>>Electric and Electronic Experiment

Basic Electronic/Logic/Electric/ Communication Trainer

HBE-Basic-iLAB

- Built-in basic measuring equipment (DMM, F/G, OSC and DAQ)
- Available to study a electric, elctronic, communications and digital logic circuit themes with one platform
- Supply various experiment themes
- Training a skills of troubleshooting
- Design to protect from misuse using power protection circuit
- Set up a module based verified circuit
- Available application experiment with built-in bread board

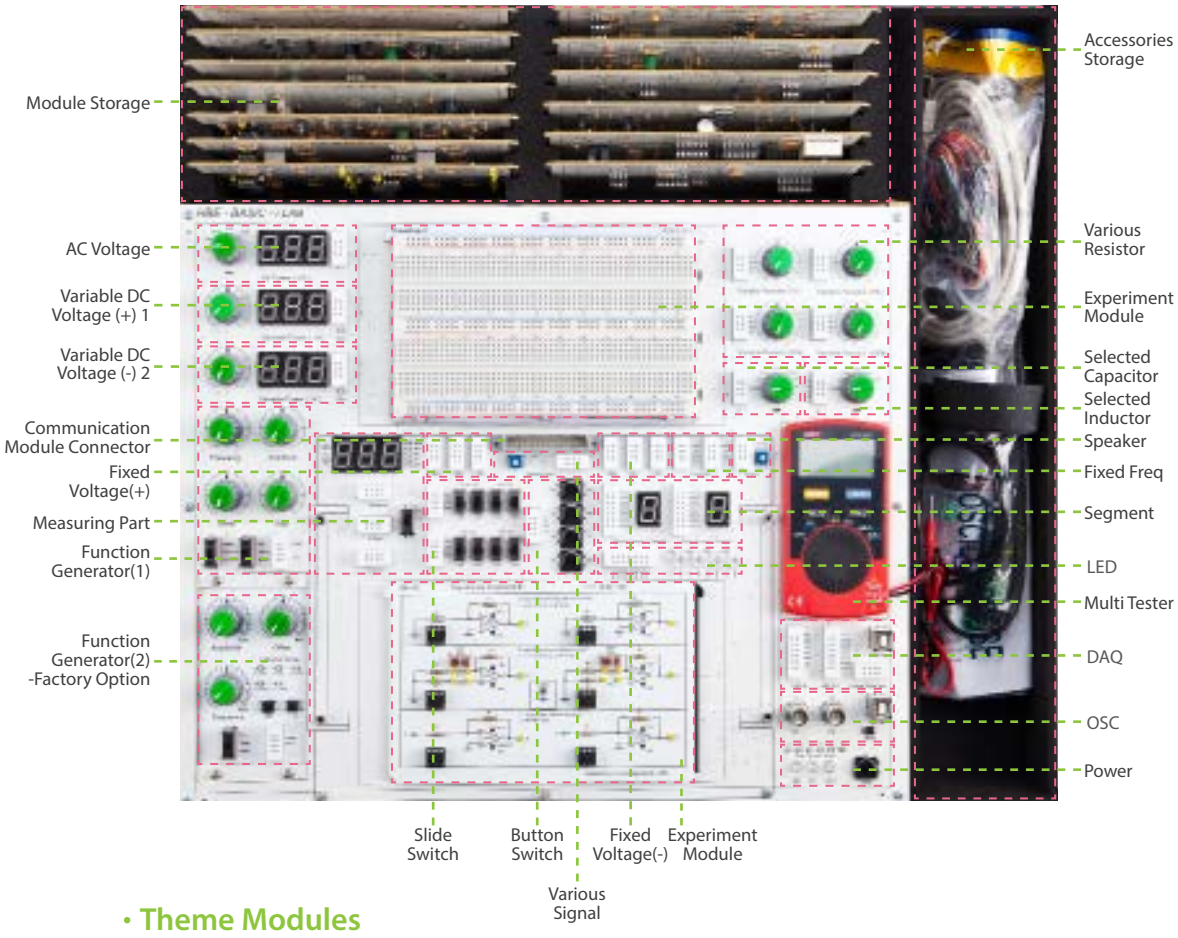
Overview

HBE-Basic-iLab is designed that student study various basic themes like Electronic, Digital Logic, Communication and electric. Various basic test instruments are built-in(DMM/OSC/FG/DAQ).

