PROJECT 25

STATEMENT

OF

REQUIREMENTS

(P25 SoR)

December 11, 2013*

(*Approved by Project 25 Steering Committee superseding P25 SoR Version April 8, 2011)

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Project 25 Statement of Requirements

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Introduction

The Project 25 (P25) Statement of Requirements (P25 SoR) is the basis for the *Project 25 New Technology Standards Project, Digital Radio Technical Standards*. The Project 25/34 Steering Committee, Association of Public-Safety Communications Officials - International (APCO) Project 25 Interface Committee (APIC), and the Telecommunications Industry Association (TIA) use the P25 SoR to develop ANSI/TIA standards, TIA Telecommunications Systems Bulletins (TSBs), and P25 standards and specifications to facilitate the procurement and operation by the public safety communications community and other narrowband private land mobile radio users of interoperable multi-vendor equipment implementing the Project 25 Standard.[1]

P25 SoR Revision History

The version of the P25 SoR indicated in the following table is the date of approval by the Project 25/34 Steering Committee, as recommended by its P25 User Needs Subcommittee.

Version	Summary Description
January 17, 2002	P25 SoR used as the basis upon which to develop a reformatted version.
April 3, 2003	Initial reformatted version.
March 9, 2006	Final reformatted version.
August 4, 2007	Updated version.
October 17, 2008	Updated version.
August 15, 2009	Updated version.
March 3, 2010	Updated version.
April 8, 2011	Revised CSSI requirements, Updated encryption section
December 11, 2013	Revised Section 4 to include security requirements, clarified requirements

Objectives of the P25 SoR

Project 25 is a multi-phase, multi-year project to establish a standards profile for the operations and functionality of new digital narrowband private land mobile radio (LMR) systems needed to satisfy the service, feature, and capability requirements of the public safety communications community for procuring and operating interoperable LMR equipment. As technologies evolve and the state of the art advances, new requirements may be defined, while existing requirements may be modified or deleted. This document defines the P25 requirements effective as of the approval date of this document.

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[1] The Project 25/34 Steering Committee specifies the suite of documents that compose the P25 Standard.

Definition of Project 25 *Phase 0*, *Phase 1*, and *Phase 2*

Project 25 continues to evolve since its inception. One key evolutionary goal of Project 25 is to achieve four-to-one spectrum utilization efficiency when compared to 25 kHz analog channels, the dominant public safety spectrum bandwidth in operation at the time of conception of Project 25. In this regard, the P25 SoR continues to evolve with unaddressed requirements to be included in future versions of the P25 SoR. To assist the phased development of P25 requirements, the following terms are defined for the purposes of this document:

> *Phase 0* refers to legacy/proprietary (i.e., non-P25) requirements and standards for an analog air interface and for the supporting legacy system (i.e., radios and infrastructure).

> *Phase 1* refers to P25 requirements and standards for a digital common air interface (FDMA) using a 12.5 kHz channel and for the supporting system (i.e., radios and infrastructure).

> *Phase 2* refers to P25 requirements and standards for a digital common air interface (TDMA- or FDMA-based) using a 6.25 kHz channel or equivalent bandwidth and for the supporting system (i.e., radios and infrastructure).

> > Note: *Phase 2* may also refer to P25 requirements and standards, developed or being developed, supporting both Phase 1 and Phase 2 systems (i.e., radios and infrastructure).

Interpreting the P25 SoR

In the two columns on the right hand side of the table that defines the P25 user needs requirements (see below) are entries designating the applicability of the specific P25 requirement within a specific P25 phase. The definition of the four possible types of entries in the table are as follows:

> *M* indicates that the specified requirement (service, feature, or capability) represents a Mandatory service, feature, or capability supported by the suite of P25 standards and is to be supported by all P25 systems. Implementation of so-designated services, features, or capabilities shall comply with the P25 standards defined by TIA. It should be noted that there might be ergonomic differences among individual manufacturers' implementations of P25-related user interfaces.

> *SO* indicates that the specified requirement (service, feature, or capability) represents a Standard Option service, feature, or capability supported by the suite of P25 standards. The user has the option of deploying so designated services, features or capabilities. Likewise, manufacturers have the option of offering so designated services, features, or capabilities. If deployed in a particular P25 system, implementation of a Standard Option shall comply with the P25 standards defined by TIA. It should be noted that there might be ergonomic differences among individual manufacturers' implementations of P25-related user interfaces.

> *SO-R* indicates that a specified requirement (service, feature, or capability) must be implemented when that SO is exercised. A service, feature, or capability that is designated as "SO-R" shall be (1) included by the manufacturer as P25-standardized functionality in operational P25 equipment or P25 system when that SO requirement is exercised by the manufacturer and (2) provided as an operational characteristic of P25 equipment or P25 system when that SO requirement is exercised by the user.

i indicates text that is not a requirement and is provided for information only. For example, an *i* is used to indicate text establishing the context for the fourth level headings that define specific P25 requirements.

The Project 25/34 Steering Committee and its P25 User Needs Subcommittee expect that (1) all applicable Mandatory requirements are included in every P25-compliant product and system and (2) Standard Option requirements may or may not be included in a P25-compliant product and system but when they are they must meet the appropriate TIA/P25 standard. Furthermore, subsets of any Standard Option requirement must be compliant with the P25 standard; subsets that are non-compliant or added (i.e., non-P25) features that would impair or inhibit P25 compliance of standard or mandatory options would deem the entire implementation of that Standard Option requirement non-compliant. The Project 25/34 Steering Committee also expects that (1) equipment or system implementing a particular Mandatory requirement be available within fifteen months of the publication of the P25 SoR containing that Mandatory requirement or within six months of the publication of the relevant standard, whichever is later, and (2) manufacturers shall implement P25-compliant features whenever equivalent proprietary features are implemented. The requirement in (2) above is waived for encryption when a Project 25 product is exported to or from a country whose import or export control laws prevent the use of standardized P25 encryption.

> NOTE – As of the publication date of this document, no active proposals exist concerning standardization of either a P25 Phase 2 6.25 kHz FDMA common air interface or a P25 Phase 2 25 kHz TDMA common air interface, and no standardization efforts are currently being undertaken to develop either a P25 Phase 2 6.25 kHz FDMA Standard or a P25 Phase 2 Four-Slot TDMA Standard. Relevant requirements proposals for these two areas will be considered after completion of ongoing P25 requirements and P25 standards development efforts (e.g., Phase 2 12.5 kHz TDMA (i.e., P25 Two-Slot TDMA) and the Inter-RF Subsystem Interface (ISSI)) consistent with the Project 25 work priorities established by the P25 Steering Committee.

Table of P25 User Needs Requirements

The following table defines the P25 user needs requirements within the context established above.

Project 25 Statement of Requirements (December 11, 2013)	Phase 1, 12.5 kHz, FDMA	Phase 2, 12.5 kHz TDMA
1.0 Project 25 (P25) Overview	i	i
1.1 P25 Statement of Requirements (P25 SoR)	i	i
1.1.1 P25 SoR Objectives	i	i
The objectives of this effort to establish a standards profile for the operations and functionality of new digital Public Safety radio systems are as follows:	i	i
Obtain maximum radio spectrum efficiency.	i	i
Ensure competition in system life cycle procurements.	i	i
Allow effective, efficient and reliable intra-agency and inter-agency communications.	i	i
Provide "user friendly" equipment, "user friendly" being defined as the least amount of mental and physical interaction by the operator.	i	i
Provide a graceful path from present analog technologies through all phases of Project 25.	i	i
1.2 Regulatory and Standards Applicability	i	i
1.2.1 Bandwidth Compliance	i	i
1.2.1.1 12.5 and 6.25 kHz Bandwidth	i	i
Adopt 12.5 kHz bandwidth channels with future migration to 6.25 kHz bandwidth channels as technology allows.	M	i
1.2.1.2 25 kHz Equivalency Bandwidth	i	i
Adopt 6.25 kHz bandwidth channels or equivalent.	i	M
1.3 Other Applicable Standards, Technical Documents, and Requirements	i	i
1.3.1 APCO Project 16	i	i
1.3.1.1 Project 16 Compatibility	i	i
The P25 system shall be generally compatible with the requirements specified by Project 16A. In all instances where Project 25 Statement of Requirements conflicts with those of APCO Project 16A, the Project 25 Requirements shall supersede.	i	i

Project 25 Statement of Requirements (December 11, 2013)	Phase 1, 12.5 kHz, FDMA	Phase 2, 12.5 kHz TDMA
1.3.2 ANSI/TIA/EIA	i	i
1.3.2.1 ANSI/TIA/EIA-603 Compliance	i	i
When operated in the analog mode all radio equipment shall meet the requirements specified in the current edition of TIA/EIA-603 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".	M	M
1.3.3 Subscriber Unit MIL-SPEC Requirements	i	i
The mobile and portable equipment shall meet the applicable sections of MIL-STD-810E "Environmental Test Methods and Engineering Guidelines" as follows.	i	i
1.3.3.1 Method 506.3; Rain, Procedure I – Blowing Rain	M	M
1.3.3.2 Method 509.3; Salt Fog, Procedure I – Aggravated Screening	M	M
1.3.3.3 Method 510.3; Sand and Dust, Procedure I – Blowing Dust	M	M
1.3.3.4 Method 514.4; Vibration, Procedure I, Category 10 – Minimum Integrity Test (3 axis)	M	M
1.3.3.5 Method 516.4; Shock, Procedure I – Functional Shock	M	M
2.0 Detailed Standards Suite Proposed	i	i
The system will be designed around a suite of operational standards so that field systems manufactured by different vendors can operate together and offer unit-to-unit communications based on predefined activation procedures.	i	i
P25 Open Interfaces	i	i
In order to meet the stated objectives and requirements, a comprehensive suite of P25 standards is necessary that defines the P25 interface characteristics and permits the interconnection of all P25 system components. The necessary P25 standards components are as follows.	i	i
2.1 P25 Common Air Interface (CAI)	i	i
Develop a P25 CAI (U_m Interface) standard.	i	i
2.1.1 P25 Common Air Interface	i	i
2.1.1.1 Phase 1 CAI	i	i

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One channel bit-rate, modulation, and link layer shall be utilized for all voice and data capabilities, excepted only for manufacturer-specific subsystems to provide backwards compatibility to existing manufacturer-specific systems.	M	i
2.1.1.2 Phase 2 CAI	i	i
For Phase 2, the above paragraph is modified to read: One channel bit-rate, modulation, and link layer shall be utilized for all voice and data capabilities, with backward compatibility as described in Section 5.3.	i	M
2.1.1.3 Common Channel Operation	i	i
For common channel operation control, voice, and/or data, features shall be integrated into a single channel.	M	M
2.1.2 P25 Standard Service Set	i	i
A P25 standard service set for all manufacturers consists of the following requirements.	i	i
2.1.2.1 Group calls in a Conventional system.	M	i
2.1.2.2 Group calls in a Trunked system.	M	M
2.1.2.3 Private calls in a Conventional system.	M	i
2.1.2.4 Private calls in a Trunked system.	M	M
2.1.2.5 PSTN Interconnect calls in a Conventional system.	SO	i
2.1.2.6 PSTN Interconnect calls in a Trunked system.	SO	SO
2.1.2.7 The system shall support digital DTMF overdial.	M	M
2.1.2.8 The system shall provide an SU or console the ability to play tone sequences to another SU.	M	M
2.1.2.9 Voice encryption control in a Conventional system.	SO	i
2.1.2.10 Voice encryption control in a Trunked system.	SO	SO
2.1.2.11 Preprogrammed (i.e., user definable) Data messages in a Conventional system.	SO	i
2.1.2.12 Preprogrammed (i.e., user definable) Data messages in a Trunked system.	SO	SO
2.1.2.13 Tracking of individual and group members in conventional systems as they move, automatically or manually, from channel to channel, site to site, or RFSS to RFSS within and between systems for resource management needed to support voice, data, and OTAR operation.	SO	i

