

Reference Materials:

NFPA 1901, *Standard for Automotive Fire Apparatus*, Chapters 12 -15 and chapters 22-23 & appendix

NFPA 1936, *Standard for Powered Rescue Tool Systems*, 2005 Edition,

NFPA 1911, *Standard for the Inspection, Maintenance, Testing, and Retirement of In-Service Automotive Fire Apparatus*, chapter 6 and chapter 22 & Appendix

to order NFPA documents call 800-344-3555 or order online at www.nfpa.org

Basic Digital Electronics by Alvis Evans can be ordered from <http://www.w5yi.org> or 1-800-669-9594

Auto Electricity & Electronics, James Duffy, Goodheart-Wilcox 1-708-687-5000 or the book can be ordered from www.amazon.com

Guide to Hydraulic Power Generation, Russell Scott Dixon. Call the EVT office at 847-426-4075 to request a copy to be emailed to you for no charge for a limited time, compliments of Scott Dixon.

Class One ES-Key/USM Network Multiplexing Manual, page 1 thru 11, can be download for no charge from

http://www.class1.com/_Downloads/class1/manuals/ES-Key-USM.pdf

V-MUX 6-Step Troubleshooting Guide & V-MUX Relationship Guide download for no charge from

<http://www.weldoninc.com/pages/downloads/Sixsteps.pdf> and <http://weldoninc.com/pages/downloads/RelationshipsReport.pdf>

LEARNING OBJECTIVES FOR THE FA-4 EXAM

The technician shall understand the concepts, terms, and phrases related to:

1. A/C Line Voltage

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|------------------------------|-------------------------------------|-------------------------|
| a. Components and terms | (9) Sine wave | (15) Transistors |
| (1) Single phase | (10) Photo resistor | (16) True Power |
| (2) Three phase | (11) Temperature senders | (17) Prime Movers |
| (3) Neutral wire | (12) Resistor | (18) Voltage Drop |
| (4) Ground wire | (13) Thermistor | (19) Testing |
| (5) Bonding | (14) Thyristors | (20) Dielectric testing |
| (6) Inrush / startup current | A. Triac | (21) Hertz |
| (7) Soft start | B. Silicon controlled rectifier-SCR | |
| (8) Frequency | | |

b. Labeling

- (1) Requirements
 - A. Operating amperage
- (2) Conspicuity

c. Application and Troubleshooting

- | | |
|------------------------|--|
| (1) Wiring connections | (7) NFPA standards |
| (2) Wiring methods | A. Conductors |
| (3) Repair techniques | B. Polarity verification |
| A. Tools | C. Circuits |
| B. Electrical | D. Remote power Distribution |
| C. Harness connectors | E. Transfer switch |
| (4) Receptacle types | F. Grounding |
| (5) Wire routing | G. Testing |
| (6) Diagnostic tools | H. Out of Service |
| | (8) effects of voltage drops on components |

d. Installations

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|-------------------------------------|-----------------|
| (1) Receptacles | (2) Light masts |
| A. Mounting height in wet locations | (3) Wiring |
| B. Switching | |

2. System Knowledge**a. Circuit drawings**

- | | |
|-----------------|----------------------------|
| (1) Resistor | (7) Pulse Width Modulation |
| (2) Diode | (8) Capacitor |
| (3) Rectifier | (9) Pressure Governor |
| (4) Transistors | (10) Potentiometer |
| (5) Thermistors | (11) AND gate |
| (6) Wire Splice | (12) OR gate |

b. Circuit protection

- | | |
|---------------------------------------|------------------------------|
| (1) Over current protection | (4) Wet/dry listings |
| (2) Circuit rating | (5) Circuit breaker switches |
| (3) Ground fault circuit interrupters | |

c. Transfer switches

- (2) Distribution remote

d. Power transmission

- e. Amperage loads

- (1) Branch circuits

- f. Component information

- (1) capacitor
 - (2) relays
- 3. Sources**
- a. Shoreline power
 - b. Invertors & converters
 - (1) Dynamic power
 - (2) Static power
 - c. Generators
 - (1) Interlocks
 - (2) Generator installation
 - A. Requirements
 - B. Voltage regulation
 - (3) Drives
 - (4) Generator Governors
 - (5) Generator Diagnostics
 - (6) Drive Diagnostics
 - (7) Generator poles
 - (8) Hydraulic generators
 - A. Capacitor effects
 - B. PTO inspection
 - C. Filters
 - D. Hose reversal
- 4. Accessories**
- a. Cable reels
 - b. Scene lighting
 - (1) Requirements
 - (2) Interlocks
 - (3) Light towers
 - (4) Remote towers
 - (5) Operational testing
 - c. Rescue tools
 - (1) Quik-connect requirements
 - (2) Battery powered
 - d. Ladder rack
 - (1) interlocks
 - e. Hydraulic power unit
 - (2) Troubleshooting
 - A. Shedding loads
 - B. Interlocks
 - C. Alarms
 - (3) Testing
 - A. Electromagnetic interference
 - (4) Parallel & Series wiring
 - (5) System Knowledge
 - A. Auxiliary battery
 - (6) Sensors
- 5. Low Voltage Systems**
- a. Load managers/sequencers
 - (1) Setup
 - A. Minimum continuous loads
 - B. Programming
 - C. Prioritizing
 - D. Amp loads
 - E. Emergency lighting sequencer
- 6. Multiplex Systems**
- a. Components
 - (1) V-MUX modules
 - A. Hercules node
 - B. Vista node
 - C. Mini node
 - D. Deutsch connectors
 - (2) Class 1- ES-KEY
 - A. Polarity selected inputs
 - (3) Sensors
 - A. Active
 - B. Passive
 - b. Interface
 - (1) Fast idle function
 - (2) PEER to PEER
 - c. Programming
 - (1) Interlocks
 - (2) Control Module
 - (3) Reports
 - (4) Communication
 - d. Terminology
 - (1) CAN
 - e. Troubleshooting
 - (1) VMUX
 - (2) Welding
 - (3) CAN
 - f. System Knowledge
 - (1) Wiring
 - (2) amount of components
 - (3) effect of AC voltage
- 7. Operations**
- a. Load minder
 - b. Auto level
 - c. Rotation limiting
 - d. Pressure governor
 - (1) Transducer signal
 - (2) Analog input signal
 - e. Transducers
 - f. Proximity switches
 - g. Engine Controls
 - (1) Throttle position sensor
 - (2) Electronic unit injector
 - (3) Sensors
 - h. Vehicle data recorder
 - i. Ground connections