Project 25 Compliance Assessment Program

(P25 CAP)

Project 25 Compliance Assessment Bulletin (CAB)

ISSI-CSSI Conformance Test Tool Verification Requirements

Inter-Radio Frequency Subsystem Interface-Console Subsystem Interface Conformance Test Tool Verification Requirements

P25-CAP_ISSI-RFSS Conf Test Tool REQ CAB (DEC 2020)
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Notice of Disclaimer and Limitation of Liability

The Project 25 Compliance Assessment Program (P25 CAP) provides equipment purchasers demonstrated evidence of a product’s compliance with a select group of requirements defined in the suite of P25 Standard. Although successful tests will demonstrate P25 compliance for the specific requirements tested, the conclusions drawn from these tests do not apply to every environment or individual users’ needs. P25 CAP-mandated tests only demonstrate product compliance with the tested features listed in the Supplier’s Declaration of Compliance and, therefore, only attest to a product’s compliance with specific requirements within the P25 Standard.

Revision History

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</tr>
</tbody>
</table>
# Table of Contents

Notice ofDisclaimer and Limitation of Liability ................................................................. 2
Revision History ................................................................................................................. 2
Table of Contents .................................................................................................................. 3
  List of Figures and Tables ................................................................................................. 5
Executive Summary ............................................................................................................ 6
  Effective Date .................................................................................................................. 6
  Document Glossary of Terms & Acronyms (see Appendix A) ................................. 7
  Document References ................................................................................................. 7
  TIA-102 Document References .................................................................................. 8

1. Introduction to this Document .................................................................................... 10
  1.1 Purpose of this Document ................................................................................. 10
  1.2 Introduction to Project 25 Interfaces ................................................................ 10
  1.3 Project 25 Compliance Assessment Program (P25 CAP) Introduction .............. 11
  1.4 Importance of Verified Conformance Test Tools .......................................... 13
  1.5 Types of ISSI/CSSI Conformance Testing ....................................................... 14
  1.6 ISSI/CSSI Conformance Test Tool Verification ............................................... 15
  1.7 Alternate Conformance Testing Approaches .................................................... 18

2. Example Test Tool Verification Testing Methods .................................................. 18
  2.1 Manual, Independent Assessment Using Protocol Analyzer ............................ 19
  2.2 Example 1 - ICC Test Tool in Self-Test Mode ............................................... 19
  2.3 Example 2 - ICC Test Tool Testing Against Operational RFSS ..................... 20
  2.4 Example 3 - ICC Test Tools Back-to-Back ..................................................... 20

3. Test Tool Testing Guidance and Requirements ....................................................... 21
  3.1 ICC Test Tool Testing Requirements and Assumptions .................................. 21
  3.2 First Test Tool Verification, Challenges and Recommendations .................... 23
  3.3 Process Role Definitions for Test Tool Verification ....................................... 24

4. ICC Test Tool Verification Process Steps ............................................................... 26
  4.1 Step 1 - Initial Notification ............................................................................. 26
  4.2 Step 2 - Checkpoint I - Kickoff Webinar ....................................................... 27
  4.3 Step 3 - Submit ICC Test Tool Verification Test Plan ..................................... 28
4.4 Step 4 – Perform Test Tool Verification Testing ................................................................. 31
4.5 Step 5 – Compile P25 CAP Submission Documents .......................................................... 32
4.6 Step 6 – Approval & Notifications .................................................................................... 33

5. ISSI/CSSI Test Tool Testing – Scope of Features ................................................................. 35

5.1 Test Document References ................................................................................................. 35
5.2 Policies, Clarifications - All Testing ..................................................................................... 35
5.3 [1] ISSI-RFSS Configuration – Conformance Testing ......................................................... 36
5.4 [2] CSSI-RFSS Configuration – Conformance Testing ....................................................... 38
5.5 [3] CSSI-Console Subsystem Configuration – Conformance Testing ............................... 42

Questions, Getting Started ........................................................................................................ 44

Appendix A – Glossary of Terms and Acronyms ................................................................. 45
Appendix B – ICC Test Tool Verification Process Map ......................................................... 52
List of Figures and Tables

Figure 1. Overview of Key Project 25 Standards-based Interfaces .................................................. 10
Figure 2. How a Verified ICC Test Tool Is Used in ISSI/CSSI Conformance Testing ..................... 15
Figure 3. Example 1 – ICC Test Tool in Self-Test Mode ................................................................. 19
Figure 4. Example 2 – ICC Test Tool Testing Against Operational RFSS ....................................... 20
Figure 5. Example 3 – ICC Test Tools Back-to-Back ...................................................................... 21
Figure 6. ISSI-RFSS Conformance Test Tool Verification ............................................................... 36
Table 1. ISSI-RFSS Group Voice - Conformance Test Case List ....................................................... 36
Table 2. ISSI-RFSS Supplementary Data - Conformance Test Case List ........................................ 38
Figure 7. CSSI-RFSS Conformance Test Tool Verification ............................................................... 38
Table 3. CSSI-RFSS Group Voice - Conformance Test Case List ..................................................... 40
Table 4. CSSI-RFSS Unit to Unit Call - Conformance Test Case List ............................................. 40
Table 5. CSSI-RFSS Supplementary Data - Conformance Test Case List ........................................ 41
Figure 8. CSSI-CSS Conformance Test Tool Verification ............................................................... 42
Table 6. CSSI-CSS Group Voice - Conformance Test Case List ..................................................... 43
Table 7. CSSI-CSS Unit to Unit Voice - Conformance Test Case List ............................................. 43
Table 8. CSSI-CSS Supplementary Data - Conformance Test Case List ......................................... 44
Table 9. Glossary of Terms and Acronyms ..................................................................................... 45
Executive Summary

The Department of Homeland Security (DHS) Science and Technology Directorate (S&T) Office for Interoperability and Compatibility Technology Center (OIC-TC) Project 25 Compliance Assessment Program (P25 CAP) is a voluntary program that allows P25 equipment suppliers to formally demonstrate their products’ compliance with a select group of requirements within the suite of P25 standards.

This ISSI/CSSI Conformance Test Tool Compliance Assessment Bulletin (ICC Test Tool CAB) provides the verification procedures for test tool products that are designed to perform conformance testing of P25 Inter-Radio Frequency (RF) Subsystem Interface (ISSI) and Console Subsystem Interface (CSSI) equipment in accordance with P25 CAP ISSI and CSSI Conformance Test Cases and Pass/Fail documents, creating a robust and repeatable verification program in accordance with applicable DHS S&T and P25 CAP technical and reporting requirements.

This document has been preceded by a fully-vetted preliminary version, entitled P25 CAP ISSI/CSSI Conformance Test Tool Verification Process – Interim Guidance Document v6.0. This document provides expansive detail on how and why the process evolved. This ICC Test Tool CAB draws heavily upon that document and, as planned, replaces the interim guidance with the final and official processes and procedures contained herein.

Intended users of ICC Test Tool verification procedures include organizations independently verifying ICC Test Tool products, vendors developing commercial ICC Test Tool products, ISSI/CSSI equipment conformance testing laboratories, entities conducting pilot-testing of ICC Test Tool products, and manufacturers developing detailed and summary technical and related reports of ICC Test Tool products for DHS S&T and P25 CAP purposes.1

The intent in applying ICC Test Tool products in practice is to significantly increase end user confidence in the procurement and operation of ISSI/CSSI equipment that meets standards and is interoperable and the basis of meeting Federal government grant programs.2

Effective Date

This ICC Test Tool CAB becomes effective on December 30, 2020.

1 See ICCTT Interim Guidance Document, page 4, Section 1.1.

2 Ibid., page 5, Section 1.2.
Document Glossary of Terms and Acronyms (see Appendix A)

Document References

The section below provides a list of the primary references for this document. Other detailed reference information is embedded in the material or listed in numbered footnotes. The versions and filenames current as of this revision are provided, however practitioners are encouraged to verify which is most current version available by checking the DHS P25 CAP website. Certain documents such as the Test Case documents, the Pass/Fail Criteria and the Summary Test Report (STR) and Suppliers Declaration of Compliance (SDOC) template documents are available only by request via email to P25CAP@hq.dhs.gov.


[5] **P25 CAP ISSI/CSSI Conformance Test Tool Verification Process – Interim Guidance Document v6.0, July 2020** – This interim guidance document was used as the basis for this document and is referenced heavily throughout. A significant amount of content from this document were carried forward into this final CAB (as planned).


**TIA-102 Document References**


[BACA-B-1] [102BACA-B-1] Project 25 Inter-RF Subsystem Interface Messages and Procedures for Voice Services, Mobility Management, and RFSS Capability Polling Services, Addendum 1 - Group Emergency Behaviors; TIA-102.BACA-B-1 (Addendum to TIA-102.BACA-B), TIA, July 2013.

[BACA-B-2] [102BACA-B-2] Project 25 Inter-RF Subsystem Interface Messages and Procedures for Voice Services, Mobility Management, and RFSS Capability Polling Services, Addendum 2- Erratum 1 to Fix Errors and Omissions; TIA-102.BACA-B-1 (Addendum to TIA-102.BACA-B), TIA, November 2016.


[CACC-1] [102CACC-1] Project 25 Inter-RF Subsystem Interface Conformance Test Procedures- Addendum 1 - Supplementary Data; TIA-102.CACC-1, TIA, August 2011.

[CACD-D] [CACD-D] Project 25 Inter-RF Subsystem Interface Interoperability Test Procedures for Trunked Voice Operation Involving the ISSI; TIA-102.CACD-C, TIA, November 2018.

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1. **Introduction to this Document**

This section describes the purpose of this document, the scope, intended audience(s) and the importance of establishing a robust ICC Test Tool Verification Process. This document also provides a brief overview of Project 25 ("P25") TIA-102 Standards-based interfaces, an introduction to the P25 Compliance Assessment Program ("P25 CAP") and a description of the types of testing the program supports.

1.1 **Purpose of this Document**

The purpose of this ICC Test Tool CAB document is to clearly convey the procedures, requirements and guidance necessary to achieve DHS S&T P25 CAP approval and recognition of an ISSI/CSSI Conformance Test Tool.

1.2 **Introduction to Project 25 Interfaces**

The TIA-102 suite of Project 25 specification and standards documentation establishes the operation and behaviors of P25 standards-based features and functions. The Project 25 TIA-102 standards suite is comprehensive, with documents that precisely specify the message sequences, message content and exchange procedures for P25 Interfaces. P25 Interfaces include over-the-air, called Common Air Interfaces ("CAI"), and **wireline**

![Figure 1. Overview of Key Project 25 Standards-based Interfaces](image-url)
interfaces that operate over a network.

This paper is focused on conformance to the standards specifications of the P25 Inter-RF Subsystem (“ISSI”) and Console Subsystem (“CSSI”) wireline interfaces.

Figure 1 shows the primary types of end user devices: mobile Subscriber Units (“mSUs”) and Console Dispatch Operator positions (“cSUs”). A P25 Trunked RF Subsystem (RFSS A) is shown equipped with P25 base repeaters using the P25 CAI. RFSS A is also connected to P25 RFSS B using the P25 ISSI/CSSI wireline interface standard. Finally, the P25 trunked system RFSS B is connected to a third-party P25 Console Subsystem (CSS B’) using the P25 CSSI interface.

