

# >> Communication System

## Opt-Electronics Training & Optical Network System

### HBE-OPT 303 SE



- OPT-303-SE conducts the WDM transmitting & receiving test, based on such built-in functions as Function Generator, Dual Light Source (1310/1550nm), Dual Optical Receiver (power meter), and Digital Oscilloscope
- OPT-303-SE conducts optical communication practice and operation test by use of a light source with various wavelengths (650nm-MM, 1310nm-SM, 1550nm-SM, etc.)

### Features

- OPT 303 SE conducts the WDM transmitting & receiving test, based on such built-in functions as Function Generator, Dual Light Source (1310/1550nm), Dual Optical Receiver (power meter), and Digital Oscilloscope.
- OPT 303 SE conducts optical communication practice and operation test by use of a light source with various wavelengths. (650nm-MM, 1310nm-SM, 1550nm-SM, etc.)
- It is possible to make a test on physical properties of light-using equipment. (e.g., total reflection principle, refraction & reflection property, loss property, etc.)
- OPT 303 SE measures Optical Coupler, Attenuator (5dB,10dB), WDM (Mux & Demux). It also offers performance tests on different kinds of optical application devices provided.
- Digital control of all input/output data by use of FPGA. (e.g., LCD control, Signal Input/Output Selection, etc.)
- It controls PC software through private digital devices (Digital Potentiometer, 8-channel, 12-bit Serial DAC, etc.) and programs : Selection Function, LCD Display, Amplitude, Frequency, LD Bias Current, etc.
- It inputs various user-designating data signals beside outputting built-in functions (i.e., selection of eight signals - Sign, Triangle, Square, Ext Dig, Ext Anal.
- OPT 303 SE uses private 8-channel, 12-bit ADC (Analog Digital Converter) to improve the accuracy of LCD output data in the equipment.
- OPT 303 SE uses private high-speed / high-dynamic range ADC for parallel transmission of input/output data. (12-bit, 1-channel, 20MSPS, High SNR-69dB, etc.)
- OPT 303 SE can make a PC output of every output waveform in equipment It has a built-in digital oscilloscope function.



HBE-OPT 303 SE Accessories

## Name of Parts



9. CONNECTOR  
SC / PC Type Dual Optical Connector
10. WDM  
Wavelength Division Multi-plexer  
- 1310 / 1550nm  
- Connector Type : FC / PC-SC / PC, SC / PC-SC / PC
11. HYBRID ADAPTER SET  
- Type : SC-ST, SC-FC, FC-ST
12. OPERATION DIAL  
Frequency : Frequency Control Device  
Amplitude1 / 2 : Amplitude Control Device  
LD Bias1 / 2 : LD Bias Current Control Device

1. FUNCTION  
Internal Function Generator Block : Sign, Square, Triangle
2. TRANSMITTER  
Optical Light Source Operation Block  
- 650nm : Visual LD Multi-mode  
- 1310nm / 1550 nm : FP-LD Single-mode
3. FPGA CONTROL (DIGITAL)  
Digital Control Block of Internal / External Input / Output Data  
- FPGA Device : ALTERA EP2C5Q208  
- SRAM : 256K x 16 15ns
4. RECEIVER  
Pin-PD Operation Block  
- 650nm multi-mode Pin-PD  
- 1310 / 1550nm Single-mode Pin-PD
5. SELECTED FUNCTIONS  
Selection Switch of Internal/ External Signal  
-, , , Ext. Analog
6. LCD Display  
Selection Switch of LCD Data  
- LD0 / LD1 Current, Monitor PD Power, Si / Ge Current, PD Power (Optical Power Meter)
7. TRANSMITTING  
Selection of Output Signal of CH 1 Transmitter Port (LD and Si / Ge Diode Input Signal)
8. RECEIVING  
Selection of Output Signal of CH 2 Receiver Port (PD and Si / Ge Diode Output Signal)

