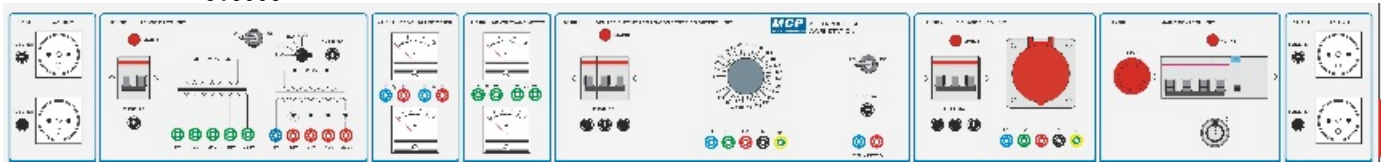
511001   411002   511001

ONE-PHASE AND THREE-PHASE MAINS CONTROL UNIT

Model	Phase	Block(s)
111001	1	1
111002	1	1
132001	3	2
132002	3	2

*N Block(s) size (W×H×D) = (100×N)×194×231 mm

1 : Indicator of On/Off
2 : Single-phase electronic magnetic break switch (400V, 10A) and leakage protection switch (30mA)
3 : Three-phase electronic magnetic break switch (690V, 50A) and leakage protection switch (30mA)
4 : Emergency switch with On/Off key (660V,10A)
5 : Emergency switch (660V,10A)
6 : On/Off key (660V,10A)
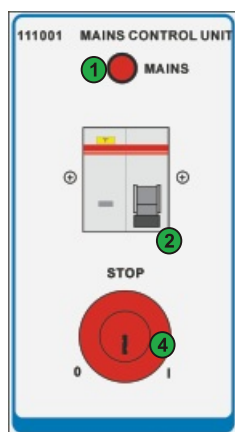
111001
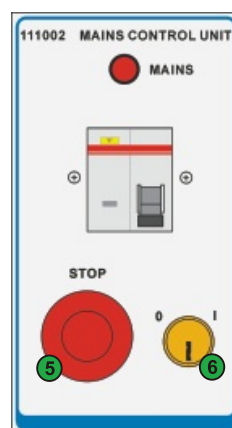
111002
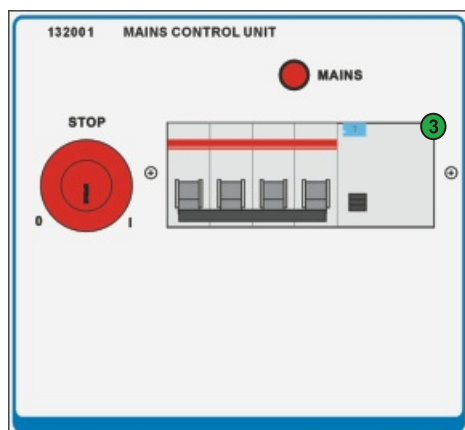
132001
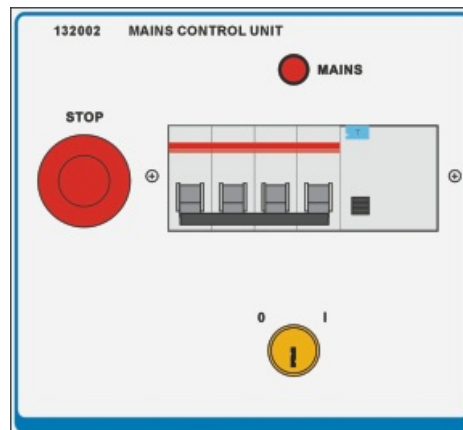
132002

AC POWER SUPPLY UNIT CE

Model	AC output	Phase	Block(s)
212001	0~250V/4A	1	2
212002	12V/24V/40V/250V/4A	1	2
234001	0~250V/4A X 3 Phase	3	4
232002	230V/4A X 3 Phase	3	2

*N Block(s) size (W×H×D) = (100×N)×194×231 mm

1 : Indicator of on/off
2 : Single-phase electronic magnetic break switch (400V, 10A)
3 : Three-phase electronic magnetic break switch (690V, 50A)
4 : Output fuse protection
5 : Three-phase output socket
6 : Voltage adjusting knob
7 : Output safety sockets
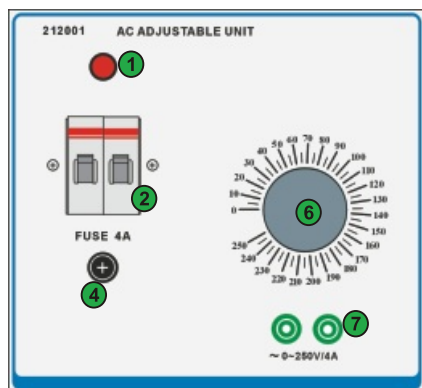
212001