Features

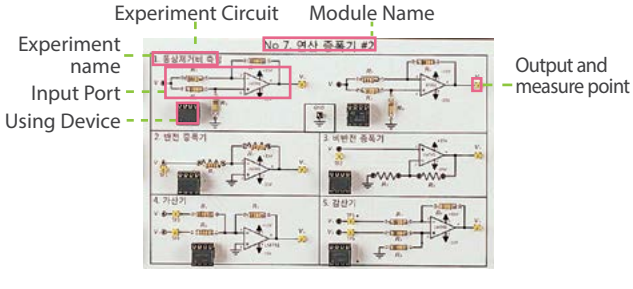
- It consists of various input and output devices that can be configured to experiment such as oscilloscope, a waveform generator and multimeter.
- You can do all the laboratory exercises intuitively configure the basic electrical and electronic circuit modules into practice.
- You can use in combination with digital Logic circuit, analog and digital communications.
- You can use the output device such as Speaker, FND, LED and configure a circuit of Breadboard with AC Power, Variable DC Power, Fixed Power, Variable Resistor and Analog, Digital switch.
- Provide PC program and oscilloscope of 2 channels(1ch up to 60Msps).
- Provide a waveform generator can output Sine, Triangle and Square wave of 100KHz/10VIVp-p) base.
- Provide the Breadboard that is consisted of 3 terminal strip and 4 Bus strip.
- Builted in power down circuitry to protect devices and shortage state.
- The DAQ device is builted that can use Signal for Monitoring and for output of 8 bit an easy-to-use digital logic circuit modules.

Configuration and Names

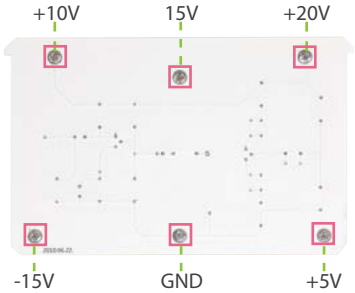


• Theme Modules

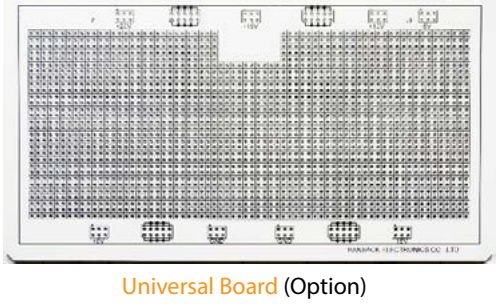
• Electronic / Electric module (Electronic Module is basic included / Electric module is optional)



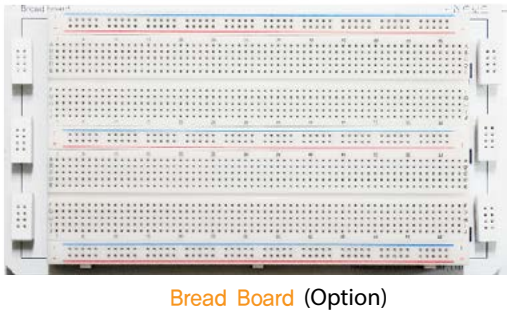
Front Side



Back Side



Universal Board (Option)



Bread Board (Option)

