

ASTRO[®] 25 RF Site Preventative Maintenance (A25-SPM)



Motorola Solutions[®] & ETA[®] International Competency Requirements

The intent of this **ASTRO[®] 25 RF Site Preventative Maintenance (A25-SPM) technician** certification is to ensure that technicians have the appropriate knowledge and skills necessary to perform preventative maintenance on an ASTRO[®] 25 RF Site.

The certification program consists of a written exam including technical questions as well as maintenance and/or procedural scenario questions. Completion of the SRV0039 - ASTRO[®] 25 RF Trunked Repeater Site Level 1 Preventive Maintenance Best Practices course is required, and if necessary, the associated prerequisite courses to the SRV0039 are also required prior to attempting the **(A25-SPM)** certification exam.

Prior experience with ASTRO[®] 25 radio systems and RF equipment is strongly recommended as a prerequisite to the certification. An ASTRO[®] 25 RF Site life cycle consists of Installation, Site Performance Verification, and Preventative Maintenance.

The written exam is comprised of the following topics:

Safety – General, Site, PPE, RF, DC	15%
Preventative Maintenance Overview	13%
RF Measurement and Configuration	33%
MyView™ Portal and Standard Checklists	15%
PM Checklists and Measurement	24%

The following five categories of knowledge competency listing identifies the individual subject topics in which ASTRO[®] 25 RF Site preventative maintenance technicians are expected to learn and in which the technician must be knowledgeable and skilled preparing for the certification written exam:

1.0 Preventive Maintenance Overview

- 1.1 Describe Preventative Maintenance of an ASTRO[®] 25 RF Site to include:
 - 1.1.1 Preventive Maintenance procedures review
 - 1.1.2 tasks as applied
 - 1.1.3 the hierarchy of bundled services
 - 1.1.4 goals of performing preventative maintenance
 - 1.1.5 Mid Line versus Base Line data interpretation
 - 1.1.6 measurements overview

2.0 Safety

- 2.1 Describe OSHA and general safety requirements to include:
 - 2.1.1 First Aid as required:
 - 2.1.1.1 kit contents
 - 2.1.1.2 training procedures
 - 2.1.2 that an A14 standards approved ladder is required
 - 2.1.3 severe weather procedures while at an RF site
 - 2.1.4 procedures for mitigating unauthorized RF site intrusion by anything or anyone
 - 2.1.5 other general safety applications
- 2.2 Describe DC Power Systems safety precautions to include:
 - 2.2.1 proper use of an eye wash station as required
 - 2.2.2 that a 48 V DC Power Source can provide sufficient current in a short circuit to be a fire hazard and/or an extreme safety hazard

- 2.2.3 hazardous chemicals and materials handling situations of:
 - 2.2.3.1 highly corrosive and dangerous battery electrolyte procedures
- 2.3 Describe RF Exposure and related hazards to also include:
 - 2.3.1 that a transmitter can never be operated into an open circuit
 - 2.3.2 cable disconnection from a transmitter (Tx) or the Tx distribution system procedures
 - 2.3.3 additional RF safety best practices requirements

3.0 Radio Frequency (RF) Measurement Accuracy and Considerations

- 3.1 Describe decibel math working knowledge to include:
 - 3.1.1 dBm (decibel with reference to milliwatt)
 - 3.1.2 dBW (decibel Watt)
 - 3.1.3 procedures of adding or subtracting decibels as being the same as multiplying or dividing Watts
 - 3.1.4 how 0 dBm is a power level of 1 mW
 - 3.1.5 how 30 dBm is a power level of 1 W
 - 3.1.6 30 dBm as equal to 0 dBW
- 3.2 Define Testing Pass/Fail and Test Uncertainty Ratio (TUR) to include:
 - 3.2.1 APCO® P25 / TIA-102 in compliance with ANSI standards
 - 3.2.2 that effective testing equipment setup must be better than the tolerance
 - 3.2.3 that TUR describes the ability of the test equipment and setup to make an accurate pass/fail determination of the Site equipment being tested
- 3.3 Describe TUR tolerances to include:
 - 3.3.1 10:1 ratio is ideal
 - 3.3.2 4:1 ratio is workable
 - 3.3.3 1:1 ratio is unworkable
 - 3.3.3.1 Explain what an “unworkable TUR” means
- 3.4 Describe RF Site Preventive Maintenance essential testing equipment and cables require:
 - 3.4.1 that using known loss cables and equipment in the RF Site Performance Verification procedure (SPV) is the only way to ensure acceptable TUR and reproducibility of test results
- 3.5 Explain how to perform the required RF Site Preventive Maintenance using:
 - 3.5.1 Test equipment:
 - 3.5.1.1 Communication Analyzer
 - 3.5.1.2 Power Sensors
 - 3.5.1.3 Frequency Standard (FS) requirements
 - 3.5.1.4 Configuration Service Software (CSS)
 - 3.5.1.5 Unified Event Manager (UEM)
 - 3.5.1.6 Unified Network Configurator (UNC)
 - 3.5.2 RF accessories and connectivity:
 - 3.5.2.1 Cabling
 - 3.5.2.2 Attenuators
 - 3.5.2.3 RF Couplers
- 3.6 List P25 Measurements procedures to include:
 - 3.6.1 RF Transmit (Tx) testing:
 - 3.6.1.1 Frequency Tolerance and Error
 - 3.6.1.2 Tx BER (Bit Error Rate)
 - 3.6.1.2.1 specifications
 - 3.6.1.3 Tx modulation fidelity emission mask
 - 3.6.1.4 frequency deviation for C4FM (continuous 4-level frequency modulation)
 - 3.6.1.5 Tx symbol deviation
 - 3.6.1.5.1 TDMA (time division multiple access)
 - 3.6.1.5.2 FDMA (frequency-division multiple access)

