

Hands-On

# T1-T3 and Fiber Networks

Operations, Maintenance & Troubleshooting



## BICSI CECs

This course has been approved for CEC credits by BICSI. Please read below for a breakdown of the credits that we offer for this course. For more information regarding BICSI please visit our website.

RCDD: 16	NTS: 16	OSP: 16	Inst: 16	Tech: 16	Cert. Trainer: 16
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## Course Description

A vast majority of Telecommunications companies use T1 (DS1) and Fiber Optic network systems as the primary method of transporting voice and data on their transmission networks therefore, having well trained technicians with the ability to install, maintain and troubleshoot these systems is vital to providing high-quality reliable service to customers in a highly competitive environment.

This 2-day Hands-On course is an intense training experience that combines T1, T3 and fiber optics theory and operations with Hands-On troubleshooting. BTS provides a live working classroom lab with typical equipment currently deployed in the telecommunications industry. Students learn how these systems work, then are required to use the knowledge to test, troubleshoot and repair the circuits.

## Students Will Learn

- **The Theory, Operations and Functions of T1 and T3 Systems, including Channel Banks, Muxes, and Crossconnects.**
- **How to use T1 and T3 Test Equipment To Monitor, Troubleshoot and Repair Network Circuits.**
- **How T1 and T3 Circuits network into Fiber Optic Systems.**
- **The Need For Network Synchronization (BITS) Systems.**
- **Special Circuits, such as Analog Data, DDS, Fractional T-1 and ISDN.**
- **T1 Framing, Line Coding, Signaling and Alarm Signals.**
- **T1 Circuit Layout from the Network, through the Central Office, the T1 or HDSL Span Line, to the Customer Premise and the NIU SmartJack.**
- **Hands-On Testing of T1 Circuits using T1 Test Sets and Standard Test Patterns at the DSX-1 Crossconnect and other Test Access Points.**
- **T3 Theory and Operation, Including Multiplexers, DSX-3 Crossconnects And SONET Fiber Optic Equipment.**

- **Hands-On Testing Of T3 Circuits Using T3 Test Sets and Standard Test Patterns.**
- **Network Synchronization Systems using BITS Clock Equipment in the Central Office and Stratum-1 Timing Reference Sources, Such As GPS.**
- **T1 and T3 Test Sets are covered extensively to give the Student confidence in using THEIR Test Equipment to test and troubleshoot.**
- **And More.**

## Target Audience

This training course is intended for telecommunications technicians responsible for installation, maintenance, troubleshooting and repair of T1, T3 and fiber optic equipment and circuits both in the local loop and the network, including Customer Premise, Span Line and Central Office locations.

## Prerequisites

None.

## Course Outline

### Module I: T1 Operation, Maintenance and Troubleshooting

Circuit Layout and Circuit ID Numbers  
 Binary Numbers  
 T1 Channel Bank Operation  
 Special Circuits (Analog Data, DDS, Frac. T-1, ISDN, T1 HiCap)  
 Analog-to-Digital Conversion  
 Signaling (SF and ESF)  
 Line Coding (AMI and B8ZS)  
 T1 Signal Specs.  
 T1 Signal Errors and Alarms  
 T1 Stress Test Patterns  
 DSX-1 Crossconnects  
 I/O DCS Systems  
 T1 Traditional Spanlines, including span power and repeaters.  
 HDSL, HDSL-2 and HDSL-4 Spanlines  
 Customer Prem. Equipment (NIU Smartjacks, CSUs, RJ48 Jacks)  
 Loop Codes for Customer Premise Equipment  
 Troubleshooting techniques and step-by-step procedures  
 And more...

### Module II: T3 and Fiber Optics Operation, Maintenance and Troubleshooting

M13 Multiplexer Operation and Equipment  
T3 Signal Characteristics  
T3 Signal Errors and Alarms  
T3 test signals and stress patterns  
DSX-3 Crossconnects  
3/1 DCS  
SONET Technology and Fiber Optic Terminal Equipment  
Digital Bit Rates from DS0 to OC192  
WDM and DWDM Transport Technology  
Fiber Optic Patch Panels and Connectors  
Fiber Optic Ring Technology  
Frame Relay and ATM Networks  
And More...

#### Module III: Network Synchronization

Stratum Clock Reference  
BITS Clocks  
Timing Distribution within the Central Office  
GPS Stratum-1 Reference  
And More...

### **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**

2 Days