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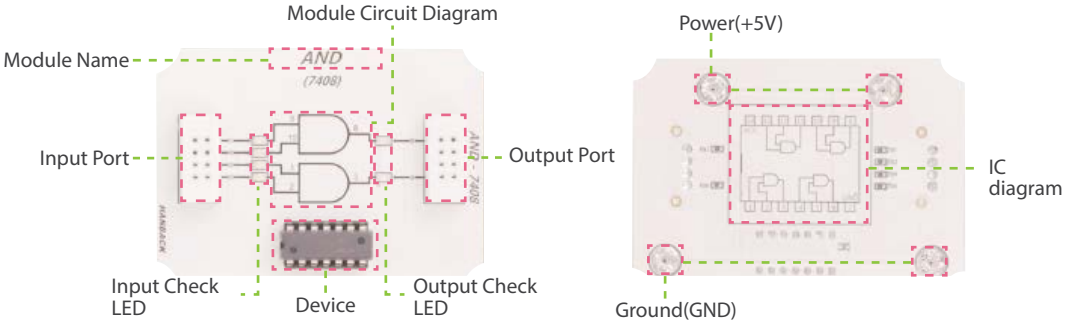
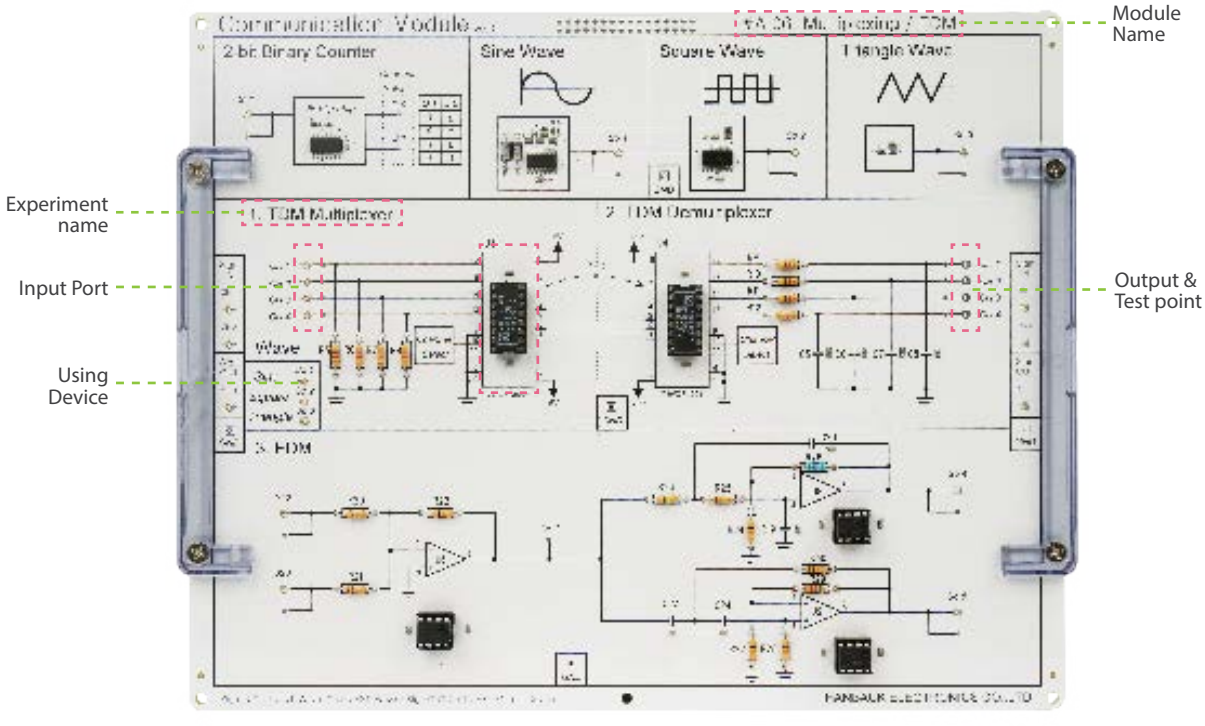
• Digital Logic Module (Optional)



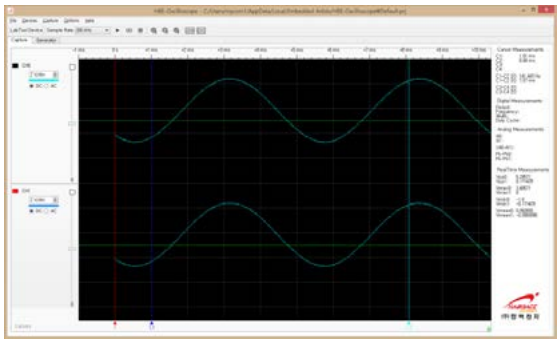
Front Back

• Communication Module (Optional)



