

TRAINING PROGRAM OF INSTRUCTION (TPI)
FOR
DINFOS-BRTSM
Broadcast Radio/Television Systems Maintenance Course



Approved by:

Commandant Defense Information School
Supersedes TPI Dated: April 2006



**BROADCAST RADIO AND TELEVISION SYSTEMS MAINTENANCE
COURSE**

TRAINING PROGRAM OF INSTRUCTION

Table of Contents

<u>Element</u>	<u>Page</u>
Preface	4
Functional Area 1 - Fundamentals of Broadcast Television Systems	6
Video Signal Characteristics Student Progress Measurement	9
Functional Area 2 – Computer Systems	
Principles of Computers Networking I Networking II	
Functional Area 3 – Non-Linear Editors (NLE)	13
Functions of NLE NLE Setup, Configuration, and Troubleshooting	
Functional Area 4 - Camera Systems	16
Functions of the Television Camera & Camera Back Television Camera Circuitry & Operations Checks Maintenance and Repair	
Functional Area 5 - Videotape Recorders (VTRs)	20
Fundamentals of VTR Operation VTR Maintenance and Repair	
Functional Area 6 - Audio Systems	23
Principles of Audio Systems and Standards Audio Consoles and External Equipment Audio Distribution and Processing Digital Audio Theory Digital Audio Editors	

Audio Automation

Functional Area 7 - Studio Systems **30**

Signal Paths and Signal Timing
TV Graphics and Digital Video Effects
Studio Production Preparation
TV Studio Automation Systems
Studio Design and Interoperability

Functional Area 8 - Broadcast Transmission Systems **36**

Fundamentals of Broadcast Transmission
Principles of Antennas
AM Transmission and Transmitters
FM Transmission and Transmitters
TV Transmission and Transmitters
Microwave and Studio Link Systems
Cable Television (CATV) Systems
Satellite Transmission
Emerging Technologies

Functional Area 9 - Contingency Training Exercise **46**

Pre-Deployment (Collective training)
Deployment (Collective training)
Post-Deployment (Collective training)

Functional Area 10 - Course Administration **50**

Course Opening
Course Closing

TRAINING PROGRAM OF INSTRUCTION

Preface

TRAINING PROGRAM OF INSTRUCTION FILE NUMBER (TPFN):
DINFOS-BRTSM

TITLE: Broadcast Radio/Television Systems Maintenance Course

TRAINING LOCATION: Fort George G. Meade, Maryland

SPECIALTY AWARDED: USN NEC - 4747

PURPOSE: The purpose of this course is to provide higher-level instruction for broadcast radio and television systems engineers. This course is designed to target the training of skills and knowledge to support studio production and broadcast missions of the armed services and American Forces Radio and Television Service.

COURSE DESCRIPTION: Develops the professional broadcast radio and television maintenance specialist from an apprentice to journeyman level of competence. This course is designed to provide in-depth exploration of the principles and technological application in the following functional areas: broadcast television systems, audio, camera, video tape recorder, studio, transmission systems, computer systems, non-linear editors and a contingency (field) training exercise.

PREREQUISITES:

Army - 25R20 and above

Navy - NEC – 4746 (or NEC 4743 with a waiver approved through the Naval Media Center, approved by the DINFOS Commandant)

Air Force - AFSC – 2E1X4

International students attending this course must have an ECL of 75. Must have normal color vision; cannot have acrophobia, be claustrophobic or have vertigo

SECURITY CLEARANCE: None

CLASS SIZE:

MAXIMUM 8

MINIMUM 3

ANNUAL COURSE CAPACITY 24 STUDENTS

COURSE LENGTH: 71 Training Days

ACADEMIC HOURS	557
ADMINISTRATIVE HOURS	<u>11</u>
TOTAL COURSE HOURS	568

INSTRUCTOR CONTACT HOURS: 878

TYPE/METHOD OF INSTRUCTION:

Administrative (AD) -	11.00
Lecture (L) -	186.00
Demonstration (D) -	15.25
Performance Exercise (PE) -	147.87
Examinations	
Performance (EP) -	162.21
Written (EW) -	45.50

TRAINING START DATE: 01 October 2007

ENVIRONMENTAL IMPACT: None. DOD policy was followed to assess the environmental impact.

MANPOWER: The Inter-service Training Review Organization (ITRO) formula was used to determine the number of instructors required.

EQUIPMENT AND FACILITIES: The Course Design Resource Estimate (CDRE) contains this information.

TRAINING DEVELOPMENT PROPONENT: The Defense Information School (DINFOS), Directorate of Training, Course Development Department (CDD): 301-677-4420; DSN 622-4420.

FUNCTIONAL AREA 1
FUNDAMENTALS OF BROADCAST TELEVISION SYSTEMS

TPFN: DINFOS BRTSM-001

UNITS: 001 Video Signal Characteristics
 002 Student Progress Measurement

TERMINAL TRAINING OUTCOME: The instruction and training throughout this Functional Area provides refresher training in basic television signals. The student is taught proper video signal characteristics in accordance with NTSC, FCC, and RS-170A standards. Upon completion of this functional area, the student will be able to identify different video signals, how to correct distortion and basic quality control measures for broadcast equipment. Student competency is assessed through written examinations, practical exercises, and performance examinations.

TPFN HOURS AND TYPES:

10.75 - lecture	(L)
6 - practical exercise	(PE)
1.25 - written exam	(EW)

TPFN TOTAL HOURS: 18

FUNCTIONAL AREA 1
FUNDAMENTALS OF BROADCAST TELEVISION SYSTEMS

TPFN: DINFOS-BRTSM-001-001

UNIT TITLE: Video Signal Characteristics

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify each section of the composite video signal, function of each section, and how each section interacts with the complete composite video signal. Composite video sections covered include the horizontal and vertical blanking intervals and active video. The student will identify the development of the TV signal from its inception through black and white broadcasting and color broadcasting. The student will identify color TV standards, and discuss how the current standards came into existence. Standards covered include NTSC, FCC, and RS-170A. Student competency is assessed on a written exam where the student must correctly answer a minimum of 70% of the questions.

