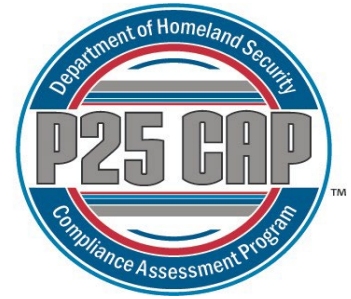




**Homeland
Security**

Science and Technology

Office for Interoperability and Compatibility
Technology Center



Project 25 Compliance Assessment Program

Project 25 Compliance Assessment Bulletin

**P25 ISSI/CSSI CONFORMANCE
TEST TOOL VALIDATION**

P25-CAP_ISSI-CSSI CONF TEST TOOL VALIDATION (AUG 2023)

August 2023

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 user's 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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Draft	12/27/2022	Released for Public Comment
1.0	8/24/2023	Revised and released for Publication

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1 Introduction

1.1 Purpose

The purpose of this document is to clearly convey the procedures, requirements, and guidance used by the Department of Homeland Security Science & Technology (DHS S&T) P25 Compliance Assessment Program (P25 CAP)¹ for approving and recognizing an Inter-subsystem interface/Console sub-system interface (ISSI/CSSI) Conformance Test Tool (ICCTT) for the conduct of the P25 Compliance assessment.

There are three forms of conformance testing that will be accepted by P25 CAP:

- Conformance Testing using a Designated Test Tool
- Conformance Testing Without a Designated Test Tool
- Alternate Conformance Testing Method

This document details the necessary steps for approval of the first designated test tool. The document also lists the requirements that must be met if one chooses to develop a designated tool for P25 CAP testing; Conformance testing utilizing a testing Technician without a designated Test Tool; and the requirements for alternative forms of testing.

For P25 CAP acceptance of the assessment, testing must be performed by a DHS-recognized laboratory that has been accepted to perform ISSI/CSSI Conformance Testing. This shall be required of laboratories that intend to submit a test tool for verification, labs that want to perform alternative forms of testing, and any laboratory that submits ISSI/CSSI conformance equipment test results for P25 CAP recognition. These laboratories are listed on the DHS P25 CAP Recognized Labs web page²

Under project sponsorship of DHS S&T, the Department of the Interior (DOI)'s Radio and Spectrum Section Telecommunications Lab (DOI Telecom) initiated a study in March 2019 consisting of two distinct efforts involving conformance testing of commercial equipment implementing the P25 ISSI/CSSI. The common objective of these efforts was to assist the sponsors in their support of the P25 CAP to promote the competitive offering of ISSI/CSSI equipment implemented in accordance with relevant P25 CAP CABs and underlying CAP ISSI/CSSI Conformance Test Case CAB and CAP ISSI/CSSI Conformance Test Pass/Fail Criteria that meet P25 users' needs.

DHS S&T has developed procedures to certify commercial test tool products that are designed to perform conformance testing of ISSI and CSSI equipment and implemented in accordance with relevant P25 CAP CABs. These procedures will support DHS S&T recognition of ISSI/CSSI conformance test tool products enabling their use for P25 CAP purposes.

As of the date of this CAB, P25 CAP has accepted the *Valid8 P25 ISSI CSSI Protocol Conformance Test Suite*³ as a Designated Test Tool for use in ISSI/CSSI Conformance Testing scenarios.

¹ <https://www.dhs.gov/science-and-technology/p25-cap>

² <https://www.dhs.gov/science-and-technology/recognized-labs>

³ <https://www.valid8.com/datasheets/p25-issi-cssi-conformance>

2 Assumptions / Constraints

Verification of an ICCTT (ISSI/CSSI Conformance Test Tool) product is challenging for a variety of reasons and needs to consider criteria concerning the accommodation of unique product characteristics while satisfying applicable CAB-specified requirements and other criteria needed to determine product acceptability.

An ICC Test Tool or ICCTT is an application or device that assesses the conformance to the CAP ISSI/CSSI Conformance Test Case CAB and CAP ISSI/CSSI Conformance Test Pass/Fail Criteria.

ICCTT products are software-based and shall continue to evolve during the period of performance of a particular ICCTT product verification effort. The framework is intended to accommodate these evolutions. The framework supports the development of a verification test plan at the beginning of the ICCTT product verification process that documents the extent to which various evolving versions of the ICCTT product are to be verified.

The CAB-specified technical requirements are intentionally designed for the conduct of ISSI/CSSI equipment conformance testing using a verified ICCTT product that will result in significantly increased confidence that the ISSI/CSSI equipment is implemented in accordance with those requirements. The technical requirements and underlying base standards are complex.

Use of ICCTT products by a CAP-recognized ISSI/CSSI conformance testing laboratory and ISSI/CSSI equipment manufacturers is expected to result in the discovery of technical and other issues with those ICCTT products that will need to be addressed by the responsible organizations. The primary responsible organizations are, as appropriate, the ICCTT product vendor to fix/update the product, the CAB maintainers to revise the CAB technical/reporting requirements, and the CAP ISSI/CSSI Conformance Test Case CAB and CAP ISSI/CSSI Conformance Test Pass/Fail Criteria P25 committees to revise CAP ISSI/CSSI Conformance Test Case CAB and CAP ISSI/CSSI Conformance Test Pass/Fail Criteria.

The high-level ICCTT product verification process framework described in this document provides a starting point for discussion by stakeholders concerning the extent to which an agreed framework can and should be established. These stakeholders include ICCTT product vendors, ISSI/CSSI equipment manufacturers and end users, compliance assessment/accreditation bodies, and P25 standardization bodies as well as the P25 CAP, DHS/OIC, and recognized ISSI/CSSI equipment conformance testing laboratories.

The most important goal in verifying a vendor's ICCTT product or a lab's approach to conformance testing is to ensure the test product or test method will consistently and accurately detect and indicate deviations of ISSI/CSSI equipment. Applicants shall refer to applicable CAB-specified technical requirements. Applicants must provide results needed to complete the required CAB-specified reporting requirements outlined throughout this document. The framework provides a starting point for accomplishing this goal while recognizing that products are subject to constant upgrade and that the requirements may be revised over time. The process framework also recognizes that the ICCTT product verification process should include development of a verification plan to facilitate verification repeatability and comparability, which may include consideration of such factors as software reliability and usability while not constraining product capabilities and characteristics enabling the vendor's intended range of use for its ICCTT product.

3 References

3.1 Normative References

1. **ISSI-RFSS Conformance Test Case Document** – Project 25 Compliance Assessment Program *ISSI-RFSS Conformance Test Cases; current version: December 2020*. Filename: P25-CAP_ISSI-RFSS Conf Test REQ CAB (DEC 2020).pdf
2. **CSSI-RFSS Conformance Test Case Document** – Project 25 Compliance Assessment Program *CSSI-RFSS Conformance Test Cases; current version: December 2020*. Filename: P25-CAP_CSSI-RFSS Conf Test REQ CAB (DEC 2020).pdf
3. **CSSI-CSS Conformance Test Case Document** – Project 25 Compliance Assessment Program *CSSI-CSS Conformance Test Cases; current version: December 2020*. Filename: P25-CAP_CSSI-CSS Conf Test REQ CAB (DEC 2020).pdf
4. **ISSI/CSSI Conformance Test Pass/Fail Criteria** – Project 25 Compliance Assessment Program *ISSI/CSSI Conformance Test Pass/Fail Criteria; current version: December 2020*. Filename: P25-CAP_CSSI-CSS Conf Test REQ CAB (DEC 2020).pdf
5. **ISSI CSSI Equipment Test SDOC Template** – Project 25 Compliance Assessment Program *ISSI/CSSI Equipment Test Supplier’s Declaration of Compliance (SDOC) Template; current version: December 2020*. Filename: P25-CAP_ISSI-CSSI Equipment Conformance SDOC TEMPLATE (DEC 2020).docx
6. **ISSI CSSI Equipment Test STR Template** – Project 25 Compliance Assessment Program *ISSI/CSSI Equipment Test Summary Test Report (STR) Template; current version: December 2020*. Filename: P25-CAP_ISSI-CSSI Equipment Conformance STR TEMPLATE (Dec 2020).xlsx
7. **ISSI/CSSI Conformance Test Requirements CAB** – Project 25 Compliance Assessment Program *baseline ISSI/CSSI Conformance Test Requirements Compliance Assessment Bulletin; current version: December 2020*. Filename: P25-CAP_ISSI-CSSI Conf Test REQ CAB (DEC 2020).pdf
8. **ISSI/CSSI Conformance Test Tool Verification Requirements CAB** – Project 25 Compliance Assessment Program *ISSI/CSSI Conformance Test Tool Verification Requirements Compliance Assessment Bulletin; current version: December 2020*. Filename: P25-CAP_ISSI-RFSS Conf Test Tool REQ CAB (DEC 2020).pdf

3.2 Informative References

1. **National Institute of Standards and Technology (NIST) Internal Report 8397** – Guidelines on Minimum Standards for Developer Verification of Software: Department of Commerce October 2021.⁴

⁴ <https://doi.org/10.6028/NIST.IR.8397>

4 Test Tool Requirements, Functionalities, & Documentation

When creating a test tool that is to be approved by DHS for P25CAP testing, requirements and functionalities that the software-based tool will provide must meet these basic criteria. Specialized tools that may need to be used in conjunction with the designated test tool are listed. These external tools are not required and examples of the specialized external tools that have proven useful are listed.

Test cases will change over time as conditions warrant. When a test case is revised, it will be the responsibility of the Test Tool developer to revise the applicable tests to reflect the revised scenarios. The test Tool Developer will have a set period of time to update and release the revised software or face loss of P25 CAP certification.

Directly below are the requirements & functionalities for a test tool that is being approved for testing by DHS to ensure that software is sufficiently safe and secure; software must be designed, built, delivered, and maintained well. Frequent and thorough verification by developers as early as possible in the software development life cycle (SDLC) is one critical element of software security assurance.

The conformance test tool solution enables conformance testing of P25 wireline interfaces/protocol to be analyzed. The test tool simulates the messages and procedures for radio frequency sub-systems (RFSS), 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:

4.1 Minimum Requirements

- All P25 features in current test cases must be included; the ICC Test Tool or ICCTT 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 ICCTT to accommodate any combination of features implemented by ISSI/CSSI sub-system manufacturers. These test cases are listed in the normative reference documents [1], [2], [3], [4], and [7].
- All features must be assessed by the testing Technician using a protocol analyzer. The testing Technician is also referred to as a Subject Matter Expert or SME; both titles refer to the same responsibilities and are separately defined in the glossary. The ICCTT verification must include a manual message-by-message comparison and assessment performed by a testing Technician of all features and functions included in the current version of the P25 ISSI/CSSI Conformance test cases in the current P25 CAP ICCTT CAB documents.
- The 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 required. These terms are meant to identify a working system seeking P25 CAP recognition or setup to run the minimum required tests outlined in the

Pass/Fail criteria.

- Test cases span three configurations, three test case documents; 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-WACN/Inter-System Tests; 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. Each combination of possible WACN/Inter-System IDs creates a unique scenario which must be tested and recorded. The ICCTT Matrix is a good tool to use to ensure every possibility is tested and evidence of an accurate test is recorded. [see 4.3 below]
- P25 CAP checkpoints allow dialog to discuss tailoring and exceptions. Any variations or limitations would be coordinated and approved by P25 CAP prior to completing Test Tool verification testing.

4.2 Minimum Functionalities

- Decode and validate that the P25 protocol messages flowing from the Equipment Under Test (EUT) contain the correct information and are in the correct sequence as defined in the CAP ISSI/CSSI Conformance Test Case CAB and CAP ISSI/CSSI Conformance Test Pass/Fail Criteria.

Perform all test cases as defined for each EUT System configuration supported as defined in the CAP ISSI/CSSI Conformance Test Case CAB and CAP ISSI/CSSI Conformance Test Pass/Fail Criteria. These test cases are listed in the normative reference documents [1], [2], [3], [4], and [7].

- 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 specified parameter values are returned within the proper ranges as required by the protocol [see section 4.3]

- Correctly implement the ISSI and CSSI wireline protocols for the test cases defined by P25 CAP test documents.
- Create reporting and support for automated options necessary to support the commercial, testing and development environments.
- The tool must allow the certified Technician to make line changes in the configuration pertaining to the parameters of the EUT such as RFSS ID, WACN ID, System ID etc.
- The tool must have the ability to be updated to versions compliant with the current revisions of the standard. Performing outdated tests based on previous versions of the standard will not be accepted. The updates will be coordinated and documented on the P25 CAP website.
- The tool must be able to conduct testing remotely.
- The test tool must be able to provide a detailed summary of each test performed and the processes including step-by-step occurrences, that took place during the test. There must be traceability for each test the tool is configured to perform. The evidence should show the equipment tested was based on all the applicable, published P25 CAP Compliance Assessment Bulletins (CAB) covering conformance. It is suggested that the tool be run in conjunction with Wireshark. Applicable test cases may include tests of features and options installed in the product contemplated for purchase.