Project 25 Statement of Requirements (December 11, 2013)	Phase 1, 12.5 kHz, FDMA	Phase 2, 12.5 kHz TDMA
2.1.2.14 Tracking of individual and group members in trunked systems as they move from site to site and RFSS to RFSS within and between systems for resource management needed to support voice, data, and OTAR operation.	M	M
2.1.2.15 Dynamic subscriber unit talk-group regrouping allows merging and un-merging of multiple talk groups in addition to individual radios into a single dynamically defined talk group in a Conventional system.	M	i
2.1.2.16 Dynamic subscriber unit talk-group regrouping allows merging and un-merging of multiple talk groups in addition to individual radios into a single dynamically defined talk group in a Trunked system.	SO-R	SO-R
Requirements 2.1.2.15 and 2.1.2.16 are "dynamic" features used to help dispatchers dealing with unscheduled situations requiring cooperative work of several agencies that normally use distinct talk groups. The regrouping leads to dynamic creation of a "merged" talk group containing all the units previously belonging to the designated talk groups. Whenever possible, the operation of the dynamically regrouped units should be encrypted if initial talk groups were operating in encrypted mode. When the security levels of merged groups do not match then the merged group defaults to operating at the highest common security level and users should be informed when their level of security is reduced. Algorithm ID and Key ID information for the merged talk group are required and may be different from those of any of the talk groups that were merged.	i	i
2.1.2.17 Emergency alarm in a Conventional system.	M	i
2.1.2.18 Emergency alarm in a Trunked system.	SO-R	SO-R
The term "alarm" refers generally to the indication of an occurrence of a system event that may require a response by the system or operator. The term "alert" refers generally to user-oriented signaling (e.g., involving tones).	i	i
2.1.2.19 Transport of a talker's ID from the sending equipment to the receiving equipment during voice and data transmissions in a Conventional system.	M	i
2.1.2.20 Transport of a talker's ID from the sending equipment to the receiving equipment during voice and data transmissions in a Trunked system.	M	M
2.1.2.21 Text Messaging – enables text messages to be sent from one unit to another. Text messages may be up to 256 characters in length and may be sent via SU keyboard entry or from a data terminal device connected to a SU, exclusive of overhead.	SO	SO

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2.1.2.22 Broadcast Call – a one-way single transmission (i.e., no 'hang time') group call.	M	M
2.1.2.23 Radio (i.e., SU) and Infrastructure (i.e., Fixed Network Equipment (FNE)) Authentication – secure authentication of an SU's and FNE's identity.	i	i
2.1.2.23.1 SUs shall be able to be securely authenticated by FNE using manual configuration in trunked systems.	SO-R	SO-R
2.1.2.23.2 FNE shall be able to be securely authenticated by SUs using manual configuration in trunked systems.	SO-R	SO-R
2.1.2.23.3 SUs shall be able to be securely authenticated by FNE using automatic configuration in trunked systems.	SO	SO-R
2.1.2.23.4 FNE shall be able to be securely authenticated by SUs using automatic configuration in trunked systems.	SO	SO-R
2.1.2.23.5 Mutual authentication of SUs and FNE shall be able to be securely performed by SUs using manual configuration in trunked systems.	SO	SO-R
2.1.2.23.6 Mutual authentication of SUs and FNE shall be able to be securely performed by SUs using automatic configuration in trunked systems.	SO	SO-R
The requirements in 2.1.2.23 apply to conventional systems (i.e., SUs and FNE). Note: A requirement level will be specified if and when available technology permits P25-standardized operation of this feature for conventional systems.	i	i
2.1.2.24 Announcement Group Call – a group call addressed to a group of talk groups (i.e., an 'announcement group' that is transmission trunked only).	SO	SO
2.1.2.25 Emergency Call.	i	i
2.1.2.25.1 Emergency group call in a conventional system.	M	i
2.1.2.25.2 Emergency group call in a trunked system.	SO-R	SO-R
2.1.2.26 Radio Check – enabling a user to determine if a specific SU is currently available on the system.	SO	SO
2.1.2.27 Unit De-authorization – the system, if authorized, may support the capability to de-authorize a subscriber unit immediately to terminate services to it.	SO	SO
2.1.2.28 Busy Channel Lockout (Conventional Polite Mode).	i	i
The conventional SU shall be able to operate in a busy channel lockout mode, sensing whether the channel is busy before transmitting.	M	i
2.1.2.29 Radios operating in the Unaddressed Voice Call mode are configured to not include talk group ID in their decision to unmute for a received call.	M	M

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2.1.2.30 Radios operating in the Digital Carrier Squelch mode are configured to unmute based on receiving carrier, ignoring both the received NAC and the received talk group ID.	M	M
2.1.2.31 System-wide group call to all SUs in a trunked system.	SO	SO
2.1.2.32 On a conventional system, All Call is a group call to all SUs on one or more channels.	SO	i
2.1.2.33 The system shall provide for the restriction of SUs and talk groups to particular sites or RFSSs within the system. Operational considerations may cause this configuration to change over time. The system may broadcast information about current operational status and parameters so that subscriber units are able to adjust their operation accordingly.	i	i
The requirements in 2.1.2.33 apply to trunked systems.	SO	SO
The requirements in 2.1.2.33 apply to conventional systems. Note: A requirement level will be specified if and when available technology permits P25-standardized operation of this feature for conventional systems.	i	i
2.1.2.34 Operational Use of Conventional Talkgroups $0000 and $FFFF	i	i
Subscriber radios shall have a setting for the No Call talk group ($0000) that inhibits reception of all talk groups except the All Call talk group ($FFFF).	M	M
2.1.2.35 Surveillance Mode of Operation by P25 Radios	i	i
Users have a need for a mode of operation that can be used during surveillance activities. This mode of operation shall mute all audible indicators, including key beeps and other confirmation and alert tones and disable the internal speaker, and must allow for the use of headsets, or other audio accessories, attached to an accessory connector on a portable radio. Encrypted wireless headsets are acceptable provided that all lights and sounds are disabled. The headset shall provide earphone audio and support transmit microphone audio, and must allow for PTT operation. The "surveillance mode" of operation shall also disable all lights, including display backlighting and other indicator lights. The radio programming software shall provide a selection to allow or prevent calls from being received from the $FFFF ("Everyone") Talk Group when in the surveillance mode. The surveillance mode of operation shall be enabled/disabled on a per channel basis. This mode of operation shall not limit or prevent transmit capability.	SO	SO
2.1.2.36 Standards Definition of Priorities for Operational Use Codes	i	i

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	When there are perceived or actual conflicting instructions (i.e., codes) in one or more P25 standards the APIC shall identify for the P25 UNS which code takes precedence. (For example, in the case of conventional Talk Groups $0000 (the No Call Talk Group - hear no one except the All Call Talk Group/speak to no one) and $FFFF (the All Call Talk Group - hear everyone/speak to everyone), the P25 standards shall define the conditions the codes are used and the priority they are used in operation.)	M	M
2.1.2.37	Conventional Repeater Hangtime	i	i
	Hangtime is typically sent for several seconds after a conventional repeater has received a transmission from a SU enabling positive feedback to the user that the repeater has been successfully accessed. This data pattern must be standardized to allow for expected operation and interoperability between the repeater and SU equipment.	i	i
2.1.2.37.1	A conventional (non-trunked) repeater shall send during transmitter hangtime a specified data pattern, including specification of the information imbedded in that data pattern.	M	i
2.1.2.37.2	Conventional systems shall provide a signal to SUs that can trigger visual feedback to subscriber unit users indicating that their transmission has reached the repeater station. The visual feedback indication by the SU shall be a settable feature of the SU through programming. The visual feedback indication may be a settable feature of the SU by the user if allowed by the programming.	SO	i
2.1.2.37.3	Conventional systems shall provide a signal to SUs that can trigger audible feedback to subscriber unit users indicating that their transmission has reached the repeater station. The audible feedback indication by the SU shall be a settable feature of the SU through programming. The audible feedback indication may be a settable feature of the SU by the user if allowed by the programming.	M	i
2.2	P25 Data Interfaces: Mobile Data Interface (A Interface) and Fixed Host Data Interface (E_d Interface)	i	i
	A Mobile Data Terminal (MDT) should not be interpreted to preclude the radio as an MDT.	i	i
2.2.1	P25 Mobile Data Interface (A Interface)	i	i
	Develop a P25 Mobile Data Interface standard.	i	i
2.2.1.1	Mobile Data Interface Protocols	i	i
	The A Interface between a SU and one or more MDTs shall be compatible with IP (IPv4 and IPv6) standards.	SO	SO
2.2.1.2	MDT to MDT Communication	i	i
	The P25 system shall provide the ability for any MDT attached to an SU to communicate with any other MDT attached to an SU (direct mode, repeat mode, network mode).	SO	SO
2.2.1.3	MDT to Fixed Host Communication	i	i

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The system shall provide the ability for any MDT attached to an SU to communicate with any fixed host attached to the network.	SO	SO
2.2.1.4 Minimum Data Speed	i	i
Data transmission shall operate at a speed of at least 9600 bps (including overhead) over the air.	M	M
2.2.2 P25 Fixed Host Data Interface (E_d)	i	i
Develop a P25 Fixed Host Data Interface standard.	i	i
2.2.2.1 Fixed Host Data Interface Protocols	i	i
An RF Subsystem (RFSS) shall support a fixed-host data interface based on the Internet protocol suite.	SO	SO
2.2.2.2 Fixed Host to MDT Communication	i	i
The network shall provide the ability for a fixed host to identify and transparently communicate data with any MDT attached to an SU.	SO	SO
2.2.2.3 Fixed Host to Fixed Host Communication	i	i
The P25 infrastructure shall provide the ability for a fixed host to communicate with any other fixed host attached to the P25 infrastructure (i.e., the Fixed Hosts may be attached via an E_d Interface on the same or different RFSSs).	SO	SO
2.3 P25 Telephone Interconnect Interface	i	i
Develop a P25 Telephone Interconnect Interface (E_t Interface) standard, which provides analog and digital interfaces between the P25 infrastructure (i.e., RFSS) and the Public Switched Telephone Network (PSTN) enabling telephone interconnect of SUs and the PSTN.	i	i
2.3.1.1 Full Duplex Telephone Interconnect	i	i
Full duplex telephone interconnect operation may be supported between subscriber equipment and RF Subsystems (RFSSs).	SO	SO
2.3.1.2 System Operator Control of PSTN Access	i	i
The system operator shall be able to selectively control SU access to/from the PSTN.	SO	SO
2.4 P25 Inter-RF Subsystem Interface (ISSI)	i	i
Develop a P25-defined ISSI (G Interface) standard enabling connectivity between all P25 RF Subsystems (RFSSs). In the context of the P25 SoR, a P25 RFSS is a collection of infrastructure equipment capable of terminating the P25-defined interfaces as specified in the P25 SoR.	i	i

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The ISSI is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 RFSS equipment and to users of P25 RFSS equipment.	SO	SO
The ISSI should be considered by user organizations as a planning and operational requirement to achieve interoperability within and among P25 systems via interconnection of RFSSs from the same or different manufacturers.	i	i
2.4.1 Multiple P25 RF Subsystem Connectivity	i	i
2.4.1.1 P25 RFSS Connectivity	i	i
Any P25 RFSS that implements the ISSI shall be able to be connected using the ISSI to any other P25 RFSS that implements the ISSI regardless of the types of P25 CAI(s), if any, implemented by those P25 RFSSs. When connecting P25 RFSSs using the ISSI, the interconnected RFSSs may be in the same or different P25 WACNs or P25 Systems. Each P25 RFSS shall be uniquely identifiable.	SO-R	SO-R
2.4.1.2 P25 RFSS and ISSI Function and Equipment Upgrade Capability	i	i
Manufacturers of P25 RFSS equipment (hardware and software) that is designed to support the ISSI function are expected to offer P25 RFSS equipment in a manner that will not require major replacement of P25 RFSS equipment to support addition of that manufacturer's ISSI equipment offerings. The ISSI function and equipment should be upgradeable though ISSI software revisions that enable maximum continued use of existing ISSI hardware. Manufacturers of P25 RFSS equipment that is not currently designed to support the ISSI function and equipment are expected to not require major replacement of that manufacturer's legacy P25 RFSS equipment if and when that manufacturer chooses to offer P25 RFSS equipment designed to support the ISSI function and equipment.	i	i
2.4.1.2.1 P25 RFSS equipment from a manufacturer that offers the ISSI shall be upgradeable to provide the ISSI function and to implement the associated ISSI equipment (hardware and software) without requiring major replacement of P25 RFSS equipment (hardware and software).	SO-R	SO-R
2.4.1.2.2 ISSI equipment shall be upgradeable via software and hardware revisions.	SO-R	SO-R
2.4.1.2.3 ISSI equipment shall be upgradeable via software-only revisions.	SO-R	SO-R
2.4.1.3 P25 RFSS Roaming	i	i
The ISSI shall support roaming of SUs among P25 RFSSs.	SO-R	SO-R
2.4.2 Operational Modes	i	i
2.4.2.1 Trunked:	i	i