For the purposes of this paper, the combined acronym “ISSI/CSSI” is used as a shorthand and refers to any aspects that apply equally to the ISSI and CSSI interfaces.

1.3 Project 25 Compliance Assessment Program (P25 CAP) Introduction

The Project 25 Compliance Assessment Program (“P25 CAP”) is a voluntary program that allows P25 equipment suppliers to formally demonstrate their products’ compliance with a select group of requirements within the suite of P25 standards. The purpose of the Program is to provide emergency response agencies with evidence that the communications equipment they are purchasing meets P25 standards in three key areas: performance, conformance, and interoperability.3

The P25 CAP is administered independently of the P25 standards creation, publication and maintenance. It is intended to provide assurance to users that the equipment tested within the program will perform, interoperate and conform to the messages, message sequence and message content described by the standards.

This material is exclusively focused on verification and recognition of ICC Test Tool products and has been developed to assist public safety technology entities, including private corporations interested in developing commercially available ICC Test Tool product and any organization working to independently verify ICC Test Tool products.

All equipment suppliers that participate in the P25 CAP must use DHS-recognized laboratories to conduct performance, conformance and interoperability tests on their products. The P25 CAP defines the tests to be run to determine compliance and the format for consistently reporting results of interest to the market. It also ensures that the

3 See Ref [5], page 5.
laboratories and laboratory personnel follow strict guidelines for ensuring that repeatable results can be consistently obtained by qualified testers or test equipment regardless of which P25 CAP-recognized lab performs the testing. The lab accreditation includes verifying the ability of the testers to perform the tests and determine if the results meet the Pass/Fail criteria.

To verify compliance to the Telecommunication Industry Association (TIA)-102 P25 standards specification, the P25 CAP implements three categories of tests. These are Interoperability Testing, Performance Testing and (protocol) Conformance Testing, and are described further below.

1.3.1 P25 Interoperability Testing

P25 Interoperability testing verifies that the operation and behavior of the implementation matches the operation and behavior described by the P25 standards. This type of testing is often described as “end to end” testing, reflecting the focus on the behaviors of the end user mobile and portable subscribers and dispatch console positions. In the P25 Wireline Interface context, this is accomplished by connecting CSS or RFSS equipment to both ends of the interface and using this equipment to stimulate traffic and carefully observe resulting behavior of the network, stations and devices.

Interoperability tests describe the equipment configuration and operational steps that simulate specific and precise operational behaviors, which are specified and precisely defined in P25 TIA-102 standards. Because interoperability test pass/fail are usually based upon observation, test equipment is not currently used in this category. The interoperability tests also establish Pass/Fail criteria that enables P25 test cases to be consistently implemented, tested, measured and assessed by P25 CAP test engineers. However, while interoperability testing involves monitoring the visual and audible behaviors of end user subscriber radios and consoles, additional equipment may be necessary to fully verify functionality in a wider variety of configurations and end user scenarios.

The P25 CAP recognizes the need to continue enhancing the scope and robustness of ISSI/CSSI interoperability testing and is exploring additional approaches and methods to more readily reveal potential end user interoperability issues and obstacles.

1.3.2 P25 Performance Testing

With the increased performance demands inherent to managing highly complex RF devices in a highly complex interoperability environment, P25-compliant CAI and network performance testing provide a critical underpinning to the reliability, robustness and
interoperability of P25 radios, base stations and RF subsystems. Building upon the Federal Communications Commission (FCC) certification, the P25 performance test suite includes intricate functional testing, verification of receiver sensitivity, faded reference sensitivity, adjacent channel rejection performance, throughput delay, transmitter attack time and transient frequency behaviors, just to name a few.

P25 Performance testing is established for the wireless CAI domain and is currently outside the scope of wireline interface testing. It is included here for a comprehensive view of P25 CAP.

### 1.3.3 P25 Wireline Conformance Testing

Conformance tests verify that interoperability is a result of the implementation having implemented the messages, message exchange procedure and certain message content defined in the TIA-102 ISSI/CSSI BACA suite of standards documents.

Conformance tests describe the equipment configuration and operational steps that simulate the standard operation and behavior as well as the messages, message sequence and message content that determine Pass/Fail criteria of the test. Pass/fail criteria may also determine whether the implementation processes optional message content per the standard. Test equipment is needed to capture actual messages, message sequence and message content.

As required by the lab accreditation process the P25 Test Engineer is trained on the configuration and operation of the equipment, has knowledge of the standard, is capable of executing the test, is capable of operating the test equipment, and is familiar with the pass/fail criteria that determine if the captured messages, message sequence and message content meet the pass/fail criteria.

### 1.4 Importance of Verified Conformance Test Tools

This section outlines the importance of verifying Conformance Test Tools and how they function as crucible of reliability within the overall P25 Standards ecosystem. The intent in applying ICC Test Tool products in practice is to significantly increase public safety industry confidence that P25 ISSI/CSSI equipment meets P25 standards and is interoperable.\(^4\)

Here are some of the reason’s robust verification of ICC Test Tools is important:

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Because Conformance Test Tools verify that the underlying protocol messages are consistent with the P25 Standards, the testing helps prevent mistakes in the interface behavior that could result in disruptions to public safety operations. More importantly, if the messaging is incorrect, this requires new software code that would likely be expensive, difficult and take months, even years to address.

The availability of robust, effective Conformance Test Tools will make development of P25-standards based interfaces more efficient and speed time to market.

Any errors in the tools, test cases or testing procedures could miss errors in commercial products, reducing reliability and potentially resulting in interoperability problems and operational disruptions.

Important form of technical verification fills a critical gap in the P25 standards compliance, relying until now on cooperation of manufacturers, trial and error in early implementations, and feedback from customer deployments.

1.5 Types of ISSI/CSSI Conformance Testing

Because this endeavor focuses exclusively on protocol conformance testing, additional detail on the types of conformance testing is provided below. For each of the sets of applicable requirements identified above, four types of ISSI/CSSI equipment conformance testing are involved and described below.

- **MSC Conformance Testing** – Whether the Message Sequence Chart (MSC) was followed in accordance with applicable requirements. This applies to messages issued by the ICC Test Tool product and by the real or simulated Equipment Under Test (EUT).

- **Message Content Conformance Testing** – Whether the protocol message content was exchanged in accordance with applicable requirements. This applies to messages issued by the ICC Test Tool product and by the real or simulated EUT.

- **Parameter Values Pass/Fail Conformance Testing** – Whether the Pass/Fail criteria were satisfied in accordance with applicable requirements. This applies to messages issued by the ICC Test Tool product and by the real or simulated EUT.

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5 See reference [5], Section 4.2 page 20.
- **Overall ICC Test Tool Product Verification** – Whether all applicable technical requirements were satisfied, including those requirements relevant to the ICC Test Tool product verification environment (e.g., testing configuration and connection types), and also that sufficient information can be obtained to satisfy the reporting requirements and that any other verification criteria stated in the verification plan have been satisfied.

### 1.6 ISSI/CSSI Conformance Test Tool Verification

The following section examines the general concepts and provides context for verifying the protocol behaviors for the P25 wireline ISSI/CSSI interfaces, in particular. This section will outline how a verified ICC Test Tool will be used, provide a generic functional overview of an ICC Test Tool, some of the unique challenges and considerations around the “testing of test tool” category of Compliance Assessment and, lastly, why robust testing of ICC Test Tools is so critical.

#### 1.6.1 How a Verified ISSI/CSSI Conformance Test Tool Will Be Used

When testing the conformance to the digital messages and protocols defined by the P25 TIA-102 BACA standards documents, a baseline test configuration is used and shown below.

![Figure 2. How a Verified ICC Test Tool Is Used in ISSI/CSSI Conformance Testing](image)

The illustration shows an ISSI/CSSI Enabled RFSS as the EUT, connected via an ISSI/CSSI interface to the P25 CAP Verified ICC Test Tool that is simulating RFSS 2. The illustration also shows a P25 CAP Test Lab Technician using the plain language graphical user interface (“GUI”) from the ICC Test Tool to generate a detailed ISSI/CSSI conformance “EUT Test Report,” as shown.

The EUT shown in Figure 2 could be a real or simulated RFSS, CSS, or a console integrated with a RFSS and referred to as a “Native Console.” In this general testing arrangement, the Test Tool EUT equipment takes on the role as RFSS 1 and the ICC Test Tool simulates the
messages of an RFSS or CSS, taking on the role of RFSS 2. Within the general testing arrangement, the ICC Test Tool reports the extent to which the equipment under test passes or fails each test in accordance with applicable test case, role and Pass/Fail requirements.6

The procedures in the Conformance Test Cases are segmented into three distinct equipment-under-test (EUT) configurations. These test configurations are: 1) ISSI testing for RFSS equipment, 2) CSSI testing for RFSS equipment, and 3) CSSI testing for CSS equipment. These configurations are illustrated and described in more detail in the Test Case overview section 5 of this document.

1.6.2 Overview of Conformance Test Tools7

This section provides a high-level overview of ISSI/CSSI Conformance Test Tool functionality, with additional details and information available in the body of this document. Although functionality may vary by ICC Test Tool solution provider to address market requirements, suggested, typical ICC Test Tool commercial products include, but are not limited to, the capabilities and functions listed below.

- Decode and validate that the P25 protocol messages flowing from the EUT contain the correct information and are in the correct sequence as defined in the TIA-102 standard;
- Perform all Test Cases as defined for each EUT System configuration supported;
- Indicate an accurate assessment of “Pass” or “Fail” for each test case with log files;
- Provide detailed logs for reference during troubleshooting and debugging;
- Display and provide plain language explanations for failed test cases, to assist developers with troubleshooting;
- Verify all parameter values are returned within the proper ranges as required by the protocol;
- Correctly implement the ISSI and CSSI wireline protocols for the test cases defined by P25 CAP test documents; and
- Create reporting and support for automated options necessary to support the commercial, testing and development environments.

6 See reference [5], Section 4.3 Technical Verification, page 21.

7 See reference [5], Section 1.2, page 6.
To function properly, an ISSI/CSSI Conformance Test Tool must precisely mimic the messages that would be present on an ISSI or CSSI wireline interface and make Pass/Fail assessments for each test case with plain language interpretations of test results to aid in troubleshooting. It should be noted that while a full emulation of an RFSS or CSS is not required to perform this function, any emulated RFSS or CSS should resemble real, functioning systems and configurations as much as possible. In summary, a fully implemented ISSI/CSSI Conformance Test Tool is a highly specialized and specific software application that provides significant functionality and ease-of-use advantages.

1.6.3 Considerations and Challenges of Conformance Test Tool Testing

The testing and verification of a commercial ISSI/CSSI Conformance Test Tool poses a number of challenges, as presented and discussed throughout this paper. These challenges, issues and considerations are also outlined in more detail in the “ISSI/CSSI Conformance Test Tool High-Level Framework, Interim Guidance v6” document.

These considerations and challenges include:

- **Many Test Tool Verification Testing Configurations** – The processes need to be flexible enough to accommodate a variety of test tool verification methods.

