All-Hazards Communications Technician (COMT)

Training Course

Unit 7: Telephone Technology Awareness

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Unit 7: Objectives

- Explain the operational capabilities of the various types of telephone systems the COMT may encounter
- Understand the appropriate applications of the various technology resources
- Understand the technical and physical principles behind the appropriate technologies

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Telephone Systems

- Wired:
  - Analog: Plain Old Telephone System (POTS)
  - Digital: Voice Over Internet Protocol (VOIP), Private Branch Exchange (PBX), Integrated Services Digital Network (ISDN)
  - Cable: Cable Television (CATV) telephone

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Telephone Systems (Cont)

- Wireless:
  - Cellular telephone (A&B 800 MHz)
  - Personal Communications Service (PCS) telephones (1.2 GHz and above)
  - Satellite telephones
  - Wi-Fi telephone services (Skype, Vonage)
  - "Cordless Telephones" (POTS)

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Cell Phones

- Pros
  - Availability
  - Portability
  - Pre-deployed
- Cons
  - Vulnerabilities (several)
  - Congestions (overload)

Marty Cooper – Inventor of first portable mobile cell phone

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Cell on Wheels

- COWS
  - Cell on Wheels
    - Temporary deployments
  - Many carriers have availability
  - Expand
    - Capacity
    - Coverage
    - Backup
  - Not a replacement for incident tactical/command wireless
  - Some carriers can supply large quantities of cell phones as well

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Cellular and PCS Emergency Services

- Verizon Significant Events Center
  - (800) 981-9558
- Sprint-NEXTEL Emergency
  - (888) 639-0020
- AT&T National Communications System-National Coordinating Center
  - (703) 235-5080
- Ensure any and all costs are identified and approved prior to deployment

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

POTS Basics

- Basic telephones work on two wires (a pair)
- These wires are called “Tip” and “Ring”
- To work, they require a DC voltage be present on the line called “Talk Battery”
- Talk Battery is usually between 24 and 52 volts DC

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

POTS Basics (Cont)

- Ringing Voltage is applied to the line on an incoming call to power the bell or ringer; ringing voltage is 90 volts AC at 20 cycles per second
- A line can be identified by dialing an Automatic Number Identification (ANI) code; a computerized voice will say the number.

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Order Phone Lines

- Case for land lines
  - Fixed systems for Incident Command Posts (ICPs) and EOCs
  - Fixed numbers for Public Information Officers (PIO)
  - Phones assigned by function and not person
  - Establishment of call centers for public information
- Request lines from the Communications Unit Leader (COML)
- Order two lines minimum (fax and phone)

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Locating Phone Lines

- If you are based inside a building, start there
  - Talk to building maintenance personnel (priority)
  - Try the building's phones
  - Check the wall jacks

VoIP Telephone

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Locating Phone Lines (Cont)

- Be aware of differences between analog and digital services
  - Digital PBX requires conversion for analog voice and fax connection
  - Connect ahead of the PBX for analog connections
- Be aware of digital or VoIP enterprise systems

VoIP Telephone

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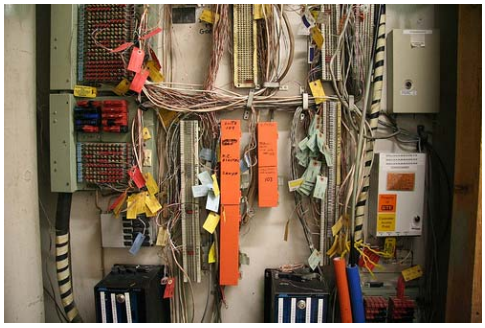
COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Point of Demarcation (Demarc)

Large buildings and businesses
Located in equipment/phone rooms



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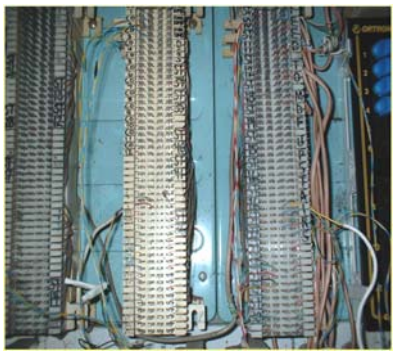
COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Inside Plant (ISP) Terminal Blocks

Large buildings and businesses
Located in equipment/phone rooms



66 Block

110 Block

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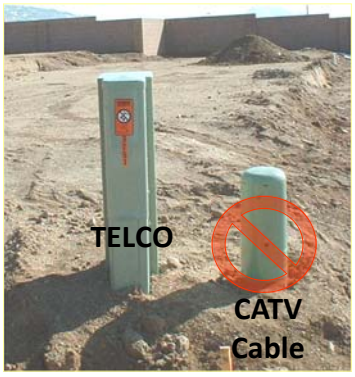
COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Outside Plant (OSP)

Junction Boxes – Not all are TELCO



Caution – Outside plant facilities can carry high voltage. Request the carriers assistance.