INSTRUCTIONAL TYPE AND HOURS: 8.75L, 1.25EW

TOTAL INSTRUCTIONAL HOURS: 10

PREREQUISITE TPFN(S): None

TASK(S):

- 001- Identify composite color video signal (characteristics)
- 002- Identify NTSC standards
- 003- Identify principles of colorimetry
- 004- Identify digital compression techniques
- 005- Define bit-error rate and testing
- 006- Unit written exam

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: None

REFERENCES: National Association of Broadcasters, (NAB) Engineering Handbook, 9th Edition, Video and audio signal paths; National Television System Committee standards

FUNCTIONAL AREA 1
FUNDAMENTALS OF BROADCAST TELEVISION SYSTEMS

TPFN: DINFOS-BRTSM-001-002

UNIT TITLE: Student Progress Measurement

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): A brief review of the material in Unit 1 is conducted to assess the student's comprehension and clarify key points. Students practice setting up equipment and using test equipment to verify video signals.

INSTRUCTIONAL TYPE AND HOURS: 2 L; 6 PE

TOTAL INSTRUCTIONAL HOURS: 8

PREREQUISITE TPFN(S): All previous TPFNs

TASK(S): 001- Perform basic TV/radio signal measurements

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (PE, EP)

SAFETY FACTORS: None

REFERENCES: National Association of Broadcasters, (NAB) Engineering Handbook, 9th Edition, Video and audio signal paths; National Television System Committee standards; www.videouniversity.com

FUNCTIONAL AREA 2
COMPUTER SYSTEMS

TPFN: DINFOS BRTSM-002

UNITS: 001 Principles of Computers
 002 Networking I
 003 Networking II

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area teaches the student practical aspects of computer and network maintenance and repair with emphasis on logical troubleshooting techniques. At the conclusion of this functional area, the student will be able to maintain network hardware and software, analyze problems, and monitor the networking hardware utilized in audio/video broadcast facilities. Student competency is assessed through written examinations, practical exercises, and performance examinations.

TPFN HOURS AND TYPES:

46.5 - lecture	(L)
15 – practical exercise	(PE)
4.5 - exam written	(EW)
14 – exam performance	(EP)
2 – demonstration	(D)

TPFN TOTAL HOURS: 82

FUNCTIONAL AREA 2
COMPUTER SYSTEMS

TPFN: DINFOS-BRTSM-002-001

UNIT TITLE: Principles of Computers

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Analyze the fundamentals of modern PC maintenance and networking concepts, to include: components, types, functions, capabilities, and connections of PCs to communicate with peripherals. Student competency is assessed through written examinations that require the student to obtain a score of no less than 70 percent.

INSTRUCTIONAL TYPE AND HOURS: 14.5 L; 2.5 EW

TOTAL INSTRUCTIONAL HOURS: 17

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Identify basic PC maintenance
002- Identify general network concepts
003- Identify storage formats
004- Unit written exam

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Upgrading and repairing PCs 17th Ed; Windows XP professional resource kit

FUNCTIONAL AREA 2
COMPUTER SYSTEMS

TPFN: DINFOS-BRTSM-002-002

UNIT TITLE: Networking I

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Set up and configure individual computers and perform system checks and upgrades. The student will identify various servers' operating system concepts. Student competency is measured through practical exercises and examinations that require the student to complete the tasks in accordance with manufacturers' specifications and/or industry-established guidelines for the equipment.

INSTRUCTIONAL TYPE AND HOURS: 24 L; 2 EW; 3 PE; 2 EP

TOTAL INSTRUCTIONAL HOURS: 31

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Perform Operating System installation
002- Identify concepts of server OS

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Upgrading and repairing PCs 17th Ed.; Hardware bible, 6th. Ed.; CISCO field manual

FUNCTIONAL AREA 2
COMPUTER SYSTEMS

TPFN: DINFOS-BRTSM-002-003

UNIT TITLE: Networking II

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): The student will establish a network/LAN. Additionally, the student will perform system checks and upgrades. Student competency is measured through practical exercises and examinations that require the student to complete the tasks in accordance with manufacturers' specifications and/or industry-established guidelines for the equipment.

INSTRUCTIONAL TYPE AND HOURS: 8 L; 2 D; 12 PE; 12 EP

TOTAL INSTRUCTIONAL HOURS: 34

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Construct a local area network

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Upgrading and repairing PCs 17th Ed.; Hardware bible, 6th. Ed.; CISCO field manual

FUNCTIONAL AREA 3
NON-LINEAR EDITORS (NLEs)

TPFN: DINFOS BRTSM-003

UNITS: 001 Functions of NLEs
 002 NLE Setup, Configuration, and Troubleshooting

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area will provide the student with the necessary tools to set-up, configure, and troubleshoot non-linear editors in a broadcast environment. This unit introduces the technology and practice of digital editing, for the purpose of troubleshooting and maintenance. At the conclusion of this functional area, the student will be able to set-up/configure non-linear editors, and analyze problems using basic trouble shooting techniques. Student competency is assessed through written examinations, practical exercises, and performance examinations.

TPFN HOURS AND TYPES:

11 - lecture	(L)
7.5 – practical exercise	(PE)
3 - exam written	(EW)
14 – exam performance	(EP)
2.5 – demonstration	(D)

TPFN TOTAL HOURS: 38

FUNCTIONAL AREA 3
NON-LINEAR EDITORS (NLEs)

TPFN: DINFOS-BRTSM-003-001

UNIT TITLE: Functions of Non-Linear Editors

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify the basic functions of NLEs and the configuration of NLEs. Student competency is assessed through written examinations that require the student to obtain a score of no less than 70 percent.