## Contents

1. Measurement of the features of Si, Ge diodes
  2. Measurement of the features of 1310nm Wavelength of FP-LD (Light Source function)
  3. Measurement of the features of 1550nm Wavelength of FP-LD (Light Source function)
  4. Measurement of the features of 650nm Wavelength of FP-LD (Light Source function)
  5. Measurement of the features of PD , an optical-electric conversion device (Optical power meter function)
  6. Circuit arrangement by various driving system of photo diode (Optical Detector)
  7. Measurement of the features of optical attenuation by use of Fixed Attenuator
  8. Measurement of connection of various optical connectors
  9. Measurement of optical coupler principle and coupling ratio
  10. Measurement of the critical angle of total reflection
  11. Measurement of the features of optics reflection and refraction using lenses
  12. Measurement of the loss due to the curvature radius of optical fiber
  - \*13. Comparison of the features of Single-mode/Multi-mode optical cables 255
  - \*14. Experiment of the features of optical-cable splice using the V-Groove (HBE-OPT 303 only) (Option: V-Groove, Stripper, Cleaver, Cleaner, Bare fiber(1km), Bare fiber adapter)
  - \*15. Measurement of attenuation due to the length of optical fiber (Option: Cleaver, Cleaner, Bare fiber(1km), Bare fiber adapter)
  - \*16. Transmission of random digital and analog signals (1310nm/1550nm)
  17. Measurement of WDM(Wavelength Division Multi-plexer) system
  - \*18. Experiment of the feature based on the modulation (AM/FM) method of fiber-optics (Option: OPT-A, Oscilloscope, BNC cable)
  19. Understanding of the optical-talk-set principle by use of a voice signal (Option: OPT 303 SE 2set & Optical Talk Set)
  20. Measurement of the features of RS-232C wireless transmission by use of irED and photo TR
- \* Chapter is needed Extra Option

## Communication System

HBE-Avionics Protocol  
HBE-Comm

### HBE-OPT 303 SE

HBE-Basic iLAB (Comm)  
HBE-CAN

# Communication System

## >> HBE-OPT 303 SE

### Design specifications

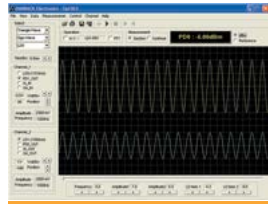
| Item                     | Description   |
|--------------------------|---|
| Light Source             | <ul style="list-style-type: none"> <li>FP-LD (1310, 1550nm) - Singlemode wavelength                             <ul style="list-style-type: none"> <li>- MQW-FP Laser diode module</li> <li>- Wavelength : 1310/1550nm</li> <li>- Built in optical isolator</li> <li>- Built in InGaAs monitor PIN photodiode</li> <li>- 10/125<math>\mu</math>m(Core/Clade) single-mode fiber pigtail with SC-PC connector</li> <li>- Optical output power : 10mW (max)</li> </ul> </li> <li>FP-LD (650nm) - Multimode wavelength                             <ul style="list-style-type: none"> <li>- 650nm wavelength (Visual LD)</li> <li>- Light output power is more than - 6dBm</li> <li>- Uncooled operation without TEC</li> </ul> </li> </ul> |
| Optical Detector         | <ul style="list-style-type: none"> <li>InGaAs PIN PD - SM @ 1310/1550nm wavelength                             <ul style="list-style-type: none"> <li>- Operation @ 1000~1600nm</li> <li>- Low dark current(0.1nA)</li> <li>- Low capacitance</li> <li>- High responsiveness (0.9 A/W)</li> </ul> </li> <li>InGaAs PIN PD-MM @ 650nm wavelength</li> </ul>  |
| Diode                    | <ul style="list-style-type: none"> <li>Si, Ge</li> </ul>  |
| Digital Control          | <ul style="list-style-type: none"> <li>FPGA : EP2C5Q208(ALTERA)</li> <li>SRAM : 256K * 16 15ns</li> <li>Low Speed ADC : 8ch 12bit 200Kbps ADC</li> <li>High Speed ADC : 1ch 12bit 20Mbps ADC</li> <li>Serial DAC : 8ch 12bit 1<math>\mu</math>s DAC</li> </ul>  |
| Signal Input             | <ul style="list-style-type: none"> <li>INTERNAL                             <ul style="list-style-type: none"> <li>- Function generator Frequency range : 10Hz ~ 50KHz,</li> <li>- Amplitude : 0V ~ 5Vpp</li> <li>- Wave type : Sin, Triangle, Square, User Digital, User Analog</li> </ul> </li> <li>EXTERNAL : 0V ~ 5Vpp Analog &amp; Digital port, MIC input</li> </ul>  |
| Signal Output Terminal   | <ul style="list-style-type: none"> <li>BNC, Audio Jack</li> </ul>   |
| Power Supply             | <ul style="list-style-type: none"> <li>Input : 85~264Vac 50/60Hz</li> <li>Output : 5Vdc (3/0.3A), +12Vdc (0.7A), +3.3Vdc, +2.5Vdc</li> </ul>  |
| Optical devices provided | <ul style="list-style-type: none"> <li>Basic devices provided                             <ul style="list-style-type: none"> <li>- Visual Attenuator, Fixed Attenuator (5dB/10dB)</li> <li>- WDM Set (MUX, DeMUX-1310/1550nm)</li> <li>- Hybrid Adapter Set, Optical Coupler, Single Mode Fiber</li> <li>- 650nm Visual LD &amp; PD, Multi mode Fiber, Multi mode Coupler</li> <li>- Optical Apparatus set Etc, USB Dongle</li> </ul> </li> </ul>   |

