

# >>Optical Communication Trainer

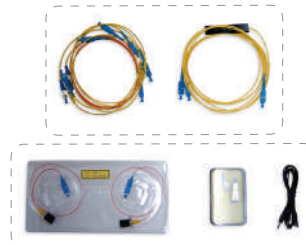


## Opt-Electronics Training & Optical Network System CM-027

- CM-027 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
- CM-027 conducts optical communication practice and operation test by use of a light source with various wavelengths (650nm-MM, 1310nm-SM, 1550nm-SM, etc.)

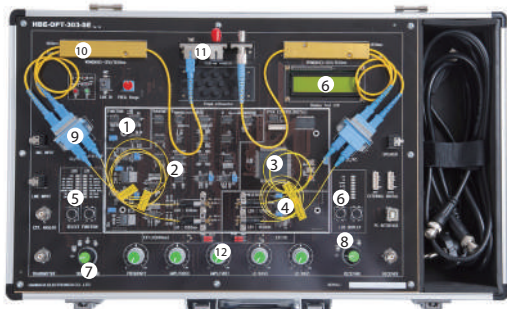
### Features

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- CM-027 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.)
- CM-027 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.
- CM-027 uses private 8-channel, 12-bit ADC (Analog Digital Converter) to improve the accuracy of LCD output data in the equipment.
- CM-027 uses private high-speed / high-dynamic range ADC for parallel transmission of input/output data. (12-bit, 1-channel, 20MSPS, High SNR-69dB, etc.)
- CM-027 can make a PC output of every output waveform in equipment It has a built-in digital oscilloscope function.



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
3. Measurement of the features of 1550nm Wavelength of FP-LD
4. Measurement of the features of 650nm Wavelength of FP-LD
5. Measurement of the features of PD, Optical-Electric Conversion Device
6. Circuit arrangement by various driving system of photo diode
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 principles 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 Features of Single-mode/Multi-mode Optical Cables
14. Measurement of Attenuation due to the Length of Optical Fiber
15. Transmission of Random Digital and Analog Signals (1310nm/1550nm)
16. Measurement of WDM(Wavelength Division Multi-plexer) System
17. Experiment of the Features based on the Modulation (AM/FM) Method of Fiber-Optics
18. Understanding of the Optical-Talk-Set Principle using a Voice Signal
19. Measurement of the Features of RS-232C Wireless Transmission using irED and Photo TR

# Optical Communication Trainer

> CM-027

## Design specifications

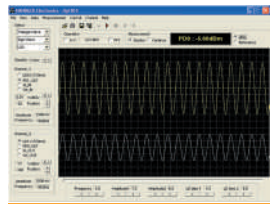
Item	Description
Light Source	<ul style="list-style-type: none"><li>• FP-LD (1310, 1550nm) - Singlemode wavelength<ul style="list-style-type: none"><li>- MQW-FP Laser diode module</li><li>- Wavelength : 1310/1550nm</li><li>- Built in optical isolator</li><li>- Built in InGaAs monitor PIN photodiode</li><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

CM-027 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