INSTRUCTIONAL TYPE AND HOURS: 11 L; 3 EW

TOTAL INSTRUCTIONAL HOURS: 14

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Identify basics of NLE
002- Identify the configuration (process) NLEs

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: AVID Xpress Pro User's Guide

FUNCTIONAL AREA 3
NON-LINEAR EDITORS

TPFN: DINFOS-BRTSM-003-002

UNIT TITLE: NLE Set Up, Configuration, and Troubleshooting

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Perform the initial set up and configuration of NLEs. The student will also operate the NLE to identify malfunctions, troubleshoot, and repair the NLE as necessary. Student competency is measured through performance examinations that require the student to complete the tasks in accordance with the manufacturers' specifications.

INSTRUCTIONAL TYPE AND HOURS: 2.5 D; 7.5 PE; 14 EP

TOTAL INSTRUCTIONAL HOURS: 24

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Operate an NLE
002- Troubleshoot NLEs

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: AVID Xpress Pro User's Guide

FUNCTIONAL AREA 4
CAMERA SYSTEMS

TPFN: DINFOS BRTSM-004

UNITS: 001 Functions of the Television Camera & Camera Back
 002 Television Camera Circuitry & Operations Check
 003 Maintenance and Repair

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area will provide the student with the necessary tools to set-up, configure, and troubleshoot camera systems. The student will learn and practice the fundamentals of camera maintenance as well as perform operational checks, analyze internal circuitry using schematics, and perform various alignments. At the conclusion of this functional area, the student will be able to set up and maintain a camera system in a broadcast facility. Student competency is assessed through written examinations, practical exercises, and performance examinations.

TPFN HOURS AND TYPES:

15.5 - lecture	(L)
7.5 – practical exercise	(PE)
5 - exam written	(EW)
2 – exam performance	(EP)
2.5 – demonstration	(D)

TPFN TOTAL HOURS: 32.5

FUNCTIONAL AREA 4
CAMERA SYSTEMS

TPFN: DINFOS-BRTSM-004-001

UNIT TITLE: Functions of the Television Camera and Camera Back

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify principles associated with the camera and principles associated with the optical system using Charged Coupled Devices (CCD) cameras. The student will analyze the different read/write capabilities and digital compression format of digital camera backs. Student competency is assessed through written examinations that require the student to obtain a score of no less than 70 percent.

INSTRUCTIONAL TYPE AND HOURS: 10.5 L; 4 EW

TOTAL INSTRUCTIONAL HOURS: 14.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

- 001- Identify principles of optical system
- 002- Identify camera & camera back principles.
- 003- Identify video compression and read/write capability of digital camera back

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: None

REFERENCES: Operation and maintenance manuals.

FUNCTIONAL AREA 4
CAMERA SYSTEMS

TPFN: DINFOS-BRTSM-004-002

UNIT TITLE: Television Camera Circuitry & Operations Checks

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Operationally check the portable camera and camera back. Each student will practice using various test charts. The student will also analyze the color camera circuitry using block diagrams. Student competency is measured through written examinations that require the student to obtain a score of no less than 70 percent and performance examinations that require the student to complete the tasks in accordance with the manufacturer's specifications.

INSTRUCTIONAL TYPE AND HOURS: 5 L; 1 D; 4 PE; 1 EP; 1 EW

TOTAL INSTRUCTIONAL HOURS: 12

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Perform operational check of (digital) camera and camera back
002- Analyze circuit cards (block diagrams)

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Operation and maintenance manuals.

FUNCTIONAL AREA 4
CAMERA SYSTEMS

TPFN: DINFOS-BRTSM-004-003

UNIT TITLE: Maintenance and Repair

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Align cameras in accordance with maintenance manual specifications. The student will also troubleshoot cameras. Student competency is measured through a performance examination that requires the student to complete the tasks in accordance with the manufacturer's specifications.

INSTRUCTIONAL TYPE AND HOURS: 1.5 D; 3.5 PE; 1 EP

TOTAL INSTRUCTIONAL HOURS: 6

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Perform camera system alignments

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Operation and maintenance manuals.

FUNCTIONAL AREA 5
VIDEO TAPE RECORDER (VTRS)

TPFN: DINFOS BRTSM-005

UNITS: 001 Fundamentals of VTR Operation
 002 VTR Maintenance and Repair

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area will provide the student with the necessary tools to maintain and troubleshoot video tape recorders in a broadcast environment. The student will learn and practice the fundamentals of VTR maintenance as well as perform operational checks, analyze internal circuitry using schematics, and perform various alignments. At the conclusion of this functional area, the student will be able to maintain, troubleshoot and align VTRs in accordance with manufactures' specifications. Student competency is assessed through written examinations, practical exercises, and performance examinations.

TPFN HOURS AND TYPES:

13.5 - lecture	(L)
16 - practical exercise	(PE)
2 - exam written	(EW)
5 – exam performance	(EP)

TPFN TOTAL HOURS: 36.5

FUNCTIONAL AREA 5
VIDEOTAPE RECORDERS (VTR)

TPFN: DINFOS-BRTSM-005-001

UNIT TITLE: Fundamentals of VTR Operation

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify videotape recorder principles. The student will cover VTR circuitry to the block level. These circuits will include; system control, servo systems, signal processing, audio, power supply, and time-base correctors (TBCs). Student competency is assessed through written examinations that require the student to obtain a score of no less than 70 percent.

INSTRUCTIONAL TYPE AND HOURS: 12 L, 3PE, 2 EW, 1 EP

TOTAL INSTRUCTIONAL HOURS: 18

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Identify video recorder (VCR) principles
002- Perform operations check on a videotape recording system
003- Identify VTR circuits (block level) to include: overall video, audio, servo and system control

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Manufacturer's operations and technical manuals; schematic diagrams.

FUNCTIONAL AREA 5
VIDEOTAPE RECORDERS (VTR)

TPFN: DINFOS-BRTSM-005-002

UNIT TITLE: VTR Maintenance and Repair

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Operationally check a videotape recording system. The student also performs mechanical and electrical alignments IAW established standards. Student competency is measured through performance examinations that require the student to complete the tasks in accordance with the manufacturer's specifications.

INSTRUCTIONAL TYPE AND HOURS: 1.5 L, 13 PE, 4 EP

TOTAL INSTRUCTIONAL HOURS: 18.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Perform select mechanical alignments
002- Perform select electrical alignments
003- Unit performance exam

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Manufacturer's operations and technical manuals; schematic diagrams.