- **Variety of Test Tool Applications and Capabilities** – The process must accommodate a variety of real-world ISSI/CSSI applications, implementations and capabilities.

- **All Features in P25 CAP Test Cases Must Be Testable** – In order to accommodate the full scope of features possible, the ICC Test Tool must support all P25 CAP tested features.

- **Evolving P25 Standard** – The verification process needs to be flexible enough to accommodate evolutionary changes to the P25 TIA-102 Standard.

- **New Test Cases, Features** – The verification process must be flexible enough to accommodate the expansion of additional features and functionality flowing across the ISSI/CSSI interface.

- **Conformance Test Cases Support Active Simulation Mode (only)** – To provide the test labs with efficient processes the ISSI/CSSI conformance test cases have been optimized to simulate an RFSS by creating messages and monitoring the response. For this reason, it would be significant effort for the P25 CAP testing program to rewrite them in order to support verification of a Test Tool which could support testing of an ISSI/CSSI a passive mode between two active RFSSs.


- **Initial or “First” Test Tool Verification** – Special challenges exist for the initial tool, resulting in the need for more manual verification among other challenges.
- **Conformance Does Not Guarantee Interoperability** – The conformance test tool will not necessarily ensure that different manufacturer implementations of P25 standards will interoperate in real deployments.

### 1.7 Alternate Conformance Testing Approaches

Recognizing the many challenges associated with Test Tool verification approach outlined above, the P25 Compliance Assessment Program will consider alternate ISSI/CSSI Conformance testing approaches that do not rely upon the use of a CAP-verified ISSI/CSSI Test Tool product, the subject of this Bulletin. Some limitations are created by short term challenges, such as a limited number of vendors of an ICC Test Tool available for competitive procurements, others are created by underlying architectures.

The Test Tool configuration described in this document functions as a simulated RFSS using prompt and response evaluations. While this approach has many benefits, it is critical the P25 CAP remains vigilant to ensure the Test Tool-based approach does not create limitations as the ISSI and CSSI evolve over time.

Among the specific needs is to enable passive evaluation of an active ISSI/CSSI connection, which are used and operational and in use by public safety agencies throughout the US. In this instance, a wireline monitor may be the best method for testing conformity if conducted with appropriate subject matter experts and under controlled conditions.

Additional information is available in the *ISSI/CSSI Conformance Test Requirements CAB*, as this is clarification regarding Conformance Testing rather than relating directly to verification of a Test Tool. Additionally, it should be noted that either the use of an ICC test tool or an alternate approach may require retesting in the event of major software updates or system changes during testing.

### 2. Example Test Tool Verification Testing Methods

The following sections present examples of ICC Test Tool Verification Testing Configuration approaches. As described in the next Process Steps Section 3, the developers of an ICC Test Tool can select from these examples or propose a different approach. The process recognizes that capabilities and tools may evolve over time. The verification configurations below are only examples to assist in the development of an ICC Test Tool Verification Plan.
2.1 Manual, Independent Assessment Using Protocol Analyzer

The manual, independent assessment verification approach utilizes a specialized and narrow simulation of message sequences and parameter content, which must behave precisely as defined in P25 ISSI/CSSI TIA-102 standard of the P25 ISSI/CSSI interface, optimized for ISSI/CSSI conformance testing. Using separate commercial off-the-shelf protocol analyzer or wireline monitor equipment, a P25 test engineer can non-intrusively observe the Protocol Data Units (PDUs) transmitted over the ISSI/CSSI physical connection, enabling the analysis of ISSI/CSSI protocol message flows, behaviors and content. Some versions come with special “plug-ins,” modes, or features specifically for supporting P25 protocols.

As illustrated in the Example ICC Test Tool Configurations outlined below, the protocol analyzer approach is shown being used or referenced in a variety of configurations and presented in the sections that follow. In the examples that follow, the illustrations do not mean to imply the manual protocol testing happens simultaneously while performing tests in other configurations, but rather are included to show the Test Tool EUT results are compared to the independently assess results at some point in the process.

2.2 Example 1 – ICC Test Tool in Self-Test Mode

In the first example, “Example 1,” a P25 Test Engineer and P25 protocol subject matter expert (SME) uses a protocol analyzer in a passive or non-intrusive mode while the ICC Test Tool is connected to itself in a self-test mode as shown below. A manual comparison to the P25 CAP Pass/Fail document using protocol analyzer is then performed. For this intricate process, the test engineer requires additional familiarity with P25 and protocol testing.

Figure 3. Example 1 – ICC Test Tool in Self-Test Mode
This allows the intricate message flow behaviors between an ICC Test Tool product and an EUT to be examined. In this example, the P25 Test Engineer compares the results generated by the ICC Test Tool Equipment Under Test against a manual assessment from analyzing the detailed behavior that can be observed from a generic protocol analyzer device.

2.3 Example 2 – ICC Test Tool Testing Against Operational RFSS

The illustration below shows another example of a possible ICC Test Tool verification testing configuration and method. This example utilizes an ISSI-capable and P25 CAP tested RFSS 2.

Figure 4. Example 2 – ICC Test Tool Testing Against Operational RFSS

The configuration above assumes RFSS 1 is an operational, P25 CAP-tested ISSI/CSSI capable RFSS, and equipment and therefore a baseline protocol to test against the ICC Test Tool EUT, which is simulating RFSS 2 in the example shown above.

2.4 Example 3 – ICC Test Tools Back-to-Back

In the example Conformance Test Tool verification method illustrated below, the ICC Test Tool under Test is connected in a “back-to-back” fashion to a “benchmark” ICC Test tool, which has been successfully verified as P25 compliant via the process described herein.
For this method, the P25 protocol test engineer would compare the results of the Test Tool EUT to the results generated by a P25 CAP Verified ICC Test Tool emulating RFSS 2.

### 3. Test Tool Testing Guidance and Requirements

This section outlines the ICC Test Tool Verification Testing Requirements, objectives and assumptions that are applicable to all ICC Test Tool Verification Testing, except as noted or as explicitly allowed during the review process outlined in the next section. As an introduction to the step-by-step process description, this section defines and describes the participants in the process, by defining and describing the process roles. The process presented in Section 4 describes exactly what is expected of each of the roles, for each step in the process.

#### 3.1 ICC Test Tool Testing Requirements and Assumptions

The conformance test tool solution enables conformance testing of P25 wireline interfaces. The test tool simulates the messages and procedures for RFSSs, consoles and mobile subscribers to test trunked system Fixed Network Equipment (FNE) equipped with the P25 ISSI/CSSI interfaces. General requirements that apply to all ICC Test Tool Verification Testing are listed below.

- **ALL P25 Features in Current Test Cases Must Be Included** – The ICC Test Tool must be capable of initiating and simulating the messages for all ISSI/CSSI P25 CAP Test Cases in all documents for the ISSI/CSSI Configurations supported, enabling the ICC Test Tool to accommodate any combination of features implemented by ISSI/CSSI subsystem manufacturers.

- **All Features Must Be Assessed by P25 Test Engineer⁹ Using a Protocol Analyzer** – The ICC Test Tool verification must include a manual message by

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⁹ Refer to Section 1.3 for a general description of the qualifications
message comparison and assessment performed by a P25 Protocol Test Engineer for all features and functions included in the current version of the P25 ISSI/CSSI Conformance Test Cases in the current P25 CAP ICC Test Tool CAB documents.

- **Test Tool Shall be Tested Against Two or More Operational Systems** – Verification of the test tool with two or more operational or “real” P25 Trunked system (RFSS) from different vendors is recommended.¹⁰

- **NOTE: Test Cases Span Three Configurations, Three Test Case Docs** – Each section refers to a referenced test document specific to the configuration (“[1]”, “[2]” or “[3]”). Note the individual test case section number references are the same across all three documents.

- **Pass/Fail Document** – Ultimately, conformance testing is about adhering to sometimes precise parameters, behaviors and values. For planning purposes, the test teams and test cases refer to the specific sections of the ISSI/CSSI Pass/Fail document, which must also be referenced.

- **Inter-Wide Area Carrier Number (WACN)/Inter-System Tests** – For obvious reasons, testing of ISSI/CSSI interfaces requires special attention to the tests, level of support and configurations around different combinations of the same and different WACN-System ID combinations.

- **P25 CAP Checkpoints Allow Dialog to Discuss Tailoring and Exceptions** – Any variations or limitations would be discussed and approved by P25 CAP prior to completing Test Tool verification testing, using the checkpoint sessions outlined in the Verification Process Steps described in the next section.

### 3.1.1 Summary of Types of Testing Requirements

For clarity, a test tool developer and test lab team preparing an ICC Test Tool Verification Testing Plan would need to test the test tool three times, as shown in the example below.

- Test 1: Independent (manual) Assessment using a Protocol Analyzer
- Test 2: Test Tool Against P25CAP Tested ICC Test Tool
- Test 3: Test Tool Against P25CAP Tested RFSS or CSS

It is recognized that some ISSI/CSSI features—Emergency Group Cancel, for example—are not currently supported by more than a few manufacturers. The Test Tool Verification

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¹⁰ See reference [5], page 8.
Process is established with flexibility to accommodate and address these among other potential testing limitations.

Additionally, this process reflects a new deliverable, called a “P25 Feature Inventory,” which articulates precisely what configurations and modes are supported by the tool and importantly, precisely what features are supported by the RFSS equipment used to test the tool.

A variety of example verification testing methods and approaches, as outlined in the previous section may be used, OR the developer and test lab may decide to propose alternative approaches.

3.1.2 Verification Assumes Compliance with Underlying IP Protocols

A complex interplay exists between the P25 standards protocol layer, and the underlying Internet Engineering Task Force (IETF)* Session Initiation Protocol (SIP)/Real-time Session Protocol (RTP) layer. The P25 CAP ISSI/CSSI conformance testing requirements (i.e., relevant CABs) are applicable to ISSI/CSSI equipment implementing P25/TIA-102 ISSI/CSSI protocol standards that are separate from the underlying SIP/RTP protocol standards. However, recognizing the purpose of an ICC Test Tool is to test the functional protocol conformance at the P25 layer, there are few examples in which the Test Tool will need to generate to “FAIL” results from errors from issues at the SIP/RTP layer. This includes the incorrect choice among valid SIP/RTP syntax options, among other possible examples.

The P25 CAP ICC Test Tool Verification process assumes that the Test Tool software and RFSS product owner(s) relied upon strict adherence to well-established IETF SIP/RTP standards. It would not impractical for DHS P25 CAP to rely solely upon P25 CAP testing to flag underlying IETF SIP/RTP compliance issues. However, with so many SIP/RTP compliant variations, the tested ISSI protocols could be completely compliant with SIP/RTP and still not be compliant to P25. It is these inconsistencies the Conformance Tests still needs accurately assess and Pass or Fail in compliance with the P25 Standard.