• Measuring Software (PC)

DAQ



Oscilloscope

Hardware Specification (HBE-Basic-iLAB Main)

• Input Parts

Item	Specification
AC Power	0VAC, 3VAC, 6VAC, 9VAC, 12VAC 3Digit 7-Segment Display (Selected AC Power)
Variable DC Power1	+1.5V ~ +18.5V 3Digit 7-Segment Display (Output DC Power)
Variable DC Power2	-1.5V ~ -18.5V 3Digit 7-Segment Display (Output DC Power)
Analog Signal	+5V ~ -5V
Fixed Power(DC)	+20V, +15V, +5V, GND, -5V, -15V
Slide Switch	+15V / 0V Switch 2EA +5V / 0V Switch 2EA -5V / 0V Switch 2EA -15V / 0V Switch 2EA
Button Switch	+15V / 0V Switch 1EA +5V / 0V Switch 1EA -5V / 0V Switch 1EA -15V / 0V Switch 1EA
Function Generator1	Waveform : Sine / Triangle / Square DC Offset : -5V ~ + 5V Amplitude : 0V ~ 10Vp-p Frequency : 0 ~ 1kHz, 1kHz ~ 10kHz, 10kHz ~ 100kHz Duty Rate : 10~90%(Square) Output Level : +5V TTL Level
Function Generator2 (Option)	Waveform : Sine / Triangle / Square DC Offset : -5V ~ + 5V Amplitude : 0V ~ 10Vp-p Frequency : 0 ~ 1kHz, 1kHz ~ 10kHz, 10kHz ~ 100kHz, 100kHz ~ 1MHz, 1MHz ~ 5MHz
Fixed Frequency	Output Level : +5V TTL Level Frequency : 0.5Hz, 1Hz, 50Hz, 100Hz, 500Hz, 1kHz, 5kHz, 10kHz
Variable Resistor	1kΩ 1EA, 5kΩ 1EA, 10kΩ 1EA, 50kΩ 1EA
Select Capacitor	100pF, 1nF, 10nF, 47nF, 100nF, 1uF Capacitor Select
Select Inductor	47uH, 100uH, 220uH, 470uH, 1mH, 2.2mH Inductor Select

• Output Parts

Item	Specification
LED display	5pi RED LED 8EA
7-Segment Display	Anode Common 7-Segment 1EA Cathode Common 7-Segment 1EA
Speaker	4Ω Speaker with Volume Control

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• Measurement Parts

Item	Specification
Oscilloscope	Using PC Software (USB Cable connected) Sampling Speed : 20kHz ~ 60MHz / 1ch 14 step / 2ch 11 step 1ch up to 60Msps(2ch up to 30Msps) Voltage Range : +25V ~ -25V Voltage Division : 0.02V ~ 5V / 8 step Impedance : 1MΩ Capacitance : 20pF View : AC / DC Control Measure : Frequency, Vmax, Vmin, Vp-p, Vmean, Cursor Measurements,
Multi-Tester	Power supply in board. AC Voltage (up to 600V) AC Current (up to 400mA) DC Voltage (up to 600V) DC Current (up to 400mA) Resistance (up to 40MΩ) Capacitance (up to 100uF) Frequency (10Hz ~ 100kHz)
Measurement Block	Display : 3 Digit 7-Segment display Measure Select : Voltage / Ampere / Frequency Voltage measure : 0 ~ 30V Ampere measure : 0 ~ 9.99A Frequency measure : 0Hz ~ 5MHz
DAQ	Using PC Software (USB Cable connected) Sampling Speed : 1ms, 10ms, 100ms 1s Input : 8 bit Digital Data Output : 8 bit TTL Level Waveform Genetator : A/D Convertor with 8 bit output data