FUNCTIONAL AREA 6
AUDIO SYSTEMS

TPFN: DINFOS BRTSM-006

UNITS:	001	Principles of Audio Systems and Standards
	002	Audio Consoles and External Equipment
	003	Audio Distribution and Processing
	004	Digital Audio Theory
	005	Digital Audio Editors
	006	Audio Automation

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area will provide the student with the necessary tools to set-up, maintain, and troubleshoot audio systems. The student will learn the principles of broadcast audio systems and the standards that pertain to those systems. They will practice measuring audio signals to ensure compliance to set standards. The student will analyze, align, and troubleshoot audio consoles, audio distribution and processing systems, digital audio recorders, and audio automation systems. The student will practice installation procedure for the AudioVault system, in addition to doing an operational check and troubleshooting for malfunctions. The student will become familiar with radio remote concepts, storage capabilities and types of media associated with digital audio recorders as well as remote cueing and formats. Student competency is assessed through written examinations, practical exercises, and performance examinations.

TPFN HOURS AND TYPES:

25 - lecture	(L)
19.5 – practical exercise	(PE)
11.5 - exam written	(EW)
14.75 – exam performance	(EP)
1.25 – demonstration	(D)

TPFN TOTAL HOURS: 72

FUNCTIONAL AREA 6
AUDIO SYSTEMS

TPFN: DINFOS-BRTSM-006-001

UNIT TITLE: Principles of Audio Systems and Standards

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify the principles of broadcast audio systems and the standards that pertain to those systems. The student will then make audio measurements to ensure compliance with standards. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete the performance tasks in accordance with DOD/AFRTS standards of engineering practices.

INSTRUCTIONAL TYPE AND HOURS: 6 L, .25 D, .5 PE, 1 EW, .25 EP

TOTAL INSTRUCTIONAL HOURS: 8

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Identify principles of broadcast audio (systems) standards
002- Measure audio (to) standards IAW DOD engineering practices (current edition)

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: DOD/AFRTS Handbook of Engineering Standards and Practices; manufacturer's operations and technical manuals; schematic diagrams.

FUNCTIONAL AREA 6
AUDIO SYSTEMS

TPFN: DINFOS-BRTSM-006-002

UNIT TITLE: Audio Consoles and External Equipment

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Analyze the operation of audio consoles. The student will perform an alignment of an audio console IAW established standards. The student will also identify radio remote concepts. Student competency is assessed through written and performance examinations. The student must obtain a score 70 percent or above on written exams and complete the performance tasks in accordance with the manufacturer's specifications.

INSTRUCTIONAL TYPE AND HOURS: 3.5 L, .50 D, 1.5 PE, 1 EW, 1.5 EP

TOTAL INSTRUCTIONAL HOURS: 8

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Analyze the operation of audio consoles
002- Perform an alignment of an audio console
003- Identify Radio Remote concepts

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Manufacturer's operations and technical manuals; schematic diagrams.

FUNCTIONAL AREA 6
AUDIO SYSTEMS

TPFN: DINFOS-BRTSM-006-003

UNIT TITLE: Audio Distribution and Processing

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Analyze the operations of audio distribution and processing systems. The student will perform alignments of those systems and then troubleshoot to determine malfunctions within the system and repair as necessary. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete the performance tasks in accordance with the manufacturers' specifications.

INSTRUCTIONAL TYPE AND HOURS: 2 L, .50 D, 2.5 PE, 1 EW, 2 EP

TOTAL INSTRUCTIONAL HOURS: 8

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Analyze principles and operations of audio distribution and processing systems
002- Perform alignment of audio distribution and processing systems
003- Perform troubleshooting of audio distribution and processing systems

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Manufacturer's operations and technical manuals; schematic diagrams.

FUNCTIONAL AREA 6
AUDIO SYSTEMS

TPFN: DINFOS-BRTSM-006-004

UNIT TITLE: Digital Audio Theory

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Analyze the operations of digital audio recorders. The student will then analyze the interface configurations of the digital audio recorders. Finally, he or she will identify storage capabilities and types of media associated with digital audio recorders. Student competency is assessed through written examinations that require the student to obtain a score of no less than 70 percent.

INSTRUCTIONAL TYPE AND HOURS: 6 L, 2 EW

TOTAL INSTRUCTIONAL HOURS: 8

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Identify principles of digital audio
002- Identify storage/media types

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: None.

REFERENCES: Manufacturer's operations and technical manuals; schematic diagrams.

FUNCTIONAL AREA 6
AUDIO SYSTEMS

TPFN: DINFOS-BRTSM-006-005

UNIT TITLE: Digital Audio Editors

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify the principles of digital audio editors. The student will perform an operational check of the system and troubleshoot the system for malfunctions. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete the performance tasks in accordance with the manufacturer's specifications.

INSTRUCTIONAL TYPE AND HOURS: 2 L, 3 PE, 1 EW; 2 EP

TOTAL INSTRUCTIONAL HOURS: 8

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Identify principles of digital audio editors
002- Perform operational checks
003- Troubleshoot digital audio editors

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Manufacturer's operations and technical manuals; schematic diagrams.

FUNCTIONAL AREA 6
AUDIO SYSTEMS

TPFN: DINFOS-BRTSM-006-006

UNIT TITLE: Audio Automation

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify the principles of audio automation. The student will analyze the operation and configuration of audio systems and discuss remote cueing and formats. The student will perform installation of the AudioVault system. He or she will then operationally check and troubleshoot the system. The student will also identify and perform voice tracking. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete the performance tasks in accordance with the manufacturer's specifications.