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The ISSI shall support two or more RF Subsystems operating in a trunked mode.	SO-R	SO-R
2.4.2.2 Conventional:	i	i
The ISSI shall support two or more RF Subsystems operating in conventional (i.e., non-trunked) mode.	SO-R	SO-R
2.4.2.3 Mixed mode:	i	i
The ISSI shall support two or more P25 RF Subsystems (RFSSs) where any combination of them is operating elements of the RFSS in trunked mode and any other RFSS is operating elements in conventional mode.	SO-R	SO-R
2.4.3 Networking Configurations	i	i
2.4.3.1 Support of Operational Modes	i	i
Networking configurations used to interconnect P25 RFSSs shall support operational modes listed in Section 2.4.2.	SO-R	SO-R
2.4.3.2 Point to point	i	i
In its simplest form, the ISSI is used to connect two P25 RFSSs using any of the modes listed in Section 2.4.2.	SO-R	SO-R
2.4.3.3 Multipoint	i	i
In a multipoint configuration, the ISSI is used to support two or more P25 RFSSs.	SO-R	SO-R
2.4.4 Bearer Media for Interconnection	i	i
Bearer services and/or teleservices provide interconnectivity between P25 RFSSs. The ISSI is to be capable of operation, as required by system performance, over:	i	i
2.4.4.1 Dedicated links,	SO	SO
2.4.4.2 T1, E1, Fractional T1 and Fractional E1 links and their aggregation into higher bandwidth links (e.g., SONET),	SO-R	SO-R
2.4.4.3 IP based networks (IPv4 and IPv6).	SO-R	SO-R
2.4.5 Services to be supported	i	i
2.4.5.1 Supported Services	i	i
The ISSI shall support all services specified as Mandatory and Standard Option in the current P25 SoR, the TIA P25 Systems and Standards Definition documents, and their future revisions.	SO-R	SO-R
2.4.6 Interface Requirements	i	i

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2.4.6.1 The ISSI shall consist of a control element and a traffic element.	SO-R	SO-R
2.4.7 Control Element	i	i
The Control Element shall convey messages associated with the provision of services, including, but not limited to:	i	i
2.4.7.1 The management and location tracking of subscribers,	SO-R	SO-R
2.4.7.2 The authentication of subscribers,	SO-R	SO-R
2.4.7.3 The management of the setup, maintenance, and tear down of a call, and	SO-R	SO-R
2.4.7.4 The provision of over the air control and over the air rekeying of subscriber terminals.	SO-R	SO-R
2.4.8 Traffic Element	i	i
2.4.8.1 The traffic element shall convey P25 voice and/or data traffic in both encrypted and clear formats between connected P25 RFSSs.	SO-R	SO-R
2.4.9 Operational Description	i	i
A prerequisite with ISSI interconnected systems is that operational arrangements must be established between interconnected RFSSs and data elements exchanged must be uniformly interpreted. Such arrangements might include accounting matters (such as system usage, PSTN interconnect usage), talk group correlation, etc.	i	i
2.4.10 Roaming Subscriber Management	i	i
2.4.10.1 ISSI Roaming Management	i	i
The ISSI shall support management of subscribers who roam onto ISSI-interconnected RFSSs.	SO-R	SO-R
2.4.10.2 SU Identification	i	i
The ISSI shall support home validation of units that roam to a visited RFSS.	SO-R	SO-R
2.4.10.3 SU Validation	i	i
The validation of an SU roamer is accomplished via communication from the SU's home RFSS to the visited RFSS.	SO-R	SO-R
2.4.10.4 Resource Entitlement	i	i
Resource entitlement for the validated SU roamer is accomplished via communication from the SU's home RFSS to the visited RFSS. (For example, communication of resource entitlement for services and time limits.)	SO-R	SO-R
2.4.10.5 Granting Requested Resources	i	i

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The visited RFSS may then grant the requested resources according to the SU's home resource entitlement, which may further be limited by the visited RFSS (i.e., according to the visited RFSS's resource availability or policy).	SO-R	SO-R
2.4.10.6 Temporary Duplicate "Home Data File"	i	i
Once a roamer has been validated and its resource entitlement conveyed to the visited RFSS. The visited RFSS shall maintain a temporary duplicate "home data file" in order to provide a faster grade of service. (Temporary refers to how long the data shall be maintained before it must be refreshed/updated, such as hours, days, etc. This directly impacts ISSI data link requirements.)	SO-R	SO-R
2.4.10.7 PSTN Usage	i	i
The ISSI shall support Project 25-defined telephone interconnect signaling.	SO-R	SO-R
2.4.10.8 Encryption Key Management	i	i
The ISSI shall allow transfer of P25-defined key management information across the ISSI.	SO-R	SO-R
2.4.10.9 Authorized Roamer Access in Emergency Mode	i	i
An authorized roaming subscriber shall be granted access to the visited RFSS and to the ISSI whenever an emergency button is pressed on the SU. All ensuing emergency communications from the subscriber unit shall also be sent to the home RFSS. An authorized roamer's emergency declaration and unit ID shall be recognized by the visited RFSS.	SO-R	SO-R
2.4.10.10 ISSI Support for Polling of RFSS Capabilities	i	i
Provide knowledge to a system operator that the communication services for that operator's SUs are functioning properly on another RFSS.	SO	SO
2.5 P25 Network Management Interface (NMI)	i	i
Develop a P25 NMI (E_n Interface) standard.	i	i
Any manufacturer that builds an RFSS must offer the NMI as a standard option.	SO	SO
2.5.1 Network Management	i	i
2.5.1.1 Single Management Control.	i	i

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All subsystems and associated subscriber units that compose a P25 system and/or WACN shall be able to operate under the control of a single network management scheme, regardless of manufacturer. The scope of the single network management scheme includes the five basic aspects of network management: Configuration Management, Fault Management, Security Management, Performance Management, and Accounting Management.	SO-R	SO-R
2.5.1.2 Accounting/System Usage Information	i	i
An RFSS shall be able to provide accounting/system usage information via the NMI.	SO-R	SO-R
2.5.2 Element Management	i	i
Any manufacturer that builds a managed element must offer the corresponding network management capabilities as a standard option,	SO	SO
2.5.2.1 Single Point of Entry	i	i
Management of P25 system components and software levels shall be able to be performed from a single point. This shall be accomplished in such a manner that an entry change to one database will automatically change all other associated databases without further user action.	SO-R	SO-R
2.5.2.2 Assign Limited Set of Database Fields	i	i
It shall be possible, as a standard option, for the database administrator to assign a limited set of database fields for update by one or more specified database users.	SO-R	SO-R
2.5.2.3 Multiple Data Bases	i	i
As a standard option, to be able to update a limited subset of database fields.	SO-R	SO-R
2.5.2.4 Vertical Partitioning	i	i
Overall system management shall be able to delegate vertical partitioning management to the organization responsible for the operation of the partition.	SO-R	SO-R
2.5.2.5 Roaming Restrictions	i	i
Roaming restrictions shall be established by the system manager without manual programming of SUs. This requirement is only applicable to trunked systems (SUs and infrastructure).	SO	SO

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2.6 P25 Console Subsystem Interface (CSSI)	i	i
Develop a P25 CSSI (E$_c$ Interface) standard. Define requirements for a P25 Console Subsystem Interface and not define requirements for console capabilities.	i	i
2.6.1 CSSI Applicability	i	i
2.6.1.1 CSSI Applicability to P25 Console Subsystem Manufacturers and to Users	i	i
The CSSI is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 Console Subsystem equipment and to users of P25 Console Subsystem equipment.	SO	SO
2.6.1.2 CSSI Applicability to P25 RFSS Manufacturers and to Users	i	i
The CSSI is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 RFSS equipment and to users of P25 RFSS equipment.	SO	SO
2.6.1.3 CSSI Subject to General P25 Requirements	i	i
A P25 RFSS or P25 infrastructure that supports P25 console capabilities but not by implementing the CSSI is considered to be subject to the general requirement stated in the introduction: "…2) manufacturers shall implement P25-compliant features whenever equivalent proprietary features are implemented." Manufacturers are thus required to make available to users equipment that implements the CSSI in the case that the manufacturer makes available equipment that provides P25 console capabilities that are (1) functionally integrated into that manufacturer's P25 RFSS or P25 infrastructure or (2) uses proprietary means to interconnect that manufacturer's P25 consoles with P25 Console Subsystems or with P25 Fixed Station Subsystems. For the purposes of this requirement, a P25 Console Subsystem is a P25 RFSS that provides P25 console capabilities.	SO-R	SO-R
2.6.2 General CSSI Requirements	i	i
2.6.2.1 Packet Data	i	i
The CSSI shall support the exchange of packet data between a Console and (1) Mobile Data Terminals (MDTs) (including SUs that incorporate MDT functionality), (2) RFSSs (e.g., Fixed Station Hosts), and (3) other Consoles.	SO-R	SO-R
2.6.2.2 Console Rekeying	i	i

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The CSSI shall support the remote provisioning and management of security keys via a P25 Key Management Facility (KMF).	SO-R	SO-R
2.6.2.3 Telephone Patching	i	i
The CSSI shall support telephone patching by the console.	SO-R	SO-R
2.6.2.4 Conventional/Trunking Patching	i	i
The CSSI shall support patching between and among conventional and trunking resources. This means the CSSI shall support patching of conventional resources to conventional resources, trunking resources to trunking resources, and conventional resources to trunking resources.	SO-R	SO-R
2.6.2.5 Time Synchronization	i	i
The CSSI shall support the exchange of time synchronization data (where the time synchronization error does not exceed five seconds) between consoles, where the consoles may be exchanging information via different RFSSs, different P25 Systems, or different P25 Wide Area Communication Networks (WACNs).	SO-R	SO-R
2.6.2.6 Supplementary Data Service	i	i
The CSSI shall support the exchange of messages for supplementary data service between a Console and (1) Subscriber Units, (2) RFSSs, and (3) other Consoles.	SO-R	SO-R
2.6.3 CSSI Requirements for Conventional Services	i	i
When the CSSI is used to support the exchange of information between a console and a conventional RFSS, the CSSI shall conform to the following requirements.	i	i
2.6.3.1 Conventional Services	i	i
The CSSI shall enable console support of all of the services specified in the P25 Standard Services Set (2.1.2) for the conventional mode of operation.	SO-R	SO-R
2.6.3.2 Voter Control and Status (Conventional)	i	i
The CSSI shall enable voter control by a console and reporting of voter status to a console for the conventional mode of operation.	SO-R	SO-R
2.6.3.3 Conventional Channel Status and Control	i	i