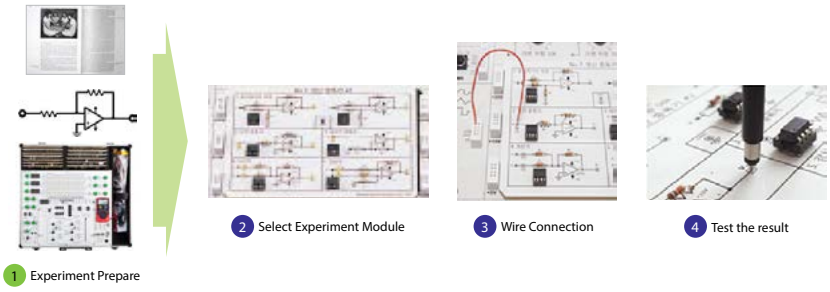
• Theme Module Block

Item	Specification
Electronic Theme Block	Power : +20V, +15V, +10V, +5V, GND, -5V, -15V Size : 172 mm x 110mm or 200mm x 110mm 2EA
Communication Theme Block	Power : +15V, +5V, GND, -5V, -15V Size : 250mm x 200mm 1EA
Digital Logic Theme Block	Power +5V, GND Size : 70mm x 50mm 4EA Using Adaptor Module in Electronic Thema Block

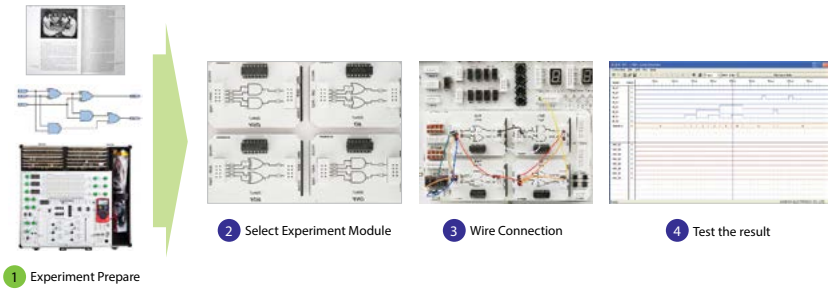
• Over Current Check Block

Item	Specification
Protection Circuit	Max. current : +20V 200mA / +15V 500mA / +10V 300mA / +5V 500mA / -5V 500mA / -15V 500mA Power off when over-current is flowing on circuit due to short-circuit etc Power off when temperature is over limited range (70℃) Beep when power off with operated protection circuit Indicate LED which power area was occurred problem when power off Indicate LED about current status(Connect/Operate/Short) of power Available power on/off manually with switch

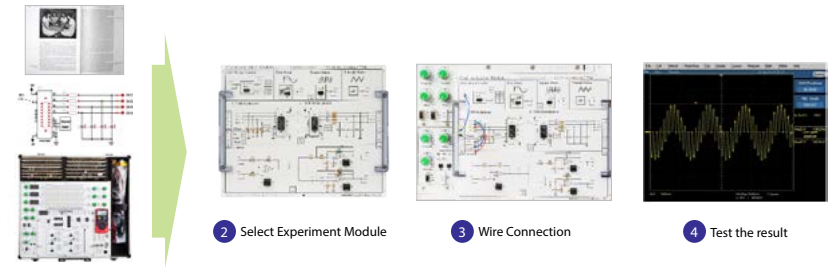
Experiment procedure example



Electronic/ Electric Module Example



Digital Logic Module Example



Communication Module Example

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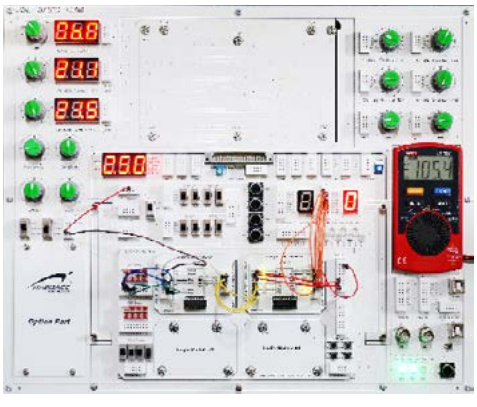
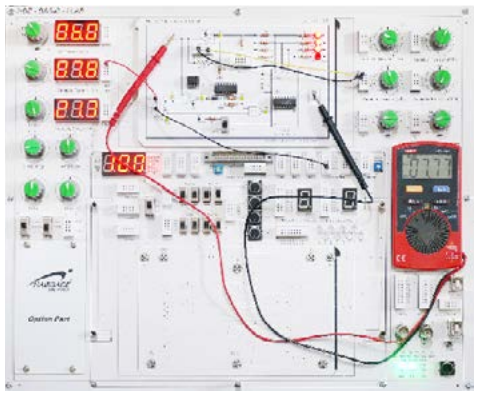
Application example