4.3 Test Report Documentation – ICCTT Matrix

To determine the conformance of the equipment under test (EUT), every test case must be performed in the sequence outlined for that test case in the CAB documents. The results must be assessed by P25 CAP staff. To capture this information, an ICCTT matrix has been developed. The ICCTT Matrix identifies each test to be run (including self-tests of the Tool) and provides a location to input a summary of the test results and provides a location to attach a copy of the Test Tool output for that test.

This template provides a place to record test results for all three testing types: when using a Designated Test Tool, when not using a Designated Test Tool, or when using an alternative conformance testing method. A copy of the Matrix may be obtained by submitting a request to P25 CAP support staff at P25CAP@hq.dhs.gov.

Following is a screenshot from one page of the ICCTT Matrix:

ISSI/CSSI Test Tool Test Plan – Summary Test Report Table

	Voice Mode	
Feature, Service or Function Name (BOLD = MIN P25 REQ)	FDMA Full Rate	TDMA Half Rate
<i>ISSI-RFSS Conformance Test (Inter-WACN)</i>		
<i>P25 Voice Services</i>		
3-1-1, RFSS Initiates Group Call-Unconfirmed, Group Home Role		
3-1-2, RFSS Receives Group Call-Unconfirmed, Group Home Role		
3-2-1, RFSS Initiates Emergency Call-Unconfirmed, Group Home Role		
3-2-2, RFSS Receives Emergency Call-Unconfirmed, Group Home Role		
3-3-1, RFSS Initiates Unconfirmed Group Call, Group Serving Role		
3-3-2, RFSS Receives Unconfirmed Group Call, Group Serving Role		
3-4-1, RFSS Initiates Emergency Call-Unconfirmed, Group Serving Role		
3-4-2, RFSS Receives Emergency Call-Unconfirmed, Group Serving Role		
3-5-1, RFSS Initiates Confirmed Group Call, Group Home Role, Delayed Resources		
3-5-2, RFSS Receives Confirmed Group Call, Group Home Role, Delayed Resources		
3-6-1, RFSS Initiates Confirmed Group Call, Group Serving Role, Delayed Resources		
3-6-2, RFSS Receives Confirmed Group Call, Group Serving Role, Delayed Resources		
3-7-1, RFSS Initiates Confirmed Group Call, Group Home Role, No Resources		
3-7-2, RFSS Receives Confirmed Group Call, Group Home Role, No Resources		
3-8-1, RFSS Initiates Confirmed Group Call, Group Serving Role, No Resources		
3-8-2, RFSS Receives Confirmed Group Call, Group Serving Role, No Resources		
4-1-1, RFSS Initiates Group Call-Unconfirmed, Group Home Role		
4-1-2, RFSS Receives Group Call-Unconfirmed, Group Home Role		
4-2-1, RFSS Initiates Emergency Call-Unconfirmed, Group Home Role		
4-2-2, RFSS Receives Emergency Call-Unconfirmed, Group Home Role		
4-3-1, RFSS Initiates Unconfirmed Group Call, Group Serving Role		
4-3-2, RFSS Receives Unconfirmed Group Call, Group Serving Role		
4-4-1, RFSS Initiates Emergency Call-Unconfirmed, Group Serving Role		
4-4-2, RFSS Receives Emergency Call-Unconfirmed, Group Serving Role		
4-5-1, RFSS Initiates Confirmed Group Call, Group Home Role, Delayed Resources		
4-5-2, RFSS Receives Confirmed Group Call, Group Home Role, Delayed Resources		
4-6-1, RFSS Initiates Confirmed Group Call, Group Serving Role, Delayed Resources		

4-6-2, RFSS Receives Confirmed Group Call, Group Serving Role, Delayed Resources		
4-7-1, RFSS Initiates Confirmed Group Call, Group Home Role, No Resources		
4-7-2, RFSS Receives Confirmed Group Call, Group Home Role, No Resources		
4-8-1, RFSS Initiates Confirmed Group Call, Group Serving Role, No Resources		
4-8-2, RFSS Receives Confirmed Group Call, Group Serving Role, No Resources		
<i>P25 Supplementary Data Services</i>		
5-1-1, Emergency Alarm Initiated by (mSU) Home (RFFS1), Registered to (RFSS2)		
5-1-2, Emergency Alarm Initiated by (mSU) Home (RFFS2), Registered to (RFSS1)		
5-2-1, Emergency Alarm Canceled by (mSU) Home (RFFS1), Registered to (RFSS2)		
5-2-2, Emergency Alarm Canceled by (mSU) Home (RFFS2), Registered to (RFSS1)		
5-3-1, Group Emergency Cancel by (mSU) Home (RFFS1), Registered to (RFSS2)		
5-3-2, Group Emergency Cancel by (mSU) Home (RFFS2), Registered to (RFSS1)		
5-4-1, Call Alert From mSU1(HM RFSS1)Reg. (RFSS2) to mSU2(HM RFSS2),Reg. (RFSS1)		
5-4-2, Call Alert From mSU2(HM RFSS2)Reg. (RFSS1) to mSU1(HM RFSS1),Reg. (RFSS2)		
<i>ISSI-RFSS Conformance Test (Inter-System)</i>		
<i>P25 Voice Services</i>		
3-1-1, RFSS Initiates Group Call-Unconfirmed, Group Home Role		
3-1-2, RFSS Receives Group Call-Unconfirmed, Group Home Role		
3-2-1, RFSS Initiates Emergency Call-Unconfirmed, Group Home Role		
3-2-2, RFSS Receives Emergency Call-Unconfirmed, Group Home Role		
3-3-1, RFSS Initiates Unconfirmed Group Call, Group Serving Role		
3-3-2, RFSS Receives Unconfirmed Group Call, Group Serving Role		
3-4-1, RFSS Initiates Emergency Call-Unconfirmed, Group Serving Role		
3-4-2, RFSS Receives Emergency Call-Unconfirmed, Group Serving Role		
3-5-1, RFSS Initiates Confirmed Group Call, Group Home Role, Delayed Resources		
3-5-2, RFSS Receives Confirmed Group Call, Group Home Role, Delayed Resources		
3-6-1, RFSS Initiates Confirmed Group Call, Group Serving Role, Delayed Resources		
3-6-2, RFSS Receives Confirmed Group Call, Group Serving Role, Delayed Resources		
3-7-1, RFSS Initiates Confirmed Group Call, Group Home Role, No Resources		
3-7-2, RFSS Receives Confirmed Group Call, Group Home Role, No Resources		
3-8-1, RFSS Initiates Confirmed Group Call, Group Serving Role, No Resources		
3-8-2, RFSS Receives Confirmed Group Call, Group Serving Role, No Resources		
4-1-1, RFSS Initiates Group Call-Unconfirmed, Group Home Role		
4-1-2, RFSS Receives Group Call-Unconfirmed, Group Home Role		
4-2-1, RFSS Initiates Emergency Call-Unconfirmed, Group Home Role		

4-2-2, RFSS Receives Emergency Call-Unconfirmed, Group Home Role		
4-3-1, RFSS Initiates Unconfirmed Group Call, Group Serving Role		
4-3-2, RFSS Receives Unconfirmed Group Call, Group Serving Role		
4-4-1, RFSS Initiates Emergency Call-Unconfirmed, Group Serving Role		
4-4-2, RFSS Receives Emergency Call-Unconfirmed, Group Serving Role		
4-5-1, RFSS Initiates Confirmed Group Call, Group Home Role, Delayed Resources		
4-5-2, RFSS Receives Confirmed Group Call, Group Home Role, Delayed Resources		
4-6-1, RFSS Initiates Confirmed Group Call, Group Serving Role, Delayed Resources		
4-6-2, RFSS Receives Confirmed Group Call, Group Serving Role, Delayed Resources		
4-7-1, RFSS Initiates Confirmed Group Call, Group Home Role, No Resources		
4-7-2, RFSS Receives Confirmed Group Call, Group Home Role, No Resources		
4-8-1, RFSS Initiates Confirmed Group Call, Group Serving Role, No Resources		
4-8-2, RFSS Receives Confirmed Group Call, Group Serving Role, No Resources		
<i>P25 Supplementary Data Services</i>		
5-1-1, Emergency Alarm Initiated by (mSU) Home (RFFS1), Registered to (RFSS2)		
5-1-2, Emergency Alarm Initiated by (mSU) Home (RFFS2), Registered to (RFSS1)		
5-2-1, Emergency Alarm Canceled by (mSU) Home (RFFS1), Registered to (RFSS2)		
5-2-2, Emergency Alarm Canceled by (mSU) Home (RFFS2), Registered to (RFSS1)		
5-3-1, Group Emergency Cancel by (mSU) Home (RFFS1), Registered to (RFSS2)		
5-3-2, Group Emergency Cancel by (mSU) Home (RFFS2), Registered to (RFSS1)		
5-4-1, Call Alert From mSU1(HM RFSS1)Reg. (RFSS2) to mSU2(HM RFSS2),Reg. (RFSS1)		
5-4-2, Call Alert From mSU2(HM RFSS2)Reg. (RFSS1) to mSU1(HM RFSS1),Reg. (RFSS2)		
CSSI-RFSS Conformance Test (Inter-WACN) CSSI-RFSS Conformance Test (Inter-System) CSSI-Console Conformance Test (Intra-System) CSSI-Console Conformance Test (Inter-System) CSSI-Console Conformance Test (Inter-WACN)		

5 ISSI Conformance Testing Requirements

5.1 Full Rate (FDMA) Group Voice Services

The test tool being verified shall be capable of performing the test cases listed. Testing shall be executed when the ISSI is configured as an Inter-WACN connection type, or an Inter-System connection type.

P25 CAP has defined certain test cases “required PASS” test cases. “Required PASS” means that the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant-Eligible) Equipment” on the P25 CAP webpage.

The ISSI test cases in Table 1 and 2 apply to Radio Frequency Sub-System (RFSS) testing. All the test cases shall be tested. *The tables below are examples, see the actual tables in the current version of the referenced document for the required tests.*

Table 1 lists the ‘Required PASS’ test case numbers. These test cases are noted with a double asterisk (**) in Table 2.

3.2.1	3.2.2	3.4.1	3.4.2	3.5.1	3.5.2
3.6.1	3.6.2	3.7.1	3.7.2	3.8.1	3.8.2

Table 1: Required PASS Test Case Numbers

The ISSI full rate group voice services shall be tested for conformance in accordance with the test cases established in the current version of the *ISSI-RFSS Conformance Test Case Document*, reference [1].

Test Cases [1]	ISSI-RFSS Full Rate Group Voice Conformance Test Case Descriptions
3.1	Full Rate Unconfirmed Group Call - Group Home Role
3.1.1	RFSS Initiates Unconfirmed Group Call
3.1.2	RFSS Receives Unconfirmed Group Call
3.2	Full Rate Emergency Unconfirmed Group Call - Group Home Role
3.2.1	** RFSS Initiates Emergency Unconfirmed Group Call
3.2.2	** RFSS Receives Emergency Unconfirmed Group Call
3.3	Full Rate Unconfirmed Group Call - Group Serving Role
3.3.1	RFSS Initiates Unconfirmed Group Call
3.3.2	RFSS Receives Unconfirmed Group Call
3.4	Full Rate Emergency Unconfirmed Group Call - Group Serving Role
3.4.1	** RFSS Initiates Emergency Unconfirmed Group Call
3.4.2	** RFSS Receives Emergency Unconfirmed Group Call
3.5	Full Rate Confirmed Group Call - Group Home Role - Delayed Resources
3.5.1	** RFSS Initiates Confirmed Group Call

3.5.2	** RFSS Receives Confirmed Group Call
3.6	Full Rate Confirmed Group Call - Group Serving Role - Delayed Resources
3.6.1	** RFSS Initiates Confirmed Group Call
3.6.2	** RFSS Receives Confirmed Group Call
3.7	Full Rate Confirmed Group Call - Group Home Role - No Resources
3.7.1	** RFSS Initiates Confirmed Group Call
3.7.2	** RFSS Receives Confirmed Group Call
3.8	Full Rate Confirmed Group Call - Group Serving Role - No Resources
3.8.1	** RFSS Initiates Confirmed Group Call
3.8.2	** RFSS Receives Confirmed Group Call

Table 2: ISSI RFSS Full Rate Group Voice Conformance Test Cases

5.2 Half Rate (TDMA) Group Voice Services

The test tool being verified shall be capable of performing the test cases listed. Testing shall be executed when the ISSI is configured as an Inter-WACN connection type or an Inter-System connection type.

P25 CAP has defined certain test cases as “required PASS” test cases. “Required PASS” means that the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant Eligible) Equipment” on the P25 CAP webpage.

The ISSI test cases in Tables 3 and 4 apply to Radio Frequency Sub-System (RFSS) testing. All the test cases shall be tested. *The tables below are examples; see the actual tables in the current version of the referenced document for the required tests.*

Table 3 lists the “Required PASS” test case numbers. These test cases are noted with a double asterisk (**) in Table 4.

4.2.1	4.2.2	4.4.1	4.4.2	4.5.1	4.5.2
4.6.1	4.6.2	4.7.1	4.7.2	4.8.1	4.8.2

Table 3: Required PASS Test Case Numbers

The ISSI half rate group voice services shall be tested for conformance in accordance with the test cases established in the current version of the *ISSI-RFSS Conformance Test Case Document*, reference [1].

