



TLCOM
Telecommunications



exxer Skills for
the Future

THE UNION OF EXPERIENCES AND COMPETENCIES, A NEW LEVEL OF EXCELLENCE IN EDUCATION!

EXXER is born from the merger of two companies passionate about **technology**, **innovation**, and **education**.

With the purpose of providing increasingly excellent tools to assist in technological education, we believe that the combination of practical and theoretical teaching is what makes a difference in **accelerating human and global development**.




TECHNOLOGY ● INNOVATION ● EDUCATION



TLCOM

Telecommunications

 What characterizes current technologies in various application areas is connectivity. The ability of devices to communicate with each other, with other systems, and with people is only possible thanks to modern telecommunication techniques. Mastery of both wired and wireless communication technologies, once restricted to a specific training area, is now a necessary subject for comprehensive education in various technology and engineering courses.


This series of products covers topics such as:

- Fundamentals of communication;
- Modulation and demodulation, with an emphasis on digital technologies;
- Antennas;
- Propagation.


Modular kits enable a systemic understanding of the technology or the analysis of electronic circuits.

- Modern digital modulation/demodulation techniques;
- Antenna tests through PC applications. Experiments on antennas and propagation with digital modulations.

Programs and applications complement the didactic solution, ensuring greater effectiveness through more dynamic and modern learning.

 All kits in this series come with comprehensive didactic materials focused on competency-based teaching, designed for easy use by educators.

We offer complete solutions for teacher training and updates, ensuring maximum utilization of kit resources.

 Consult our specialists for more information and detailed technical specifications for each equipment in the series.



MAIN SKILLS AND COMPETENCIES

ANALOG AND DIGITAL COMMUNICATION

- Amplitude Modulation (AM), Double Sideband (DSB) AM, and Single Sideband (SSB) AM Modulation and Demodulation;
- Phase-Locked Loop (PLL);
- Amplitude Shift Keying (ASK) and Phase Shift Keying (PSK) Modulation and Demodulation;
- Digital Switching Method: 2ASK, 2PSK, 2FSK, and DPSK Modulations;
- Signal Analysis from the Eye Diagram;
- Encodings and Decodings: BPH, CMI, HDB3, and AMI;
- Digital Modulations and Demodulations: MSK, 0.3GMSK, 0.5GMSK, QPSK, OQPSK, DQPSK, π /DQPSK, and 16QAM;
- Pulse Amplitude Modulation (PAM) and Pulse Code Modulation (PCM) Modulation and Demodulation.

ANTENNAS AND PROPAGATION

- Conceptualize telecommunications and radio waves.
- Understand the basic magnitudes of a wave: frequency, period, wavelength, electromagnetic spectrum, and amplitude.
- Analyze the phenomena that occur in a transmission system with obstacles in the wave propagation path.
- Conceptualize additional magnitudes related to electromagnetic waves: decibels, gain, attenuation, signal-to-noise ratio, transmission rate, and bit error rate.
- Calculate signal-to-noise ratio and bit error rate.
- Understand the basic operation of transmitter and receiver circuits.
- Analyze the received signal through software and using a spectrum analyzer.
- Understand what the Fresnel zone is.




TECHNOLOGICAL HIGHLIGHTS

**PROFESSIONALLY
MANUFACTURED ANTENNAS**

**ANTENNA TESTING USING
DIGITAL MODULATION**

**COVERS MODERN DIGITAL
MODULATION TECHNIQUES**



 Considering the usability and learning process of each student, educational solutions have been developed and designed with distinct benefits and features for users.

KEY BENEFITS

- Modularity;
- Protected components;
- Easy storage.

KEY DIFFERENTIATORS

- Security;
- No tools required;
- Didactic material.