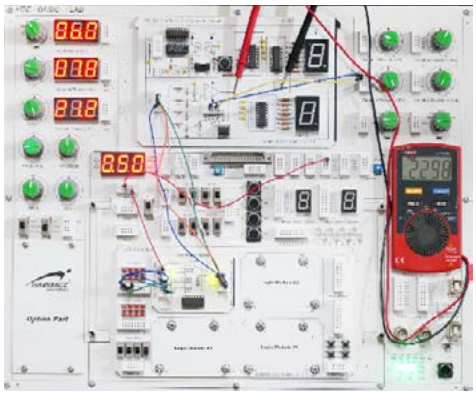
- 1Decade Counter + 7-segment Decoder



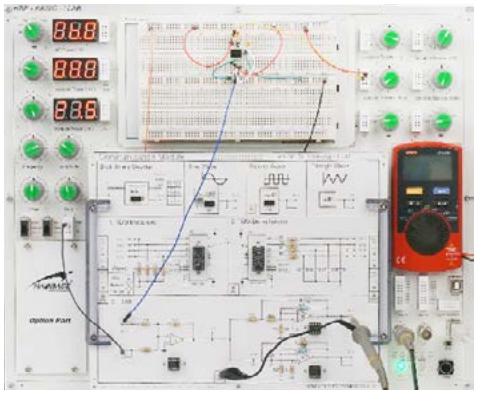
- Analog to Digital Converter Experiment



- Counter + DAC Experiment



- FDM transmission Experiment with Bread board



Curriculum

- Digital Logic Part (Option)

Experiment Module	Experiment Theme
Boolean Algebra	AND, OR, NOT Calculation
	NAND, NOR, XOR, XNOR Calculation
	Boolean algebra theorem
	Simplification of logical expressions
Combination Logic Circuit	Half-adder
	2bit Subtracter
	Adder & Subtracter
	Encoder & Decoder
	1x4 De-Multiplexer
	Comparator
Sequential Logic Circuit	RS FLIP-FLOP
	Divider Circuit
	Binary Coded Decimal
	Electronic Dice
	Decade Ring Counter
	Decade Counter

• Electronic Part(Basic)

Experiment Module	Experiment Theme
No1. Semiconductor Devices	Diode (Rectifier diode, Light-emitting diode)
	Transistor (NPN, PNP)
	MOSFET (N-Channel, P-Channel)
	Thyristors (SCR)
	TRIAC
	Photo Couplers
	Photo Conductor
No2. DC Power Circuit #1	Bridge rectifier circuit
	Smoothing circuit
	Constant-voltage IC circuit
	Constant voltage Zener diode circuit
	Zener follow-up circuit
No3. DC Power Circuit #2	Switching Mode Power Supply Circuit (MC34063A)
	Switching Mode Power Supply Circuit (LM2576)
No4. Amplifier Circuit #1	BJT Bias Circuit
	Small level & Low frequency Signal Amplifier
NO5. Amplifier Circuit #2	Audio Amplifier
	Common Source J-FET Amplifier
No6. Operational Amplifier #1	Input Offset Voltage Measurement
	Input Bias Current Measurement
	SR (Slew Rate) Measurement
No7. Operational Amplifier #2	Common Mode Rejection Ratio(CMRR) Measurement
	voltage follower
	Inverting Amplifier, Non-Inverting Amplifier
	Adder, Subtracter
No8. Operational Amplifier #3	Integrator, Differentiator
	Low Pass Filter
	High Pass Filter
	Band Pass Filter
	Comparator
No9. Oscillation Circuit	L-C Oscillation Circuit
	R-C Oscillation Circuit
	Sine wave generator
	Square wave generator
	Tri-angle wave generator
No10. Pulse Circuit	Non-stable multi-vibrator
	Monostable Multi-vibrators
	Clipper, Clamper
	RLC Response Waveform Characteristic
No11. Mod./Demod. Circuit	Amplitude Modulation/Demodulation
	Frequency Modulation/Demodulation
No12. Interface/DA converter circuit	TTL / C-MOS Interface
	Scaling Circuit using Opto-electric interface
	DA conversion experiment
No13. AD converter circuit	AD conversion experiment

