Hands-On
Outside Plant Intro-Level Technician

BTS
Real-World Experience

Course Description

This Hands-On course is a must for persons entering the Field of Telephone Communications Inside and Outside Plant Facilities. In the first part of this course, students will learn about basic electricity as it applies to telecommunications, basic telephony terms, and concepts commonly used in the field today. In addition, the student will learn the basic components of the telephone network from the customer equipment to the outside plant, central office and the toll network and basic bonding and grounding.

The second portion of this course expands from the basics learned in the first part and covers Copper, xDSL, Fiber Optics and CAT 5/6.

Each student will have Hands-On training in basic
meter reading, fault isolation, testing and troubleshooting these applications in today's telecom environment.

Students Will Learn

- **Telephony Overview**
- **Network Overview**
- **AC/DC and Series/Parallel Circuits**
- **Ohms Law**
- **Telephone System Components**
- **Outside Plant**
- **Central Office and Switching**
- **Bonding & Grounding and Protection**
- **Cooper Fault locating**
- **DSL**
- **CAT 5/6**
- **Fiber Optics**
- **Testing & Troubleshooting**
- **Provisioning & Maintenance**
- **And More**

Target Audience

Anyone working in the field of telecommunications today, especially any new hires.

Prerequisites

Be able to pass a color-blind test, and an willingness to learn.

Course Outline

Module I: Basic Electrical Principles

Terms and acronyms
Basic electrical concepts
Series and parallel circuits
AC and DC
Voltage, Current, and Resistance
Ohms Law
Inductance, Capacitance and Impedance

Module II: Basic Telephony (POTS)

Terms and acronyms
Analog Voice Frequency
Basic telephone set operation
Tip and Ring cable pair
Basic Outside Plant
Basic Central Office
Dial pulses and DTMF
NID (Network Interface Device)
Inside wiring and phone jacks
Cable construction
Cable pair color code
Aerial plant, closures and drops
Buried plant, pedestals and buried drops
Load Coils
And more

Module III: Bonding & Grounding and Protection

Basic concepts and code requirements
At the customer premise

In the outside plant
In the central office

Module IV. Identifying Cable Faults
Sheath Faults
Capacitive Faults
Resistive Faults

Module V. Section Analysis
Cable Pair Analysis Procedure
Environmental Factors
Documenting Test Results

Module VI. Locating Buried Cable
RF and Audio Signals
Marking The Cable Route
Capacitive Fault Lab Procedures:
Opens
Splits
Water Ingress
Resistive Fault Lab Procedures:
Short Locate
Ground Locate
Battery-Cross Locate
Side-Cross Locate

Module VII: Understanding xDSL
Terms and Acronyms
History of xDSL
Types of xDSL
xDSL and Applications

Module VIII: Components of a DSL System
Modems
Splitters
Filters
ATU-C/ATU-R
DSLAMs

Module IX: Digital Transmission
Explanation of bits and bytes
CAP/DMT line code
Converting digital to analog
Error detection schemes
Frames and Superframes
System parameters

Design applications
Examples of download/upload systems
Loop parameters
Capacity
Margin
Interpreting LINK TRUN-UP RESULTS
Bits Graphic
Explanation of all DSL connection results

Module X: Loop Qualification & Testing
Distance versus bit rate
Gauge/quality of cable
Bridge taps
Load coils/Smart coils
Power influence
Complete a 10 step troubleshooting procedure
Shorts/grounds/crosses/splits/opens (high joints)
Interferers
Insertion loss
TDR traces and testing

Module XI: CAT5 & CAT6 Cable Preparation, Installation and Troubleshooting
Codes and Standards
Pulling Cables
Supporting Cables
Cable Obstacles
Cable Documentation
Pathways
Special Tools
Pair Twist Limits
Bend Radius
Connector Types
Cable Management
Cable Performance Specifications
Quality Workmanship
Cable Terminating
Termination Tools
Termination
Testing

Module XII: Case Studies & Troubleshooting Tips for CAT 5-6
Project planning
Codes and standards
Installation DOS and DONTS
Architectures and Installations
Tools and Components
Connector types
Certified Testing Procedures
Architectures and Installations