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The CSSI shall support the reporting of the status of conventional channels under the control of the console as well as the control of the conventional channel itself.	SO-R	SO-R
2.6.3.4 Traditional Services (Conventional)	i	i
The CSSI shall support the exchange of information supporting traditional (i.e., legacy) communications capabilities between consoles and conventional channels.	SO-R	SO-R
2.6.3.5 Received NAC Code	i	i
The CSSI shall provide the NAC code associated with a received conventional call.	SO-R	SO-R
2.6.3.6 Transmit NAC Code	i	i
The CSSI shall support the console's ability to select the NAC for its voice transmissions.	SO-R	SO-R
2.6.3.7 Mode of Received Call	i	i
The CSSI shall provide the RF mode for received calls – digital or analog.	SO-R	SO-R
2.6.4 CSSI Requirements for Trunked Services	i	i
When the CSSI is used to support the exchange of information between a console and a trunked RFSS, the CSSI shall conform to the following requirements.	i	i
2.6.4.1 Trunked Services	i	i
The CSSI shall enable console support of all of the services specified in the P25 Standard Services Set (2.1.2) for the trunked mode of operation.	SO-R	SO-R
2.6.5 CSSI Requirements for Mixed Mode Services	i	i
When the CSSI is used to support the exchange of information between a console and an RFSS operating in a mixed services mode (i.e., the RFSS supports both trunked and conventional services), the CSSI shall conform to the following requirements.	i	i
2.6.5.1 Mixed Mode Services	i	i
In the mixed mode (both conventional and trunked mode of operation), the CSSI shall support services consistent with CSSI support of the trunked mode and conventional mode of operation. The services supported are based on the console's provisioning.	SO-R	SO-R
2.6.6 CSSI Requirements Applicable to both Trunking and Conventional	i	i

Project 25 Statement of Requirements (December 11, 2013)	Phase 1, 12.5 kHz, FDMA	Phase 2, 12.5 kHz TDMA
The following requirements apply to both trunking and conventional resources.	i	i
2.6.6.1 Unit IDs	i	i
The CSSI shall provide the source unit ID for received digital calls.	SO-R	SO-R
2.6.6.2 Group Calls	i	i
The CSSI shall support the console's ability to send and receive group calls.	SO-R	SO-R
2.6.6.3 Outbound Talk Group Selection	i	i
The CSSI shall support the console's ability to select the talk group for its voice transmissions.	SO-R	SO-R
2.6.6.4 Received Talk Group	i	i
The CSSI shall provide the Talk Group associated with a received call.	SO-R	SO-R
2.6.6.5 Unit to Unit Calls	i	i
The CSSI shall support the console's ability to send and receive unit-to-unit calls.	SO-R	SO-R
2.6.6.6 Call Alert	i	i
The CSSI shall support the Call Alert feature to and from the console subsystem.	SO-R	SO-R
2.6.6.7 Emergency Alarm	i	i
The CSSI shall support the transport of Emergency Alarm messages to the console subsystem.	SO-R	SO-R
2.6.6.8 Emergency Call	i	i
The CSSI shall support the transport of Emergency Call messages to and from the console subsystem.	SO-R	SO-R
2.6.6.9 Encryption Mode for Received Calls	i	i
The CSSI shall provide the encryption mode for received calls – encrypted or clear.	SO-R	SO-R
2.6.6.10 Arbitration between Multiple Console Transmit Requests	i	i
The CSSI shall enable the arbitration between simultaneous console transmission requests.	SO-R	SO-R
2.6.6.11 Parallel Console Audio	i	i
The CSSI shall enable a console to hear other consoles transmit audio when the other console transmits on a resource the console is also utilizing.	SO-R	SO-R

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2.6.6.12 Encryption	i	i
The CSSI shall support encrypted calls to and from the console subsystem.	SO-R	SO-R
2.6.6.13 Vocoding for Patch	i	i
The CSSI shall support patching of "like-vocoder" resources without needing to revert to base-band before completing the patch.	SO-R	SO-R
2.6.7 Miscellaneous CSSI Requirements	i	i
2.6.7.1 Detection of Failure Conditions	i	i
The CSSI shall support the exchange of information supporting detection and reporting of communication failures between a console and a RFSS, including the state of the CSSI to the rest of the system.	SO-R	SO-R
2.6.7.2 Reporting of System Failure Conditions	i	i
The CSSI shall support the exchange of information for reporting to the console any system failure that affects normal console operation.	SO-R	SO-R
2.6.7.3 GPS/AVL	i	i
The CSSI shall support the transport of GPS/AVL information.	SO-R	SO-R
2.6.7.4 Location	i	i
The CSSI shall support the ability of the console to request location information.	SO-R	SO-R
2.6.7.5 Text Messaging	i	i
The CSSI shall support the transport of text messaging information to and from the console subsystem.	SO-R	SO-R
2.6.7.6 Transport Layer	i	i
The CSSI shall support unicast operation. The CSSI may support multicast operation.	SO-R	SO-R
2.6.7.7 Digital DTMF	i	i
The CSSI shall transport digital DTMF messages to and from the console subsystem. Digital DTMF refers to messages which indicate which DTMF digit was received or should be transmitted.	SO-R	SO-R
2.7 P25 Fixed/Base Station Subsystem Interface (FSSI)	i	i

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Develop a P25 Fixed/Base Station (including Repeater) Subsystem Interface (E_f Interface) standard supporting P25 conventional voice and data services. The FSSI, written "FSI" in abbreviated form, will be defined in terms of specialized FSSI interfaces. The requirements of this section are defined in terms of a Conventional Fixed Station Interface (CFSI) and a Trunked Fixed Station Interface (TFSI). A CFSI is the interface between a fixed/base station (including repeater), written "fixed station" in abbreviated form, which is a functional component of a Fixed/Base Station (including Repeater) Subsystem, and a Conventional Fixed Station Host (CFSH). A CFSH is a functional component of either an RF Subsystem (RFSS) or a Console Subsystem. A fixed station may be one of two types: an "analog fixed station" or a "digital fixed station". An "analog fixed station" supports conventional FM RF resources or their equivalent. A conventional "digital fixed station" supports the P25 Common Air Interface. The CFSI takes one of two forms – a basic analog interface and an enhanced IP-based digital interface. Requirements for the TFSI are not to be developed because the FSSI as currently standardized cannot support trunked voice service.	i	i
The FSSI is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 Fixed/Base Station Subsystem equipment, P25 Console Subsystem equipment, or P25 RFSS equipment and to users of P25 Fixed/Base Station Subsystem equipment, P25 Console Subsystem equipment, or P25 RFSS equipment.	SO	SO
2.7.1 Conventional Analog Fixed Station Interface (CAFSI)	i	i
The CAFSI shall provide the following functions:	i	i
2.7.1.1 Transport of Clear Audio	i	i
Transport of clear audio between a fixed station and its host, providing capabilities for full-duplex, half-duplex and simplex communications at the discretion of the fixed station.	SO	i
2.7.1.2 Transport of E&M Control Signaling	i	i
Transport of E&M control signaling between a fixed station and its host to provide a simple "Push-to-talk" and "Carrier On Relay" capability. The intent of this requirement is that the FSSI support E & M interfaces used in legacy, pre-P25 analog fixed stations.	SO	i
2.7.1.3 Tone Remote Control (TRC) control signaling from a host to a fixed station to provide a variety of control functions. The intent of this requirement is that the CAFSI support TRC interfaces used in legacy, pre-P25 analog fixed stations. The TRC control shall include:	i	i

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a) For airlinks supporting conventional FM operation, transmit channel control, squelch control, monitor control, and analog/digital mode control (if the fixed station also supports P25 digital (CAI) conventional operation). b) For airlinks supporting conventional P25 digital (CAI) operation, transmit channel control, squelch control, monitor control, clear/secure controls, and analog/digital mode control (if the fixed station also supports analog conventional operation).	SO	i
2.7.1.4 Intercom Capability	i	i
An intercom capability allowing for the transport of audio between the fixed station and its host without initiating an RF transmission.	SO	i
2.7.1.5 Airlinks Supported (FM Operation)	i	i
Conventional FM operation.	SO	i
2.7.1.6 Airlinks Supported (P25 Digital (CAI) Operation)	i	i
Conventional P25 digital (CAI) operation.	SO	i
2.7.2 Conventional Digital Fixed Station Interface (CDFSI)	i	i
The CDFSI shall provide:	i	i
2.7.2.1 IP-Based Capabilities	i	i
IP-based capabilities equivalent to those capabilities provided via the CAFSI when the digital fixed station is operating in analog mode.	SO-R	i
2.7.2.2 Transport of Encrypted Audio	i	i
Transport of encrypted audio between a digital fixed station and its host.	SO-R	i
2.7.2.3 Transport of Caller-ID Information	i	i
Transport of Caller-ID information between a digital fixed station and its host. This includes Unit ID from field units to consoles and from consoles to field units.	SO-R	i
2.7.2.4 Transport of Talk-group Information	i	i
Transport of Talk-group information between a digital fixed station and its host.	SO-R	i
2.7.2.5 Transport of NAC Code Information	i	i
Reliable transport of NAC code information between a digital fixed station and its host, enabling a host console to select outgoing and display incoming Privacy Codes when the air interface is digital.	SO-R	i

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2.7.2.6 Transport of CTCSS/DCS Information	i	i
Reliable transport of CTCSS/DCS code information between a fixed station and its host, enabling a host console to select outgoing and display incoming Privacy Codes when the air interface is analog.	SO	i
2.7.2.7 Transport of Emergency Alarm	i	i
Transport of Emergency Alarm and conventional control messages from the digital fixed station to its host.	SO-R	i
2.7.2.8 Transport of Emergency Indications	i	i
Transport of Emergency Indications from the digital fixed station to its host.	SO-R	i
2.7.2.9 Transport of Received Voter Identification	i	i
Transport of Received Voter Identification from the digital fixed station to its host.	SO	i
2.7.2.10 Advanced Control of the Fixed Station – Frequency of Operation	i	i
The CDFSI shall enable remote control of a conventional Fixed Station's operation for the frequency of operation.	SO-R	i
2.7.2.11 Advanced Control of the Fixed Station – Repeating Voice	i	i
The CDFSI shall enable remote control of a conventional Fixed Station's operation for repeating or not repeating in-bound voice on the outbound CAI.	SO-R	i
2.7.2.12 Advanced Control of the Fixed Station – Receiver Squelch	i	i
The CDFSI shall enable remote control of a conventional Fixed Station's operation for disabling or re-enabling the receiver squelch.	SO-R	i
2.7.2.13 Intercom Audio	i	i
Transport intercom audio to and from the fixed station location.	SO	SO
2.7.2.14 Ethernet 100 Base-T	i	i
CDFSI equipment shall offer the option of Ethernet 100 Base-T with a RJ-45 connector as the physical and data link layers.	SO	SO
2.7.2.15 Other CDFSI Physical and Data Link Connectivity	i	i
In addition to Ethernet 100 Base-T, DFSI equipment may offer any industry standard physical and link layer protocols that support the internet protocol.	SO	SO
2.7.3 Trunked FSSI	i	i

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Requirements for a Trunked Fixed Station Interface (TFSI) are not to be developed.	i	i
2.8 P25 Wireless/Mobile Console Interface (B Interface)	i	i
Standardize an open wireless/mobile console interface (the P25 "B" Interface) that provides dispatchers with access to a P25 conventional or trunked system via control stations such as P25 advanced SUs for situations where connectivity via the CSSI or FSSI is not practical (e.g., mobile tactical communications van). Such an interface supports greater dispatching functionality than can be achieved by a normal SU. The B Interface supports the transfer of P25-standardized voice, data, and control messages between a P25 SU or P25 stand-alone Fixed Station and a P25 Consolette. A P25 Consolette is a console with limited functionality for wireless and possibly mobile (including roaming) use by dispatchers. (Note: the P25 CAI may be modified to support additional message types to support the required P25 Consolette functionality.)	i	i
2.8.1 B Interface and Wireless/Mobile Console Enhanced P25 CAI Applicability	i	i
2.8.1.1 B Interface Applicability to P25 Consolette Manufacturers and to Users	i	i
The P25 Wireless/Mobile Console Interface (B Interface) is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 Consolette equipment and to users of P25 Consolette equipment.	SO	SO
2.8.1.2 B Interface Applicability to P25 SU and Stand-Alone Fixed Station Manufacturers and Users	i	i
The P25 Wireless/Mobile Console Interface (B Interface) is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 SU and stand-alone Fixed Station equipment, and to users of P25 SU and stand-alone Fixed Station equipment.	SO	SO
2.8.1.3 Wireless/Mobile Console Enhanced P25 CAI Applicability to P25 SU and Stand-Alone Fixed Station Manufacturers and to Users	i	i
The support of wireless/mobile console enhanced P25 CAI messaging required for P25 Consolette use is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 SU and stand-alone Fixed Station equipment, and to users of P25 SU and stand-alone Fixed Station equipment.	SO	SO
2.8.1.4 Wireless/Mobile Console Enhanced P25 CAI Applicability to P25 RFSS Manufacturers and to Users	i	i
The support of wireless/mobile console enhanced P25 CAI messaging required for P25 Consolette use is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 RFSS equipment, including P25 Console Subsystem and Fixed/base station equipment, and to users of P25 RFSS equipment, including P25 Console Subsystem and Fixed/base Station equipment.	SO	SO