3.2 First Test Tool Verification, Challenges and Recommendations

Additional challenges exist for the initial or first ICC Test Tool going through the verification process. To mitigate the risks associated with testing a tool without a “gold standard” or “benchmark” Test Tool, a number of strategies are being deployed. These strategies include extensive testing with manufacturers’ commercial ISSI/CSSI-capable

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11 See reference [5], Section 2, Considerations #5), page 12.
systems (RFSSs) over a year-long Test Tool “pilot” initiative, additional verification using P25 testing to address any gaps that are revealed and a close coordination to refine and verify the underlying P25 CAP recommended test case procedures.

The processes described in the following pages are designed to be highly customizable and flexible enough to accommodate various Test Tool verification scenarios, including the Initial Test Tool Testing, which would create a “benchmark” P25 CAP Test Tool which could then be used to verify future tools against, as described in section 2.4 example above.

3.3 **Process Role Definitions for Test Tool Verification**

This section establishes guidance and assumptions around the three, primary “process roles” associated with ICC Test Tool Verification. These process roles are generic and may for instance, have multiple people and organizations fulfilling particular roles. The following sections describe the process roles that are used as the basis of and referenced extensively in the process step descriptions that follow.

3.3.1 **ICC Test Tool Developers/Owner Role (“Developer”)**

For this document and specific context, the ICC Test Tool Developer/Owner Role is the primary user or “Customer” of the ICC Test Tool Verification process and is characterized by the ownership of the Test Tool code, production and deployment of the tool for commercial use. This process assumes this ownership includes the software code and therefore the ability to troubleshoot and address any issues discovered during testing. The process is designed to be flexible enough to a variety of different types of entities who might participate, such as manufacturers who operate P25 CAP accredited laboratories.

3.3.2 **P25 CAP Test Laboratory Role (“Test Lab”)**

In this process, the term P25 CAP Test Lab Role refers to a P25 CAP Accredited Laboratory, or for the manual protocol testing described, this could mean a limited testing setup but one staffed by qualified Project 25 test engineers. This process assumes that extricating literally the “bits and bytes” out of a real-time protocol and then, importantly, being able to interpret and troubleshoot any issues found, requires a deep and seasoned TIA-102 Project 25 systems, radio, protocol and capabilities expert. This process assumes these P25 CAP testing personnel are fully trained on P25 trunked and conventional operation, configuration management of the equipment, and are capable of determining Pass/Fail assessments based upon documented P25 standards operation and behaviors.

In order to implement software fixes during testing it is expected that multiple versions are subjected to verification testing. The Test Lab is expected to internally track versions by
test cases performed and impacted to ensure any necessary regression testing is performed. This applies to ICC Test Tool under test, test CSSs and test RFSSs. P25CAP recognizes that a full scope of regression testing for all features for each software change may not be necessary, the Test Lab is expected to show due diligence on this key issue.

For any submissions not affiliated with or using a currently P25 CAP accredited Test Lab, the test plan will need to include a detailed resume of the proposed P25 Protocol SME assigned to perform ICC Test Tool Verification testing. The process shall also need to be flexible enough to accommodate multiple laboratories, test RFSS systems, locations and approaches.

3.3.3 DHS S&T P25 CAP Engineering Team ("P25 CAP")

DHS S&T leads the P25 CAP and staff of highly qualified\textsuperscript{12} P25 standards and test engineering experts.

\textsuperscript{12} Refer to Section 1.3 for a general description of the qualifications
4. **ICC Test Tool Verification Process Steps**

The following section provides detailed step-by-step instructions on what is required to achieve a P25 CAP-accredited ICC Test Tool. Each step is accompanied by detail that describes responsibilities of the three participating entities, specific deliverables required to begin the step, and what is needed to conclude that phase or step in the process.

Note the process “build-in” tailoring and exception-management procedures by requiring planning “checkpoints” at various points during the process. This process is also provided in illustrated form and can be found in Appendix B.

4.1 **Step 1 – Initial Notification**

In Step 1, the Commercial Test Tool Developer shall send an “Intent to Test ICC Test Tool” email to the P25CAP@hq.dhs.gov email address. To complete Step 1a – Initial Notification, the Developer must provide the following information itemized below. It is suggested that all the information be provided in a single email but may be provided over a series of emails as the information and details evolve. Providing the P25 CAP organization with an early notification is recommended to allow for ramp up time for resourcing and minimizing delays in response.

4.1.1 **Step 1a – Developer Sends Initial Notification Email to P25CAP at DHS**

The information below shall be provided over one or a series of emails to P25CAP email, as noted above. Please include the following information.

- **Tool Developer Point of Contact Information** – Key contact information for technical, business and executive contacts. A Test Lab contact may proxy for this role.
- **P25 CAP Test Lab Point(s) of Contact** – All point-of-contact information for each Test Lab, if more than one; include supervisory and primary test technician(s).
- **Test Tool Description/Documentation** – Information on which, if not all, ISSI/CSSI system configurations are supported, general description of P25 feature scope, and high-level information such as hardware/software and/or virtual/cloud-based architecture descriptions. Implementation details regarding the tool development and any available test data.
- **Software/Firmware Version to be Tested** (if known)
- **Target Completion Date** – As much as known, the rough timeframe of when product would be ready for testing to commence and/or target timeframe for completion.
Step 1a is complete when Developer has sent all required information to the P25CAP@hq.dhs.gov email account.

4.1.2 Step 1b – P25 CAP, Sends Latest Resource Documents

The P25 CAP and Test Lab team will review the notification information for completion and notify each other, as applicable. Based upon information received, the P25 CAP Team will begin preparing checkpoint information and compiling up-to-date and helpful tools and reference documents, as itemized next.

Both the P25 CAP Program and P25 CAP Test Lab will need to assign a primary point-of-contact for this project.

4.1.2.1 P25 CAP Deliverables to Developer and Test Lab

This step also includes coordination and scheduling for Checkpoint I Group Webinar, compilation of the most current P25 CAP documents and templates, and exchange of key points of contact information.

Deliverable Checklist for Step 1b:

- P25 CAP Primary Point of Contact Information
- P25 Supported Features Matrix Template
- P25 Feature-by-Feature Test Plan Matrix Template
- Current Version of P25 CAP ICC Test Tool CAB document
- Current ISSI/CSSI Test Case and Pass/Fail Documents
- Checkpoint Group Webinar Date/Time Confirmed, Agenda Sent
- List of Applicable TIA-102 Reference Documents

The team will provide or reference all useful and relevant background, testing and information documents such that Step 1b is complete when the P25 CAP has sent the Developer and Test Lab all current introductory and ISSI/CSSI Testing documents, such as those outlined above.

Step 1 is complete when all documents have been sent to Developer team and the initial Checkpoint I Group Webinar has been scheduled.

4.2 Step 2 – Checkpoint I - Kickoff Webinar

In Step 2, the P25 CAP and Test Lab support teams will review the initial notification material and prepare any questions they may have. The Developer team can decide how
often they would like to engage P25 CAP Engineering support and consultation; the group could decide to schedule monthly checkpoint conference calls, for instance.

The Test Lab and Developer teams are asked to participate in the Checkpoint I Group Webinar and come prepared with any questions they may have. One of the primary objectives of the checkpoint is to review and discuss any tailoring of the process due to scope or configurations.

The P25 CAP team shall host, coordinate and lead the Checkpoint I Group Webinar. Notes shall be circulated, reviewed and approved as accurate by participants. At this juncture, the team should have all they need to proceed to Step 3. At least one member from the Developer, Test Lab and P25 CAP team must be present to hold the webinar.

Step 2 is complete when the Checkpoint I Kickoff Webinar has been successfully held and Meeting Notes have been successfully circulated to all project points-of-contact identified.

**4.3 Step 3 – Submit ICC Test Tool Verification Test Plan**

For Step 3, Submission of ICC Test Tool Verification Test Plan (“Test Plan”), the Developer and Test Lab work together using materials, templates and guidance established in the Step 2 Checkpoint to document and submit the Detailed ICC Test Tool Test Plan. Additional details and elements of these documents are described in the sections below. Introduced as part of the ICC Test Tool process, this approach has potential to deliver significant efficiencies to other P25 CAP testing endeavors.

**4.3.1 3a – Verification Test Plan**

The Test Plan shall be submitted to P25 CAP comprised of the following elements, documents and deliverables, listed here and described further in the sub-sections below.

Verification Test Plan Checklist:

- Block Diagrams of Selected Verification Test Configurations
- ICC Test Tool (EUT) – Scope of Configurations Supported, Capabilities Summary
- Completed P25 Supported Features Matrix
- Completed P25 Feature-by-Feature Test Plan Matrix
- Final Key Milestones Schedule
4.3.1.1 Deliverable: Block Diagrams and Verification Test Plan Description

The Verification Test Plan shall include a few paragraphs that provide a high-level overview of the overall Test Plan, including testing block diagrams of the testing methods being used. These block diagrams should have a level of detail similar to those illustrated in the Example Test Tool Configurations outlined in Section 2. For instance, all interfaces and functional elements shall be clearly labeled.

4.3.1.2 Deliverable: RFSS and CSS P25 ISSI/CSSI Supported Feature Matrix

The Verification Test Plan package shall provide detailed information that indicates which ISSI/CSSI Conformance test cases are “[S]” are Supported by the Test RFSSs, and which test cases are “[U]” Unsupported by the RFSS test equipment. This information shall be provided based upon a blank P25 ISSI/CSSI Supported Feature Matrix Template provided by the P25 CAP team. It is acceptable to use Test “RFSS-A” and “RFSS-B” to obscure original manufacturers, if deemed necessary.

Recognizing that for the particular purpose of verifying conformance test tools, the manufacturer information need only indicate which features are “[S]” or Supported, in other words which features are expected to work on the ISSI/CSSI-enabled test RFSS trunked system. Presumably, this information would be available on the P25 CAP website in many cases. Because the purpose of Test Tool verification is to test the accuracy of the Test Tool, not the conformance of the Test RFSS equipment used to test the tool against. On the event RFSS or CSS Test Equipment fails a conformance test case for a Supported [S] feature, the Test Lab will only report failed conformance test results to the ISSI/CSSI RFSS manufacturer. Again, the purpose of Test Tool verification is to simply verify that the protocol behaviors of the Supported Test Cases were evaluated correctly by the ICC Test Tool equipment being verified.

In summary, the P25 ISSI/CSSI Supported Feature Matrix information will only show the features which are intended to operate and be supported by the RFSS Trunked System and ISSI/CSSI gateway manufacturers and therefore reflect marketing and product information already in the public domain.

Should the ICC Test Tool reveal ISSI/CSSI protocol issues in underlying equipment not under test, the P25 CAP Program asks that those be conveyed to the manufacturer so they can be investigated, debugged and resolved. Especially in the early years of formal ISSI/CSSI Conformance testing, testing of the test tool provides the benefit of additional testing and the opportunity to uncover and potentially address previously-obscured P25 feature and interoperability issues.
4.3.1.3  **Deliverable: P25 Feature Test Plan Matrix**

Once the Features Supported Inventories are compiled a simple translation into the P25 CAP Feature Test Plan Matrix Template would show precisely how each of the Test Cases would be tested, on which system types using which methods. It is expected that, especially in the earlier years of this program, that the planners examine the feature testing “coverage” to ensure the test cases are tested as many times as practical.