Tools and Components
Cable Building
Termination
Certified Testing
Troubleshooting

Module VIII. Choosing The Correct Test Set (Any type brought to class)
VOM
DynaTel 965
Tempo-Sidekick Meter
MTDR
Sunrise Sunset xDSL
EXFO, Fluke, JDSU-HST3000, etc.
And more

Module XIV: Fiber Optic General Studies
Common Industry Terminology
History of Fiber Optics
Advantages/Disadvantages of Fiber Optics
Basics of a Fiber Optic Communications System
Typical Transmission Rates for Voice, Video & Data Applications
System Topologies
Fiber Optic Standards
Theory of Light
Electromagnetic Spectrum
Total Internal Reflection
Singlemode and multimode characteristics
Index of Refraction (Refractive Index)
Light Sources (LEDs & LASERs)
Wave Division Multiplexing (WDM)
Optical Switching Fundamentals
Optical Fiber Types
Typical Fiber Specifications
Multimode Optical Fibers
Singlemode Optical Fibers
Dispersion Characteristics
Modal Dispersion
Chromatic Dispersion
FIBER CABLE TYPES:
Outside Plant
Inside Plant
Loose tube Gel Filled (OSP)
Tight Buffered Distribution (ISP)
Tight Buffered Breakout (ISP)
Jumper Cables and Hybrids styles
Reverse Oscillation Locator (OSP)
Fiber Color Code

Module XV: Fiber Optic Safety Issues
LASER Safety and Warning labels

Types of LASERs
LASER Output Power Levels
Eye Safety Precautions
Safe Glass Disposal Practices
Food and Drinks Not Safe
Proper Person Cleanliness
Safe Work Surroundings
Confined Spaces Issues

Module XVI: Fiber Optic Cable Installation and Proper Planning
Project Considerations
Cable Pre-testing
Cable Reels Identification and Handling
Proper Cable Pulling Techniques
Outdoor Cable Design Characteristics
Direct Bury Cable Installation
Directional Boring Methods
Buried Cable Depths
Man Holes and Vaults
Cable Pulling Specifications
Tensile Strength and Bend Radius
Avoiding Installation Obstacles
Grounding and Bonding Fiber Cables
Identifying Cable Types
Work Area Protection Issues
And More...

Module XVII: Fiber Optic Conntectors
Connector Types
Use of connectors
ST Style Connector Assembly; Hand and/or Machine Polishing and Inspection
SC Style Connector Assembly; Hand and/or Machine Polishing and Inspection
* Proper termination and testing of connectors
TESTING CONNECTORS AND JUMPER LOSS
Measure loss of previously installed connectors
Test loss of jumpers
Fiber Testing Parameters
Continuity Testing

Module XVIII: Fiber Optic Spicing
Mechanical and Fusion Splicing
Fusion Splicer Types and Operations
Precision Cleaver Operation
Set-up Fusion Splicer and Cleaver Work Stations
Practice Fiber Stripping, Cleaning and Cleaving
Practice In-Line Fusion Splicing
Practice Pigtail Fusion Splicing
Qualify Acceptable Splices

Module XIX: Fiber Optic Enclosures
Closures used if Fiber Optics Splicing
How to properly open and install cables
How to dress fibers in a splicing tray

Module XX: Fiber Optic Testing
The dB Scale and Units of Loss
OTDR Functions for Testing
OTDR Testing for Splices, Distances and Back Reflection
OTDR Trace Guidelines
The Dead Zone
Trace Events and Interpretation
Testing at Various Wavelengths
System Loss Parameters
Calculating System Loss
Total System OTDR Testing
Optical Loss Test Sets (OLTS)
Referencing the Test Set First
Measuring Cable System Loss
Documenting Test results

Delivery Method

Instructor-Led with numerous Hands-On labs and exercises.

Equipment Requirements
(This apply's to our hands-on courses only)

BTS always provides equipment to have a very successful Hands-On course. BTS also encourages all attendees to bring their own equipment to the course. This will provide attendees the opportunity to incorporate their own gear into the labs and gain valuable training using their specific equipment.

Course Length

5 Days