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2.8.2 General B Interface Requirements	i	i
The B Interface is defined as open, wireline-based P25 interface between a P25 advanced SU or stand-alone Fixed Station and the P25 Consolette.	i	i
2.8.2.1 B Interface Media	i	i
It is desirable that the B Interface be Ethernet, IP-based similar to the Digital FSI, conveying similar information in a similar or the same manner.	SO-R	SO-R
2.8.3 The B Interface shall support features normally associated with SUs, including the following:	i	i
2.8.3.1 Selecting channels and talk groups;	SO-R	SO-R
2.8.3.2 Sending and receiving group calls in clear and encrypted modes;	SO-R	SO-R
2.8.3.3 Sending and receiving individual calls in clear and encrypted modes;	SO-R	SO-R
2.8.3.4 Conveying PTT IDs and Talk Group IDs;	SO-R	SO-R
2.8.3.5 Sending Emergency Alert and Status Update messages;	SO-R	SO-R
2.8.3.6 Responding to Unit Status Request, Radio Check, and Radio Monitor messages;	SO-R	SO-R
2.8.3.7 Receiving Call Alert and Radio Inhibit/Uninhibit messages;	SO-R	SO-R
2.8.3.8 Sending and receiving data messages;	SO-R	SO-R
2.8.3.9 Sending Telephone Dialing.	SO-R	SO-R
2.8.4 Extended Features Supported by the B Interface	i	i
The B Interface shall also support the following extended dispatch-oriented features in both the conventional and trunking modes:	i	i
2.8.4.1 Conveying received NAC and Talk Group information and/or the ability for the consolette to configure on-the-fly the SU's receive and transmit NAC/Talk Group information;	SO-R	SO-R
2.8.4.2 Receiving Emergency Alert, Emergency Call, Silent Emergency;	SO-R	SO-R
2.8.4.3 Sending Unit Status Request;	SO-R	SO-R
2.8.4.4 Sending Call Alert, Radio Inhibit/Uninhibit, Radio Check, and Radio Monitor;	SO-R	SO-R
2.8.4.5 Initiation of audible signaling (i.e., ability to transmit undistorted (out-of-band) alert tones and priority marker tones);	SO-R	SO-R

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2.8.4.6 Ability to transmit Broadcast and Unaddressed voice calls;	SO-R	SO-R
2.8.4.7 Discreet Listening;	SO-R	SO-R
2.8.4.8 SU/Consolette priority (i.e., higher network access priority than non-consolette connected SUs);	SO-R	SO-R
2.8.4.9 Preemptive Call and Dispatcher Interrupt (Call Interrupt);	SO-R	SO-R
2.8.4.10 Dynamic Regrouping.	SO	SO
2.8.5 Audio Conveyance	i	i
It is desirable that the audio for the P25 Consolette be available as digital audio.	i	i
2.8.5.1 The digital audio stream shall result from use of a P25-specified vocoder for P25 CAI digital radio transmissions to permit tactical patching without transcoding.	SO-R	SO-R
2.8.5.2 The analog audio stream shall be PCM for FM analog radio transmissions.	SO-R	SO-R
3.0 P25 System Overview	i	i
3.1 General Project 25 Requirements	i	i
3.1.1 Spectral Efficiency	i	i
3.1.1.1 Improved spectrum efficiency	i	i
The system shall offer channel utilization that immediately improves spectrum efficiency by at least two (2) times[2] over current analog systems, with a goal of an increase in improvement to at least four (4) times as technology continues to develop.	M	i
3.1.1.2 Maintained Site Location of Subscriber Units	i	i
The site (or simulcast RF subsystem) location of all subscriber units, including authorized roamers, will be maintained in a site location registry.	SO	M

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[2] Public Safety Frequencies 821-824/866-869 MHz presently use enhanced 25 kHz channel equipment together with a 12.5 kHz / 25 kHz regional coordination plan tied to minimum spacing between base stations. In this instance, the improvement in spectrum efficiency with 12.5 kHz digital channels will be approximately 1.3 times.

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3.1.1.3 Efficient Use of RF Resources	i	i
Calls shall not require resources at sites that do not contain addressed subscriber units (except simulcast RF subsystems).	i	i
The requirements in 3.1.1.3 apply to trunked systems.	SO	SO-R
The requirements in 3.1.1.3 apply to conventional systems. Note: A requirement level will be specified if and when available technology permits P25-standardized operation of this feature for conventional systems.	i	i
3.1.1.4 Channel Allocation Based on Unit Site Presence	i	i
The system shall allocate channels at sites based upon subscriber units present that need to receive a given message.	SO	M
3.1.1.5 FCC/NTIA rules for spectral efficiency shall be satisfied.	M	M
3.1.1.6 Call Prioritization (Priority Call)	i	i
The system will prioritize call requests.	SO	SO
3.1.2 Channelization	i	i
3.1.2.1 Support existing Channelization plans	i	i
FCC/NTIA channelization plans shall be supported.	M	M
3.1.2.2 Co-Existence with P25 Phase 1 and Analog (Phase 0)	i	i
The P25 system shall be able to co-exist with Phase 1 and with older analog systems, share the same segments of allocated RF spectrum and provide little interference to existing adjacent-channel systems as well as work properly.	M	M
3.1.2.3 Adaptive to All Public Safety Bands	i	i
The system shall minimally be equally adaptive to all Public Safety mobile radio frequency bands and blocks of spectrum, without precluding its adapting to other land mobile bands.	M	M
3.1.2.4 LMRS Frequency Bands	i	i
Fixed station and subscriber equipment transmitters and receivers shall be capable of being programmed to operate over the entire range of one or more land mobile radio service (LMRS) frequency bands. Operational performance is desired to be without degradation over the band. LMRS Frequency Bands include the following:	M	M
3.1.2.5 VHF Band	i	i

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	138 - 174 MHz	i	i
3.1.2.6	UHF Band	i	i
	380 - 512 MHz	i	i
3.1.2.7	700/800 MHz Band	i	i
	764 - 869 MHz	i	i
3.1.2.8	Co-Channel Operation	i	i
	The system shall be designed to be resistant to interference from co-channel, adjacent-channel, and intermodulation effects, in a manner similar to Continuous Tone-Controlled Squelch System (CTCSS) used in analog systems.	M	M
3.1.2.9	Out of Channel Emissions	i	i
	The out-of-channel emissions of any future Project 25 standard for 25 kHz channel width or less shall be at least as spectrally pure as the out of channel emissions of the Project 25 Phase 1 FDMA Standard.	i	M
3.1.2.10	TDMA Operation	i	i
	Fixed station and subscriber equipment shall be capable of operating in a TDMA access method, where the minimum number of communication time slots is either two (2) for a 12.5 kHz bandwidth channel, or four (4) for a 25 kHz bandwidth channel.	i	M
3.1.2.11	Duplex time Slot Operation	i	i
	Fixed station equipment shall be capable of operating in a duplex time slot mode on a single carrier frequency.	i	SO
3.1.2.12	Dynamic Allocation of Channel Bandwidth for Data	i	i
	Transmission of digital data may use dynamic allocation of channel bandwidth, up to the maximum possible for a particular channel width.	i	i
3.1.3	Roaming Functions of SUs and Mobiles within and among P25 Systems	i	i
3.1.3.1	Roaming With Automatic Registration and Authorization (Intra-RFSS)	i	i
	Mobiles and portables (i.e., SUs) will be able to roam over a wide area with automatic connection (i.e., automatic registration and authorization) as the SU roams into a new RF site within the same RFSS.	i	i
	The requirements in 3.1.3.1 apply to trunked systems.	SO-R	SO-R

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The requirements in 3.1.3.1 apply to conventional systems. Note: A requirement level will be specified if and when available technology permits P25-standardized operation of this feature for conventional systems.	i	i
3.1.3.2 Roaming With Manual Registration and Authorization (Inter-RFSS)	i	i
Mobiles and portables (i.e., SUs) shall be able to roam over a wide area with manual connection (i.e., manual registration and authorization) as the SU roams into a new RF site in a different RFSS.	i	i
The requirements in 3.1.3.2 apply to trunked systems.	SO-R	SO-R
The requirements in 3.1.3.2 apply to conventional systems. Note: A requirement level will be specified if and when available technology permits P25-standardized operation of this feature for conventional systems.	i	i
3.1.3.3 Roaming With Automatic Registration and Authorization (Inter-RFSS)	i	i
Mobiles and portables (i.e., SUs) will be able to roam over a wide area with automatic connection (i.e., automatic registration and authorization) as the SU roams into a new RF site in a different RFSS. The new RF site may be located in an RFSS in the same or different P25 system or same or different P25 WACN.	i	i
The requirements in 3.1.3.3 apply to trunked systems.	SO-R	SO-R
The requirements in 3.1.3.3 apply to conventional systems. Note: A requirement level will be specified if and when available technology permits P25-standardized operation of this feature for conventional systems.	i	i
3.1.3.4 Restrictions to Optimize Roaming Decisions	i	i
SUs shall incorporate unit and talk group restrictions to optimize their roaming decisions. This requirement is only applicable to trunked systems (SUs and infrastructure).	SO	SO
3.1.3.5 Roaming for Interagency Assistance	i	i
Systems shall support authorized roamers from compatible digital systems for interagency assistance.	i	i
3.1.3.6 Affiliation	i	i
Ability for users to affiliate with a talk group.	i	i
The requirements in 3.1.3.6 apply to trunked systems.	SO-R	SO-R

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The requirements in 3.1.3.6 apply to conventional systems. Note: A requirement level will be specified if and when available technology permits P25-standardized operation of this feature for conventional systems.	i	i
3.1.3.7 Registration	i	i
SUs shall be able to connect themselves (i.e., "register") to an RFSS.	i	i
The requirements in 3.1.3.7 apply to trunked systems.	SO-R	SO-R
The requirements in 3.1.3.7 apply to conventional systems. Note: A requirement level will be specified if and when available technology permits P25-standardized operation of this feature for conventional systems.	i	i
3.1.3.8 De-registration	i	i
SUs shall be able to disconnect themselves (i.e., "de-register") from an RFSS.	i	i
The requirements in 3.1.3.8 apply to trunked systems.	SO-R	SO-R
The requirements in 3.1.3.8 apply to conventional systems. Note: A requirement level will be specified if and when available technology permits P25-standardized operation of this feature for conventional systems.	i	i
3.1.3.9 Location Registration	i	i
A registered and authorized SU that roams to access a new RF site in the same or different location registration area shall be capable of automatically requesting that the RFSS update its registration information to enable the RFSS to track the SU's current location (i.e., the current location registration area and the current RF site being access by the SU).	i	i
The requirements in 3.1.3.9 apply to trunked systems.	SO-R	SO-R
The requirements in 3.1.3.9 apply to conventional systems. Note: A requirement level will be specified if and when available technology permits P25-standardized operation of this feature for conventional systems.	i	i
3.2 System Configuration Aspects	i	i
3.2.1 System Architectures	i	i
3.2.1.1 Multiple System Configurations Capability	i	i
The system or subsystem shall be technically flexible to allow for single and multiple site systems, voting, and simulcast designs.	M	M