The P25 Feature Test Plan Matrix deliverable is complete with the customized P25 Feature Plan matrix template, as provided in by P25 CAP in Step 2 has all data and information requested provided. The purpose of the template is to ensure that when the Support Inventory data is available, the Test Plan matrix should require just minutes to prepare for submission.

4.3.1.4  **Deliverable: Final Key Milestones Schedule**

The Test Plan Package shall include a target schedule for completion of testing including target dates for major milestones and process steps outlined in this document. This allows P25 CAP support teams to ensure resources are available during critical periods of review and support.

4.3.2  **3b – P25 CAP Reviews Test Plan**

The P25 CAP team will review the submitted Test Plan Package. This review shall be performed within one week and would involve some or all of the following tasks as applicable.

- Review all submitted materials for accuracy and completions, AND
- Request minor clarifications or corrections via email, as applicable
- P25 CAP team may decide to approve Test Plan Package (skip to 3e), request a revision via email, OR
- Initiate Checkpoint II Group Webinar (3c) for more efficient resolution of any issues or questions uncovered during desktop review

4.3.3  **3c – P25 CAP Checkpoint II (Optional)**

The optional Checkpoint II Group Webinar would be scheduled as deemed necessary with the following overall objectives:

- Group review of Testing Approach
- Approve any variations for less than three tests per feature/function
- Final synch up and Q&A
☐ Articulate any requested revisions identified in initial review
☐ Circulate meeting notes capturing resolution of questions and issues

Step 3c is complete once the optional group webinar Checkpoint II has been held and meeting notes have been circulated to all project points-of-contact.

4.3.4 3d – Revise Test Plan and Resubmit (if applicable)

Complex test procedures and clarifying questions typically require a few rounds of emails and perhaps group discussion sessions. This effort shall result in a revised Test Plan package that is resubmitted, using the same process as original submission.

4.3.5 3e – P25 CAP Sends Approval, Notification

It should be emphasized here that the P25 CAP team will work to resolve issues as quickly and efficiently as possible to avoid holding up the timeline. The objective of this step is to avoid the full suite of tests to be complete and submitted, then rejected by the P25 CAP STR/SDOC review process, potentially requiring additional testing. It is assumed that addressing on the back end of the testing would be costly and labor-intensive for all involved.

Once all issues, questions and corrections have been resolved, the P25 CAP SME team will send written notification via P25 CAP email that the Test Plan Package has been accepted. This constitutes approval to begin performing Testing of submitted Test Tool.

Step 3 is complete when DHS P25 CAP has approved the Test Plan and provide approval to Proceed to Step 4 – Perform Test Tool Verification Testing.

4.4 Step 4 – Perform Test Tool Verification Testing

This section describes the primary work products and high-level process components associated with Step 4 – Perform Test Tool Verification Testing.

4.4.1 4a – Test Lab(s) Perform ISSI/CSSI Conformance Test Tool Verification Testing

Step 4a encompasses all technical testing and verification procedures outlined in the ICC Test Tool Verification Test Plan and shall be performed as described in the submitted plan. During this critical phase, the Lead Testers are encouraged to engage the P25 CAP engineering team with any questions or clarifications around specific test cases, Pass/Fail criteria or operational items.
4.4.2 4b – Iterate to Address Issues (as Needed)

It is expected that in all robust and thorough testing programs, it is inevitable that refinements and corrections will be needed. This process assumes an active iteration and refinement process between the Test Lab results and the Test Tool Developers.

4.4.3 4c – Developer Receives Test Tool Verification Test Results from Test Lab(s)

In Step 4c, the Test Tool Developer receives the Test Tool Verification Test Results from the Test Labs performing the Test Tool Testing, which contain the detailed Pass/Fail test results for each Test Case prescribed. These reports are not part of the submission for Compliance Assessment.

Step 4 is complete when the Developer has resolved all of the issues and the Test Lab(s) all successfully performed all of the Test Cases on the Test Tool identified during the scoping process. The process assumes the test results contain data necessary to compile draft P25 CAP submission documents comprising the next Step 5.

4.5 Step 5 – Compile P25 CAP Submission Documents

Step 5 can be initiated once all of the ICC Test Tool Verification testing has been completed and Test Results have been submitted by the Test Lab(s) to the Developer. Step 5 covers the submission and review of the draft ICC Test Tool STR and draft SDOC documentation.

4.5.1 5a – Developer & Test Lab(s) Compiles STR and SDOCs

Documentation required for Compliance Assessment must include the Manual Protocol Analyzer/SME Test Results including messages and content captured as needed to verify the more intricate behaviors. This allows P25 CAP experts to verify the correct Pass/Fail decisions are being made by the Test Tool.

The STRs are compiled and converted by either the Developer or Test Lab into draft P25 STR and SDOC based upon the templates provided in Step 1. Note that regardless of whether the Test Lab or the Developer team prepares the final draft STR and SDOCs for submission, the final documents need to be signed and approved by both the Developer and the Test Lab. The documents can be submitted by either group.

Step 5a is complete when the Developer has compiled drafts of the required documents, such ICC Test Tool STR and SDOCs, to P25 CAP.
4.5.2  5b – Developer Submits STR and SDOCs to P25 CAP

Step 5b is complete when the Developer has submitted drafts of the required documents, such as ICC Test Tool STR and SDOCs, to the P25 CAP email, copying project points-of-contact.

4.5.3  5c – Checkpoint III (Optional)

In order to resolve any issues as promptly as possible, the P25 CAP team may optionally decide to hold a conference call or webinar to discuss remaining issues or questions.

4.5.4  5d – Final P25 CAP Review

Once all issues, questions and corrections have been addressed as required, the P25 CAP will perform a final technical review of the submitted STR and SDOCs for the ICC Test Tool. If the P25 CAP engineering committee rejects the revision or submission, it is returned to the Developer with comments. This iteration is continued until a “final” proposed draft that addresses all items is submitted by the Developer.

Step 5d is complete when the P25 CAP has completed all reviews and all issues and questions have been successfully addressed and resolved.

4.6  Step 6 – Approval & Notifications

The final, Step 6 – Approvals & Notifications, involves the P25 CAP process steps requires to record, post and document the approval and verification processes.

4.6.1  6a – P25 CAP Approval & Notifications

The P25 CAP team will send a notification of successful completion, notifying the Developer and Test Lab contacts that the process is complete. This step also involves P25 CAP administrative tasks such as establishing final document versions, archiving process documents, and deleting out of date and draft document versions accumulated during the verification process.

Step 6a is complete when P25 CAP issues an approval email via P25CAP@hq.dhs.gov.

4.6.2  6b – Post SDOC to DHS P25 CAP Website

Once internal P25 CAP administrative tasks are complete, the DHS P25 CAP team will post the ICC Test Tool status and appropriate reference documents on such that it appears on the DHS Approved (Grant Eligible) Equipment list and documents can be accessed from the DHS P25 CAP website. This process typically takes roughly 30 days to complete in order to comply with DHS website and content review guidelines. The ICC Test Tool Verification
Process is concluded once the tasks described are complete and correct approved Tool Verification is posted to the DHS P25 CAP website.
5. **ISSI/CSSI Test Tool Testing – Scope of Features**

The following sections are for background and planning purposes only. This section explains the scope of features to be tested, the test case documents required to complete testing and where to find them, and what features are covered by which test cases in each configuration.

5.1 **Test Document References**

The P25 ISSI and P25 CSSI can be deployed in a variety of system configurations. For the purposes of both ISSI/CSSI Conformance Testing and the verification of an ICC Test Tool, the ISSI/CSSI CABs define three test configurations that cover the options available. Once again for clarity, each of these configurations corresponds to a different Test Case Document, noting the Feature Test Numbering schemes are identical between them. The P25 Test Cases that are to be used for ICC Test Tool Verification are provided in the P25 CAP Test Case and Pass/Fail Documents listed in the document references in the introduction section of this document.

5.2 **Policies, Clarifications - All Testing**

The Test Case and specific feature information in the following sections are for planning and overview purposes only. Detailed planning shall ensure the most recent source and normative Test Case and Pass/Fail documents are provided in Step 1 of the planning process.

For all of the tables that follow, the titles of features or functions are shown along with corresponding section number references corresponding to the “Full-Rate” Frequency Division Multiple Access (FDMA) and “Half-Rate” Time Division Multiple Access (TDMA) versions of the tests. Each line entry contains the document section reference number to obtain detailed test procedures and information.

For emphasis and to reduce repetition, the following specific clarifications are provided and apply to all test cases, except where specifically noted.

- Refer to all guidance and requirements outlined in Section 3.0 of this document
- Note Test Cases must also account for “Roles Definitions,” as defined in TIA and Test Case documents.
- Accompanying Pass/Fail Criteria for each test case in the table above can be found in the current version of the ISSI/CSSI Pass/Fail Criteria CAB, reference [4] in Sections 1.7 and 1.8.
The following sections outline the Conformance Testing Configurations and associated list of Test Cases for each. For clarity, each section shows the corresponding Test Case reference document, shown in brackets [REF] at the beginning of each section and table.

5.3  [1] ISSI-RFSS Configuration – Conformance Testing

This configuration simulates two, separate P25 Trunked RFSSs, RFSS1 and RFSS2, connected via an ISSI interface. To enable the verification of an ICC Test Tool as Equipment Under Test (EUT), the ICC Test Tool simulates RFSS 2 connected to RFSS 1 using an P25 ISSI wireline interface.

The following sections provide an overview of the Conformance Test Cases for the P25 Features and Services, presented in separate sections, Group Voice Services and Supplementary Data services.

5.3.1  ISSI-RFSS – Group Voice Conformance Test Case List

From Reference [1] ISSI-RFSS Conformance Test Cases, Conformance Test Cases for the Inter-Subsystem Interface (ISSI) with RF Subsystem (RFSS).