Test Cases [1]	ISSI-RFSS Half Rate Group Voice Conformance Test Case Descriptions
4.1	Half Rate Unconfirmed Group Call - Group Home Role
4.1.1	RFSS Initiates Unconfirmed Group Call
4.1.1	RFSS Receives Unconfirmed Group Call
4.2	Half Rate Emergency Unconfirmed Group Call - Group Home Role
4.2.1	** RFSS Initiates Emergency Unconfirmed Group Call

4.2.2	** RFSS Receives Emergency Unconfirmed Group Call
4.3	Half Rate Unconfirmed Group Call - Group Serving Role
4.3.1	RFSS Initiates Unconfirmed Group Call
4.3.2	RFSS Receives Unconfirmed Group Call
4.4	Half Rate Emergency Unconfirmed Group Call - Group Serving Role
4.4.1	** RFSS Initiates Emergency Unconfirmed Group Call
4.4.2	** RFSS Receives Emergency Unconfirmed Group Call
4.5	Half Rate Confirmed Group Call - Group Home Role - Delayed Resources
4.5.1	** RFSS Initiates Confirmed Group Call
4.5.2	** RFSS Receives Confirmed Group Call
4.6	Half Rate Confirmed Group Call - Group Serving Role - Delayed Resources
4.6.1	** RFSS Initiates Confirmed Group Call
4.6.2	** RFSS Receives Confirmed Group Call
4.7	Half Rate Confirmed Group Call - Group Home Role - No Resources
4.7.1	** RFSS Initiates Confirmed Group Call
4.7.2	** RFSS Receives Confirmed Group Call
4.8	Half Rate Confirmed Group Call - Group Serving Role - No Resources
4.8.1	** RFSS Initiates Confirmed Group Call
4.8.2	** RFSS Receives Confirmed Group Call

Table 4: ISSI RFSS Half Rate Group Voice Conformance Test Cases

5.3 Supplementary Data Services

The test tool being verified shall be capable of performing the test cases listed. Testing shall be executed when the ISSI is configured as an Inter-WACN connection type or an Inter-System connection type.

P25 CAP has defined certain test cases as “required PASS” test cases. “Required PASS” means that the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant Eligible) Equipment” on the P25 CAP webpage.

The ISSI test cases in Tables 5 and 6 apply to Radio Frequency Sub-System (RFSS) testing. All the test cases shall be tested. *The tables below are examples; see the actual tables in the current version of the referenced document for the required tests.*

Table 5 lists the “Required PASS” test case numbers. These test cases are noted with a double asterisk (**) in Table 6.

5.1.1	5.1.2	5.2.1	5.2.2	5.3.1	5.3.2
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Table 5: Required PASS Test Case Numbers

The ISSI supplementary data services shall be tested for conformance in accordance with the test cases established in the current version of the *ISSI-RFSS Conformance Test Case Document*, reference [1].

Test Cases [1]	ISSI-RFSS Supplementary Data Conformance Test Case Descriptions
5.1	Emergency Alarm
5.1.1	** Emergency Alarm initiated by a mSU Home to RFSS1 and Registered in RFSS2; Group Home RFSS2
5.1.2	** Emergency Alarm initiated by a mSU Home to RFSS2 and Registered in RFSS1; Group Home RFSS1
5.2	Emergency Alarm Cancel
5.2.1	** Emergency Alarm Cancel initiated by a mSU Home to RFSS1 and Registered in RFSS2; Group Home RFSS2
5.2.2	** Emergency Alarm Cancel initiated by a mSU Home to RFSS2 and Registered in RFSS1; Group Home RFSS1
5.3	Group Emergency Cancel
5.3.1	** Group Emergency Cancel initiated by a mSU Home to RFSS1 and Registered in RFSS2; Group Home RFSS2
5.3.2	** Group Emergency Cancel initiated by a mSU Home to RFSS2 and Registered in RFSS1; Group Home RFSS1
5.4	Call Alert
5.4.1	Call Alert from mSU1 to mSU2; mSU1 home to RFSS1 and registered in RFSS2; mSU2 home to RFSS2 and registered in RFSS1
5.4.2	Call Alert from mSU2 to mSU1; mSU1 home to RFSS1 and registered in RFSS2; mSU2 home to RFSS2 and registered in RFSS1

Table 6: ISSI RFSS Supplementary Data Conformance Test Cases

6 CSSI Conformance Testing Requirements - RFSS

6.1 Full Rate (FDMA) Group Voice Services

The test tool being verified shall be capable of performing the test cases listed. Testing shall be executed when the CSSI is configured as an Inter-WACN connection type, an Inter-System connection type, or an Intra-System connection type.

P25 CAP has defined certain test cases as “required PASS” test cases. “Required PASS” means that the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant Eligible) Equipment” on the P25 CAP webpage.

The CSSI test cases in Tables 7 and 8 apply to Radio Frequency Sub-System (RFSS) testing. All the test cases shall be tested. *The tables below are examples; see the actual tables in the current version of the referenced document for the required tests.*

Table 7 lists the “Required PASS” test case numbers. These test cases are noted with a double asterisk (**) in Table 8.

3.2.1	3.3.1	3.4.1
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Table 7: Required PASS Test Case Numbers

The full rate group services shall be tested for conformance in accordance with the test cases established in the current version of the *CSSI-RFSS Conformance Test Case Document*, reference [2].

Test Cases [2]	CSSI-RFSS Full Rate Group Voice Conformance Test Case Descriptions
3.1	Full Rate Unconfirmed Group Call - Group Home Role
3.1.1	RFSS Initiates Unconfirmed Group Call
3.1.2	RFSS Receives Unconfirmed Group Call
3.2	Full Rate Emergency Unconfirmed Group Call - Group Home Role
3.2.1	** RFSS Initiates Emergency Unconfirmed Group Call
3.3	Full Rate Confirmed Group Call - Group Home Role - Delayed Resources
3.3.1	** RFSS Receives Confirmed Group Call
3.4	Full Rate Confirmed Group Call - Group Home Role - No Resources
3.4.1	** RFSS Receives Confirmed Group Call

Table 8: CSSI RFSS Full Rate Group Voice Conformance Test Cases

6.2 Half Rate (TDMA) Group Voice Services

The test tool being verified shall be capable of performing the test cases listed. Testing shall be executed when the CSSI is configured as an Inter-WACN connection type, an Inter-System connection type, or an Intra-System connection type.

P25 CAP has defined certain test cases as “required PASS” test cases. “Required PASS” means that the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant Eligible) Equipment” on the P25 CAP webpage.

The CSSI test cases in Tables 9 and 10 apply to Radio Frequency Sub-System (RFSS) testing. All the test cases shall be tested. *The tables below are examples; see the actual tables in the current version of the referenced document for the required tests.*

Table 9 lists the “Required PASS” test case numbers. These test cases are noted with a double asterisk (**) in Table 10.

4.2.1	4.3.1	4.4.1
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Table 9: Required PASS Test Case Numbers

The half rate group services shall be tested for conformance in accordance with the test cases established in the current version of the *CSSI-RFSS Conformance Test Case Document*, reference [2].

Test Cases [2]	CSSI-RFSS Half Rate Group Voice Conformance Test Case Descriptions
4.1	Half Rate Unconfirmed Group Call - Group Home Role
4.1.1	RFSS Initiates Unconfirmed Group Call
4.1.2	RFSS Receives Unconfirmed Group Call
4.2	Half Rate Emergency Unconfirmed Group Call - Group Home Role
4.2.1	** RFSS Initiates Emergency Unconfirmed Group Call
4.3	Half Rate Confirmed Group Call - Group Home Role - Delayed Resources
4.3.1	** RFSS Receives Confirmed Group Call
4.4	Half Rate Confirmed Group Call - Group Home Role - No Resources
4.4.1	** RFSS Receives Confirmed Group Call

Table 10: CSSI RFSS Half Rate Group Voice Conformance Test Cases

6.3 Full Rate (FDMA) Unit to Unit Voice Services

The test tool being verified shall be capable of performing the test cases listed. All of the test cases shall be tested. Testing shall be executed when the CSSI is configured as an Inter-WACN connection type, an Inter-System connection type, or an Intra-System connection type.

P25 CAP has defined certain test cases as “required PASS” test cases. “Required PASS” means that

the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant Eligible) Equipment” on the P25 CAP webpage.

The CSSI test cases in Table 11 apply to a Radio Frequency Sub-System (RFSS). *The table below is an example; see the actual table in the reference documents for the required tests.*

The full rate unit to unit voice services shall be tested for conformance in accordance with the test cases established in the current version of the *CSSI-RFSS Conformance Test Case Document*, reference [2].

Test Cases [2]	CSSI-RFSS Full Rate Unit to Unit Voice Conformance Test Case Descriptions
5.1	RFSS1 (mSU) Initiated Unit to Unit Call with Target Availability Check
5.1.1	RFSS1 (mSU) Initiated Unit to Unit Call with Target Availability Check
5.2	RFSS2 (cSU) Initiated Unit to Unit Call with Target Availability Check
5.2.1	CSS2 (cSU) Initiated Unit to Unit Call with Target Availability Check
5.3	RFSS1 (mSU) Initiated Unit to Unit Call without Target Availability Check
5.3.1	RFSS1 (mSU) Initiated Unit to Unit Call without Target Availability Check
5.4	RFSS2 (cSU) Initiated Unit to Unit Call without Target Availability Check
5.4.1	CSS2 (cSU) Initiated Unit to Unit Call without Target Availability Check

Table 11: CSSI RFSS Full Rate Unit to Unit Voice Conformance Test Cases

6.4 Half Rate (TDMA) Unit to Unit Voice Services

The test tool being verified shall be capable of performing the test cases listed. All of the test cases shall be tested. Testing shall be executed when the CSSI is configured as an Inter-WACN connection type, an Inter-System connection type, or an Intra-System connection type.

P25 CAP has defined certain test cases as “required PASS” test cases. “Required PASS” means that the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant Eligible) Equipment” on the P25 CAP webpage.

The CSSI test cases in Table 12 apply to a Radio Frequency Sub-System (RFSS). *The table below is an example; see the actual table in the reference documents for the required tests.*

The half rate unit to unit voice services shall be tested for conformance in accordance with the test cases established in the current version of the *CSSI-RFSS Conformance Test Case Document*, reference [2].

Test Cases [2]	CSSI-RFSS Half Rate Unit to Unit Voice Conformance Test Case Descriptions
6.1	RFSS1 (mSU) Initiated Unit to Unit Call with Target Availability Check
6.1.1	RFSS1 (mSU) Initiated Unit to Unit Call with Target Availability Check
6.2	RFSS2 (cSU) Initiated Unit to Unit Call with Target Availability Check
6.2.1	CSS2 (cSU) Initiated Unit to Unit Call with Target Availability Check
6.3	RFSS1 (mSU) Initiated Unit to Unit Call without Target Availability Check
6.3.1	RFSS1 (mSU) Initiated Unit to Unit Call without Target Availability Check
6.4	RFSS2 (cSU) Initiated Unit to Unit Call without Target Availability Check
6.4.1	CSS2 (cSU) Initiated Unit to Unit Call without Target Availability Check

Table 12: CSSI RFSS Half Rate Unit to Unit Voice Conformance Test Cases

6.5 Supplementary Data Services

The test tool being verified shall be capable of performing the test cases listed. All of the test cases shall be tested. Testing shall be executed when the CSSI is configured as an Inter-WACN connection type, an Inter-System connection type, or an Intra-System connection type.

P25 CAP has defined certain test cases as “required PASS” test cases. “Required PASS” means that the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant Eligible) Equipment” on the P25 CAP webpage.

The CSSI test cases in Tables 13 and 14 apply to a Radio Frequency Sub-System (RFSS). *The tables below are examples; see the actual tables in the current version of the referenced document for the required tests.*

Table 13 lists the “Required PASS” test case numbers. These test cases are noted with a double asterisk (**) in Table 14.

7.1.1	7.2.2	7.3.1	7.3.2
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Table 13: Required PASS Test Case Numbers

The supplementary data services shall be tested for conformance in accordance with the test cases established in the current version of the *CSSI-RFSS Conformance Test Case Document*, reference [2].

Test Cases [2]	CSSI-RFSS Supplementary Data Conformance Test Case Descriptions
7.1	Emergency Alarm
7.1.1	** Emergency Alarm initiated by a mSU Home to and Registered in RFSS1; Group Home RFSS1
7.2	Emergency Alarm Cancel
7.2.1	Emergency Alarm Cancel initiated by a cSU Home to RFSS2; Group Home RFSS1

7.2.2	** Emergency Alarm Cancel initiated by a mSU Home to and Registered in RFSS1; Group Home RFSS1
7.3	Group Emergency Cancel
7.3.1	** Group Emergency Cancel initiated by a cSU Home to RFSS2; Group Home RFSS1
7.3.2	** Group Emergency Cancel initiated by a mSU Home to and Registered in RFSS1; Group Home RFSS1
7.4	Call Alert - RFSS1 (mSU) Initiated
7.4.1	Call Alert Initiated by a mSU Home to RFSS1
7.5	Call Alert - RFSS2 (cSU) Initiated
7.5.1	Call Alert Initiated by a cSU Home to RFSS2

Table 14: CSSI RFSS Supplementary Data Conformance Test Cases

7 CSSI Conformance Testing Requirements - Console

7.1 Full Rate (FDMA) Group Voice Services

The test tool being verified shall be capable of performing the test cases listed. All of the test cases shall be tested. Testing shall be executed when the CSSI is configured as an Inter-WACN connection type, an Inter-System connection type, or an Intra-System connection type.