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3.2.1.2 Single Station Sites	i	i
The system shall enable single RF sites to implement single channel trunking.	SO	SO
3.2.1.3 Station Use Efficiency	i	i
Any individual site need only deploy as many stations as necessary except in RF simulcast subsystems.	i	i
3.2.1.4 Orderly System Expansion	i	i
The system shall allow for continued enhancement of standardized functions and features so that the system can grow with user needs.	i	i
3.2.1.5 Manufacturer-specific Features	i	i
Further, a standard method shall be specified for segmenting nonstandard (or potentially future-standard), value-added features between manufacturers to safeguard from unintentional interaction between subscriber units of different manufacturer's subsystems. No manufacturer proprietary extensions shall implement features that interfere with the operation of P25-compliant equipment. Manufacturers shall implement P25-compliant features whenever equivalent proprietary features are implemented.	M	M
3.2.1.6 Full Duplex Operation	i	i
The system design will accommodate full duplex operation.	i	SO
3.2.1.7 Graceful Trunked Operation Degradation	i	i
3.2.1.7.1 The system shall provide graceful degradation that the SU can react appropriately, as infrastructure failures occur.	M	M
3.2.1.7.2 A degradation or fallback mode that requires mitigating behavior by the SU shall be signaled to the SU.	M	M
The following types of degradation shall be signaled by systems that feature them: The degraded modes available on a system depend on that system's design. The following modes are common fallback modes. Where they are offered the standardized method of signaling those fallback modes shall be used. System designers may satisfy the requirement for graceful degradation with fallback modes that do not require mitigation by subscriber units and would therefore not require signaling.	i	i

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3.2.1.7.3 Single site mode. Multi-site systems that offer single site operation as a fallback mode shall signal the SU when they are in this mode. A site signaling this degradation will have lost contact with the rest of the network. Only communication with other SUs served by the same site will be possible. An SU may attempt to gain service from a better connected site.	M	M
3.2.1.7.4 Conventional fallback. Trunked systems that offer conventional operation as a fallback mode shall signal the SU when they are in this mode. A system signaling this degradation will be unable to provide trunked voice service but does have available one or more conventional repeaters. Only communication with other SUs falling back to the same conventional repeater will be possible. An SU may attempt to gain service from another site or system. Alternatively an SU may use the services of the available conventional repeater.	SO	SO
P25 features that allow control of subscriber unit configuration by elements of the fixed equipment include: • Dynamic regroup (2.1.2.15 & 2.1.2.16) • Over the Air Programming (3.2.7) • Radio inhibit/uninhibit (3.3.5.10) • Over the Air Re-key (4.1.5.3) During times of degradation these features shall be handled in a standard, consistent manner that will be documented in the relevant procedures document. All subscriber units affected by a degradation incident shall follow common state changes with respect to these features. For example, if dynamic regroup is active at the time a site goes into a single site mode, it is not acceptable for some units to remain re-grouped while others drop back to their default group. If there is a drop back to default grouping, all regrouped SUs shall drop back at the same time.	i	i
3.2.2 System Connectivity	i	i
3.2.2.1 System Connectivity	i	i
Multiple RFSSs shall be combinable into larger wide-area systems using the ISSI described in Section 2.4.	M	M
3.2.3 ID Structures	i	i
3.2.3.1 RFSSs	i	i
Up to 64,000 different RFSSs shall be uniquely identifiable.	M	M
3.2.3.2 Talk Groups/SUs	i	i

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	Each RFSS shall provide for at least 2,000 uniquely identifiable functional talk groups or vertical partitions for distinct and separate organizations and at least 48,000 individually identifiable subscriber units (SUs) per RFSS.	M	M
3.2.3.3	Unit Hierarchical Numbering	i	i
	Through hierarchical numbering, individual subscriber units and talk-groups from any radio subsystem are uniquely identifiable in any radio subsystem in concert with their home RFSS identification (similar to hierarchical telephone numbers and area codes).	M	M
3.2.3.4	Automated Radio Identification (ID) Assignment	i	i
	The system shall have an automated method of assigning radio identification (ID) numbers to consoles, control stations, and mobile and portable subscribers as part of the system management network system database.	SO	SO
3.2.3.5	Phase 1 / Phase 2 ID Structure	i	i
	Where P25 TDMA and FDMA systems are interconnected, it is desirable that all system and subscriber equipment IDs (Talkgroup, Unit, etc) be aligned with the Project 25 ID coding format to facilitate inter-system interoperability.	i	i
3.2.3.6	Assignment of Unique IDs	i	i
	All manufacturers of Project 25 compliant systems shall use the Project 25 Guidelines to assign Wide Area Communications Network (WACN) and System Identification (IDs) when establishing WACNs and System IDs.	M	M
3.2.4	Throughput Delay	i	i
	Throughput Delay defined as the mouth-to-ear transfer delay of voice information involving a calling SU and a called SU, respectively, shall be as follows:	i	i
3.2.4.1	Direct mode Throughput Delay	i	i
	Less than 250 msec in direct radio-to-radio communications.	M	M
3.2.4.2	Conventional Repeater Mode Throughput Delay	i	i
	Less than 350 msec in radio-to-radio communications through a single conventional repeater.	M	M
3.2.4.3	Single RFSS Throughput Delay	i	i
	Less than 500 msec in radio-to-radio communications involving a single RF subsystem. This requirement does not apply to conventional repeater chains (i.e., when two or more conventional repeaters are serially interconnected within a single RFSS).	M	M

Project 25 Statement of Requirements (December 11, 2013)	Phase 1, 12.5 kHz, FDMA	Phase 2, 12.5 kHz TDMA
3.2.4.4 Multiple RFSS Throughput Delay	i	i
Less than 1000 msec in radio-to-radio communications involving two or more RF subsystems.	M	M
3.2.5 Direct Modes of Communications	i	i
3.2.5.1 Direct Mode	i	i
The system shall allow direct mobile-to-mobile communication at any time without degrading normal system performance.	M	M
3.2.6 Use of Standard Signaling	i	i
3.2.6.1 Call Processing Intelligence	i	i
RFSSs will contain all the control intelligence to support call processing and track unit location and roamers within the RFSS.	SO	M
3.2.6.2 Standard Signaling and Communications Interfaces	i	i
RFSSs shall support standard signaling and communications interfaces to be flexibly linked into wide-area networks via private or public networks.	M	M
3.2.6.3 Common Protocols and Coding Formats	i	i
To facilitate interoperable P25 CAI multi-mode (FDMA/TDMA) system design, it is desirable that all system and subscriber equipment use common (P25 defined) call setup/link protocols and ID coding formats.	i	i
3.2.6.4 Secure Trunking Control Channel	i	i
Security for the trunking control channel will be provided. Security services to be provided for the control channel include confidentiality and message replay protection. Encryption shall be the mechanism used when implementing these security services.	SO	SO
3.2.7 Over-The-Air-Programming (OTAP)	i	i
3.2.7.1 Software Changes	i	i
The system shall have OTAP capabilities to enable making software changes to mobile and portable subscriber units. This feature applies to both trunking and conventional systems.	SO	SO
3.2.7.2 Radio User Interface and Personality Profile	i	i
OTAP features shall include the radio user interface, scan list, telephone lists, groups, network access codes, wide area communications networks, etc., not to exclude any other parameters.	SO-R	SO-R

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3.2.7.3	Service Programming	i	i
	Capabilities shall include service programming, the operational parameters, including such parameters as power output and frequency, not to exclude other parameters.	SO-R	SO-R
3.2.7.4	Software Version Upgrade	i	i
	Capabilities shall include upgrading new software versions of the radio operating system, adding new features, fixing bugs, pushing security patches, etc., not to exclude any other parameters.	SO	SO
3.2.7.5	Standardized OTAP Interface	i	i
	OTAP shall be standardized such that a P25 OTAP application can OTAP all authorized P25 radios, regardless of manufacturer, supported on its network.	SO-R	SO-R
3.2.7.6	Security	i	i
	OTAP messages shall be encrypted with a FIPS-approved encryption algorithm to provide confidentiality for message contents. In addition, the following security services shall be applied to OTAP messages: authentication, integrity, and replay protection.	SO-R	SO-R
3.2.7.7	Spectrum Utilization Management	i	i
	Spectrum utilization shall be effectively managed, including the capability to limit the airtime traffic to the software or software parameters that are being updated to minimize both latency and use of air time. Other mechanisms, programmable by the system administrator, could include broadcast, scheduled updates (e.g. send downloads during off-peak hours), etc.	SO-R	SO-R
3.2.7.8	Prioritization and Availability	i	i
	The system administrator shall be provided the capability to prioritize OTAP relative to voice and data communications with the exception of an emergency call, which shall always be given a higher priority. The radio will continue to operate normally during the OTAP process.	SO-R	SO-R
3.2.7.9	Software Changeover	i	i

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If the switchover process may hinder voice operations, the subscriber units shall switch over to using downloaded software only upon manual acceptance by the user or upon a power reset. If there is no impact to voice operations, the subscriber unit shall switchover to the new software upon manual acceptance, a power reset, or if programmed by the system administrator. The radio shall be able to fallback to the pre-downloaded version if instructed.	SO-R	SO-R
3.2.7.10 Authentication	i	i
An authentication mechanism, with replay protection, shall be used to ensure software downloads are from authorized system administrators only.	SO-R	SO-R
3.2.7.11 No Encryption Impact	i	i
OTAP shall not change the radio's encryption key.	SO-R	SO-R
3.2.7.12 Infrastructure Audit Trail	i	i
The infrastructure shall maintain a log of all changes made, including who made the changes.	SO-R	SO-R
3.2.7.13 OTAP Acknowledgement	i	i
A mechanism shall be used to confirm the successful receipt of an OTAP download.	SO-R	SO-R
3.3 Support Audible Signaling	i	i
Support audible signaling to and from subscriber units for functions as described below	i	i
3.3.1 General	i	i
Because of the inability to faithfully pass audio signaling through some vocoders, radios/systems may use data messages that cause the receiving unit to generate standardized tone signals. These standardized tone signals correspond to a specific signaling command. Audible signals use data messages in the system to initiate audible signals both in the subscriber units and also in the consoles.	i	i
3.3.1.1 Configuration	i	i
Users shall be able to select no audible signaling, or any or all of the default types of signaling required in Section 3.3.2.	M	M
3.3.1.2 Configuration Subject to Personality Programming	i	i
Users may require alternative signals that are subject to personality programming in the subscriber unit and/or in the console.	SO	SO

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3.3.2 Operational or Systemic	i	i
Audible signals may be operational or system in nature.	i	i
3.3.2.1 Operational Signals (Default)	i	i
Default audible signaling shall be limited to four standardized signals:	M	M
3.3.2.2 Emergency	i	i
Emergency indicates the highest level of a declared emergency.	i	i
3.3.2.2.1 The Emergency audible indication shall consist of a complex signal comprised of sequential pulsed 600 Hz and 1800 Hz sinusoidal tone signals.	M	M
3.3.2.2.2 The signal volume shall ramp from barely audible to maximum set equipment volume over a nominal two-second period.	M	M
3.3.2.2.3 The Emergency alarm shall be initiated by the operation of a momentary switch at the subscriber unit and may also be initiated by a console. It shall terminate after sending for a nominal two seconds regardless of how long the operator holds the switch.	M	M
3.3.2.2.4 Receipt of an Emergency alarm at a console shall cause a latch up output for operation of external alarms. The console operator shall be able to release this latch.	M	M
3.3.2.2.5 A receiving terminal unit shall continue to emit periodic Emergency signals until any digital control on the radio is operated. A receiving console unit shall continue to emit a periodic emergency signal until a series of reset tasks are completed on the console. The emergency audible indication volume on the console shall be turned off or muted by a single button, but the emergency information displayed on the console shall remain until the emergency is reset.	M	M
3.3.2.2.6 The Emergency alert without registration feature enables the FNE to accept an emergency alarm from a user in distress, prior to registration and/or authentication with the target system. The SU then proceeds with the normal registration and/or authentication procedure. The system operator has the ability to disable this service if emergency alerts by unregistered or unauthenticated SUs are not desired.	M	M
3.3.2.2.7 By depressing a "clear" button on the SU, a user can cancel an emergency. For emergency alert, only the SU that initiated the emergency alert is allowed to cancel the emergency alert. In addition, the SU's ID must be considered valid by the infrastructure.	M	M
3.3.2.3 Acknowledge	i	i