Table 1. ISSI-RFSS Group Voice - Conformance Test Case List

<table>
<thead>
<tr>
<th>Full Rate FDMA Test Case Ref</th>
<th>Half Rate TDMA Test Case Ref</th>
<th>ISSI-RFSS [1] Group Voice Conformance Test Case titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>4.1</td>
<td>Unconfirmed ISSI Group Call</td>
</tr>
<tr>
<td>3.1.1</td>
<td>4.1.1</td>
<td>RFSS Initiates Unconfirmed Group Call – Group Home Role</td>
</tr>
<tr>
<td>Full Rate FDMA Test Case Ref</td>
<td>Half Rate TDMA Test Case Ref</td>
<td>ISSI-RFSS [1] Group Voice Conformance Test Case titles</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>3.1.2</td>
<td>4.1.2</td>
<td>RFSS Receives Unconfirmed Group Call – Group Home Role</td>
</tr>
<tr>
<td>3.3.1</td>
<td>4.3.1</td>
<td>RFSS Initiates Unconfirmed Group Call – Group Serving Role</td>
</tr>
<tr>
<td>3.3.2</td>
<td>4.3.2</td>
<td>RFSS Receives Unconfirmed Group Call – Group Serving Role</td>
</tr>
<tr>
<td><strong>3.2, 3.4</strong></td>
<td><strong>4.2, 4.4</strong></td>
<td><strong>Emergency Unconfirmed ISSI Group Call</strong></td>
</tr>
<tr>
<td>3.2.1</td>
<td>4.2.1</td>
<td>RFSS Initiates Emergency Unconfirmed Group Call – Group Home</td>
</tr>
<tr>
<td>3.2.2</td>
<td>4.2.2</td>
<td>RFSS Receives Emergency Unconfirmed Group Call – Group Home</td>
</tr>
<tr>
<td>3.4.1</td>
<td>4.4.1</td>
<td>RFSS Initiates Emergency Unconfirmed Group Call – Group Serving</td>
</tr>
<tr>
<td>3.4.2</td>
<td>4.4.2</td>
<td>RFSS Receives Emergency Unconfirmed Group Call – Group Serving</td>
</tr>
<tr>
<td><strong>3.5 - 3.8</strong></td>
<td><strong>4.5 - 4.8</strong></td>
<td><strong>Confirmed ISSI Group Call</strong></td>
</tr>
<tr>
<td>3.5.1</td>
<td>4.5.1</td>
<td>RFSS Initiates Confirmed Group Call (Delayed Resources) - Home</td>
</tr>
<tr>
<td>3.5.2</td>
<td>4.5.2</td>
<td>RFSS Receives Confirmed Group Call (Delayed Resources) - Home</td>
</tr>
<tr>
<td>3.6.1</td>
<td>4.6.1</td>
<td>RFSS Initiates Confirmed Group Call (Delayed Resources) - Serving</td>
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<td>3.6.2</td>
<td>4.6.2</td>
<td>RFSS Receives Confirmed Group Call (Delayed Resources) - Serving</td>
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<tr>
<td>3.7.1</td>
<td>4.7.1</td>
<td>RFSS Initiates Confirmed Group Call (No Resources) - Home</td>
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<td>3.7.2</td>
<td>4.7.2</td>
<td>RFSS Receives Confirmed Group Call (No Resources) - Home</td>
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<td>3.8.1</td>
<td>4.8.1</td>
<td>RFSS Initiates Confirmed Group Call (No Resources) - Serving</td>
</tr>
<tr>
<td>3.8.2</td>
<td>4.8.2</td>
<td>RFSS Receives Confirmed Group Call (No Resources) - Serving</td>
</tr>
</tbody>
</table>

5.3.2 ISSI-RFSS – Supplementary Data Feature Test Case List

For Emergency Alarm, Emergency Alarm Cancel and Group Emergency Cancel, the test cases reflect the initiation of these services by a mobile Subscriber Unit (mSU) pressing the Emergency Button.

For Call Alert, the scenario is slightly different, reflecting the operational scenario of a mobile Subscriber Unit initiating a Call Alert through access to a services menu on the device. It should be noted this feature requires a subscriber unit equipped with a screen.
and keypad. The test cases cover operational scenarios that vary by the configured Home and system (RFSS1 or RFSS2) on which the mSU is operating.

Table 2. **ISSI-RFSS Supplementary Data - Conformance Test Case List**

<table>
<thead>
<tr>
<th>Test Case Ref [1]</th>
<th>ISSI-RFSS Supplementary Data [1] Conformance Test Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td><strong>Emergency Alarm</strong></td>
</tr>
<tr>
<td>5.1.1</td>
<td>Initiated by mSU Home to RFSS1 and Registered in RFSS2; talkgroup Home to RFSS2</td>
</tr>
<tr>
<td>5.1.2</td>
<td>Initiated by mSU Home to RFSS2 and Registered in RFSS1; talkgroup Home to RFSS1</td>
</tr>
<tr>
<td>5.2</td>
<td><strong>Emergency Alarm Cancel</strong></td>
</tr>
<tr>
<td>5.2.1</td>
<td>Initiated by mSU Home to RFSS1 and Registered in RFSS2; talkgroup Home to RFSS2</td>
</tr>
<tr>
<td>5.2.2</td>
<td>Initiated by mSU Home to RFSS2 and Registered in RFSS1; talkgroup Home to RFSS1</td>
</tr>
<tr>
<td>5.3</td>
<td><strong>Group Emergency Cancel</strong></td>
</tr>
<tr>
<td>5.3.1</td>
<td>Initiated by mSU Home to RFSS1 and Registered in RFSS2; talkgroup Home to RFSS2</td>
</tr>
<tr>
<td>5.3.2</td>
<td>Initiated by mSU Home to RFSS2 and Registered in RFSS1; talkgroup Home to RFSS1</td>
</tr>
<tr>
<td>5.4</td>
<td><strong>Call Alert</strong></td>
</tr>
<tr>
<td>5.4.1</td>
<td>Call Alert from mSU1 to mSU2; mSU1 home to RFSS1 and registered in RFSS2; mSU2 home to RFSS2 and registered in RFSS1</td>
</tr>
<tr>
<td>5.4.2</td>
<td>Call Alert from mSU2 to mSU1; mSU1 home to RFSS1 and registered in RFSS2; mSU2 home to RFSS2 and registered in RFSS1</td>
</tr>
</tbody>
</table>

5.4 **[2] CSSI-RFSS Configuration – Conformance Testing**

The CSSI test cases below apply to a configuration in which two RFSSs are connected using a CSSI interface between them. In this configuration, the ICC Test Tool is verified by

![Figure 7. CSSI-RFSS Conformance Test Tool Verification](image)
simulating RFSS 2 that would be sent by a RFSS capable of the CSSI interface.

5.4.1  CSSI-RFSS – Group Voice Conformance Test Case List

Table 3. CSSI-RFSS Group Voice - Conformance Test Case List

<table>
<thead>
<tr>
<th>Full Rate FDMA Test Case Ref</th>
<th>Half Rate TDMA Test Case Ref</th>
<th>CSSI-RFSS [2] Group Voice Conformance Test Case titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>4.1</td>
<td>Unconfirmed Group Call</td>
</tr>
<tr>
<td>3.1.1</td>
<td>4.1.1</td>
<td>RFSS Initiates Unconfirmed Group Call – Group Home Role</td>
</tr>
<tr>
<td>3.1.2</td>
<td>4.1.2</td>
<td>RFSS Receives Unconfirmed Group Call – Group Home Role</td>
</tr>
<tr>
<td>3.2, 3.4</td>
<td>4.2, 4.4</td>
<td>Emergency Unconfirmed Group Call</td>
</tr>
<tr>
<td>3.2.1</td>
<td>4.2.1</td>
<td>RFSS Initiates Emergency Unconfirmed Group Call – Group Home</td>
</tr>
<tr>
<td>3.3, 3.4</td>
<td>4.5 - 4.8</td>
<td>Confirmed Group Call</td>
</tr>
<tr>
<td>3.3.1</td>
<td>4.3.1</td>
<td>RFSS Receives Confirmed Group Call (Delayed Resources) - Home</td>
</tr>
<tr>
<td>3.4.1</td>
<td>4.4.1</td>
<td>RFSS Initiates Confirmed Group Call (No Resources) - Home</td>
</tr>
</tbody>
</table>

5.4.2 CSSI-RFSS Unit to Unit Voice Calls - Conformance Test Case List

The information summarized in Table 4 lists the conformance test cases for trunked Unit to Unit (“Individual”) call. The TIA-102 standard supports two, general methods of establishing Unit to Unit services, one version with Target Availability Check (“TAC”) and one without Target Available Check. The two left-hand columns in the table refer to the sections of Reference [2] Test Case document, for FDMA and TDMA operation respectively. Note the test case titles are the same for both sections.

Test Cases for this configuration, summaries in Table 4 below, can be found in Reference [2], CSSI-RFSS Conformance Test Case Document, Sections 5 and 6.

Table 4. CSSI-RFSS Unit to Unit Call - Conformance Test Case List

<table>
<thead>
<tr>
<th>Full Rate FDMA Test Case Ref</th>
<th>Half Rate TDMA Test Case Ref</th>
<th>CSSI-RFSS [2] Unit to Unit Voice Conformance Test Case List</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1, 5.2</td>
<td>6.1, 6.2</td>
<td>Unit to Unit Call WITH Target Availability Check (TAC)</td>
</tr>
<tr>
<td>5.1.1</td>
<td>6.1.1</td>
<td>mSU on RFFS1 initiates Unit to Unit Call WITH TAC</td>
</tr>
<tr>
<td>5.2.1</td>
<td>6.2.1</td>
<td>Console (cSU) on RFFS2 initiates Unit to Unit Call WITH TAC</td>
</tr>
<tr>
<td>5.3, 5.4</td>
<td>6.3, 6.4</td>
<td>Unit to Unit Call WITHOUT Target Availability Check (TAC)</td>
</tr>
<tr>
<td>5.3.1</td>
<td>6.3.1</td>
<td>mSU on RFFS1 initiates Unit to Unit Call WITHOUT TAC</td>
</tr>
<tr>
<td>5.4.1</td>
<td>6.4.1</td>
<td>Console (cSU) on RFFS2 initiates Unit to Unit Call WITHOUT TAC</td>
</tr>
</tbody>
</table>
5.4.3 CSSI-RFSS – Supplementary Data Conformance Test Case List

The information summarized in Table 5 lists the conformance test cases for a selection of trunked supplementary data features. These features operate over the control channel and so are not affected by FDMA versus TDMA operation. This group of tests includes the commonly Call Alert and Emergency Alarm services. Test Cases for this configuration can be found in Reference [2], CSSI-RFSS Conformance Test Case Document, Section 7.

Table 5. CSSI-RFSS Supplementary Data - Conformance Test Case List

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td>Emergency Alarm</td>
</tr>
<tr>
<td>7.1.1</td>
<td>Initiated by mSU Home to and Registered in RFSS1; talkgroup Home to RFSS1</td>
</tr>
<tr>
<td>7.2</td>
<td>Emergency Alarm Cancel</td>
</tr>
<tr>
<td>7.2.1</td>
<td>Initiated by CONSOLE Home to RFSS2; talkgroup Home to RFSS1</td>
</tr>
<tr>
<td>7.2.2</td>
<td>Initiated by mSU Home to and Registered in RFSS1; talkgroup Home to RFSS1</td>
</tr>
<tr>
<td>7.3</td>
<td>Group Emergency Cancel</td>
</tr>
<tr>
<td>7.3.1</td>
<td>Initiated by CONSOLE Home to RFSS2; talkgroup Home to RFSS1</td>
</tr>
<tr>
<td>7.3.2</td>
<td>Initiated by mSU Home to and Registered in RFSS1; talkgroup Home to RFSS1</td>
</tr>
<tr>
<td>7.4, 7.5</td>
<td>Call Alert</td>
</tr>
<tr>
<td>7.4.1</td>
<td>RFSS1 mSU Initiated - Initiated by mSU Home to RFSS1</td>
</tr>
<tr>
<td>7.5.1</td>
<td>RFSS2 cSU Initiated - Initiated by Console Home to RFSS2</td>
</tr>
</tbody>
</table>
5.5 [3] CSSI-Console Subsystem Configuration – Conformance Testing

In this configuration, RFSS 1 is a CSS connected to an RFSS 2 using the CSSI interface. For ICC Test Tool verification, the Test Tool EUT emulates RFSS 2, and is tested against a Console Subsystem (CSS). The CSSI in this configuration are used to connect a third-party Console Subsystems.