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Standard Telephone Network Interface Device (SNI or NID)

Two-line residential and small business located outside on the building

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Digital Services – T-1, DSL, ISDN

- Digital services vary considerably
- Utilize the expertise of the Gov't Acct. Rep. of the service carrier or provider
- Consider a Technical Specialist (THSP)

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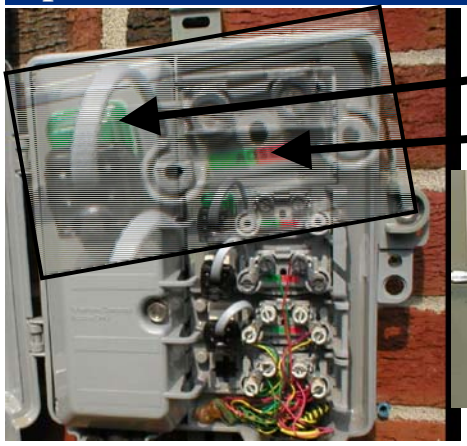
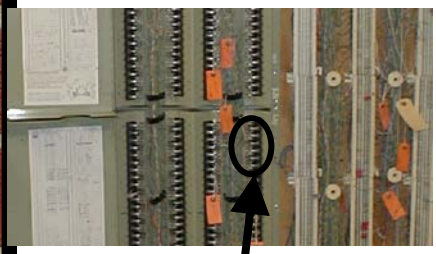
COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Digital Subscriber Line (DSL) and Special Circuits



DSL Filter

DSL Circuit Label



Avoid tagged circuits
May be critical digital or data

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

25-Pair Cable Color Codes

TIP		RING
white/blue	pair 1	blue/white
white/orange	pair 2	orange/white
white/green	pair 3	green/white
white/brown	pair 4	brown/white
white/slate	pair 5	slate/white
red/blue	pair 6	blue/red
red/orange	pair 7	orange/red
red/green	pair 8	green/red
red/brown	pair 9	brown/red
red/slate	pair 10	slate/red
black/blue	pair 11	blue/black
black/orange	pair 12	orange/black
black/green	pair 13	green/black
black/brown	pair 14	brown/black
black/slate	pair 15	slate/black
yellow/blue	pair 16	blue/yellow
yellow/orange	pair 17	orange/yellow
yellow/green	pair 18	green/yellow
yellow/brown	pair 19	brown/yellow
yellow/slate	pair 20	slate/yellow
violet/blue	pair 21	blue/violet
violet/orange	pair 22	orange/violet
violet/green	pair 23	green/violet
violet/brown	pair 24	brown/violet
violet/slate	pair 25	slate/violet

Insulation Marking

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

8-Strand and 4-Strand Wiring Color Chart - Voice

Eight-strand colors	Four-strand equivalent
T1 = WHITE with blue mark	Green
R1 = BLUE with white mark	Red
T2 = WHITE with orange mark	Black
R2 = ORANGE with white mark	Yellow
T3 = WHITE with green mark	
R3 = GREEN with white mark	
T4 = WHITE with brown mark	
R4 = BROWN with white mark	

RJ-11 Connector

May be 4 or 6 connector (RJ-12)

RJ-45 Connector

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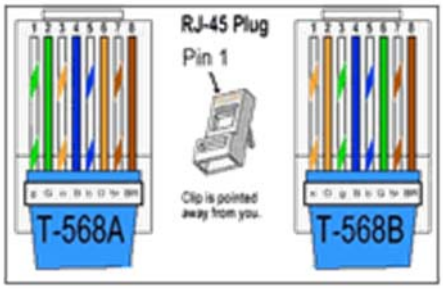
COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

RJ-45
Wiring Color Chart - Digital



RJ 45 Jack Wiring

Pin #	T568A	T568B
1	White/Green	White/Orange
2	Green	Orange
3	White/Orange	White/Green
4	Blue	Blue
5	White/Blue	White/Blue
6	Orange	Green
7	White/Brown	White/Brown
8	Brown	Brown