P25 CAP has defined certain test cases as “required PASS” test cases. “Required PASS” means that the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant Eligible) Equipment” on the P25 CAP webpage.

The CSSI test cases in Tables 15 and 16 apply to a CSS-based Console or a Console integrated with a RFSS (native console). *The tables below are examples; see the actual tables in the current version of the referenced document for the required tests.*

Table 15 lists the “Required PASS” test case numbers. These test cases are noted with a double asterisk (**) in Table 16.

3.2.1	3.3.1	3.4.1
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Table 15: Required PASS Test Case Numbers

The full rate group services shall be tested for conformance in accordance with the test cases established in the current version of the *CSSI-CSS Conformance Test Case Document*, reference [3].

Test Cases [3]	CSSI-CSS Full Rate Group Voice Conformance Test Case Descriptions
3.1	Full Rate Unconfirmed Group Call - Group Serving Role
3.1.1	Console Initiates Unconfirmed Group Call
3.1.2	Console Receives Unconfirmed Group Call
3.2	Full Rate Emergency Unconfirmed Group Call - Group Serving Role
3.2.1	** Console Receives Emergency Unconfirmed Group Call
3.3	Full Rate Confirmed Group Call - Group Serving Role - Delayed Resources

3.3.1	** Console Initiates Confirmed Group Call
3.4	Full Rate Confirmed Group Call - Group Serving Role - No Resources
3.4.1	** Console Initiates Confirmed Group Call

Table 16: CSSI CSS Full Rate Group Voice Conformance Test Cases

7.2 Half Rate (TDMA) Group Voice Services

The test tool being verified shall be capable of performing the test cases listed. All of the test cases shall be tested. Testing shall be executed when the CSSI is configured as an Inter-WACN connection type, an Inter-System connection type, or an Intra-System connection type.

P25 CAP has defined certain test cases as “required PASS” test cases. “Required PASS” means that the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant Eligible) Equipment” on the P25 CAP webpage.

The CSSI test cases in Tables 17 and 18 apply to a CSS-based Console or a Console integrated with a RFSS (native console). *The tables below are examples; see the actual tables in the current version of the referenced document for the required tests.*

Table 17 lists the “Required PASS” test case numbers. These test cases are noted with a double asterisk (**) in Table 18.

4.2.1	4.3.1	4.4.1
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Table 17: Required PASS Test Case Numbers

The half rate group services shall be tested for conformance in accordance with the test cases established in the current version of the *CSSI-CSS Conformance Test Case Document*, reference [3].

Test Cases [3]	CSSI-CSS Half Rate Group Voice Conformance Test Case Descriptions
4.1	Half Rate Unconfirmed Group Call - Group Serving Role
4.1.1	Console Initiates Unconfirmed Group Call
4.1.2	Console Receives Unconfirmed Group Call
4.2	Half Rate Emergency Unconfirmed Group Call - Group Serving Role
4.2.1	** Console Receives Emergency Unconfirmed Group Call
4.3	Half Rate Confirmed Group Call - Group Serving Role - Delayed Resources
4.3.1	** Console Initiates Confirmed Group Call
4.4	Half Rate Confirmed Group Call - Group Serving Role - No Resources
4.4.1	** Console Initiates Confirmed Group Call

Table 18: CSSI CSS Half Rate Group Voice Conformance Test Cases

7.3 Full Rate (FDMA) Unit to Unit Voice Services

The test tool being verified shall be capable of performing the test cases listed. All of the test cases shall be tested. Testing shall be executed when the CSSI is configured as an Inter-WACN connection

type, an Inter-System connection type, or an Intra-System connection type.

P25 CAP has defined certain test cases as “required PASS” test cases. “Required PASS” means that the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant Eligible) Equipment” on the P25 CAP webpage.

The CSSI test cases in Table 19 apply to a CSS-based Console or a Console integrated with a RFSS (native console). *The table below is an example; see the actual table in the current version of the referenced document for the required tests.*

The full rate unit to unit services shall be tested for conformance in accordance with the test established in the current version of the *CSSI-CSS Conformance Test Case Document*, reference [3].

Test Cases [3]	CSSI-CSS Full Rate Unit Voice Conformance Test Case Descriptions
5.1	RFSS1 (cSU) Initiated Unit to Unit Call with Target Availability Check
5.1.1	RFSS1 (Console) Initiated Unit to Unit Call with Target Availability Check
5.2	RFSS2 (mSU) Initiated Unit to Unit Call with Target Availability Check
5.2.1	RFSS2 (mSU) Initiated Unit to Unit Call with Target Availability Check
5.3	RFSS1 (cSU) Initiated Unit to Unit Call without Target Availability Check
5.3.1	RFSS1 (Console) Initiated Unit to Unit Call without Target Availability Check
5.4	RFSS2 (mSU) Initiated Unit to Unit Call without Target Availability Check
5.4.1	RFSS2 (mSU) Initiated Unit to Unit Call without Target Availability Check

Table 19: CSSI CSS Full Rate Unit to Unit Voice Conformance Test Cases

7.4 Half Rate (TDMA) Unit to Unit Voice Services

The test tool being verified shall be capable of performing the test cases listed. All of the test cases shall be tested. Testing shall be executed when the CSSI is configured as an Inter-WACN connection type, an Inter-System connection type, or an Intra-System connection type.

P25 CAP has defined certain test cases as “required PASS” test cases. “Required PASS” means that the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant Eligible) Equipment” on the P25 CAP webpage.

The CSSI test cases in Table 20 apply to a CSS based Console or a Console integrated with a RFSS (native console). *The table below is an example; see the actual table in the current version of the referenced document for the required tests.*

The half rate unit to unit services shall be tested for conformance in accordance with the test cases established in the current version of the *CSSI-CSS Conformance Test Case Document*, reference [3]. *The tables below are examples; see the actual tables in the reference documents for the required tests.*

Test Cases [3]	CSSI-CSS Half Rate Unit to Unit Voice Conformance Test Case Descriptions
6.1	RFSS1 (cSU) Initiated Unit to Unit Call with Target Availability Check
6.1.1	RFSS1 (Console) Initiated Unit to Unit Call with Target Availability Check
6.2	RFSS2 (mSU) Initiated Unit to Unit Call with Target Availability Check
6.2.1	RFSS2 (mSU) Initiated Unit to Unit Call with Target Availability Check
6.3	RFSS1 (cSU) Initiated Unit to Unit Call without Target Availability Check
6.3.1	RFSS1 (Console) Initiated Unit to Unit Call without Target Availability Check
6.4	RFSS2 (mSU) Initiated Unit to Unit Call without Target Availability Check
6.4.1	RFSS2 (mSU) Initiated Unit to Unit Call without Target Availability Check

Table 20: CSSI CSS Half Rate Unit to Unit Voice Conformance Test Cases

7.5 Supplementary Data Services

The test tool being verified shall be capable of performing the test cases listed. All of the test cases shall be tested. Testing shall be executed when the CSSI is configured as an Inter-WACN connection type, an Inter-System connection type, or an Intra-System connection type.

P25 CAP has defined certain test cases as “required PASS” test cases. “Required PASS” means that the test case results shall be a PASS if the equipment is to be considered P25 CAP Compliant. Only P25 CAP Compliant equipment will be posted as “Approved (Grant Eligible) Equipment” on the P25 CAP webpage.

The CSSI test cases in Tables 21 and 22 apply to a CSS-based Console or a Console integrated with a RFSS (native console). *The tables below are examples; see the actual tables in the current version of the referenced document for the required tests.*

Table 21 lists the “Required PASS” test case numbers. These test cases are noted with a double asterisk (**) in Table 22.

7.1.1	7.2.1	7.3.1	7.3.2
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Table 21: Required PASS Test Case Numbers

The supplementary data services shall be tested for conformance in accordance with the test cases established in the current version of the *CSSI-CSS Conformance Test Case Document*, reference [3].

Test Cases [3]	CSSI-Console Supplementary Data Test Case Descriptions
7.1	Emergency Alarm (test tool initiated, acknowledged by Console)
7.1.1	** Emergency Alarm initiated by a mSU Home to and Registered in RFSS2; Group Home RFSS2 (received by Console)
7.2	Emergency Alarm Cancel
7.2.1	** Emergency Alarm Cancel initiated by a mSU Home to and Registered in RFSS2; Group Home RFSS2 (received by Console)
7.2.2	Emergency Alarm Cancel initiated by a Console Home to RFSS1; Group Home RFSS2
7.3	Group Emergency Cancel

7.3.1	** Group Emergency Cancel initiated by a mSU Home to and Registered in RFSS2; Group Home RFSS2 (received by Console)
7.3.2	** Group Emergency Cancel initiated by a Console Home to RFSS1; Group Home RFSS2
7.4	Call Alert - RFSS1 (cSU) Initiated
7.4.1	Call Alert Initiated by a Console Home to RFSS1
7.5	Call Alert - RFSS2 (mSU) Initiated
7.5.1	Call Alert Initiated by a mSU Home to RFSS2

Table 22: CSSI CSS Supplementary Data Test Cases

8 Questions, Getting Started

Any organization 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: Approval of the First Recognized Test Tool

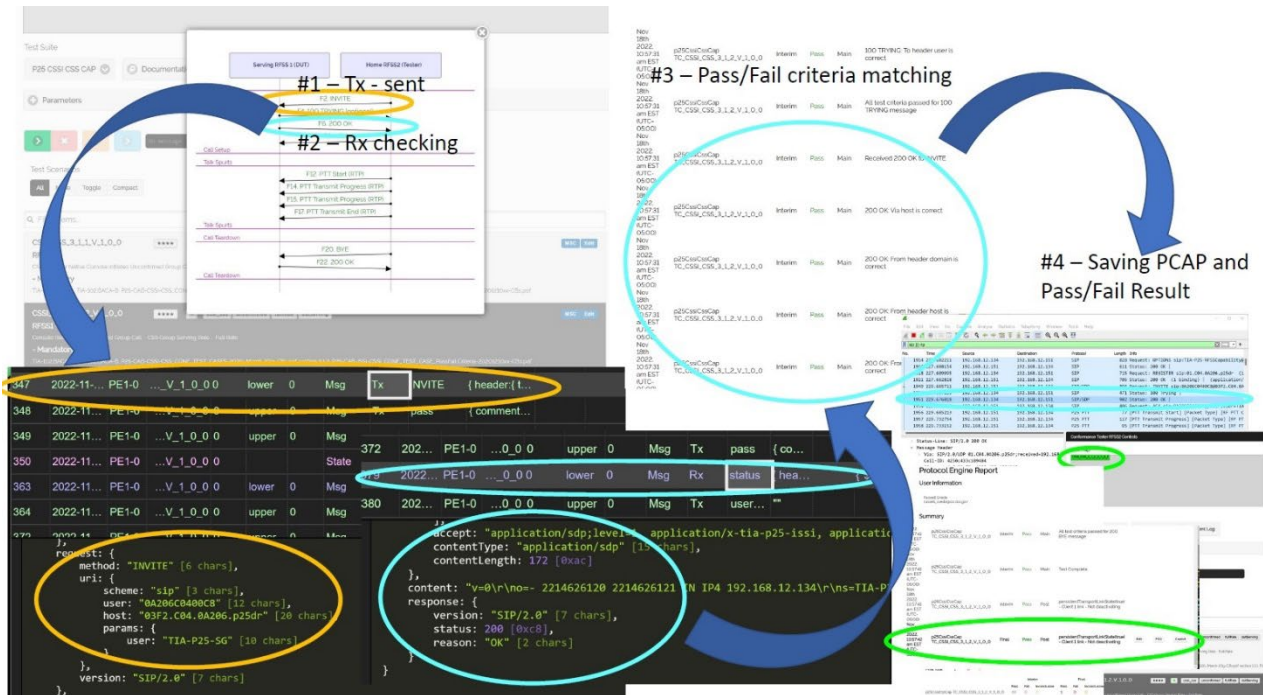
A detailed assessment of the test tool's line parameters for each test case must be evaluated. To determine the conformance of the equipment under test (EUT) every test case must perform the sequence as outlined in the CAB documents and must be assessed by a DHS affiliate.

DOI Telecom worked with the test tool developer and several volunteer manufacturers to set up the test tool and perform each test outlined in the ISSI/CSSI Conformance Test Pass/Fail Criteria document [4].