212002

234001

232002

MULTI-PURPOSE WORKSTATION
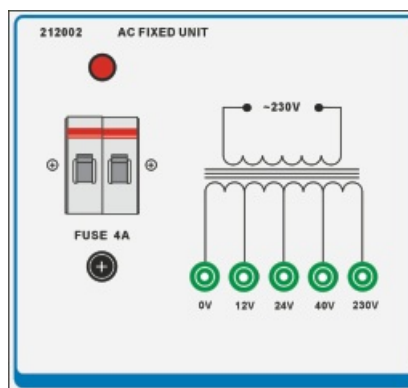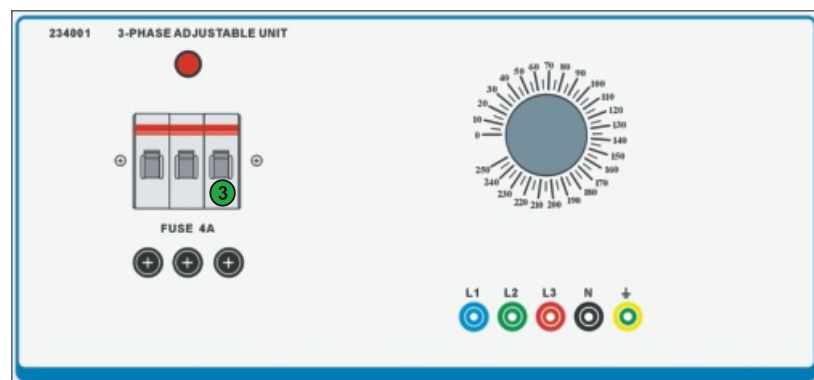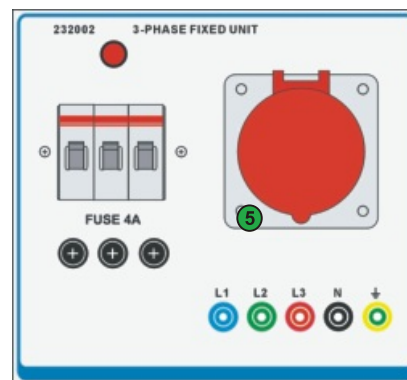
DC & AC POWER SUPPLY UNIT CE

Model	AC output	DC output	Block(s)
313001	0~250V/4A	0~250V/4A(rectified DC)	3
312002	NA	0~30V/0~5A(regulated DC)	2
313003	12V/24V/40V/250V/4A	12V/24V/40V/250V/4A(rectified DC)	3
311004	NA	24V/10A(switching power supply)	1
334005	0~250V/4A X 3 Phase	0~250V/4A(three phase rectified, 4% small ripple)	4