※ Specifications can be changed without notice

## Main Screen of Program

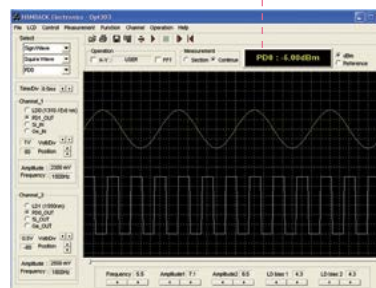
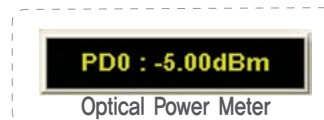
HBE-OPT 303 SE program is the software for observing a phenomenon occurred from the main board, and output characteristics are as follows.

- Optical power (dBm) display resulting from PD0 (1310nm) and PD1 (1550nm) through the Mini LCD window (the function of optical power meter)
- References of optical power meter
- Display of optical power value of monitor LD detected from Monitor PD
- Display of output data from light source (1310 / 1550nm)
- Display of PD0 and PD1 output waveforms (1310 / 1550nm)
- X-Y output of input-output waveform
- The FFT of each input/output waveform (the function of spectrum analyzer)
- Saving all measured data(Text/BMP)
- The measurement mode by section. It samples every section of output waveform, making a comparison and analysis of them
- Data analysis in the form of becoming real-time processing by receiving and making a continuous arrangement



### User signal choices

1. Test of transmission of single light source (1310nm or 1550nm)
  - CH1 : LD0(1310nm) / PD1
  - CH2 : LD1(1550nm) / PD0
2. Test of transmission of dual light source
  - CH1 : LD0(1310nm) / PD1
  - CH2 : LD1(1550nm) / PD0
3. Measurement of the features of Si Diode
  - CH1 - Si\_In
  - CH2 - Si\_Out
4. Measurement of the features of Ge Diode
  - CH1 - Ge\_In
  - CH2 - Ge\_Out
5. MINI LCD



This mini LCD shows the functions of optical power meter. Data output is calculated by converting the power value of light source and reference value of variations to dBm and dB. LCD Display Output

- ① LD0 ② LD1 ③ M-PD0 ④ M-PD1 ⑤ Si ⑥ Ge ⑦ PD0 ⑧ PD1

HBE-Avionics Protocol

HBE-Comm

**HBE-OPT 303 SE**

HBE-Basic iLAB (Comm)

HBE-CAN