The Laboratory Technician used a dedicated server to run an emulator in which the tool is controlled. The Technician then:

- Opened the line parameters to ensure it is configured properly and the parameters chosen were correct.
- Used the Web User Interface to login to the tool.
- Performed the self-test procedure and ensured the local test summary passes each specific transaction. The test tool inherently runs *Wireshark* so the entire test is captured and can be verified that the tool is adhering to the test case requirements outlined in the CAB documents.
- This laptop test tool was then connected to an isolated switch that was also connected to the EUT.
- Once a connection was established between the Test Tool and the EUT all test cases were performed and documented.
- The local test summary and the Wireshark capture was then recorded in the Laboratory ICCTT test tool matrix.

Following is a diagram of the processes the tool goes through to record and verify the layer 2/3 data being passed during a specific test:



The diagram illustrates the test CSSI_CSS_312_V_100 Console Receives Unconfirmed Group Call – CSS Group Serving Role – Full Rate

#1 Shows a Transmit (Tx) packet sent from the Home RFSS (Test Tool). The invite configuration parameters are programmed by the Technician operating the tool, per the CAB requirements as shown on the bottom left of the diagram. The Invite shall be verified using a protocol analyzer (in this case Wireshark) as shown in the bottom right of the diagram.

#2 Shows the Invitation from Step #1 was received by the EUT and an OK is sent back to the test tool to setup the call. The invite configuration parameters are programmed by the Technician operating the tool, per the CAB requirements as shown on the bottom center of the diagram. This is verified using a protocol analyzer as shown in the bottom right of the diagram.

#3 Pass/Fail criteria is shown to be matching on the test tool’s summary report. The bottom right circled in blue shows the OK sent from #2

#4 Saving PCAP and Pass/Fail Result shows the test completely passed all fields listed for test CSSI_CSS_312_V_100. The bottom right side of the diagram shows a feature of the test tool to provide a PCAP that provides bit-by-bit records of the entire test performed.

P25-CAB-CSSI-ISSI_CONF_PASS_FAIL_CRITERIA [4]

Messages and message sequences that make up the test cases defined in [1], [2], and [3] are found in the P25-CAB-CSSI-ISSI_CONF_PASS_FAIL_CRITERIA [4] document. Each test case is a series of messages

where each message within the series of messages must be correct for the test case to pass. The Pass/Fail document defines the correct content and format for each required message for a test case to pass. The test tool verifies message content, message format, and message sequence for each test case, according to the appropriate Test Case documentation and Pass/Fail documentation. Conformance test tools will also identify which message(s) within the test case at issue if the test case fails. The series of messages for a test case is sometimes referred to as a “message sequence chart” or a “bounce chart.” These charts can be found in references [1], [2] and [3].

Below is an example from the Pass/Fail Criteria document that outlines the syntax and requirements for just one of the many tests defined. The designated test tool must be verified that it is able identify and provide evidence that the EUT is providing the correct information per the CAB standard.

EXAMPLE:

Unconfirmed Group Call Invite with "application/sdp" Content-Type field

The content-type of an Unconfirmed Group Call INVITE may be either “application/sdp” or “multipart/mixed”. For example, a console sourced call may or may not have the “c-ctxrp” parameter. The presence of either the “application/sdp” or “multipart/mixed” content-type shall be validated by the conformance test tool for an Unconfirmed Group Call INVITE message. When the content-type in an Unconfirmed Group Call INVITE is “multipart/mixed”, the conformance test tool shall also validate that a content-type of “application/x-tia-p25-issi” exists for delineating the body boundary that contains the P25 parameters.

The messaging parameters and parameter values for an Unconfirmed Group Call INVITE message that do NOT have "multipart/mixed" Content-Type field are indicated in this section. This section indicates needs for when the INVITE message is sourced from either a Group Home RFSS or Group Serving RFSS. Also addressed are the needed values for Full Rate vs. Half Rate Call.

INVITE sip: **SGID@RFSS_X.SYSTEM_X.WACN_X.p25dr;user=TIA-P25-SG** SIP SIP/2.0

Via: SIP/2.0/UDP **RFSS_X.SYSTEM_X.WACN_X.p25dr;branch=z9hG4bK89a7**

Route: <sip: **TIA-P25-Groupcall@RFSS_X.SYSTEM_X.WACN_X.p25dr**;lr>

Max-Forwards: 70

From: <sip: **SGID@p25dr;user=TIA-P25-SG** >;tag=a2c165447

To: <sip: **SGID@p25dr;user=TIA-P25-SG** >

Call-ID: 1-5723@192.168.0.11

CSeq: 1 INVITE

Contact: <sip: **SGID@RFSS_X.SYSTEM_X.WACN_X.p25dr;user=TIA-P25-SG** >

Priority: 8;a

Allow: ACK,BYE,CANCEL,INVITE,REGISTER,MESSAGE,OPTIONS

Accept: application/sdp;level=1, **application/x-tia-p25-issi**

Content-Disposition: session; handling=required

Content-Type: application/sdp

Content-Length: 160

v=0

o=- 14492751 44927511 IN IP4 192.168.0.11 P25-CAB-CSSI-CSS_CONFORMANCE_TEST_CASES – May 2019

10

s=TIA-P25-GroupCall

t=0 0

c=IN IP4 192.168.0.11

m=audio 25000 RTP/AVP 100

a=rtpmap:100 X-TIA-P25-FullRate/8000

The following identify what parameters shall be present and what the allowed values for each of the parameters are.

INVITE sip: **SGID@RFSS_X.SYSTEM_X.WACN_X.p25dr;user=TIA-P25-SG** SIP SIP/2.0

This line shall be present. The bolded items shall specify the proper syntax according to [BACA-B]. For an INVITE being sent from the Group Home RFSS to the Group Serving RFSS, the RFSS ID shall match the RFSS ID of the Group Serving RFSS. The RFSS ID shall NOT be present in this line for an INVITE being sent from the Group Serving RFSS to the Group Home RFSS. The SGID shall match the SGID under test. The SIP version shall be SIP/2.0. "p25dr;user=TIA-P25-SG" is case sensitive.

Via: SIP/2.0/UDP **RFSS_X.SYSTEM_X.WACN_X.p25dr;branch=z9hG4bK89a7**

This line shall be present. Via field shall be present according to RFC3261 and rules specified in [BACA-B] table 23. A valid branch parameter shall exist according to [RFC3261].

Route: <sip: **TIA-P25-Groupcall@RFSS_X.SYSTEM_X.WACN_X.p25dr**;lr>

This line shall be present for a Group SERVING RFSS initiated INVITE message sent to a Group Home RFSS and "TIA-P25-Groupcall" is case sensitive. This line shall NOT be present for a Group HOME RFSS initiated INVITE sent to a Group SERVING RFSS. When present, the bolded items shall specify the proper syntax according to [BACA-B]. The RFSS_X.SYSTEM_X.WACN_X shall match that of the Group HOME RFSS.
 Max-Forwards: 70
 This line shall be present. The Max-Forwards header field is used as described in [RFC3261]. [BACA-B] states that an RFSS SHOULD set the Max-Forwards value in all outgoing SIP messages (e.g., INVITE, ACK, etc.) to 70.
 From: <sip: **SGID@p25dr;user=TIA-P25-SG** >;tag=a2c165447
 This line shall be present. "From" field shall be present and bolded items shall specify the proper syntax according to [BACA-B]. The SGID shall match the SG under test. A valid SIP "tag" shall exist according to [RFC3261]. "p25dr;user=TIA-P25-SG" is case sensitive.
 To: <sip: **SGID@p25dr;user=TIA-P25-SG** >
 This line shall be present. "To" field shall be present and bolded items shall specify the proper syntax according to [BACA-B]. SGID shall match the SG under test. "p25dr;user=TIA-P25-SG" is case sensitive.
 Call-ID: 1-5723@192.168.0.11
 This line shall be present. Call-ID is a mandatory header field as defined in Table 2 (Summary of header fields) in the Section 20 of [RFC3261].
 CSeq: 1 INVITE
 This line shall be present. CSeq is a mandatory header field as defined in Table 2 (Summary of header fields) in the Section 20 of [RFC3261].
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 Contact: <sip: **SGID@RFSS_X.SYSTEM_X.WACN_X.p25dr;user=TIA-P25-SG** >
 This line shall be present. The bolded items shall specify the proper syntax according to [BACA-B]. Contact header field is mandatory as defined in Table 2 (Summary of header fields) in the Section 20 of [RFC3261]; the SGID shall match the SG under test; The RFSS_X.SYSTEM_X.WACN_X shall match the RFSS ID the message is being sent from. "p25dr;user=TIA-P25-SG" is case sensitive.
Priority: 8;a
 This line shall be present. Multiple priority values are possible: restricted to the integer values 1 through 10; non-emergency call shall be a number 1-10 and the value "a"; Emergency Call shall be a number 1-10 and the value "e".
 Allow: ACK,BYE,CANCEL,INVITE,REGISTER,MESSAGE,OPTIONS
 This line shall be present. Shall describe the set of methods supported by the User Agent (UA) generating the message.
 Accept: application/sdp;level=1, **application/x-tia-p25-issi**
 This line shall be present. This header field SHALL always contain the following body type descriptors: "application/sdp;level=1" and "application/x-tia-p25-issi"
 Content-Disposition: session; handling=required
 This line shall be present and shall be set as: Content-Disposition: session; handling=required
 Content-Type: application/sdp
 This line shall be present. This example is for a mobile initiated Unconfirmed Group Call INVITE that does NOT require a "multipart/mixed" Content-Type field. An INVITE with a "multipart/mixed" Content-Type field is optional for an Unconfirmed Group Call.
 Content-Length: 160
 This line shall be present. The Content-length header field shall be present as defined in [RFC3261].
 v=0
 This line shall be present. The protocol version is set to 0 as defined in [RFC4566].
 o=- 14492751 44927511 IN IP4 192.168.0.11
 This line shall be present. O= is the originator of the media session as described in [BACA-B].
s=TIA-P25-GroupCall
 This line shall be present. The header field "s=" shall be set to "TIA-P25-GroupCall" for a group call and "TIA-P25-GroupCall" is case sensitive.
 t=0 0
 This line shall be present. The header field "t=" shall be set as RTP unbounded as t= 0 0.
 c=IN IP4 192.168.0.11
 This line shall be present according to [RFC4566] which states "A session description SHALL contain either at least one "c=" field in each media description or a single "c=" field at the session level. It MAY contain a single session-level "c=" field and additional "c=" field(s) per media description, in which case the per-media values override the session-level settings for the respective media.
m=audio 25000 RTP/AVP 100
 This line shall be present. The media type shall be audio. 25000 is only an example port number and port numbers shall follow the definition defined in [RFC4566]. Field "m=" in this case indicate a full rate call – the bolded value of 100. For half rate calls, RTP/AVP 101 would be used.
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 12
a=rtpmap:100 X-TIA-P25-FullRate/8000
 This line shall be present. Header field a= in this case: 100 identifies a full rate call and either 100 X-TIA-P25-IMBE/8000 or 100 X-TIA-P25-FullRate/8000 is valid. Older implementations will only support 100 X-TIA-P25-IMBE/8000 while newer implementations shall support both 100 X-TIA-P25-IMBE/8000 and 100 X-TIA-P25-FullRate/8000. For a half rate call: a=rtpmap:101 X-TIA-P25-HalfRate/8000. "X-TIA-P25-FullRate", "X-TIA-P25-HalfRate" and "X-TIA-P25-IMBE" are case sensitive.

Remote Testing:

Some instances required tests to be performed and or monitored remotely. If a test tool offers the capability for remote testing, the tool must be able to perform the required tests remotely with same results as it was performed locally. A VPN providing end-to-end encryption can be setup in conjunction with separate gateways over a cellular connection. This method is used to provide security for both parties through the VPN and also to verify that testing can be performed remotely on systems that rely on cellular connections to reach the network. Below is an example of how the tests were able to be performed remotely and monitored by the DOI laboratory.

Remote Testing Capability Example:

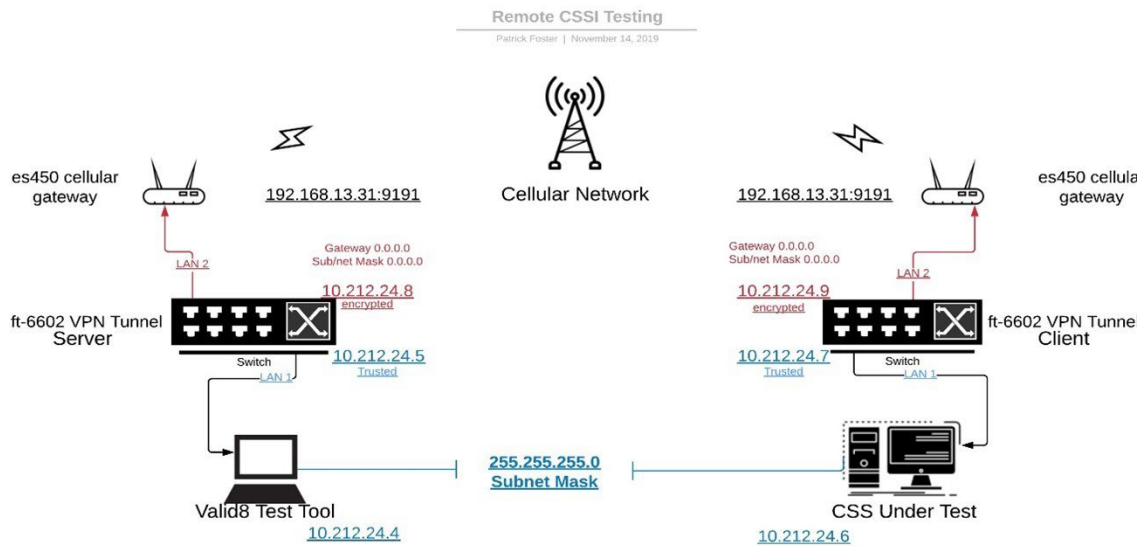


Diagram 1: Remote CSSI Testing Example

Remote testing of CSSI with vendor equipment using the test tool was successfully and securely performed by utilizing end-to-end VPN (DCB-ft-6606) connected to cellular gateways (Sierra Wireless es450). The Client VPN and Gateway configured in the laboratory and sent to the vendor. Once a secure connection is established testing can be performed using TeamViewer from the laboratory utilizing the test tool to control the CSS under test.