*N Block(s) size (W×H×D) = (100×N)×194×231 mm

1 : Indicator of on/off
2 : Single-phase electronic magnetic break switch (400V, 10A)
3 : Three-phase electronic magnetic break switch (690V, 50A)
4 : Output fuse protection
5 : AC/DC output change switch
6 : Current meter and voltage meter
7 : On/Off switch with LED indicator
8 : Voltage adjusting knob
9 : Output safety sockets
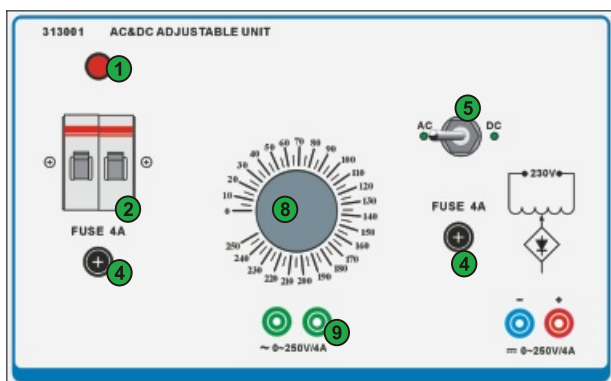
313001
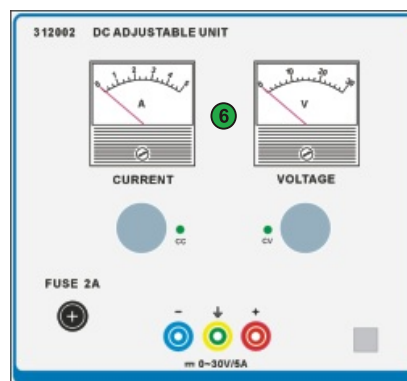
312002
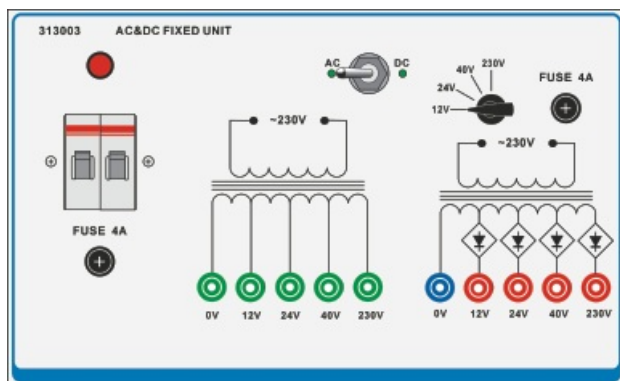
313003
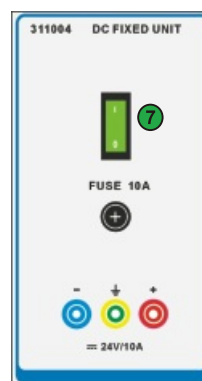
311004
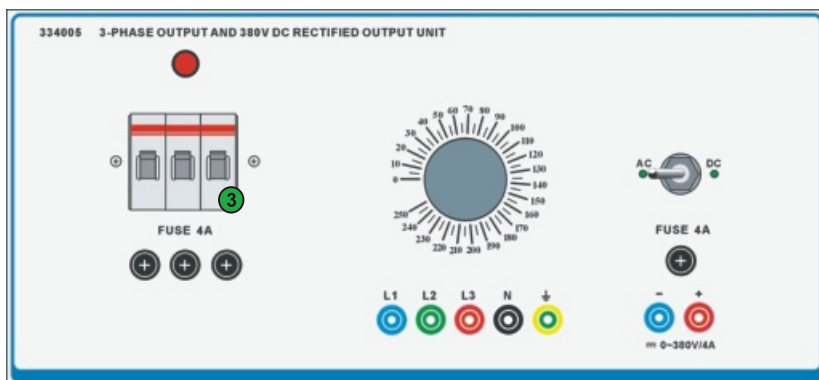
334005

POWER SUPPLY | TEST INSTRUMENT | EDU. INSTRUMENT | METER | MACHINE | ACCESSORY

158

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

METER UNIT $C\epsilon$
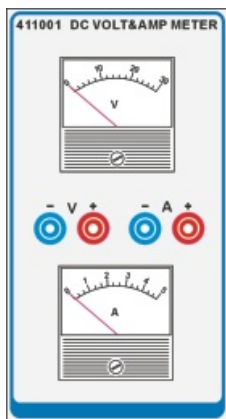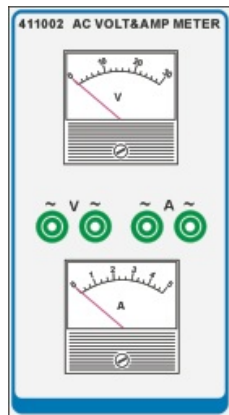
411001

411002

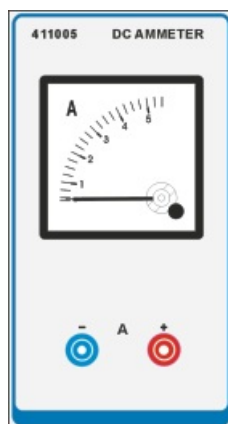| Model	Class	Block
411001	2.5	1
411002	2.5	1
411003	1.5	1
411004	1.5	1
411005	1.5	1
411006	1.5	1

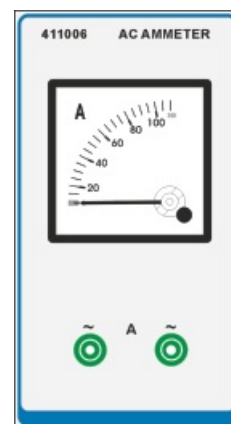*N Block(s) size (W×H×D) = (100×N)×194×231 mm
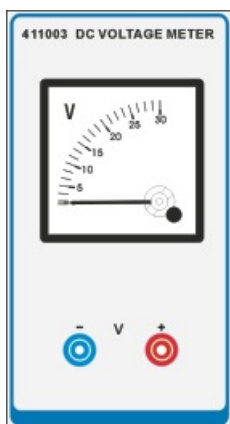
411003
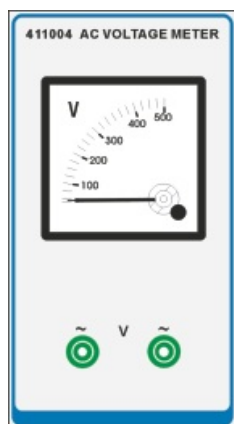
411004