CONFIGURACIONES DEL DISPOSITIVO

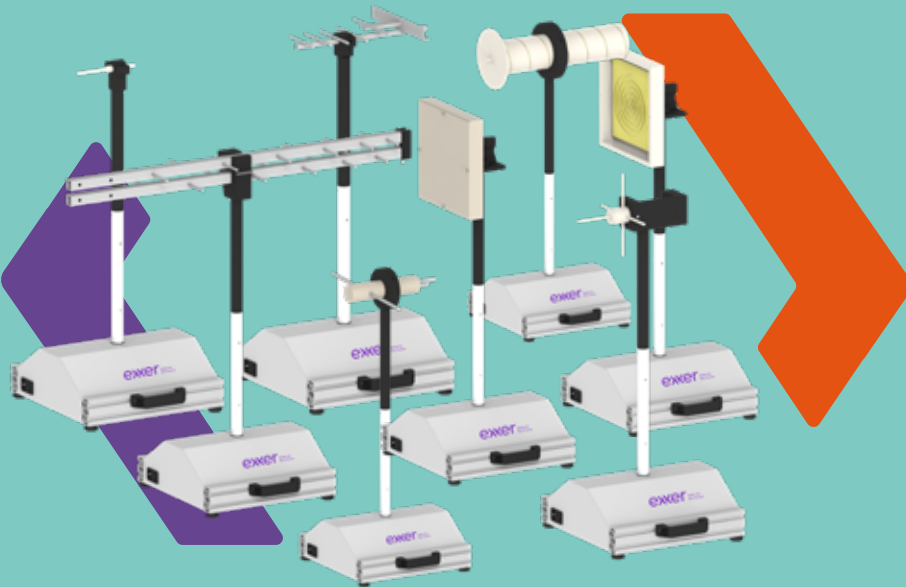
PARTNUMBER	DESCRIPTION
TLCOM2000	Antenna testing bench
TLCOM3000	Analog and digital communication testing bench

FEATURES:

A didactic kit for telecommunications studies that allows exploration of the main types of antennas used in UHF and VHF, enabling analysis of different characteristics and understanding their operation. It uses digital modulations and demodulations, allowing observation of concepts related to modern forms of telecommunication.

TLCOM2000

Antenna Testing Bench



Configurations

- Operating Frequency: 915MHz (UHF);
- Antennas:
 - Wave Dipole;
 - 1/2 Wave Dipole;
 - 3/4 Wave Dipole;
 - Yagi-Uda;
 - Log-Periodic;
 - Spiral;
 - Helical;
 - Telescopic;
 - Ground Plane;
 - L-Type.

ELECTRICAL FEATURES

Power Supply

Dual voltage 110/220VAC – 50/60Hz

Connections

BNC Connectors and Coaxial Cables

FEATURES

A didactic kit for the study of Telecommunications, composed of various modules that allow exploration of the main types of modulations, enabling the analysis of different characteristics and understanding their operation. More than that, it uses analog and digital modulations and demodulations, allowing the observation of concepts from modern forms of telecommunication.

TLCOM3000

Analog and Digital Communication Testing Bench



Configurations

- Amplitude Modulation (AM), Double Sideband (DSB) AM, and Single Sideband (SSB) AM Modulation and Demodulation;
- Phase-Locked Loop (PLL);
- Amplitude Shift Keying (ASK) and Phase Shift Keying (PSK) Modulation and Demodulation;
- Digital Switching Method: 2ASK, 2PSK, 2FSK, and DPSK Modulations;
- Signal Analysis, based on the Eye Diagram;
- Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM) Multiplexing and Demultiplexing;
- Encodings and Decodings: BPH, CMI, HDB3, and AMI;
- 08 Modes of Digital Modulations and Demodulations: MSK, 0.3GMSK, 0.5GMSK, QPSK, OQPSK, DQPSK.

DIMENSIONS

Height	466mm
Width	687mm
Depth	277mm
Weight	4,0Kg

ELECTRICAL FEATURES

Power Supply	Dual voltage 110/220VAC – 50/60Hz
Connections	2mm Safety Terminals

DEVELOPMENT TOOLS

Our educational solutions are complemented with the necessary development tools and professional software for the comprehensive training of the student.

Included
Licenses

XS403 Antenna Analysis and Testing

- Platform: [Windows | Linux | macOS]
- License: [Included License | Freeware | Opensource]






UTILIZATION

Guidance on the recommended use of the kit.

We suggest this configuration for better classroom utilization.

 We suggest this configuration for better classroom utilization. The kits and activities are designed considering the sizes of the related equipment listed below. The minimum necessary infrastructure is a prerequisite for the full use of the didactic kit functionalities.

We recommend the computer and connectivity requirements detailed alongside for the use of the programs and applications accompanying the kit.

PARTNUMBER	DESCRIPTION	EQUIPMENT (STUDENT/KIT)	UTILIZATION
TLCOM2000	Antennas	3 a 4	1 kit for 3 sets of equipment
TLCOM3000	Analog and Digital Communications	3 a 4	1 kit for 3 sets of equipment

INFRASTRUCTURE		
ELECTRICAL	TLCOM2000 1 single-phase outlet according to the kit power supply	TLCOM3000 1 single-phase outlet according to the kit power supply

CONNECTIVITY	
Ethernet Connections per Workstation	1 Ethernet port (recommended for computers) 2 Ethernet ports for each antenna kit
Wi-Fi Network	Recommended for computers
Internet Access	Recommended
Computer	Required; according to the minimum program configuration



COURSEWARE

The didactic kits are accompanied by rich educational material with a practical focus that proposes exercises for the development of skills and competencies.