P25 CAP ISSI/CSSI Conformance testing will validate the FNE equipment under test portion of the SIP, SDP, and RTP messages that are exchanged during specific test cases between the FNE equipment under test and the conformance test tool.

The conformance test tool solution enables conformance testing of these interfaces in the P25 public safety network. The test tool simulates RFSSs, console subscriber units, and mobile subscriber units to test FNE equipment with the P25 ISSI/CSSI interfaces.

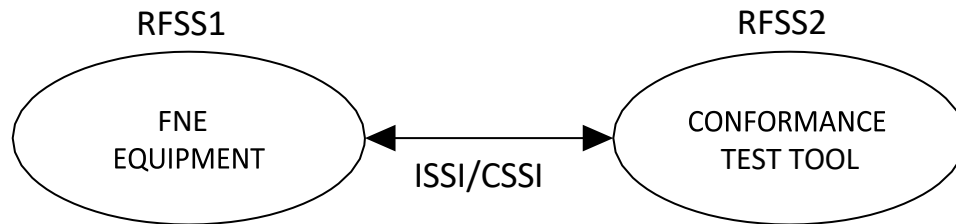


Diagram 2 Conformance Test

Test Tool Testing Methodology

The FNE equipment under test is always referenced as RFSS1 in the test cases. The conformance test tool will always be referenced as RFSS2. As appropriate, the equipment under test will be configured and tested as a group home RFSS and group serving RFSS. For group voice test cases and unit to unit voice test cases, the equipment will be tested for the full rate vocoder mode (FDMA) and the half rate vocoder mode (TDMA). As appropriate, the equipment under test will be configured and tested for supplementary data services. See references [1], [2], [3] and [4] for more details.

Equipment Under Test (EUT) Configurations

Three EUT configurations are recognized in P25 CAP Conformance testing for ISSI/CSSI equipment: ISSI testing for RFSS equipment, CSSI testing for RFSS equipment, and CSSI testing for console equipment.

Multiple console configurations shall be conformance tested. A “console” based on CSS equipment is testable. A “CSS-based console” is a console with RFSS equipment but the equipment does not support RF sites. A “console” that is integrated with a RFSS that does support RF sites is also testable and has been referred to as a “native console.” Conformance testing for either console configuration is limited to Group Serving roles.

As appropriate, the equipment under test will initiate the test case, i.e., the equipment initiates the test case by transmitting to the test tool. The equipment under test will also be the target of the test case, i.e., the test tool initiates the test case by transmitting to the equipment.

When a CSSI or an ISSI of a RFSS is under test and the test case calls for the RFSS to initiate the test case, it is expected that a mobile subscriber unit (registered to the RFSS under test) would initiate the test case. If appropriate for the test case, the mobile subscriber unit would also be affiliated to the subscriber group being used for the test.

When a CSSI of a console is under test and the test case calls for the console to initiate the test case, it is expected that a console subscriber unit would initiate the test case. If appropriate for the test case, the console subscriber unit would also be affiliated to the subscriber group being used for the test.

When an ISSI of an RFSS is under test, the test tool simulates a Group Serving RFSS or a Group Home RFSS, depending on the test case. The Inter-WACN or the Inter-System connection type can be used for ISSI testing.

When a CSSI of an RFSS is under test, the test tool simulates a Group Serving Console role. The Inter-WACN, Inter-System, or Intra-System connection type can be used for testing.

When a CSSI of a console is under test, the test tool simulates a Group Home RFSS. The Inter-WACN, Inter-System, or Intra-System connection type can be used for testing.

Manual, Independent Assessment of the Test Tool Using a 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 CAP ISSI/CSSI Conformance Test Case CAB and CAP ISSI/CSSI Conformance Test Pass/Fail Criteria of the P25 ISSI/CSSI interface, optimized for ISSI/CSSI conformance testing. Using a separate commercial off-the-shelf (COTS) Protocol Analyzer or Wireline Monitor equipment, a P25 Protocol Expert can non-intrusively observe the Packet 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 Project 25 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. This approach for validation of the ISSI/CSSI test tools requires submission of a detailed test report showing administration of applicable P25 Test Cases and Pass/Fail documents.

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.

Example 1 – ICC Test Tool in Loopback

In the first example, “Example 1,” a *P25 Protocol Subject Matter Expert (SME)* (the testing Technician) uses a Protocol Analyzer in a passive or non-intrusive mode while the ICC Test Tool is connected to itself in “loopback” mode. As an alternative, a manual comparison to the P25 CAP Pass/Fail document using a Protocol Analyzer is performed by the testing Technician:

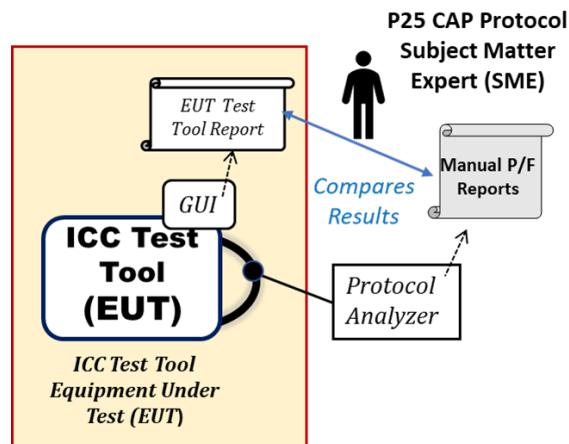


Diagram 3: ICC Test Tool in Loopback

This allows the intricate message flow behaviors between an ICC Test Tool product and an EUT to be examined. In this example, the testing Technician 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.

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 RFSS2:

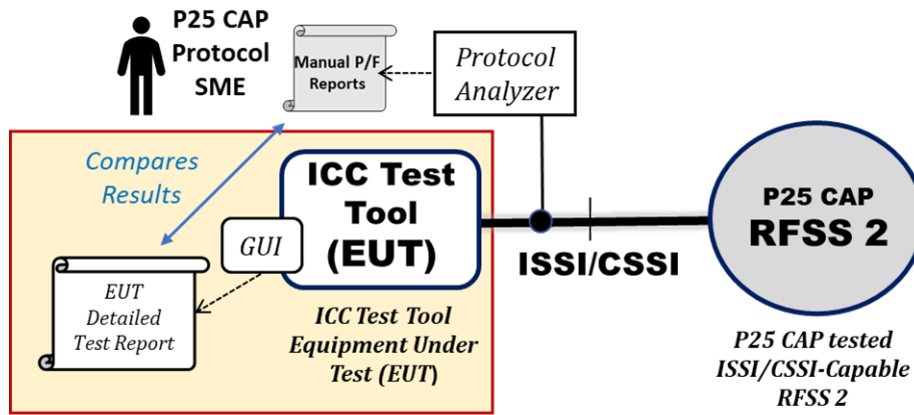


Diagram 4: ICC Test Tool Testing Against Operational RFSS

The configuration above assumes the RFSS2 is an operational, P25 CAP-tested, ISSI/CSSI-capable RFSS equipment and therefore a baseline protocol to test against the ICC Test Tool EUT, which is simulating RFSS1 in the example shown above.

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 verified by P25 CAP:

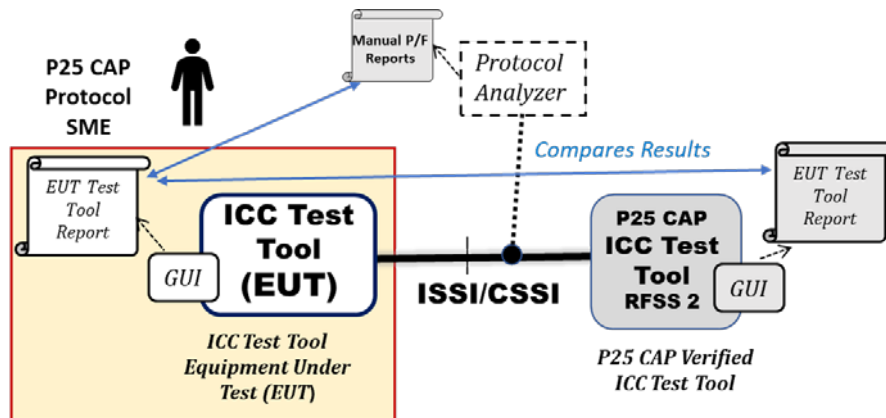


Diagram 5: ICC Test Tools Back-to-Back

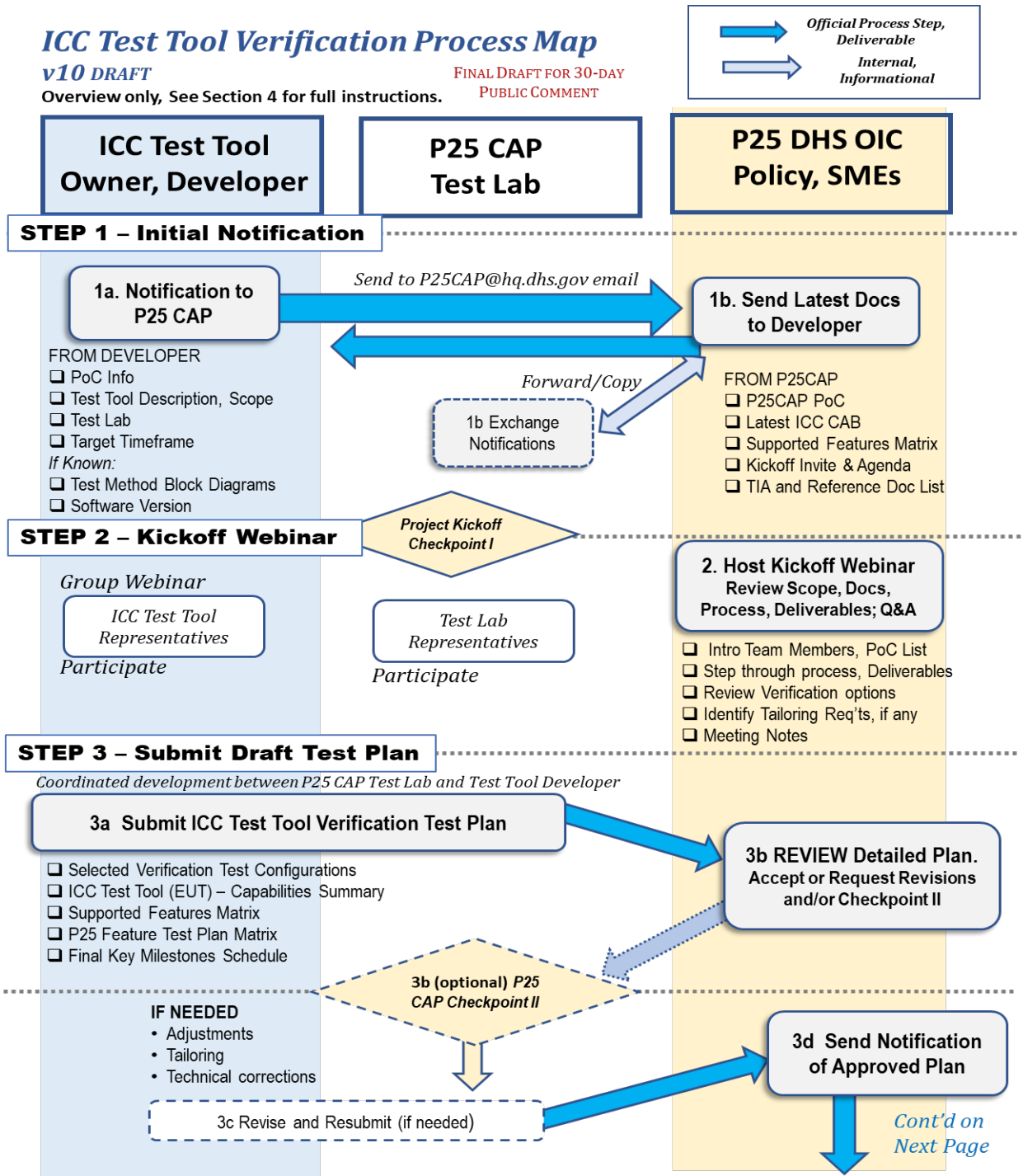
For this method, the P25 protocol Subject Matter Expert would compare the results of the Test Tool EUT to the results generated by a P25 CAP Verified ICC Test Tool emulating RFSS2.