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• Basic Communication Part (Option)

Experiment Module	Experiment Theme
Oscillators	Colpitts Oscillator
	Hartley Oscillator
	Wien-Bridge Oscillator
	Parallel RC Oscillator
	Crystal Oscillator
	Voltage Controlled Oscillator
Filter	Low-pass filter
	High-pass filter
	Band-pass filter
	Band-stop filter
AM Mod/Demod	AM Modulator
	AM Demodulator (Diode Detector)
	AM Demodulator (Product Detector)
DSB-SC/SSB Mod/Demod	DSB-SC Modulator
	SSB Modulator
	DSB-SC Product Detector
	SSB Product Detector
FM Mod/Demod	FM Modulator(LM566 characteristic experiment)
	FM Modulator(Frequency modulation using LM566)
	FM Modulator(PLL characteristic experiment using LM565)
	FM Demodulator(LM565 V-F characteristic experiment)
	FM Demodulator(PLL Frequency Demod. experiment)
Multiplexing	Time Division Multiplexing/Demultiplexing
	Frequency Division Multiplexing/De-multiplexing
AD/DA Converter	A/D Converter
	D/A Converter
PCM/Delta	PCM Modulator
	PCM Demodulator
	Delta Modulator
	Delta Demodulator
PWM Communication	PWM Modulator
	PWM Demodulator
ASK Mod/Demod	ASK Modulator
	ASK Demodulator
PSK Mod/Demod	PSK Modulator
	PSK Demodulator
FSK Mod/Demod	FSK Modulator
	FSK Demodulator
Line Code	Bipolar NRZ Signal Encoder/Decoder
	RZ Signal Encoder/Decoder
	Manchester Encoder/Decoder
	AMI Encoder/Decoder
PLL	PLL Frequency Synthesizer

• Electric Part (Option)

*can change to basic modules instead of Electronic Part

Experiment Theme Module
No1. Ohm's Law
No2. Kirchhoff's law (Voltage & Current)
No3. Voltage & Current Divider Rule
No4. Maximum power-transfer theorem
No5. Thevenin's Theorem / Norton's Theorem / Principle of superposition
No6. Loop Analysis & Node Analysis method
No7. RC Series & Parallel Circuit
No8. RL Series & Parallel Circuit
No9. RLC Series & Parallel Circuit
No10. Diode
No11. Clipper & Clamper
No12. Rectifier Circuit(Half/Full wave, Bridge)
No13. Filter (Low pass / High Pass. Band Pass/Stop)

Product Configuration

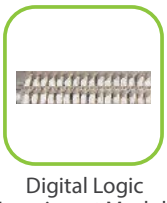

HBE-Basic-iLAB


Manual

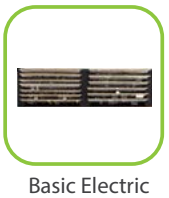

AC Power Cable


USB Cable
(A to B Type)

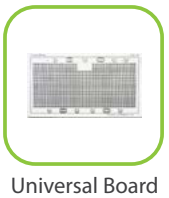

Oscilloscope Cable

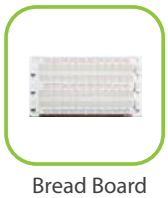

Digital Logic Experiment Module (Option)


Analog/Digital Basic Communication Experiment Module (Option)


Basic Electric Experiment Module (Option)

Electric modules can change to basic modules instead of Electronic Part.


Universal Board (Option)


Bread Board (Option)