



## CDMA Transceiver Trainer (SMT-7209)

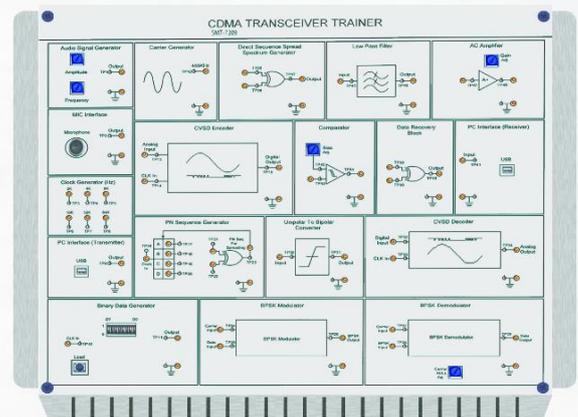
This ESOLS Engineering product **CDMA Transceiver Trainer** is a comprehensive training system designed to help students explore the fundamental principles of **Code Division Multiple Access (CDMA) communication**. This trainer demonstrates the **coding schemes used in CDMA**, along with **modulation and demodulation concepts**, enabling learners to understand how multiple users can share the same communication channel through code-based separation. By providing a hands-on approach, the system allows users to experiment with **spread spectrum techniques**, which are widely used in modern wireless communication systems for secure and efficient data transmission.

In addition to CDMA modulation and demodulation, the trainer incorporates **digital coding and decoding of voice signals** using the **Continuously Variable Slope Delta (CVSD) modulation technique**. This feature helps users analyze how voice signals are digitized and transmitted efficiently in a CDMA network. The system also supports **PC-to-PC communication using dedicated software**, enabling real-time experimentation and monitoring of data transmission. With its **interactive learning environment and real-world application focus**, the **CDMA Transceiver Trainer** is an ideal tool for students, researchers, and professionals looking to build expertise in modern wireless communication technologies.

## TECHNICAL SPECIFICATIONS

### Specifications:

- **8-bit Data Generator:** For generation of Binary Data
- **Word length:** 8 bit
- **Clock frequency:** 2K, 4K, 8K, 16K, 32K, 64K
- **Data format:** NRZ
- **PN Sequence generator**  
**PN Sequence Bit length:** 15 bits
- **Direct Sequence Spread Spectrum (DSSS) Coder and Decoder**  
**Decoder Analog signal generator:** Variable up to 3.4KHz
- **Carrier generator:** 455KHz
- **Modulator:** Binary Phase Shift Keying Modulator
- **Demodulator:** Binary Phase Shift Keying Demodulator
- **Codec:** CVSD Encoder / Decoder for Audio  
**Low Pass Filter:** 5th Order Butterworth Filter with 3.4KHz cut
- **Amplifier:** AC amplifier with variable gain
- **PC- PC Communication using software**  
**Microphone interface for voice**



## Technical Data:

- **8-bit Data Generator:** For Generation of Binary Data
  - The system includes an **8-bit data generator** to produce binary data, which serves as the input signal for modulation and transmission experiments.
- **Word Length:** 8-bit
  - Data is processed in **8-bit word lengths**, ensuring compatibility with standard digital communication protocols and enabling accurate data representation.
- **Clock Frequency:** 2KHz, 4KHz, 8KHz, 16KHz, 32KHz, 64KHz
  - Provides **selectable clock frequencies** for varying data rates, allowing users to study the impact of clock speed on signal quality and transmission performance.
- **Data Format:** NRZ (Non-Return-to-Zero)
  - Uses **NRZ encoding**, where binary data is transmitted as a continuous stream without returning to zero, minimizing bandwidth requirements and improving signal efficiency.
- **PN Sequence Generator:**
  - Generates **Pseudo-Noise (PN) sequences**, which are essential in **CDMA systems** for spreading the data signal across a wider bandwidth, enhancing security and noise resistance.
- **PN Sequence Bit Length:** 15 bits
  - The **15-bit PN sequence** is used to spread the transmitted signal, making it more robust against interference and eavesdropping.
- **Direct Sequence Spread Spectrum (DSSS) Coder and Decoder:**
  - Implements **DSSS coding and decoding**, which spreads the transmitted signal over a broader frequency band, improving security and resistance to jamming.
- **Analog Signal Generator:** Variable up to 3.4KHz
  - A built-in **analog signal generator** provides adjustable frequencies up to **3.4KHz**, enabling testing with voice or other analog signals.
- **Amplifier:** AC Amplifier with Variable Gain
  - An **AC amplifier with adjustable gain** amplifies weak signals, enabling better signal analysis and accurate demodulation.
- **Carrier Generator:** 455KHz
  - The system features a **455KHz carrier generator**, which acts as the carrier frequency for the BPSK modulation process.
- **Modulator:** Binary Phase Shift Keying (BPSK) Modulator
  - The **BPSK modulator** converts binary data into phase-modulated signals, a critical modulation technique for CDMA communication.
- **Demodulator:** Binary Phase Shift Keying (BPSK) Demodulator
  - The **BPSK demodulator** retrieves the original binary data from the received signal by detecting phase shifts, ensuring high-quality data recovery.
- **Codec:** CVSD Encoder/Decoder for Audio
  - The **CVSD (Continuously Variable Slope Delta) codec** compresses and decompresses voice signals, providing efficient and high-quality audio transmission.
- **Low Pass Filter:** 5th Order Butterworth Filter with 3.4KHz Cutoff
  - The **5th order Butterworth filter** removes high-frequency noise from the demodulated signal, allowing accurate reconstruction of the original audio signal.
- **Microphone Interface for Voice:**
  - The system includes a **microphone interface** for voice input.
- **PC-to-PC Communication Using Software:**
  - Supports **PC-to-PC communication** through dedicated software, allowing users to transmit, receive, and analyze signals in

## Experimental Data:

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- Generation of CDMA-DSSS signal
- Study theory of CDMA DSSS Encoding & Decoding
- Modulation of CDMA signal using BPSK
- Demodulation of CDMA-DSSS signal using BPSK
- Study of pseudo random bit sequence generation
- Study of Voice Coding / De-coding using CVSD technique
- PC-PC communication using DSSS technique