Appendix B: Tool Validation Process and Acceptance Plan

B.1 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 below.



1.1. 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. 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.

1.1.1 Step 1a – Developer Sends Initial Notification Email to P25CAP

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(s) 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 the product would be ready for testing to commence and/or target timeframe for completion.

Step 1a is complete when the Developer has sent all required information to P25CAP@hq.dhs.gov email account.

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

The DHS 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 the project.

1.1.2.1 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 Reference Documents

The team will provide or reference all useful and relevant background, testing, and information documents such that Step 1b is complete when 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.

1.2 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 DHS P25CAP 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 information they need to proceed to Step 3. At least one member from the Developer, Test Lab, and P25CAP 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 identified project Points of Contact.

1.3 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.

1.3.1 Step 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

1.3.1.1 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.

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

The Verification Test Plan package shall provide detailed information that includes FNE/System Base station and Test Subscriber feature support documentation, along with identifying information such as product type, manufacture, brand name, model series, model number, software version, submitted STR/SDOC to reference and, importantly, which test cases are Supported “[S]” by the product. This information shall be provided based upon a blank P25 ISSI/CSSI Supported Feature Matrix Template provided by the P25 CAP team.

Recognizing that for the particular purpose of verifying conformance test tools, the manufacturer information need only indicate which features are Supported “[S].” 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. In 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 that 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. All other detailed test results information, should remain private as agreed upon under a formal nondisclosure agreement (NDA) between the manufacturer and the Test Lab.

Should the ICC Test Tool reveal ISSI/CSSI protocol issues in underlying equipment not under test, the P25 Compliance Assessment Program asks that those issues 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 opportunity to uncover and potentially address previously obscured P25 feature and interoperability issues.

1.3.1.3 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 and 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, and provides all requested data and information . 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.

1.3.1.4 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.

1.3.2 Step 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 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.

1.3.3 Step 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 sync 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.

1.3.4 Step 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 the original submission.

1.3.5 Step 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 completed 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 engineering 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 provided approval to Proceed to Step 4 – Perform Test Tool Verification Testing.

1.4 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.

1.4.1 Step 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.

1.4.2 Step 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. This process is performed privately and often under an NDA and shall remain transparent to the DHS P25 CAP process unless support is needed as mentioned above. It is included here for a complete view of the process.

1.4.3 Step 4c – Developer Receives Detailed Test Reports (DTRs) from Test Lab(s)

In Step 4c, the Developer receives the Detailed Test Reports (DTRs) from the Test Labs, which contain the detailed Pass/Fail test results for each Test Case prescribed. The DTRs are made available to the Test Tool Developer, but are not part of the submission for Compliance Assessment.

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

1.5 Step 5 – Compile P25 CAP Submission Documents

Step 5 can be initiated once all 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 Summary Test Report (STR) and draft Supplier's Declaration of Compliance (SDOC) documentation.

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

The DTRs 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 as ICC Test Tool STR and SDOCs, to P25 CAP.

1.5.2 Step 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 P25 CAP via email and copying all Project Points of

Contacts.

1.5.3 Step 5c – Checkpoint III (Optional)

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.

1.5.4 Step 5d – Final P25 CAP Review

Once all issues, questions, and corrections have been addressed as required, the P25 CAP engineering team will perform a final technical review of the submitted STR and SDOCs for the ICC Test Tool. If the DHS 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.

1.6 Step 6 – Approval & Notifications

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

1.6.1 Step 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 from P25CAP@hq.dhs.gov.

1.6.2 Step 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 so 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 approximately 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 completed and correct approved Tool Verification is posted to the DHS P25 CAP website.

B.2 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.

2.1 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 following P25 CAP Test Case and Pass/Fail Documents:

- 2.1.1 CSSI-CSS Conformance Test Cases** – *Project 25 Compliance Assessment Bulletin - Project 25 Compliance Assessment Program - Conformance Test Cases for the Console Sub-System Interface (CSSI) with Console Sub-System (CSS).*
- 2.1.2 CSSI-RFSS Conformance Test Cases** – *Project 25 Compliance Assessment Bulletin - Project 25 Compliance Assessment Program - Conformance Test Cases for the Console Sub-System Interface (CSSI) with Radio Frequency Sub-System (RFSS).*
- 2.1.3 ISSI-RFSS Conformance Test Cases** – *Project 25 Compliance Assessment Bulletin - Project 25 Compliance Assessment Program - Conformance Test Cases for the Inter-RF Sub-System Interface (ISSI) with Radio Frequency Sub-System (RFSS).*
- 2.1.4 ISSI/CSSI Pass/Fail Criteria CAB** – *Project 25 Compliance Assessment Bulletin - Project 25 Compliance Assessment Program - Conformance Test Pass/Fail Criteria for the Console Sub-System Interface (CSSI) and Inter-RF Sub-System Interface (ISSI).*
- 2.1.5 P25 CAP ISSI/CSSI Conformance Test Tool Verification Process – Interim Guidance Document v6.0** – This interim guidance document was used as the basis for this document and is referenced heavily throughout. Significant sections from this document were carried over for consistency.
 Filename: P25CAP ICCTT Verification Interim Guidance Doc v6.0 (7-31-20).pdf

2.2 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.

In all of the tables that follow, the titles of features or functions are shown along with section number references corresponding to the “Full-Rate” FDMA and “Half-Rate” 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.

2.2.1 [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 RFSS1 connected to RFSS2 using an P25 ISSI wireline interface.

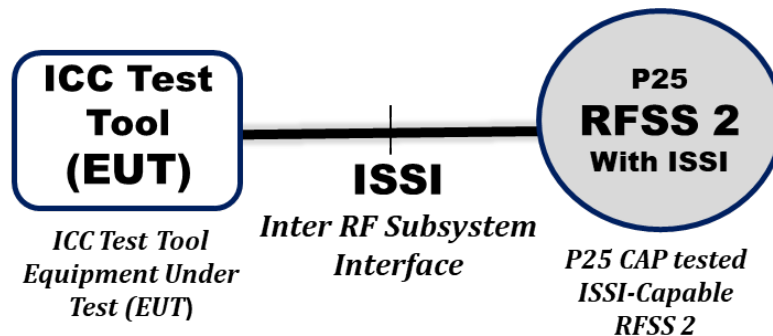


Figure 1: ISSI RFSS Conformance Test Tool Verification

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.

2.2.2 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).

Full Rate FDMA Test Case Ref	Half Rate TDMA Test Case Ref	ISSI-RFSS [1] <i>Group Voice Conformance Test Case titles</i>
3.1	4.1	Unconfirmed ISSI Group Call
3.1.1	4.1.1	RFSS Initiates Unconfirmed Group Call – Group Home Role
3.1.2	4.1.2	RFSS Receives Unconfirmed Group Call – Group Home Role
3.3.1	4.3.1	RFSS Initiates Unconfirmed Group Call – Group Serving Role
3.3.2	4.3.2	RFSS Receives Unconfirmed Group Call – Group Serving Role
3.2, 3.4	4.2, 4.4	Emergency Unconfirmed ISSI Group Call
3.2.1	4.2.1	RFSS Initiates Emergency Unconfirmed Group Call – Group Home
3.2.2	4.2.2	RFSS Receives Emergency Unconfirmed Group Call – Group Home

3.4.1	4.4.1	RFSS Initiates Emergency Unconfirmed Group Call – Group Serving
3.4.2	4.4.2	RFSS Receives Emergency Unconfirmed Group Call – Group Serving
3.5 - 3.8	4.5 - 4.8	Confirmed ISSI Group Call
3.5.1	4.5.1	RFSS Initiates Confirmed Group Call (Delayed Resources) - Home
3.5.2	4.5.2	RFSS Receives Confirmed Group Call (Delayed Resources) - Home
3.6.1	4.6.1	RFSS Initiates Confirmed Group Call (Delayed Resources) - Serving
3.6.2	4.6.2	RFSS Receives Confirmed Group Call (Delayed Resources) - Serving
3.7.1	4.7.1	RFSS Initiates Confirmed Group Call (No Resources) - Home
3.7.2	4.7.2	RFSS Receives Confirmed Group Call (No Resources) - Home
3.8.1	4.8.1	RFSS Initiates Confirmed Group Call (No Resources) - Serving
3.8.2	4.8.2	RFSS Receives Confirmed Group Call (No Resources) - Serving

Table 23: ISSI RFSS Group Voice Conformance Test Case List

2.2.3 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.

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

5.4.2	Call Alert from mSU2 to mSU1; mSU1 home to RFSS1 and registered in RFSS2; mSU2 home to RFSS2 and registered in RFSS1
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Table 24: ISSI RFSS Supplementary Data Conformance Test Case List

2.3 [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 simulating RFSS1 that would be sent by a RFSS capable of the CSSI interface:

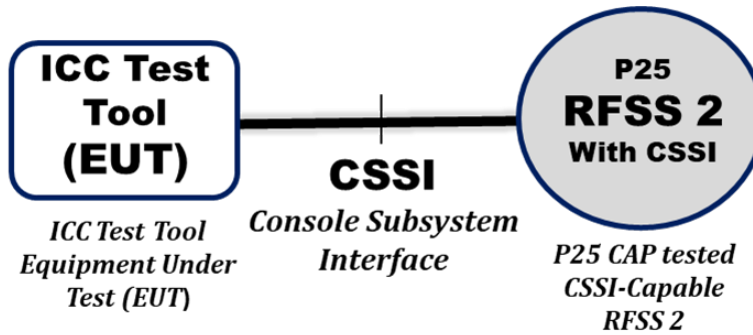


Figure 2: CSSI RFSS Conformance Test Tool Verification

2.3.1 CSSI-RFSS – Group Voice Conformance Test Case List

See Reference [2] **CSSI-RFSS Conformance Test Cases**, Conformance Test Cases for the Console Subsystem Interface (CSSI) with Radio Frequency Subsystem (RFSS). The information summarized in Table 3 below references Sections 3 and Sections 4 from reference [2] CSSI-RFSS Test Case documents for FDMA and TDMA operation:

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

Table 25: CSSI RFSS Group Voice Conformance Test Case List

2.3.2 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 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], P25CAP CSSI-RFSS Conformance CAB, Sections 5 and 6.

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

Table 26: CSSI RFSS Unit to Unit Call Conformance Test Case List

2.3.3 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], P25CAP CSSI-RFSS Conformance CAB, Section 7.

Test Case Section [2]	CSSI-RFSS Supplementary Data [2] Conformance Test Cases
7.1	Emergency Alarm
7.1.1	Initiated by mSU Home to and Registered in RFSS1; talkgroup Home to RFSS1
7.2	Emergency Alarm Cancel
7.2.1	Initiated by CONSOLE Home to RFSS2; talkgroup Home to RFSS1
7.2.2	Initiated by mSU Home to and Registered in RFSS1; talkgroup Home to RFSS1
7.3	Group Emergency Cancel
7.3.1	Initiated by CONSOLE Home to RFSS2; talkgroup Home to RFSS1
7.3.2	Initiated by mSU Home to and Registered in RFSS1; talkgroup Home to RFSS1
7.4, 7.5	Call Alert

7.4.1	RFSS1 mSU Initiated - Initiated by mSU Home to RFSS1
7.5.1	RFSS2 cSU Initiated - Initiated by Console Home to RFSS2

Table 27: CSSI RFSS Supplementary Data Conformance Test Case List

2.3.4 [3] CSSI-Console Subsystem Configuration – Conformance Testing

In this configuration, RFSS1 is CSS connected to an RFSS2 using the CSSI interface. For ICC Test Tool verification, the Test Tool EUT emulates RFSS1 and is tested against a Console Subsystem (CSS).

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. Note the generic CSS EUT configuration applies whether the Consoles are integrated or “Native” consoles or are being operated remotely from the RFSS1 or a third-party console subsystem connected to RFSS1 (not shown).

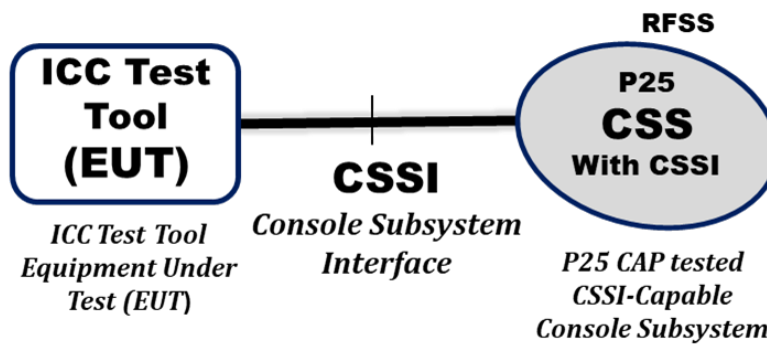


Figure 3: CSSI CSS Conformance Test Tool Verification

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.

2.3.5 CSSI-CSS – Group Voice Conformance Test Case List

Table 4 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], P25CAP CSSI-CSS Conformance CAB, Section 3 for full rate FDMA and Section 4 for half rate TDMA.