INSTRUCTIONAL TYPE AND HOURS: 9.5 L, 12 PE, 1.5 EW, 9 EP

TOTAL INSTRUCTIONAL HOURS: 32

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

- 001- Identify principles of audio automation
- 002- Analyze operation and configuration (block diagram)
- 003- Identify installation procedures of the Audio Vault
- 004- Perform installation of the Audio Vault
- 005- Perform operations checks of an automation system (Audio Vault)
- 006- Perform troubleshooting procedures to sub-assembly
- 007- Identify principles of audio voice tracking
- 008- Perform an operations check of voice tracking
- 009- Unit written exam

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Manufacturer's operations and technical manuals; schematic diagrams.

**FUNCTIONAL AREA 7
STUDIO SYSTEMS**

TPFN: DINFOS BRTSM-007

UNITS:	001	Signal Paths and Signal Timing
	002	Television Graphics and Digital Video Effects
	003	Studio Production Preparation
	004	TV Studio Automation Systems
	005	Studio Design and Interoperability

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area will provide the student with the necessary tools to set-up, configure, and troubleshoot equipment in a studio environment. The student will analyze the principles of the various switchers, television graphics and digital video effects equipment, acoustics for broadcast applications, television studio lighting systems, and TV automation systems used in the broadcast studio environment. The student will analyze the timing and phasing of the systems and perform timing and phasing of a studio. The student will also perform operational checks of the equipment, perform preventative maintenance, and troubleshoot the equipment to isolate malfunctions. As part of a maintenance team, the students are required to plan the interconnection of a broadcast system. The team will then be required to document the facility design. Next, the team will interconnect and test the system design and equipment. Student competency is assessed through written examinations, practical exercises, and performance examinations.

TPFN HOURS AND TYPES:

7.25 - lecture	(L)
24.5 - practical exercise	(PE)
4.75 - exam written	(EW)
66 - exam performance	(EP)

TPFN TOTAL HOURS: 102.5

FUNCTIONAL AREA 7
STUDIO SYSTEMS

TPFN: DINFOS-BRTSM-007-001

UNIT TITLE: Signal Paths and Signal Timing

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify the principles of the various switchers used in the broadcast studio environment. The student will analyze the timing and phasing of the systems and perform the actual timing and phasing of a studio. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete the performance tasks in accordance with industry (NTSC) standards and the manufacturers' specifications.

INSTRUCTIONAL TYPE AND HOURS: 2.75 L; 3 PE; 1.75 EW; 3 EP

TOTAL INSTRUCTIONAL HOURS: 10.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Analyze principles of switchers (routing, master control, bridging, and production)
002- Analyze system timing and subcarrier phasing
003- Perform system timing and subcarrier phasing

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: NAB Handbook of Engineering Practices; Manufacturers' operations and technical manuals; schematic diagrams.

FUNCTIONAL AREA 7
STUDIO SYSTEMS

TPFN: DINFOS-BRTSM-007-002

UNIT TITLE: Television Graphics and Digital Video Effects (DVE)

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Analyze the principles of TV graphics and DVE equipment. The student will perform operational checks of the equipment and troubleshoot the equipment to isolate malfunctions. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete all performance tasks in accordance with the manufacturers' specifications.

INSTRUCTIONAL TYPE AND HOURS: .75 L, 3 PE, .75 EW, 6 EP

TOTAL INSTRUCTIONAL HOURS: 10.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Analyze principles of TV graphics & DVE equipment
002- Perform operational checks of TV graphics & DVE equipment
003- Troubleshoot TV graphics & DVE equipment to sub-assembly level

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Manufacturer's operations and technical manuals; schematic diagrams.

FUNCTIONAL AREA 7
STUDIO SYSTEMS

TPFN: DINFOS-BRTSM-007-003

UNIT TITLE: Studio Production Preparation

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify the principles of acoustics for broadcast applications and television studio lighting systems. The student will perform camera and camera control unit (CCU) systems set-up and color balance camera systems. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete all performance tasks in accordance with manufacturer's specifications and industry (NTSC) standards.

INSTRUCTIONAL TYPE AND HOURS: 1.5 L, 4.5 PE, 1.5 EW, 10 EP

TOTAL INSTRUCTIONAL HOURS: 17.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

- 001- Identify principles of acoustics for broadcast applications
- 002- Identify principles of television studio lighting systems
- 003- Perform camera/camera control unit (CCU) system set-up
- 004- Perform color balance on camera systems

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Manufacturer's operations and technical manuals; NAB Engineering Handbook; schematic diagrams.

FUNCTIONAL AREA 7
STUDIO SYSTEMS

TPFN: DINFOS-BRTSM-007-004

UNIT TITLE: TV Studio Automation Systems

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Analyze the principles of TV automation systems. The student will perform operational checks and preventive maintenance of TV automation systems. He/she will then troubleshoot TV automation systems to the sub-assembly level. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete all performance tasks in accordance with manufacturer's specifications.

INSTRUCTIONAL TYPE AND HOURS: .75 L, 8 PE, .75 EW, 14 EP

TOTAL INSTRUCTIONAL HOURS: 23.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

- 001- Analyze principles of TV automation systems
- 002- Perform operational checks of TV automation systems
- 003- Perform preventive and database maintenance (Collective task)
- 004- Troubleshoot to sub-assembly level

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: Manufacturer's operations and technical manuals; schematic diagrams.

FUNCTIONAL AREA 7
STUDIO SYSTEMS

TPFN: DINFOS-BRTSM-007-005

UNIT TITLE: Studio Design and Interoperability

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): As part of a maintenance team, the student will plan the interconnection of a broadcast system, including audio and video equipment. Students will then be required to document the facility design. Next, the team will interconnect and test the system design and equipment. Team training is completed with an instructor-led review and critique. Finally, each student is required to troubleshoot the installed broadcast system. Student competency is assessed through performance examinations that require the student to complete the tasks in accordance with DOD/AFRTS standards of engineering practices and industry (NTSC) standards.