To enable conformance testing of the CSSI interface in this configuration, the ICC Test Tool must correctly implement the CSSI protocol as it should behave as if generated from a CSSI-capable RFSS. The ICC Test Tool assesses the IP-based packets flowing from the Console Subsystem EUT to verify CSSI Conformance.

The following sections provide an overview of the Conformance Test Cases for the P25 Features and Services, presented in three sections: Group Voice Services, Unit to Unit Calls, and Supplementary Data services.

5.5.1 CSSI-CSS – Group Voice Conformance Test Case List

Table 6 below itemizes the Group Voice conformance test cases required for testing a CSSI connection to a CSS, as illustrated in the previous section. This section of tests has fewer test cases because in Project 25, a Console (cSU) does not initiate Emergency Calls.

Test Cases for this configuration can be found in Reference [3] CSSI-CSS Conformance Test Case Document, Section 3 for full rate FDMA and Section 4 for half rate TDMA.
Table 6. **CSSI-CSS Group Voice - Conformance Test Case List**

<table>
<thead>
<tr>
<th>Full Rate FDMA Test Case Ref</th>
<th>HALF Rate TDMA Test Case Ref</th>
<th>CSSI - CSS [3] Group Voice Conformance Test Case titles</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>4.1</td>
<td>Unconfirmed Group Call</td>
</tr>
<tr>
<td>3.1.1</td>
<td>4.1.1</td>
<td>Console Initiates Unconfirmed Group Call – Group Serving</td>
</tr>
<tr>
<td>3.1.2</td>
<td>4.1.2</td>
<td>Console Receives Unconfirmed Group Call – Group Serving</td>
</tr>
<tr>
<td>3.2</td>
<td>4.2, 4.4</td>
<td>Emergency Unconfirmed Group Call</td>
</tr>
<tr>
<td>3.2.1</td>
<td>4.2.1</td>
<td>Console Receives Emergency Unconfirmed Group Call – Group Serving</td>
</tr>
<tr>
<td>3.3, 3.4</td>
<td>4.5 - 4.8</td>
<td>Confirmed Group Call (Console Initiated)</td>
</tr>
<tr>
<td>3.3.1</td>
<td>4.3.1</td>
<td>Console Initiates Confirmed Group Call (Delayed Resources) - Serving</td>
</tr>
<tr>
<td>3.4.1</td>
<td>4.4.1</td>
<td>Console Initiates Confirmed Group Call (No Resources) - Serving</td>
</tr>
</tbody>
</table>

**5.5.2 CSSI-CSS – Unit to Unit Voice Conformance Test Case List**

The information summarized in Table 7 below lists the conformance test cases for a trunked, Unit to Unit (or Individual) Call. The TIA-102 standard supports two general methods of establishing Unit-to-Unit services, one version *with* Target Availability Check (TAC) and one without TAC. The two left-hand columns in the table refer to the sections of Reference [3] Test Case document, for FDMA and TDMA operation respectively. Note the test case titles are the same for both sections.

Test Cases for this configuration can be found in Reference [3], *CSSI-CSS Conformance Test Case Document*, Sections 5 and 6.

Table 7. **CSSI-CSS Unit to Unit Voice - Conformance Test Case List**

<table>
<thead>
<tr>
<th>Full Rate FDMA Test Case Ref</th>
<th>Half Rate TDMA Test Case Ref</th>
<th>CSSI-CSS [3] Unit-to-Unit Voice Conformance Test Case List</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1, 5.2</td>
<td>6.1, 6.2</td>
<td>Unit-to-Unit Call WITH Target Availability Check (TAC)</td>
</tr>
<tr>
<td>5.1.1</td>
<td>6.1.1</td>
<td>RFSS1 Console (cSU) initiates Unit to Unit Call WITH TAC</td>
</tr>
<tr>
<td>5.2.1</td>
<td>6.2.1</td>
<td>mSU on RFSS2 initiates Unit to Unit Call WITH TAC</td>
</tr>
<tr>
<td>5.3, 5.4</td>
<td>6.3, 6.4</td>
<td>Unit-to-Unit Call WITHOUT Target Availability Check (TAC)</td>
</tr>
<tr>
<td>5.3.1</td>
<td>6.3.1</td>
<td>RFSS1 Console initiates Unit to Unit Call WITHOUT TAC</td>
</tr>
<tr>
<td>5.4.1</td>
<td>6.4.1</td>
<td>mSU on RFSS2 initiates Unit to Unit Call WITHOUT TAC</td>
</tr>
</tbody>
</table>
5.5.3  **CSSI-CSS – Supplementary Data Conformance Test Case List**

All assumptions listed above still apply.

Test Cases for this configuration can be found in Reference [3] *CSSI-CSS Conformance Test Case Document*, Section 7.

**Table 8. CSSI-CSS Supplementary Data - Conformance Test Case List**

<table>
<thead>
<tr>
<th>Test Case Ref [3]</th>
<th>CSSI-CSS Supplementary Data-Conformance Test Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.1</td>
<td><strong>Emergency Alarm – ICC Test Tool Initiated, Acknowledged by CSS</strong></td>
</tr>
<tr>
<td>7.1.1</td>
<td>Initiated by mSU Home to and Registered in RFSS2; talkgroup Home to RFSS2; Received by CONSOLE in RFSS1</td>
</tr>
<tr>
<td>7.2</td>
<td><strong>Emergency Alarm Cancel</strong></td>
</tr>
<tr>
<td>7.2.1</td>
<td>Initiated by mSU Home to and Registered in RFSS2; talkgroup Home to RFSS2; Received by CONSOLE in RFSS1</td>
</tr>
<tr>
<td>7.2.2</td>
<td>Initiated by CONSOLE in RFSS1; talkgroup Home to RFSS2</td>
</tr>
<tr>
<td>7.3</td>
<td><strong>Group Emergency Cancel</strong></td>
</tr>
<tr>
<td>7.3.1</td>
<td>Initiated by mSU Home to and Registered in RFSS2; talkgroup Home to RFSS2; Received by CONSOLE in RFSS1</td>
</tr>
<tr>
<td>7.3.2</td>
<td>Initiated by CONSOLE in RFSS1; talkgroup Home to RFSS2</td>
</tr>
<tr>
<td>7.4, 7.5</td>
<td><strong>Call Alert</strong></td>
</tr>
<tr>
<td>7.4.1</td>
<td>Initiated by CONSOLE Home to RFSS1</td>
</tr>
<tr>
<td>7.5.1</td>
<td>Initiated by mSU Home to RFSS2</td>
</tr>
</tbody>
</table>

**Questions, Getting Started**

Any organizations considering embarking upon the verification of an ISSI/CSSI Conformance Test Tool or anyone who has questions beyond the scope of this document are urged to contact the P25 CAP support team at P25CAP@hq.dhs.gov.
## Appendix A – Glossary of Terms and Acronyms

Because the ICC Test Tool Verification Compliance Assessment Bulletin (CAB) is an advanced engineering document and assumes an advanced understanding of Project 25 (P25) and familiarity with basic acronyms and terminology. Common vernacular and universally familiar acronyms that are well-known by technical public safety audiences are not included. This list does not include acronyms associated familiar government oversight agencies and programs. Where applicable, relevant ICC Test Tool background and contextual information is provided to assist the reader.

### Table 9. Glossary of Terms and Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AES</strong></td>
<td><strong>Advanced Encryption Standard (AES)</strong> – AES is the P25-endorsed encryption algorithm using a key size of 256 bits. This algorithm can be used for both digital voice and packet data traffic encryption.</td>
</tr>
<tr>
<td><strong>CAB</strong></td>
<td><strong>Compliance Assessment Bulletin (CAB)</strong> – The CAB is a type of guidance document developed by the P25 Compliance Assessment Program and which establishes test scope, policies and testing requirements.</td>
</tr>
<tr>
<td><strong>CAI</strong></td>
<td><strong>Common Air Interface (CAI)</strong> – Project 25 term referring to the common, standards-based Air Link. Project 25 defines CAIs, including Direct Mode, Conventional Repeater, and both FDMA and TDMA trunking.</td>
</tr>
<tr>
<td><strong>CAP</strong></td>
<td><strong>(P25) Compliance Assessment Program (P25 CAP)</strong> – This term refers to the Project 25 Compliance Assessment Program.</td>
</tr>
<tr>
<td><strong>CCH</strong></td>
<td><strong>Control Channel (CCH)</strong>. See <strong>Control Channel</strong>.</td>
</tr>
<tr>
<td><strong>Console</strong></td>
<td><strong>Console</strong> – Trunked Consoles can be connected to a P25 trunked system (RFSS), which also supports RF Site connections. These Consoles, referred to as “Native Consoles,” can be local or remoted from central Fixed Network Equipment (FNE). See <strong>Native Console, CSSI</strong>.</td>
</tr>
<tr>
<td><strong>Console Subsystem (CSS)</strong></td>
<td><strong>Console Subsystem (CSS)</strong> – A trunked subsystem that supports only Consoles and is connected to an RFSS using the CSSI interface. The standard allows a CSS to connect using a WACN-System ID, which is either the same or different to the trunked RFSS it is connected to over the CSSI. A CSSI connection that uses the same WACN/SYS ID is called an “Intra-CSSI” connection. See <strong>CSSI</strong>.</td>
</tr>
</tbody>
</table>
Control Channel

Control Channel (CCH) – The trunking system component that automatically controls multiple and simultaneous talkgroup and Individual Call operations. The CCH uses a separate dedicated paired channel at every logical RF site on a P25 trunked network. When not on an active call, radios continuously listen to the Control Channel.

CSSI

Console Subsystem Interface (CSSI) – This trunked P25 wireline interface standard enables the interoperability and interconnection among CSUs operating across disparate P25 trunked networks and Console Subsystems. The P25 CSSI has the flexibility to support connectivity among the same or different WACN or System IDs. Because the P25 CSSI wireline interface is primarily deployed in third-party Console Subsystem implementations, the CSSI has become a key enabler for P25 Network operators to improve their procurement and advanced technology options. See CSS, ISSI.

DTR

Detailed Test Report (DTR) – This acronym is used to refer to the report template used to capture detailed testing data for the P25 Compliance Assessment Program.

EUT

Equipment Under Test (EUT), pronounced (“EE you tee”) – The acronym EUT is a testing term to signify exactly what equipment is being tested and assessed. In this document, the EUT is the ICC Test Tool, except where noted.

FDMA

FDMA (Frequency Division Multiple Access) – In the P25 environment, the term FDMA refers to the access method for Phase 1 Trunking. Phase 1 FDMA uses a Full-Rate Vocoder and supports one talk or data path per working traffic channel. See TDMA, Full Rate vocoder.

FNE

Fixed Network Equipment (FNE) – In the P25 context, this term refers to the equipment that is not mobile, but fixed and stays in one place.

Full-Rate (FR)

Full-Rate (FR) – This term refers to an aspect of the Vocoder. Basically, a Vocoder converts a voice audio into a digital stream of 1s and 0s. For P25 Phase 1, FDMA the vocoder operates in full rate mode, enabling only one voice path per RF traffic channel on a trunked system. See FDMA, Half-Rate.