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

Table 28: CSSI CSS Group Voice Conformance Test Case List

2.3.6 CSSI-CSS – Unit to Unit Voice Conformance Test Case List

The information summarized in Table 5 below lists the conformance test cases for a trunked, Unit to Unit (or “private call”) 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 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 can be found in Reference [3], P25 CAP CSSI-Console Subsystem (CSS) Conformance CAB, Sections 5 and 6.

Full Rate FDMA Test Case Ref	Half Rate TDMA Test Case Ref	CSSI-CSS [3] Unit to Unit Voice Conformance Test Case List
5.1, 5.2	6.1, 6.2	Unit to Unit Call WITH Target Availability Check (TAC)
5.1.1	6.1.1	RFSS1 Console (cSU) initiates Unit to Unit Call WITH TAC
5.2.1	6.2.1	mSU on RFSS2 initiates Unit to Unit Call WITH TAC
5.3, 5.4	6.3, 6.4	Unit to Unit Call WITHOUT Target Availability Check (TAC)
5.3.1	6.3.1	RFSS1 Console initiates Unit to Unit Call WITHOUT TAC
5.4.1	6.4.1	mSU on RFSS2 initiates Unit to Unit Call WITHOUT TAC

Table 29: CSSI CSS Unit to Unit Voice Conformance Test Case List

2.3.7 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], P25 CAP CSSI-Console Subsystem (CSS) Conformance CAB, Section 7.

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

Table 30: CSSI CSS Supplementary Data Conformance Test Case List

Appendix C: Process for the Conduct of Conformance Testing Without a Designated Test Tool and Alternative Testing Methods

C.1 Conformance Testing Without a Designated Test Tool

The development of the ISSI/CSSI Conformance Test Tool Verification Requirements CAB [8] document revealed many challenges associated with the conformance test tool-based verification. For these reasons and others outlined in this document, the P25 Compliance Assessment Program will consider an alternate ISSI/CSSI Conformance testing approach that does not rely upon the use of a CAP-verified ISSI/CSSI Test Tool product. Some limitations are created by short term challenges, such as a limited number of vendors of an ICC Test Tool available for competitive procurements, and others created by underlying architectures.

The Test Tool described in the conformance and verification document functions as a simulated RFSS using prompt and response evaluations. While this approach has many benefits, it is critical the P25 Compliance Assessment Program 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 in operational use by Public Safety agencies throughout the United States. 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.
- To ensure the alternative conformance testing approach remains equally robust, the P25 CAP will request additional detail and documentation. These include, but are not limited to:
 - Requiring a test plan review prior to commencing testing
 - Submission of full Manual Protocol Analyzer Test Reports, an expanded scope of features tested, and wireline monitor data content captures to verify the more intricate behaviors, as needed. The alternate approach will need to maintain the scope of established of *P25 Conformance Test Cases [1], [2], and [3]* and *P25 CAP Conformance Test Case Pass/Fail Criteria [4]*.

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.

Should development of this alternate approach be needed, the P25 CAP will need to work closely with our advisors, governance, and stakeholders to develop necessary compliance documents for the alternate approach. The resulting P25 CAP process will need to be repeatable and well-documented such that it achieves accurate and comprehensive results enabling P25 CAP to verify conformance to the P25 standard.

Those interested in further information or are interested in initiating this program, please contact the P25 CAP support staff at P25CAP@hq.dhs.gov.

To begin ISSI/CSSI Conformance testing without the use of a designated test tool, the laboratory must

demonstrate their competence through a rigorous and objective assessment process conducted by the approved accreditation bodies. All equipment suppliers that participate in the P25 CAP must use DHS-recognized laboratories.

P25 CAP ISSI/CSSI Conformance testing will validate the FNE equipment under test portion of the SIP, SDP, and RTP messages that are exchanged during specific test cases between the FNE equipment under test as well as the equipment being used to for testing. Without a test tool running an emulator, you would need a separate RFSS and those exchanges must be recorded for analysis as well.

The following diagram illustrates a presumed CAP compliant system:

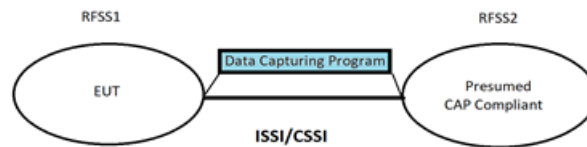


Figure 4: Data Capturing Program

Three Equipment Under Test (EUT) configurations are recognized in P25 CAP Conformance testing for ISSI/CSSI equipment: ISSI testing for RFSS equipment, CSSI testing for RFSS equipment, and CSSI testing for console equipment. Two different console configurations can be conformance tested. A “console” based on CSS equipment is testable. A “CSS-based console” is essentially a console with RFSS equipment, but the equipment does not support RF sites. A “console” that is integrated with an RFSS that does support RF sites is also testable and has been referred to as a “native console.” Conformance testing for either console configuration is limited to Group Serving roles. As appropriate, the equipment under test will initiate the test case, i.e., the equipment initiates the test case by transmitting to the test tool. The equipment under test will also be the target of the test case, i.e., the test tool initiates the test case by transmitting to the equipment. When a CSSI or an ISSI of an RFSS is under test and the test case calls for the RFSS to initiate the test case, it is expected that a mobile subscriber unit (registered to the RFSS under test) would initiate the FNE EQUIPMENT CONFORMANCE TEST TOOL RFSS1 RFSS2 ISSI/CSSI ISSI/CSSI Conformance Testing Requirements CAB – December 2020 test case. If appropriate for the test case, the mobile subscriber unit would also be affiliated to the subscriber group being used for the test. When a CSSI of a console is under test and the test case calls for the console to initiate the test case, it is expected that a console subscriber unit would initiate the test case. If appropriate for the test case, the console subscriber unit would also be affiliated to the subscriber group being used for the test. When an ISSI of an RFSS is under test, the test tool simulates a Group Serving RFSS or a Group Home RFSS depending on the test case. The Inter-WACN or the Inter-System connection type can be used for ISSI testing. When a CSSI of an RFSS is under test, the test tool simulates a Group Serving Console role. The Inter-WACN, Inter-System, or Intra-System connection type can be used for testing. When a CSSI of a console is under test, the test tool simulates a Group Home RFSS. The Inter-WACN, Inter-System, or Intra-System connection type can be used for testing.

Once the test case has been setup correctly and the actions to perform the test have been executed correctly (keying the mic, disabling emergency alarm, group call ack, etc.) the data capturing tool’s recording must be analyzed line by line to ensure each sequence in the Pass/Fail criteria CAB has been met as well as the proper syntax outlined in the CAB. P25 specific parameters and parameter values must be verified manually. Each test case must show protocol exchanges, e.g., show layer 2/3

messaging. The evidence should show the equipment tested was based on all the applicable published P25 CAP Compliance Assessment Bulletins.

The detailed test result should be combined with a summary of the full test case result to be analyzed and verified.

Appendix D: Glossary of Terms and Acronyms

<i>AES</i>	Advanced Encryption Standard (AES) – AES is the Project 25-endorsed encryption algorithm using a key size of 256 bits. This algorithm can be used for both digital voice and packet data traffic encryption.
<i>CAB</i>	Compliance Assessment Bulletin (CAB) – The CAB is a type of guidance document developed by the P25 Compliance Assessment Program that establishes test scope, policies, and testing requirements.
<i>CAI</i>	Common Air Interface (CAI) – 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.
<i>CAP</i>	(P25) Compliance Assessment Program (P25 CAP) – This term refers to the Project 25 Compliance Assessment Program.
<i>CCH</i>	Control Channel (CCH). <i>See Control Channel.</i>
<i>Console</i>	Console – 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).
<i>Console Subsystem (CSS)</i>	Console Subsystem (CSS) – 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.
<i>Control Channel</i>	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.

<i>CSSI</i>	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. As 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.
<i>DTR</i>	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.
<i>EUT</i>	Equipment Under Test (EUT) – This acronym 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.
<i>FDMA</i>	FDMA (Frequency Division Multiple Access) – In the P25 environment, the term <i>FDMA</i> 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.
<i>FNE</i>	Fixed Network Equipment (FNE) – In the Project 25 context, this term refers to the equipment that is not mobile; instead it is fixed and stays in one place.
<i>Full-Rate (FR)</i>	Full-Rate (FR) – This term refers to an aspect of the Vocoder. A Vocoder converts 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.
<i>Gateway</i>	Gateway – A telecommunications Gateway 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.
<i>GUI</i>	Graphical User Interface (GUI) – In general, this term refers to the interactive graphical and visual interfaces with an End User.

<i>Half Rate (HR)</i>	Half-Rate (HR) – This term refers to the type of vocoder. A vocoder converts 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 voice efficiency.
<i>Home System</i>	Home System – The Home and Serving System designations are essential to the ISSI/CSSI interface functionality. All Console and Subscriber Units Home to a System and use that System's WACN-SYS ID combination as part of the Subscriber Unit ID (SUID). A SUID can have only one Home System. Project 25 also has a designation for a home talkgroup (Group Home).
<i>ICC Test Tool</i>	ISSI/CSSI Conformance Test Tool (ICC Test Tool) – An ICC Test Tool is an application or device that assesses the conformance to the CAP ISSI/CSSI Conformance Test Case CAB and CAP ISSI/CSSI Conformance Test Pass/Fail Criteria.
<i>IETF</i>	Internet Engineering Task Force (IETF) – The IETF is the primary Internet Standards body. From their website, “ <i>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.</i> ” For more information, see: https://www.ietf.org/
<i>Individual Call</i>	Individual Call (aka Unit to Unit Call) – A P25 Individual Call operating on a Trunked Network allows any two P25 units to communicate directly through the network and privately, such that no other units can hear the call.
<i>Inter-WACN ID/Sys ID</i>	Inter-WACN, Inter-System ID – This term refers to ISSI/CSSI connectivity scenarios in which the RFSSs being connected together have different WACN and or System IDs.
<i>ISSI</i>	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.
<i>ISSI/CSSI</i>	ISSI/CSSI – The combined acronym ISSI/CSSI is used as shorthand and refers to any aspects that apply identically and equally to the ISSI and CSSI interfaces.
<i>MSC</i>	Message Sequence Chart (MSC) – A message sequence chart is a visual presentation technique that provides protocol message sequence detail.

<i>Native Console</i>	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).
<i>OTA</i>	Over the Air (OTA) – The protocol or wireless “language” devices use to communicate Over the Air (OTA).
<i>OTS</i>	Off the Shelf (OTS) – This term refers to equipment that is commercially available, “off-the-shelf.”
<i>Project 25 (P25)</i>	Project 25 (P25) – The Project 25 global standard operates with the Telecommunications Industry Association (TIA) and focuses on the 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.
<i>Protocol Analyzer</i>	Protocol Analyzer – A Protocol Analyzer is a commonly-used network diagnostic tool, which captures and analyzes signals and packets of data traffic over a digital communications link. For the verification of an ICC Test Tool, a Technician 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.
<i>RF Site</i>	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 in many forms and types, including indoor distributed antenna systems (DAS), concealed and on hilltops and rooftops.
<i>RTP</i>	Real-Time Protocol (RTP) – RTP is an IETF IP-standards based <i>network layer</i> protocol, which enables the optimization of low-latency, real-time audio and video services.
<i>SDOC</i>	Supplier's Declaration of Compliance (SDOC) – This is an abbreviation for one of the documents used to convey testing information to the P25 Compliance Assessment Program.
<i>Serving System</i>	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 that is “visiting” or “foreign,” which means it affiliates with a different WACN-SYS ID and must be assigned a WUID. Project 25 also has a designation for a Serving talkgroup (Group Serving). See <i>WUID, Home System</i> .

<i>SIP</i>	SIP (Session Initiation Protocol) – A signaling protocol used to create, manage and terminate sessions in an IP-based network. See RTP, SIP/RTP.
<i>SIP/RTP</i>	SIP/RTP – Refers to the combination of underlying IP-based protocols, SIP and RTP, used by the ISSI/CSSI interfaces.
<i>SME</i>	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.
<i>STR</i>	Summary Test Report (STR) – This is term for one of two primary documents used to convey testing information to the P25 Compliance Assessment Program.
<i>Subscriber Unit (SU)</i>	Subscriber Unit (SU) (<i>Radio, Subscriber, Portable, Mobile</i>) – 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.”
<i>SUID</i>	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 functions almost exactly like a phone number.
<i>System ID (SYS ID)</i>	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.
<i>TAC</i>	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.
<i>TDMA</i>	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.
<i>Technician</i>	Technician – As used in this document, a laboratory technician conducting the tests in a P25 CAP Recognized laboratory that is accredited to ISO 17025:9001 standards.
<i>TIA</i>	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 other uses. See <i>Project 25</i> .

<i>Vocoder</i>	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 narrow-bandwidth channel.
<i>WACN (ID)</i>	Wide Area Carrier Number ID (WACN ID) – When combined with the System ID, the numerical WACN identifier is part of the unique Identifier assigned to every Project 25 Trunked System.
<i>Wireline Monitor</i>	Wireline Monitor – The terms Protocol Analyzer and Wireline Monitor are used interchangeably in this document.
<i>WUID</i>	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.