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3.3.2.3.1 Acknowledge indicates an operator-designated affirmation of a request. This signal allows acknowledgment of a request without speaking.	M	M
3.3.2.3.2 The acknowledge audible indication shall consist of a single, nominal 250 msec pulse of 500 Hz sinusoidal tone signal followed immediately by a single, nominal 250 msec pulse of 1500 Hz sinusoidal tone signal.	M	M
3.3.2.3.3 The acknowledge tone signal level shall be 10dB below the volume control voice level. The total signal duration time shall be nominally 500 ms.	M	M
3.3.2.3.4 Acknowledge is initiated by the subscriber unit.	M	M
3.3.2.4 Message Audible Indication	i	i
Message Audible Indication indicates that attention is needed to the message that follows.	i	i
3.3.2.4.1 A 1004 Hz sinusoidal tone pulsed on for 250 msec followed by 250 msec of no tone, followed by another pulse of 1004 Hz sinusoidal tone for 250 msec.	M	M
3.3.2.4.2 The console operator shall initiate the Message Audible Indication by initiating a momentary function or switch. The Message Audible Indication tone shall continue in a repeating cycle until the operator releases the momentary function or switch.	M	M
3.3.2.5 Channel Marker	i	i
3.3.2.5.1 Channel Marker is an indication placed periodically on a talk channel that indicates to new arrivals that the channel is in use. Allows someone coming onto the channel late to know that the channel is in use even when speech is not present. The Channel Marker audible signal shall consist of:	M	M
3.3.2.5.2 An 800 Hz sinusoidal signal pulsed signal held on for 250 msec followed by 10 msec of no signal followed by another pulse of 800 Hz sinusoidal signal for 250 msec.	M	M
3.3.2.5.3 The Channel Marker signal shall continue to be repeated at system-defined intervals until cancelled by the console operator.	M	M
3.3.2.5.4 The console operator shall initiate the Channel Marker.	M	M
3.3.2.5.5 The Channel Marker signal shall be 10 dB below the volume control voice level.	M	M
3.3.2.5.6 In trunked applications, a new arrival on the talkgroup shall be immediately notified of channel priority use by the channel marker function whenever the receiving radio is capable of immediately transmitting on the marked talkgroup.	M	M
3.3.3 Operational Signals (Personality Programmed)	i	i

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3.3.3.1.1 As a standard option, it shall be possible to program the Terminal Device personality to permit selection of the tone signaling patterns and tone frequencies and shall include the choices: "NONE" and "Default".	SO	SO
3.3.3.1.2 Personality programmed signals shall be presented in a matrix of audible tone signal functions, tone patterns and tone frequencies which will be presented for selection of the terminal device's internally generated audible signals. A terminal device is any subscriber unit – mobile, portable, or control station and any console.	SO	SO
3.3.3.1.3 In the case of Emergency Alert, the choices shall include that the initiating terminal unit will either generate or not generate a local indication of the signal being transmitted.	SO	SO
3.3.3.1.4 Subscriber unit (mobile, portable, or control station) personality programming shall provide the ability to permit an appropriately programmed unit to reset an emergency status that has been sent to the system. An option button on the unit's control panel shall be programmed to perform a "CLEAR" function. By activating the emergency status activation switch while holding down the CLEAR button, the system emergency status shall be reset.	SO	SO
3.3.4 Service and Bearer Channel Interface/Service Set	i	i
An RFSS supports standard service signaling and bearer channel interface for interconnection with other RFSSs by a public or private wide-area network. The standard service set between RFSSs is composed of the following requirements.	i	i
3.3.4.1 Group Calls Setup	M	M
3.3.4.2 Private Calls Setup	M	M
3.3.4.3 Voice Encryption Control	M	M
3.3.4.4 RFSS Registration (roaming)	M	M
3.3.4.5 Analog Bearer Channel (Note: Support of analog bearer channel is required for backward compatibility for NPSTC mutual aid channels.)	M	M
3.3.4.6 Digital Bearer Channel	M	M
3.3.4.7 Access Control and Security	M	M
3.3.4.8 Site Affiliation Control	i	i

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The site affiliation control feature is supplementary to roaming voice and data services and is used to manage traffic loading during periods of high activity. The feature allows a point of attachment to broadcast information announcing its intention to restrict or prohibit users, groups, or traffic that does not meet the requirements of the advertisement. The system operator shall control whether the point of attachment restrict or prohibit emergency services due to traffic loading. This service also provides mechanisms that allow subscribers that cannot otherwise get service (for example, subscribers with no alternate point of attachment) to request exceptions to the advertised rules. The FNE may decide to grant a channel to a lower than advertised class if a channel is available.	i	i
The requirements in 3.3.4.8 apply to trunked systems.	SO-R	SO-R
The requirements in 3.3.4.8 apply to conventional systems. Note: A requirement level will be specified if and when available technology permits P25-standardized operation of this feature for conventional systems.	i	i
3.3.4.9 Call Preemption (Preemptive Priority Call)	i	i
The system will preempt existing calls in order to service new calls and may attempt to ensure that no RF contention issues will occur before allowing preemption.	SO	SO
3.3.5 Other System Functionalities	i	i
3.3.5.1 Dispatcher Interrupt of Calls	i	i
A dispatcher shall have the ability to interrupt any call enabled by the system that an individual may be engaged in.	M	M
3.3.5.2 Digital Calls	i	i
All calls shall be digital except compatible analog voice calls. All digital calls shall use the P25 defined vocoder. Encrypted digital call shall use P25 defined encryption algorithms end to end (see 4.0). Voice quality for unencrypted digital calls shall be equal to or superior to current clear voice analog systems and the measure of quality shall include both male and female voices and in defined and measurable quiet, moderate, and loud ambient environments and shall be measured in a defined applicable test based on voice intelligibility designed for public safety systems.	i	i
3.3.5.2.1 The requirements in 3.3.5.2 apply to conventional systems.	M	i
3.3.5.2.2 The requirements in 3.3.5.2 apply to trunked systems.	SO-R	SO-R
3.3.5.3 Operating Environment	i	i

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3.3.5.3.1 A manufacturer of a Project 25 software product shall define the extent of the operating environment over which the product is known to work.	M	M
3.3.5.4 Electronic Serial Number (ESN)	i	i
The fixed network equipment may support functions of inquire and validation of radio unit ESN.	SO	SO
3.3.5.5 Dispatcher Audio Takeover	i	i
The dispatcher, while monitoring a call, may interrupt the outbound audio of a transmitting radio and be heard by all units in the call, excluding non-full duplex transmitting radios but including the full duplex transmitting radios.	M	M
3.3.5.6 Dispatcher Busy Call Takeover (Non-Duplex)	i	i
When no channel is available (all traffic channels in use) in an emergency situation, the dispatcher may override a channel, exclusive of the formerly transmitting unit. The pre-emption may be ruthless or "top-of-queue" as established by the system management function. Non full-duplex transmitting SU will continue to transmit on the inbound channel.	M	M
3.3.5.7 Dispatcher Busy Call Takeover (Duplex)	i	i
When no channel is available (all traffic channels in use) in an emergency situation, the dispatcher may override a channel, inclusive of the formerly transmitting unit. The pre-emption may be ruthless or "top-of-queue" as established by the system management function.	SO	SO
3.3.5.8 Subscriber Unit Audio Preemption	i	i
This feature enables shutting down a full duplex transmitting SU when it is pre-empted by another user involved in the call. Rules for audio pre-emption may be established by the system operator.	i	SO
3.3.5.9 Call Termination by a Dispatcher	i	i
This feature is supplementary to group and individual calls. It allows a dispatcher to terminate a call in progress. Upon invocation of this feature, the radio system tears down the selected call, freeing up pre-emptable system resources as soon as possible. In some circumstances, such as when a half duplex radio is the current talker in the group or individual call, the current site of the current talker may not be freed until the completion of the talker's transmission. When the system has completed tearing down the call, normal operation of the group is resumed.	M	M
3.3.5.10 Radio Inhibit	i	i

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The system may enable an SU to be inhibited such that the SU appears to be powered off. When inhibited, the SU does not accept any user input or provide any user output. When the system provides this feature, the system shall also enable an SU to be un-inhibited, thereby returning the SU to normal operation.	SO	SO
3.3.5.11 Discreet Listening	i	i
The discreet listening feature allows an appropriately authorized system operator to listen to any active SU conversation, regardless of call type (e.g., individual call) and without the SU being aware of this activity. This differs from remote SU monitoring which provides the ability to key up remote SUs for monitoring (i.e., initiate a new call).	SO	SO
3.3.5.12 Radio Unit Monitoring (Remote Unit Monitoring)	i	i
The system, if authorized, may enable a dispatcher to initiate a call which enables the dispatcher to listen to audio activity at a subscriber radio.	SO	SO
3.3.5.13 Call Alerting	i	i
The system may enable a user ('originator') to convey the identity of their SU to the SU of another user ('recipient').	SO	SO
3.3.6 Location Services Via GPS	i	i
The Global Positioning System (GPS) or other coordinate location services shall provide all the following mobile radiolocation services under system or operator control for the purpose of:	i	i
3.3.6.1 Channel selection in conventional systems or talk group selection in trunked systems;	SO	SO
3.3.6.2 Use in existing data bearer services;	SO	SO
3.3.6.3 Emergency location in the event of emergency by activation of an emergency switch;	SO	SO
3.3.6.4 Location coordinates upon PTT that shall include reporting of the following parameters: identity, latitude and longitude, altitude, time of fix;	SO	SO
3.3.6.5 Location coordination for periodic tracking of the unit that shall include reporting of the following parameters: identity, latitude and longitude, altitude, time of fix;	SO	SO

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This feature enables the Fixed Network Equipment (FNE) to receive location information from a SU which is equipped with GPS or other location tracking system. The SU periodically transmits a short message containing its location information. The transmit periodicity is a configurable parameter. It is not necessary for the SU to transmit the location information while it is in 'receive mode'.	i	i
3.3.6.6 Displaying current location coordinates on the subscriber unit.	SO	SO
It shall be possible to send position reports to the following destinations:	i	i
3.3.6.7 A wired device for receiving location reports;	SO-R	SO-R
3.3.6.8 A single subscriber unit;	SO	SO
3.3.6.9 The same group of users who would receive a voice transmission from the unit making a position report.	SO	SO
3.3.6.10 Subject to unit configuration it shall be possible to query a subscriber unit for its current location.	SO-R	SO-R
3.3.6.11 It shall be possible to configure conventional systems to send position reports on either the same channel as the voice or a separate channel.	SO-R	SO-R
4.0 Security Services	i	i
Security Services includes encryption of voice, data, and signaling information; as well as Over-the Air-Rekeying (OTAR) and key management equipment and systems. Security Services and the identified sub-elements are refelected as a Standard Option (SO) type of P25 requirement applicable to manufacturers of applicable P25 equipment and to users of the applicable P25 equipment providing elements of the identified Security Services.	SO	SO
4.1 Encryption Standard Encryption is the conversion of data into a form called a Cipher Text that cannot easily be understood by unauthorized people. Decryption is the process of converting Cipher Text back into its original form, so it can be understood	i	i
4.1.1 Encryption Requirements	i	i

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References for the following requirements are FIPS PUB 46-3 DES (Data Encryption Standard), FIPS 140-2 (Security Requirements for Cryptographic Modules), NIST Special Publication 800-67 1.1 (Recommendation for the Triple Data Encryption Algorithm (TDEA) Block Cipher), NIST Special Publication 800-20 (Triple Data Encryption Algorithm (TMOVS): Requirements and Procedures), and FIPS 197 (Advanced Encryption Standard). Note: FIPS PUB 46-3 DES has been withdrawn by NIST; however, the citation is included to provide a reference for those P25 systems supporting DES service.	i	i
4.1.1.1 Advanced Encryption Standard (AES)	i	i
Except for equipment using NSA-approved encryption or equipment intended for supply to markets where the supply of strong encryption is subject to import/export restriction, all Project 25 equipment implementing encryption shall utilize the Advanced Encryption Standard (AES) algorithm. Key length for the AES shall be 256 bits when used for encryption of P25 user information (i.e., P25 voice and P25 packet data).	SO-R	SO-R
4.1.1.2 Data Encryption Standard (DES)	i	i
The DES algorithm has reached the end of its useful cryptographic life. For interoperability purposes, in addition to AES, the Data Encryption Standard (DES) algorithm may be available in Project 25 equipment implementing encryption. The use of DES in new systems is strongly discouraged.	SO	SO
4.1.2 Encrypted Voice Quality	i	i
Voice quality for encrypted communication shall be equal to current clear voice (unencrypted) mode. The measure of quality shall include both male and female voices and in defined and measurable quiet, moderate, and loud ambient environments and shall be measured in a defined applicable test based on voice intelligibility designed for public safety radios.	SO-R	SO-R
4.1.3 Multiple Algorithms	i	i
The system shall allow the use of multiple encryption algorithms with compatible modes of operation and shall provide the same functions associated with clear (unencrypted digital) operation. Subscriber units shall be capable of using zero, one or multiple encryption algorithms, as required. Systems and subscriber equipment that are intended to support the encryption option shall use P25 defined encryption algorithms.	SO	SO
4.2 Key Fill	i	i