Gateway

Gateway – A telecommunications is a specialized network appliance that allows data or signals to flow between discretely different networks. A gateway provides a translation between at
least two or more different protocols. Gateways are often confused with “RF Switches,” which connect signals from different RF bands. See ISSI/CSSI.

**GUI**

Graphical User Interface (GUI), pronounced (“GOO-ee”) – In general, this term refers to the interactive graphical and visual interfaces with an end user.

**Half Rate (HR)**

Half-Rate (HR) – This term refers to the type of vocoder. A vocoder converts a voice audio into a digital stream of 1s and 0s. A half bit rate vocoder is used in P25 Phase 2 TDMA and is described as “half” because it uses half of the available bits, enabling TWO voice paths per RF traffic channel on a trunked system. This enables a doubling of the voice efficiency. See TDMA, Full-Rate.

**Home System**

Home System – All talkgroups are familiar with the P25 System use the System’s WACN-SYS ID combination as part of the full identity of the talkgroup. A talkgroup can have only one Home System.

**ICC Test Tool**

ISSI/CSSI Conformance Test Tool (ICC Test Tool) – An ICC Test Tool is an application or device that assesses the conformance to the P25 TIA-102 ISSI and CSSI wireline interface protocol standards requirements.

**IETF**

Internet Engineering Task Force (IETF) – The IETF is the primary Internet Standards body. From their website, “The mission of the IETF is to make the Internet work better by producing high quality, relevant technical documents that influence the way people design, use, and manage the Internet.” For more information, see: https://www.ietf.org/

**Individual Call**

Individual Call (aka Unit to Unit Call) – A P25 Individual Call operating on a Trunked Network allows any two P25 units to communicate directly between two radio units, rather than utilizing a trunked talkgroup.

**Inter-WACN ID/Sys ID**

Inter-WACN, Inter-System ID – This term refers to the ISSI/CSSI connectivity scenarios in which the RFSSs being connected together have different WACN and or System IDs.

**ISSI**

Inter-RF Subsystem Interface (P25 ISSI) – This trunked P25 wireline interface standard enables roaming and interconnected services across disparate P25 trunked Wide Area networks (RFSSs). The P25 ISSI has the flexibility to connect multiple P25 trunked systems that have the same or different WACN or System IDs. See...
**ISSI/CSSI**

ISSI/CSSI – The combined acronym ISSI/CSSI is used as a shorthand and refers to any aspects that apply identically and equally to the ISSI and CSSI interfaces. See ISSI, CSSI.

**MSC**

Message Sequence Chart (MSC) – A message sequence chart is a visual presentation technique that provides protocol message sequence detail.

**Native Console**

Native Console – The Consoles or cSUs can be connected to a P25 Trunked system FNE that also supports RF Site connections; these cSUs, referred to as “Native Consoles,” can be local or remoted from central Fixed Network Equipment (FNE). See cSU, CSS, CSSI, ISSI.

**OTA**

Over the Air (OTA) – The protocol or wireless “language” devices use to communicate OTA.

**OTS**

Off the Shelf (OTS) – This term refers to equipment that is commercially available, “off-the-shelf.”

**Project 25 (P25)**

Project 25 (P25) – The P25 global standard operates with TIA and focuses on primary goal of Public Safety Interoperability. The P25 Process promotes open, fair competition and equipment compatibility, and is driven by participation and consensus of stakeholders. TIA publishes a suite of P25 standards documents, establishing how radios are developed, implemented and operated by End Users. See TIA.

**Protocol Analyzer**

Protocol Analyzer – A Protocol Analyzer is a commonly-used network diagnostic tool, which captures and analyzes signals and packets of data traffic (PDU}s) over a digital communications link. For the verification of an ICC Test Tool, a P25 protocol expert can use a Protocol Analyzer to non-intrusively observe the Packet Data Units (PDUs) being transmitted over ISSI/CSSI wireline interfaces, enabling an assessment of correct protocol message flows, behaviors and content. Protocol Analyzers are also referred to as Wireline Monitors.

**RF Site**

RF Site – RF Site is a term that corresponds to the Fixed Station or Base Repeater, which does not move while in operation. Although most transmitters are on freestanding Radio Towers, RF Sites are deployed come in many forms and types, including indoor Distributed Antenna System (DAS), concealed and on hilltops and rooftops.
### RTP

**Real-Time Protocol (RTP)** – RTP is an IETF IP-standards based network layer protocol, which enables the optimization of low-latency, real-time audio and video services. See SIP, SIP/RTP.

### SDOC

**Supplier’s Declaration of Compliance (SDOC)**, pronounced (“ES dok”) – This is an abbreviation for one of the documents used to convey testing information to the P25 CAP.

### Serving System

**Serving System** – The Home and Serving System designations are essential to the ISSI/CSSI interface functionality. A Serving System is any RFSS that is supporting a Subscriber which is “visiting” or “foreign,” which means it affiliates with a different WACN-SYS ID, and must be assigned a WUID. P25 also has a designation for a Serving talkgroup (Group Serving). See WUID, Home System.

### SIP

**SIP (Session Initiation Protocol)** – A signaling protocol used to create, manage and terminate sessions in an IP-based network. See RTP, SIP/RTP.

### SIP/RTP

**SIP/RTP**, pronounced (“SIP ar tee PEE”) – Refers to the combination of underlying IP-based protocols, SIP and RTP, used by the ISSI/CSSI interfaces. See SIP, RTP.

### SME

**Subject Matter Expert (SME)** – In the context of the ICC Test Tool topic, this term refers to a P25 Engineer with advanced background and knowledge on real-time protocols and P25 trunked system operations, services and capabilities.

### STR

**Summary Test Report (STR)** – This is an abbreviation for one of two primary documents used to convey testing information to the P25 CAP.

### Subscriber Unit (SU)

**Subscriber Unit (SU)** (aka Radio, Subscriber, Portable, Mobile) – Proper technical term for an end user radio unit, usually a mobile or portable radio. Another common type is called a Control Station or “Consolette.”

### SUID

**Subscriber Unit ID (SUID)** – The full SUID is a primary mechanism the ISSI/CSSI uses to identify a subscriber radio unit. The SUID is kept unique within the pool of IDs defined by a WACN-SYS ID combination by including a numerical Unit ID (UID), which are 6, 7 or 8 digits in length and which functions almost exactly like a phone number.
**System ID (SYS ID)**  
System ID (SYS ID) – When combined with the WACN, the System ID is a 12-bit hexadecimal identifier and is a key part of the unique Identifier assigned to every Project 25 trunking system. See WACN.

**TAC**  
Target Availability Check (TAC) – This term refers to a messaging sequence in the Trunked Unit to Unit Call. Unit-to-Unit Calls in the P25 Standard support three varieties of TAC handling.

**TDMA**  
Time Division Multiple Access (TDMA) – In the P25 environment, the term TDMA refers to the access method for Phase 2 Trunking. Phase 2 FDMA uses a Half-Rate Vocoder and supports two talk or data patch per working traffic channel. See TDMA, Half Rate.

**TIA**  
Telecommunications Industry Association (TIA) – TIA develops a digital communication standard that the P25 Standard Steering Committee can adopt as the P25 Standard for public safety, as well as others. See Project 25.

**Vocoder**  
Vocoder – A radio component that is a speech analyzer and synthesizer required for radio communication, where voice has to be digitized, encrypted and then transmitted on a narrowbandwidth channel.

**WACN (ID)**  
Wide Area Carrier Number ID (WACN ID), pronounced (“WACK-en”) – When combined with the System ID, the numerical WACN identifier is part of the unique Identifier assigned to every P25 Trunked System. See SysID.

**Wireline Monitor**  
Wireline Monitor – The terms Protocol Analyzer and Wireline Monitor are used interchangeably in this document. See Protocol Analyzer.

**WUID**  
Working Unit ID (WUID) – This is the Unit ID assigned by a Serving RFSS to support inter-WACN or Inter-System Roaming. The WUIDs are only triggered in Serving Systems by visiting SUIDs. The Serving System assigns WUIDs from a pool of Unit IDs set up by system administration. See SUID, Inter-System ID, Inter-WACN, Serving System.
Appendix B – ICC Test Tool Verification Process Map

ICC Test Tool Verification Process Map

Overview only, See Section 4 for full instructions.

STEP 1 – Initial Notification

1a. Notification to P25 CAP

FROM DEVELOPER
- PoC Info
- Test Tool Description, Scope
- Test Lab
- Target Timeframe
  if Known:
- Test Method Block Diagrams
- Software Version

Send to P25CAP@hq.dhs.gov email

1b. Send Latest Docs to Developer

FROM P25CAP
- P25CAP PoC
- Latest ICC CAB
- Supported Features Matrix
- Kickoff Invite & Agenda
- TIA and Reference Doc List

Forward/Copy

Project Kickoff Checkpoint I

STEP 2 – Kickoff Webinar

Group Webinar
- ICC Test Tool Representatives
  Participate

Test Lab Representatives
  Participate

2. Host Kickoff Webinar
- Review Scope, Docs, Process, Deliverables; Q&A
- Intro Team Members, PoC List
- Step through process, Deliverables
- Review Verification options
- Identify Tailoring Req’s, if any
- Meeting Notes

STEP 3 – Submit Draft Test Plan

Coordinated development between P25 CAP Test Lab and Test Tool Developer

3a. Submit ICC Test Tool Verification Test Plan

- Selected Verification Test Configurations
- ICC Test Tool (EUT) – Capabilities Summary
- Supported Features Matrix
- P25 Feature Test Plan Matrix
- Final Key Milestones Schedule

3b. REVIEW Detailed Plan.
- Accept or Request Revisions and/or Checkpoint II

3b (optional) P25 CAP Checkpoint II

IF NEEDED

- Adjustments
- Tailoring
- Technical corrections

3c. Revise and Resubmit (if needed)

3d. Send Notification of Approved Plan

Cont’d on Next Page
**ICC Test Tool Verification Process Map**

**STEP 4 – Perform Testing**

- 4a Perform ISSI/CSSI Conformance Test Tool Verification Testing
- 4b Iterate to Address Issues (As Needed)
- 4c Receive Test Tool Verification Test Results* from Lab

**STEP 5 – Compile P25 CAP Submission Documents**

- 5a Compile and Submit Draft P25 CAP Docs
- 5b Review Draft P25 CAP Doc Submissions

**IF NEEDED**
- Adjustments
- Tailoring
- Technical clarifications

**STEP 6 – Approval & Notifications**

- 5c Checkpoint III (optional)
- 5c Revise and Resubmit
- 5d Final P25 CAP Review
- 6a P25 CAP Approval & Notifications
- 6b – Post Approval to appear on DHS P25 CAP Website

*Not sent to DHS P25 CAP

**P25 CAP Test Lab**

- 3e Receive OK to Proceed with Testing Notification

**P25 DHS OIC Policy, SMEs**

- 3d Send Notification of Approved Plan

**ICC Test Tool Owner, Developer**

- EUT Test Tool Reports