411005

411006

Note: Other measuring range can also be customized
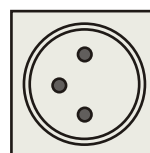
SOCKET UNIT $C\epsilon$
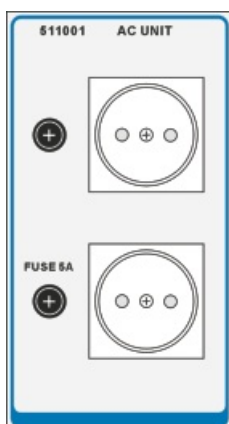
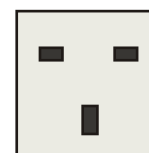**511001**

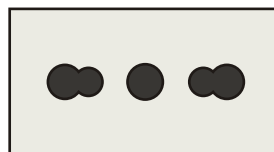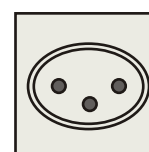511001 support the following kinds of power socket
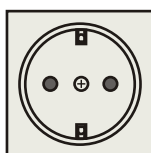
Germany   France   Spain   United Kingdom

Greece   Italy   Switzerland

Model	Block
511001	1

*N Block(s) size (W×H×D) = (100×N)×194×231 mm

EH818

EXPERIMENT SYSTEM OF ELECTRICAL INSTALLATIONS AND TESTING TECHNIQUES

Features

.Represent a small size building for residential use
.Analyze the correct mounting procedures such as:
 1. Light and EMF distribution systems with
 energy counter (kWh)
 2. Stair light system
 3. Interphone system
 4. Protective earth and equipotential system
.Testing of electrical installations according to the
 international (IEC) standards.
.Measure insulation, fault loop, impedance
 and voltage drop
.Execute continuity tests and checking of the protection
 devices on already wired and operative circuits
.Carrying out changes and transformations on
 already existing installations.

Specifications

.Mechanical characteristics
.Build in welded, chemically treated and epoxy painted sheet steel
.Each of the 4 available walls, several electrical and electronic components,
 embedded into flush-mounted junction boxes, are placed over hinged panels
.Whole structure is set on a wheel mobile base

Dimensions (W×H×D): 880×1300×800 mm

Weight: 100kg

Electrical characteristics

Wall 1 (main entrance)

- 1 Main power supply 230 V 16 A
- 1 Single-phase energy counter 230 V 20 A
- 1 Switchboard with earth leakage circuit brake
  and 3 thermal-magnetic circuit breakers
- 1 Interphone porter with 2 pushbuttons
  and 2 illuminated name-plates
- 1 Electric lock
- 1 Equipotential protective earth collector
- 1 Ground connections with 1-ohm resistor
  and sectioning terminals

POWER SUPPLY

TEST INSTRUMENT

EDU. INSTRUMENT

METER

MACHINE

ACCESSORY

Wall 2 (sitting room and kitchen)

- 1 Light installation with incandescent lamps 230V controlled by 2 pushbuttons and step-by-step relay
- 2 Outlets 230V 16A for sitting room users
- 1 Incandescent lamp 230V with dimmer
- 1 Door bell
- 1 Thermostat (day-time area)
- 1 Low energy consumption lamp controlled by two-way switches
- 2 Outlets 230V 16 A for electric household appliances
- 1 Interphone communicating with the gate porter
- 1 Buzzer for calls from bathroom

Wall 3 (bedroom and bathroom)

- 1 Incandescent lamp controlled by 2 two-way switches and 1 intermediate switch
- 1 Outlet 230V 16A for electrical household appliances
- 1 Single-phase outlet 230V 10A for the lights
- 1 Thermostat (night-time area)
- 2 Pushbuttons for service call
- 1 Pushbutton for emergency calls from the bathroom
- 1 Thermostat (bathrooms)
- 1 Outlet 230V 16A for boiler supply.

Wall 4 (office, stairwell, heating plant)

- 2 Lamps with switch
  1 Outlet 230V 16A for electric household appliances
- 1 Single-phase outlet 230V 10A for lights
- 1 Interphone communicating with the gate porter
- 1 Incandescent lamp 230V with two pushbuttons and time relay
- 1 Outlets 230V 16A for heating plant
- 3 Pilot lamps (simulation of water pumps for different heating areas)