- 3.6.1.6 Tx rated power
- 3.6.2 RF Receiver (Rx) testing:
 - 3.6.2.1 Receiver (Rx) test
 - 3.6.2.1 RSSI (Received Signal Strength Indicator) direct Rx BER
 - 3.6.2.2 Rx BER floor test result
 - 3.6.2.3 Sensitivity Direct ERS (Effective Receiver Sensitivity) using a TTA (Tower Top Amplifier) test port or a coupler if a TTA is not present
- 3.7 Describe the 47 CFR § 90.433 FCC regulatory maintenance requirements to include:
 - 3.7.1 operator / licensee requirements
 - 3.7.2 transmitter (Tx) measurements
 - 3.7.3 station records forms and documentation

4.0 “MyView™” Portal and Standard Checklists Forms

- 4.1 Describe the MyView™ processes to include:
 - 4.1.1 download
 - 4.1.2 upload
 - 4.1.3 reports and metrics view
 - 4.1.4 escalation contacts
 - 4.1.5 navigation of the platform
- 4.2 Describe the RF Site Preventative Maintenance “Standard Checklists Overview” to include:
 - 4.2.1 macros
 - 4.2.2 navigation
 - 4.2.3 tabs
 - 4.2.4 procedures documents
- 4.3 Explain how to use MyView™ Support processes

5.0 PM (Preventative Maintenance) Checklist and Measurements

- 5.1 Describe the RF Site Preventative Maintenance Standard required information to include:
 - 5.1.1 Loss entries for cabling, attenuators, couplers
 - 5.1.2 General
 - 5.1.3 Project information
 - 5.1.4 Site information
 - 5.1.5 Measurements
 - 5.1.6 Alarms
- 5.2 Describe the procedure for RF Site Preventative Maintenance measurements of Expandable Site Subsystem (ESS) and Stand-Alone (SA) to include:
 - 5.2.1 IP Addresses
 - 5.2.2 Tx (transmit):
 - 5.2.2.1 Frequency Error
 - 5.2.2.2 Tx Self-Test
 - 5.2.2.3 BER (patterns)
 - 5.2.2.4 Forward Power
 - 5.2.2.5 Reversed Power
 - 5.2.2.6 Modulation Fidelity
 - 5.2.2.7 Symbol Deviation
 - 5.2.2.8 Symbol Rate Accuracy
 - 5.2.3 Rx (Receiver):
 - 5.2.3.1 Frequency
 - 5.2.3.2 Rx Self-Test
 - 5.2.3.3 Rx Operations
 - 5.2.4 TTA (Tower Top Amplifier) Test

End of ASTRO® 25 RF Site Preventative Maintenance competencies

Suggested Additional Resource and Study Material:

Please see the https://www.motorolasolutions.com/en_us/services/managed-support-services/training.html webpage and the description information on the ETA webpage left of the competency link: <http://www.eta-i.org/motorola.html>

[Motorola Solutions Training](#) for catalog, training, and other Motorola materials and pre-requisites.

A25-SPM Committee Advisory Board is made up of various MASTER Certified Electronics Technicians (CETma) and Certified Electronics Technicians (CET) within the Motorola Solutions, Inc. organizations.

MOTOROLA, MOTO, MOTOROLA SOLUTIONS and the Stylized M Logo are trademarks or registered trademarks of Motorola Trademark Holdings, LLC and are used with permission. All other trademarks are the property of *ETA® International*.

**ETA certification programs are accredited through ICAC,
complying with the ISO/IEC 17024 standard.**