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Wire and Cable

- Data cables (CAT-3, CAT5e, CAT-6) are graded based on throughput speed
- POTS lines do not require graded cables
- Avoid extreme bends or kinks when laying cable
- Maintain the "twist" in a pair to within ¼" to maintain performance
- Not all connectors equal. Solid and stranded wire may use different connectors
- Following good craft practices reduces errors and saves time

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Telephone Tools

Installation and troubleshooting

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Telephone Test Set (Butt Set)

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Used for testing/locating a line

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Tone Generator/Probe Set (Fox and Hound)

- Determining cable routing or checking continuity
  - Avoid digital circuits - listen for digital "white noise" with monitor probe

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Wire Punchdown Termination Tool

- Make connections on wire terminal blocks
  - Type 66 and 110
    - Tips have two interchangeable ends – one cuts on impact, one does not (used to bridge connections)

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Insulation Displacement Connectors (Terminal Blocks)

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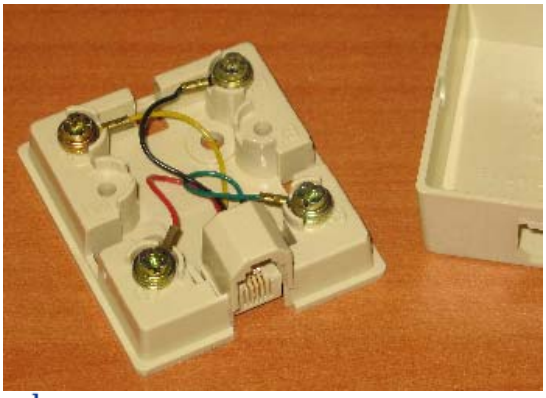
COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

RJ-11 Wall Biscuit

RJ-11 wall biscuit



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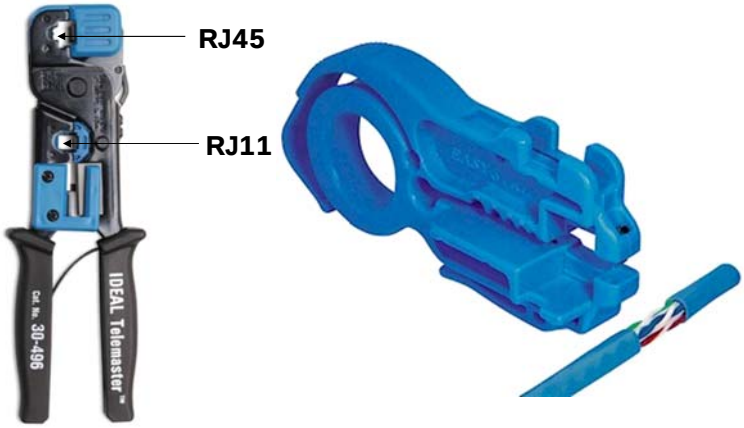
COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Crimper and Stripper



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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

GETS and WPS

- GETS
  - Government Emergency Telecommunications Service
  - Identify point of contact for GETS
  - GETS is only available if there is a dial-tone
  - Useful over satellite phones
  - For Mob Guide, find out who in your agency has GETS and Wireless Priority Service (WPS) cards
  - www.gets.ncs.gov
  - GETS Video : http://www.ncs.gov/video/intro.mpg

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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

GETS and WPS (Cont)

- WPS
  - Wireless Priority Service
  - WPS typically has a monthly fee per phone not to exceed $4.50 and is not available in all carriers
  - Utilizes the same point of contact that GETS does
  - Make sure that you have WPS on fixed cell systems
  - www.wps.ncs.gov

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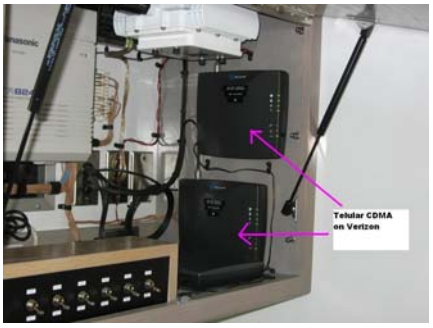
COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Fixed Cellular Devices Need WPS

- Fixed device emulates POTS line on cellular network
- Often found in Emergency Operations Centers (EOCs), Communications Centers, and Command Vehicles
- Should have Wireless Priority Service (WPS) on line(s)



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COMT UNIT 7 – TELEPHONE TECHNOLOGY AWARENESS

Plan "B"

- What is the back-up plan?
  - Cell site failure? (wireless)
  - Cable failures? (Public Switched Telephone Network [PSTN])
  - Heavy smoke or rain? (satellite)

Unit 7 Questions


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