INSTRUCTIONAL TYPE AND HOURS: 1 L, 6 PE, 33 EP

TOTAL INSTRUCTIONAL HOURS: 40

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

- 001- Plan the interconnection of a broadcast system to include audio and video equipment layout (Collective task)
- 002- Document facility design (Collective task)
- 003- Interconnect and test (Collective task)
- 004- Troubleshoot installed broadcast system

INSTRUCTOR/STUDENT RATIO: 1:8 (L) 1:4 (PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: AFRTS Engineering Handbook; NAB Handbook

FUNCTIONAL AREA 8
BROADCAST TRANSMISSION SYSTEMS

TPFN: DINFOS BRTSM-008

UNITS:	001	Fundamentals of Broadcast Transmission
	002	Principles of Antennas
	003	AM Transmission and Transmitters
	004	FM Transmission and Transmitters
	005	TV Transmission and Transmitters
	006	Microwave and Studio Link Systems
	007	Cable Television (CATV) Systems
	008	Satellite Transmission
	009	Emerging Technologies

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area will provide the student with the necessary tools to set-up, configure, and troubleshoot AM, FM, and TV transmission systems. The student will analyze the fundamentals of radio frequency theory, principles of operation for antennas, principles of analog TV transmission, AM/FM/TV signals using a spectrum analyzer, signals for best performance, characteristics of fiber-optic cable and light-wave broadcast communications, and satellite acquisition techniques. The student will perform a proof of performance operational check of an AM/FM/TV transmitters, align and troubleshoot an AM/FM/TV transmitter, and measure transmission standards IAW DOD engineering standards. The student will set up and troubleshoot a CATV headend system. Student competency is assessed through written examinations, practical exercises, and performance examinations.

TPFN HOURS AND TYPES:

53.67 - lecture	(L)
49.37 - practical exercise	(PE)
12.5 - exam written	(EW)
20.96 - exam performance	(EP)
6 - demonstration	(D)

TPFN TOTAL HOURS: 142.5

FUNCTIONAL AREA 8
BROADCAST TRANSMISSION SYSTEMS

TPFN: DINFOS-BRTSM-008-001

UNIT TITLE: Fundamentals of Broadcast Transmission

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Analyze the fundamentals of radio frequency (RF) theory to include RF wave propagation and signal loss, signal measurements and calculations of Effective Radiated Power, Voltage Standing Waves and reflected power. The student will identify transmission line characteristics of impedance, frequency vs. size and types of specialized RF connectors. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete the performance tasks in accordance with DOD/AFRTS standards of engineering practices and industry (NTSC) standards.

INSTRUCTIONAL TYPE AND HOURS: 6.67 L, 2.5 EW, 3.17 PE, .66 EP

TOTAL INSTRUCTIONAL HOURS: 13

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

- 001- Analyze broadcast transmission fundamentals, wave propagation and loss, signal measurement, and units of measurement
- 002- Identify transmission line characteristics of impedance, frequency, and size & type of specialized radio frequency (RF) connectors
- 003- Calculate effective radiated power (ERP) and Voltage Standing Wave Ratio (VSWR)/ reflected power
- 004- Identify tower safety, grounding and general inspection
- 005- Unit written exam

INSTRUCTOR/STUDENT RATIO: 1:8 (L, EW) 1:4 (PE, EP)

SAFETY FACTORS: None.

REFERENCES: NAB Engineering Handbook; Principles of Electronic Communications; AFRTS Handbook of Engineering Practices

FUNCTIONAL AREA 8
BROADCAST TRANSMISSION SYSTEMS

TPFN: DINFOS-BRTSM-008-002

UNIT TITLE: Principles of Antennas

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Analyze principles and theories of operation for antennas and the different types of antennas used for television and radio broadcast. The student will learn how to determine the best site selection practices, coverage area above height (HAAT), and coupling and phasing use in multi tower systems. Student competency is assessed through written examinations that require the student to obtain a score of no less than 70 percent.

INSTRUCTIONAL TYPE AND HOURS: 3 L; 1 EW

TOTAL INSTRUCTIONAL HOURS: 4

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Analyze antenna principles, types, coverage area, height above average terrain, site selection, polarization coupling and phasing

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: None.

REFERENCES: NAB Engineering Handbook; Principles of Electronic Communications;

FUNCTIONAL AREA 8
BROADCAST TRANSMISSION SYSTEMS

TPFN: DINFOS-BRTSM-008-003

UNIT TITLE: AM Transmission and Transmitters

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify the principles of the AM signal using a spectrum analyzer and tuning for best performance of the modulated waveform. The student will perform a proof of performance operational check of an AM transmitter. Aligning and troubleshooting an AM transmitter follow this. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete the performance tasks in accordance with DOD/AFRTS and industry (NTSC) standards, and manufacturer's specifications.

INSTRUCTIONAL TYPE AND HOURS: 8L, 1 EW, 1.5 D, 15 PE, 6.5 EP

TOTAL INSTRUCTIONAL HOURS: 32

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

- 001- Identify principles of amplitude modulation (AM), tuning for best modulation performance, proof of performance, input/output tuning, matching and loading, centering band pass filters/effects on sidebands, antenna impedance tuning and loading, and optimum tuning vs. efficiency
- 002- Use a Spectrum Analyzer
- 003- Perform Proof of Performance operations check
- 004- Perform transmitter alignment
- 005- Perform troubleshooting procedures to the sub-assembly level

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (D, PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: DOD/AFRTS Standards of Engineering Practices (current edition); NAB Engineering Handbook; Principles of Electronic Communications; Manufacturers' operations and technical manuals

FUNCTIONAL AREA 8
BROADCAST TRANSMISSION SYSTEMS

TPFN: DINFOS-BRTSM-008-004

UNIT TITLE: FM Transmission and Transmitters

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Analyze the FM signal for best performance and perform a proof of performance operational check of an FM transmitter. The student will align an FM transmitter and perform troubleshooting procedure exercise. He or she will learn how to use a field strength meter and perform field strength measurements. The student must obtain a score of no less than 70 percent on written exams and complete the performance tasks in accordance with DOD/AFRTS and industry (NTSC) standards, and manufacturer's specifications.