In addition to the User Manual, which contains information on operation and maintenance, the [Student Guide](#) is provided with practical activity proposals to be carried out with the kit. The [Educator Guide](#) includes answers to proposed activities and guidance on the didactic use of the kit. Additionally, [video tutorials](#) are offered to assist in the easy mastery of development tools and kit usage.

All this content is digitally accessible on our website, in the [Educator Portal](#).



SKILLS AND COMPETENCIES

Antennas and Propagation

- Conceptualize telecommunications and radio waves;
- Understand the basic magnitudes of a wave: frequency, period, wavelength, electromagnetic spectrum, and amplitude;
- Analyze phenomena occurring in a transmission system with an obstacle in the wave propagation path;
- Conceptualize other magnitudes related to electromagnetic waves: decibels, gain, attenuation, signal-to-noise ratio, transmission rate, and bit error rate;
- Convert units and calculate gain and attenuation;
- Calculate signal-to-noise ratio and bit error rate;
- Understand the basic operation of transmitter and receiver circuits;
- Use the software and understand its main functionalities;
- Configure the transmission and reception of signals in the didactic kit;
- Analyze the influence of an obstacle on the transmission path;
- Remotely control antennas with RX/TX controls;
- Analyze the received signal through software and using the spectrum analyzer;
- Conceptualize near and far fields;
- Understand what the Fresnel zone is;
- Analyze factors influencing signal attenuation.

Fundamentals of Telecommunications

- Frequency Division Multiplexing (FDM) Multiplexing and Demultiplexing;
- Time Division Multiplexing (TDM) Multiplexing and Demultiplexing;
- Transmission Distortion;
- Additive White Gaussian Noise (AWGN);
- Signal Analysis from the Eye Diagram;
- Encodings and Decodings: BPH, CMI, HDB3, and AMI;
- Pulse Amplitude Modulation (PAM) and Pulse Code Modulation (PCM) Modulation and Demodulation.

SKILLS AND COMPETENCIES

Basic Modulations

- Amplitude Modulation Demodulation (AM–DSB Coherent Demodulation);
- Amplitude Modulation Demodulation (Envelope Detection Method);
- Amplitude Modulation Demodulation (AM–SSB Coherent Demodulation);
- Phase–Locked Loop (PLL);
- Analog Multiplication Method: Amplitude Shift Keying (ASK) and Phase Shift Keying (PSK) Modulation;
- Digital Switching Method: 2ASK, 2PSK, 2FSK, and DPSK Modulations.

Modern Modulations

- Digital Modulations and Demodulations: MSK, 0.3GMSK, 0.5GMSK, QPSK, OQPSK, DQPSK, π /DQPSK, and 16QAM, modes activated by dip–switch selection;
- Synchronization Modes: Carrier, Symbol, and Frame;
- CVSD Encoding and Decoding.

APPLICATIONS

A modern educational solution is not complete without software and applications. With the kits in this series, exclusive licenses are provided for PC and mobile applications that complement and enhance the use of the kits.

Mobile Applications

EXXER APP

- Augmented reality kit visualization
- Data acquisition system
- > QR code/link for the application





FORMATION

As important as didactic resources and tools is the training of the teacher. We have a comprehensive package of solutions to meet your training and updating needs.

Quick Start and Tutorials

The Quick Start is a quick video guide to understand, test, and set up the product. Tutorials are videos that teach common procedures needed in classes using the kit.

Technical Delivery

During technical delivery, our specialists present the product, its features, maintenance and safety precautions, and operate it alongside the customers.

Operational Training

The goal of operational training is to educate instructors on kit usage. The didactic materials of the kit are presented, and some proposed practices are carried out. It also includes all activities from technical delivery.

Technological Training

Technological training is a deeper study of applied technology and concepts. These courses do not focus on the kits but on technical topics and competencies for teacher updates.



Headquarters:

Street José Pinto Vilela, 156
Neighborhood Centro
Zip Code 37540-000
Santa Rita do Sapucaí — MG
Phone: (35) 3473-4050

Branch:

Av. Rubem Bento Alves, 5167
Neighborhood Santa Catarina
Zip Code 95030-325 Caxias
do Sul — RS
Phone: (54) 3771-6600

 www.exxer.com

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