INSTRUCTIONAL TYPE AND HOURS: 5.5 L, 1 EW, 1.5 D, 13.6 PE, 4.9 EP

TOTAL INSTRUCTIONAL HOURS: 26.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

- 001- Analyze principles of frequency modulation (FM) and antenna impedance, tuning, and loading
- 002- Perform Proof of Performance operations check
- 003- Perform alignment
- 004- Identify field strength measurement concepts
- 005- Perform field strength measurements
- 006- Perform troubleshooting procedures to the sub-assembly level

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (D, PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: DOD/AFRTS Standards of Engineering Practices (current edition); NAB Engineering Handbook; Principles of Electronic Communications; Manufacturers' operations and technical manuals

FUNCTIONAL AREA 8
BROADCAST TRANSMISSION SYSTEMS

TPFN: DINFOS-BRTSM-008-005

UNIT TITLE: TV Transmission and Transmitters

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Analyze the principles of analog TV transmission and the schematics of a TV transmitter. The student will analyze signals for best performance and conduct a proof of performance operational check of a TV transmitter. He or she will align and troubleshoot a TV transmitter. The student will learn how to measure transmission standards IAW DOD engineering standards. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete all performance tasks in accordance with DOD/AFRTS standards of engineering practices and manufacturer's specifications.

INSTRUCTIONAL TYPE AND HOURS: 5 L, 2 EW, 1 D, 10.1 PE, 3.4 EP

TOTAL INSTRUCTIONAL HOURS: 21.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

- 001- Analyze principles of analog TV signal transmission
- 002- Analyze TV transmission system schematics, antenna impedance, tuning, and loading
- 003- Perform proof of performance operations check
- 004- Measure transmission standards IAW DoD engineering standards (current edition)
- 005- Perform transmitter alignment
- 006- Perform troubleshooting procedures to sub-assembly
- 007- Unit written exam

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (D, PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: NAB Engineering Handbook; Principles of Electronic Communications; AFRTS Handbook of Engineering Practices; Manufacturers' operations and technical manuals

FUNCTIONAL AREA 8
BROADCAST TRANSMISSION SYSTEMS

TPFN: DINFOS-BRTSM-008-006

UNIT TITLE: Microwave and Studio Link Systems

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify microwave and studio-transmitter-link (STL) and multi-channel and multi-point distribution systems and the principles of operation. Student competency is assessed through written examinations that require the student to obtain a score of no less than 70 percent.

INSTRUCTIONAL TYPE AND HOURS: 2 L; 1 EW

TOTAL INSTRUCTIONAL HOURS: 3

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Identify microwave and studio-transmitter-links (STL): multi-channel and multi-point distribution system principles of operation (block diagrams)

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: None

REFERENCES: NAB Engineering Handbook; Principles of Electronic Communications

FUNCTIONAL AREA 8
BROADCAST TRANSMISSION SYSTEMS

TPFN: DINFOS-BRTSM-008-007

UNIT TITLE: Cable Television (CATV) Systems

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): The student will set up and troubleshoot a CATV headend system, perform tap measurements, identify characteristics of fiber-optic cable and principles of light-wave broadcast communications as well as terminate fiber connectors and perform loss tests. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete the performance tasks in accordance with industry standards, and manufacturer's specifications.

INSTRUCTIONAL TYPE AND HOURS: 7 L, 2 D, 2 EW, 7.5 PE, 5.5 EP

TOTAL INSTRUCTIONAL HOURS: 24

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

- 001- Analyze principles of multi-channel cable distribution, system hardware, design trade-offs, and performance measurements
- 002- Identify characteristics of fiber optic cable and principles of light-wave broadcast communications
- 003- Set up and troubleshoot CATV head end system
- 004- Perform tap measurements using field strength meter, spectrum analyzer, and system analyzer
- 005- Terminate fiber with connectors and perform loss check

INSTRUCTOR/STUDENT RATIO: 1:8 (L, D, EW) 1:4 (D, PE, EP)

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: NAB Engineering Handbook; Principles of Electronic Communications; Grass Valley Group Fiber-Optic tutorial; Corning Premises Optical Fiber tutorial

FUNCTIONAL AREA 8
BROADCAST TRANSMISSION SYSTEMS

TPFN: DINFOS-BRTSM-008-008

UNIT TITLE: Satellite Transmission

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Explain basic satellite antenna theory and system design. The student will discuss combined L-band and RF distribution systems. The student will identify satellite acquisition techniques (elevation, azimuth, and declination location). He or she will compare and contrast AFRTS Satellite services of SATNET, DTS, and HOTBIRD systems. Student competency is assessed through written examinations that require the student to obtain a score of no less than 70 percent.

INSTRUCTIONAL TYPE AND HOURS: 14 L, 2 EW

TOTAL INSTRUCTIONAL HOURS: 16

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

- 001- Explain satellite basic antenna theory and system design
- 002- Discuss combined L-band and RF distribution systems
- 003- Identify satellite acquisition techniques (elevation, azimuth, and location)
- 004- Compare and contrast AFRTS Satellite Services (Virtual Channels, Audio, Video, Bit Rate, and data) of SATNET, DTS, and HOTBIRD
- 005- Unit written exam

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: None

REFERENCES: NAB Engineering Handbook; Principles of Electronic Communications; AFRTS Broadcast Center satellite handbook

FUNCTIONAL AREA 8
BROADCAST TRANSMISSION SYSTEMS

TPFN: DINFOS-BRTSM-008-009

UNIT TITLE: Emerging Technologies

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify principles of INMARSAT and Iridium Satellite phone systems and discuss emerging technologies to include IboC, 8VSB, and QAM. Student competency is assessed through a written examination that requires the student to obtain a score of no less than 70 percent. The student will also be evaluated on his or her ability to prepare for and positively contribute to assigned discussions focusing on new/emerging technologies.

INSTRUCTIONAL TYPE AND HOURS: 2.5 L

TOTAL INSTRUCTIONAL HOURS: 2.5

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Discuss emerging technologies.

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: None

REFERENCES: NAB Engineering Handbook; Principles of Electronic Communications;
AFRTS Broadcast Center satellite handbook

FUNCTIONAL AREA 9
CONTINGENCY TRAINING EXERCISE

TPFN: DINFOS BRTSM-009

UNITS: 001 Pre-Deployment (Collective training)
 002 Deployment (Collective training)
 003 Post-Deployment (Collective training)

TERMINAL TRAINING OUTCOME: The instruction and training throughout this functional area will provide the student with the skills necessary to prepare for and perform as part of a maintenance team in a field environment. The student will identify contingency resources, plan pre-deployment requirements, and evaluate a site for satellite downlink. In addition, the student will interconnect satellite and microwave equipment; set up a satellite-receiving site for AFRTS and DTS systems; set up satellite signal decoders, perform system calculations for downlink design, acquire the signal, establish uplink/satellite communications and troubleshoot the satellite systems. The student will also set up low-power television and radio systems, interconnect antennas, align and troubleshoot contingency systems and perform field strength measurements. Student competency is based on the team's ability to perform the tasks in accordance with DOD/AFRTS standards, industry standards, and manufacturers' specifications.

TPFN HOURS AND TYPES:

3 - lecture	(L)
2.5 – practical exercise	(PE)
1 - exam written	(EW)
25.5 – exam performance	(EP)
1 - demonstration	(D)

TPFN TOTAL HOURS: 33

FUNCTIONAL AREA 9
CONTINGENCY TRAINING EXERCISE

TPFN: DINFOS-BRTSM-009-001

UNIT TITLE: Pre-Deployment (Collective training)

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): Identify contingency resources, plan pre-deployment requirements, and evaluate a site for satellite downlink. The student will also set up an AC power generator. Student competency is assessed through written and performance examinations. The student must obtain a score of no less than 70 percent on written exams and complete the performance task in accordance with US Army technical manual/s for the power generator.

INSTRUCTIONAL TYPE AND HOURS: 3 L; 1 D; 1 EW; 1.5 PE; 2.5 EP

TOTAL INSTRUCTIONAL HOURS: 9

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Identify contingency resources and planning
002- Evaluate site
003- Set up AC power generators

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: NAB Engineering Handbook; Principles of Electronic Communications; AFRTS Broadcast Center satellite handbook; US Army TMs 9-2815-252-24, 9-6115-659-137P, and 9-6115-641-24

FUNCTIONAL AREA 9
CONTINGENCY TRAINING EXERCISE

TPFN: DINFOS-BRTSM-009-002

UNIT TITLE: Deployment (Collective training)

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): As part of a maintenance team in a field environment that simulates contingency operations, the student will interconnect satellite and microwave equipment to set up a satellite-receiving site for AFRTS and DTS systems. The team will set up satellite signal decoders, perform system calculations for downlink design, acquire the signal, establish uplink/satellite communications and troubleshoot the satellite systems. The team will also set up low-power television and radio systems, interconnect antennas, align and troubleshoot contingency systems and perform field strength measurements. Student competency is based on the team's ability to perform the tasks in accordance with DOD/AFRTS standards, industry standards, and manufacturers' specifications.

INSTRUCTIONAL TYPE AND HOURS: 23 EP

TOTAL INSTRUCTIONAL HOURS: 23

PREREQUISITE TPFN: All previous TPFNs

TASK(S):

- 001- Interconnect (satellite & microwave) equipment
- 002- Set up satellite receiving site (AFRTS and DTS)
- 003- Set up satellite signal decoders
- 004- Perform system calculations for uplink/downlink design
- 005- Acquire AFRTS SATNET/DTS signal
- 006- Troubleshoot satellite system
- 007- Set up low-power (TV-FM) systems
- 008- Set up and interconnect antennas (TV-FM)
- 009- Perform field-strength measurements
- 010- Align and troubleshoot contingency system (TV-FM)
- 011- Establish uplink/satellite communications

INSTRUCTOR/STUDENT RATIO: 1:4

SAFETY FACTORS: The student must follow all safety precautions pertaining to electrical shock, burns, fires, and the misuse of tools and equipment.

REFERENCES: NAB Engineering Handbook; Principles of Electronic Communications; AFRTS Broadcast Center satellite handbook; Manufacturers' operations and technical manuals

FUNCTIONAL AREA 9
CONTINGENCY TRAINING EXERCISE

TPFN: DINFOS-BRTSM-009-003

UNIT TITLE: Post-Deployment (Collective training)

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): The student will participate in an After Action Review facilitated by the instructor. The student will first describe what the team and the individuals performed well, not so well, and how to improve their performance. Instructor observations are added to complete this phase of the training.

INSTRUCTIONAL TYPE AND HOURS: 1 PE (AAR)

TOTAL INSTRUCTIONAL HOURS: 1

PREREQUISITE TPFN: All previous TPFNs

TASK(S): 001- Conduct after action review of contingency operations

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: None

REFERENCES: US Army Field Manual FM 25-101, Battle Focused Training

FUNCTIONAL AREA 10
COURSE ADMINISTRATION

TPFN: DINFOS-BRTSM-010-001

UNIT TITLE: Course Opening

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): The student will participate in in-processing activities including an orientation brief and welcome by the Commandant and staff.

INSTRUCTIONAL TYPE AND HOURS: 3 Admin

TOTAL INSTRUCTIONAL HOURS: 3

PREREQUISITE TPFN: None

TASK(S): 001- In-processing
002- Welcome and course orientation

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: None

REFERENCES: DINFOS POPMAN

FUNCTIONAL AREA 10
COURSE ADMINISTRATION

TPFN: DINFOS-BRTSM-010-002

UNIT TITLE: Course Closing

UNIT INTERMEDIATE TRAINING OBJECTIVE (ITO): The student will participate in an end-of-course critique, graduation ceremony, and out-processing activities.

INSTRUCTIONAL TYPE AND HOURS: 8 Admin

TOTAL INSTRUCTIONAL HOURS: 8

PREREQUISITE TPFN: None

TASK(S): 001- Course critiques
002- Graduation
003- Out-processing

INSTRUCTOR/STUDENT RATIO: 1:8

SAFETY FACTORS: None

REFERENCES: DINFOS POPMAN