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4.2.1 Key Fill Interface	i	i
The key fill interface shall support the bidirectional transfer of red (unencrypted) and black (encrypted) key variables from the key fill device to the equipment containing the encryption service using a standardized messaging protocol for communication between the key fill device and the equipment containing the encryption service.	SO	SO
4.2.1.1 Key Fill Protocol	i	i
The key fill interface protocol shall use Key Management Messages (KMMs) similar to the KMMs defined by the OTAR Protocol but with modifications to support key fills.	SO	SO
4.2.1.2 Key Fill Interface Port	i	i
The key fill interface port shall support a standard physical interface, which may be implemented on the key fill device itself, on the physical interface connecting the key fill device to the equipment containing the encryption service, or on the equipment containing the encryption service itself. This interface will enable the transfer of key fill and other information to and from the key fill device and equipment containing the encryption service.	SO-R	SO-R
4.2.2 Key Fill Device	i	i
The key fill device shall be capable of transferring one or more key variables in a single message.	SO	SO
4.2.2.1 Key Fill Device for Transferring Keys	i	i
The key fill device shall be capable of transferring Traffic Encryption Keys and Key Encryption Keys.	SO	SO
4.2.2.2 Zeroize Operation	i	i
The key fill device shall be capable of sending a message to zeroize one or more of the key variables used by the encryption service.	SO	SO
4.3 Key Management	i	i
4.3.1 Common Key Management System	i	i
A common key management system will be used to achieve key exchange interoperability between different manufacturer's Key Management Facilities (KMFs) regardless of Air Interface.	SO	SO

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4.3.2 Key Fill Mechanism	i	i
The system will provide a key fill device to transfer initial and subsequent keying information into the equipment using encryption.	SO	SO
4.3.3 Key Management Procedure	i	i
The Key Management Procedure is a series of one or more messages grouped together to provide a basic key management function. The Key Management Procedures listed below provide basic OTAR interoperable key management operations.	i	i
4.3.3.1 Change – RSI Procedure	SO-R	SO-R
4.3.3.2 Changeover Procedure	SO-R	SO-R
4.3.3.3 Delete – Key Procedure	SO-R	SO-R
4.3.3.4 Hello	SO-R	SO-R
4.3.3.5 Modify – Key Procedure	SO-R	SO-R
4.3.3.6 Registration Procedure	SO-R	SO-R
4.3.3.7 Rekey Procedure	SO-R	SO-R
4.3.3.8 Warm – Start Procedure	SO-R	SO-R
4.3.3.9 Zeroize Procedure	SO-R	SO-R
4.3.3.10 Capabilities Procedure	SO	SO
4.3.3.11 Delete – Keyset Procedure	SO	SO
4.3.3.12 Deregistration Procedure	SO	SO
4.3.3.13 Inventory Procedure	SO	SO
4.3.3.14 Key – Assignment Procedure	SO	SO
4.3.3.15 Modify – Keyset – Attributes Procedure	SO	SO
4.3.3.16 Set – Time – Date Procedure	SO	SO
4.3.4 OTAR	i	i
The system shall support over-the-air rekeying (OTAR) of encryption keys.	SO	SO
4.3.4.1 Radio Inhibit	i	i

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4.3.4.1.1 A subscriber unit shall accept the radio inhibit command via OTAR	SO-R	SO-R
4.3.4.1.2 A subscriber unit while inhibited shall accept the OTAR commands.	SO-R	SO-R
4.3.4.2 Radio Enable	i	i
A subscriber unit while inhibited shall accept the OTAR Radio Enable command	SO-R	SO-R
4.3.4.3 The following OTAR Commands shall be included	i	i
4.3.4.3.1 Capabilities - Command	SO	SO
4.3.4.3.2 Capabilities - Response	SO	SO
4.3.4.3.3 Change – RSI Command	SO-R	SO-R
4.3.4.3.4 Change – RSI Response	SO-R	SO-R
4.3.4.3.5 Changeover - Command	SO-R	SO-R
4.3.4.3.6 Changeover - Response	SO-R	SO-R
4.3.4.3.7 Delayed - Acknowledgment	SO-R	SO-R
4.3.4.3.8 Delete – Key – Command	SO	SO
4.3.4.3.9 Delete – Key - Response	SO	SO
4.3.4.3.10 Deregistration Command	SO	SO
4.3.4.3.11 Deregistration Response	SO	SO
4.3.4.3.12 Hello	SO-R	SO-R
4.3.4.3.13 Inventory Command	SO	SO
4.3.4.3.14 Inventory - Response	SO	SO
4.3.4.3.15 Key – Assignment – Command	SO	SO
4.3.4.3.16 Key – Assignment – Response	SO	SO
4.3.4.3.17 Modify – Key – Command	SO-R	SO-R
4.3.4.3.18 Modify – Keyset – Attributes – Command	SO	SO
4.3.4.3.19 Modify – Keyset – Attributes – Response	SO	SO

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4.3.4.3.20 Negative – Acknowledgment	SO-R	SO-R
4.3.4.3.21 No – Service	SO-R	SO-R
4.3.4.3.22 Registration Command	SO-R	SO-R
4.3.4.3.23 Registration Response	SO-R	SO-R
4.3.4.3.24 Rekey – Command	SO-R	SO-R
4.3.4.3.25 Rekey Acknowledgment	SO-R	SO-R
4.3.4.3.26 Set – Date – Time	SO	SO
4.3.4.3.27 Unable – to – Decrypt Response	SO-R	SO-R
4.3.4.3.28 Warm – Start – Command	SO-R	SO-R
4.3.4.3.29 Zeroize – Command	SO-R	SO-R
4.3.4.3.30 Zeroize – Response	SO-R	SO-R
5.0 Subscriber Equipment	i	i
5.1 Mobile/Portable Subscriber Unit Requirements	i	i
5.1.1 General Requirements	i	i
5.1.1.1 Description of Multimode Subscriber Units	i	i
Subscriber units communicate in either a conventional or trunked environment using clear (unencrypted digital), digitally encrypted voice, or data modes regardless of the manufacturer of the equipment. All systems and subscriber equipment use the P25 defined vocoder. Systems and subscriber equipment that are intended to support the encryption option use P25 defined encryption algorithms. These are required to facilitate mixed mode (FDMA/TDMA) end-to-end delivery of both clear and optionally encrypted voice and data.	i	i
5.1.1.2 Electronic Serial Number	i	i
The existence of an ESN (Electronic Serial Number) in a radio (subscriber unit) is to be mandatory. The validation response to an ESN inquiry is to be mandatory.	M	M
5.1.1.3 Support of Analog Communications	i	i

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Support analog communications within this SU when involved in a call from an analog unit.	M	SO
5.1.1.4 Data Port	i	i
5.1.1.4.1 Support a data port to an attached MDT (mobile data terminal), portable computer, or other peripheral device.	SO	SO
5.1.1.4.2 The data port will enable text messages to be sent from one unit to another. Text messages may be up to 256 characters in length and may be sent via SU keyboard entry or from a data terminal device connected to a SU, exclusive of overhead.	SO	SO
5.1.1.5 Equivalent Product Size	i	i
Equipment size shall be comparable to existing analog systems. Portable subscriber units shall be offered for covert and uniformed users (covert portable being smaller) with batteries that shall power these portables for at least 8 hours (5,5,90 duty cycle) with minimal size and weight.	M	M
5.1.1.6 Subscriber Unit Channel Scan	i	i
Mobile and portable equipment, both trunking and conventional, shall be able to sequentially scan both conventional channels (at least 8) and a trunked system's control channel in both clear and encrypted mode. While on the trunked system's control channel, the mobile and portable equipment shall be able to sequentially scan trunked talkgroups (at least 8) in both clear and encrypted mode. All scans are to be completed in minimum time. The conventional and/or trunked talkgroups to be scanned shall have selectable priority.	SO	SO
This feature provides mechanisms by which conventional and trunked subscriber radios are made aware of activity on nearby conventional channels. It is particularly intended to notify a radio user of the presence of activity on mutual aid channels (priority 1), and on his "home" conventional channel or trunked talkgroup (priority 2) when he has selected some other conventional channel or trunked talkgroup for his current operations. Secondarily, it provides the ability to monitor lower priority conventional channels and/or trunked talkgroups (priority 3) on an "as-available" basis. Full-duplex subscriber equipment should continue scanning conventional channels and/or trunked talkgroups while transmitting.	i	i
5.1.1.7 Not Home Talk Group Scan	i	i
This feature is supplementary to group services. It allows the radio users to identify a priority scan group (the "selected" group) and up to 8 non-priority scan groups. When the priority group is not active, the user will be able to monitor audio from non-priority groups on a resource available basis.	M	M
5.1.1.8 Continuity of Scanning while Scanned Talk Groups are Patched	i	i

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Mobile and portable equipment shall be able to continue scanning both conventional channels and trunked talkgroups in both clear and encrypted voice when the channels or talkgroups are patched at the dispatch center or gateway location. The new scanning priority shall be the highest of the members of the patched talkgroups. Subscriber scanning shall return to the original scan talkgroup lists and priorities when the talkgroup patches are disabled at the dispatch center or gateway location.	SO	SO
5.1.2 Phase 1-Specific Requirements	i	i
5.1.2.1 Support a 12.5 or 25 kHz analog mode	i	i
Support a 12.5 kHz analog mode and a 25 kHz analog mode where permitted by applicable regulatory authority for Phase 1 equipment.	M	SO
5.1.2.2 Dual Mode Receive Operation	i	i
Phase 1 subscriber (mobile and portable) units must have, without user intervention, the ability to receive a properly coded analog or digital signal on the same programmed channel.	SO	i
5.1.2.3 Dual Mode Receive Operation	i	i
The ability to transmit in the mode received (analog or digital), without operator intervention, should be available as a customer specified feature.	SO	i
5.1.3 Phase 2-Specific Requirements	i	i
5.1.3.1 Phase 2 Subscriber Analog Modes	i	i
Support a 12.5kHz Analog Mode and a 25kHz Analog Mode	i	SO
5.1.3.2 Direct Mode in TDMA Implementations	i	i
SUs equipment shall be capable of direct mode communication using Phase 1 FDMA.	i	M
5.1.4 Other General Requirements	i	i
5.1.4.1 Minimum Keypad Configuration	i	i
To adopt 4 rows by 3 columns matrix as the minimum key pad configuration with the first level and shifted functions to be software programmable and assignable. Label Configuration to conform to the North American telephone keypad standard numerical and symbol layout.	SO	SO
5.1.4.2 Support a multi-point data port to multiple external peripherals.	SO	SO

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5.1.4.3 Subscriber Unit Transmitter Inhibit Mode	i	i
Support a Subscriber Unit Transmitter Inhibit Mode. This is a mode on portable and mobile equipment which when selected by the user would inhibit the transmitter under all conditions until the mode is deselected by the user. While in the transmitter inhibited mode, the receiver would still be capable of receive operation.	SO	SO
5.1.4.4 Support Audible Signaling	i	i
Support audible signaling to and from subscriber units for functions as defined in 3.3.2.	M	M
5.1.4.5 Connection of an External Audio and Push-to-Talk System	i	i
Mobile radio equipment shall include an interface to allow connection of an external audio and push-to-talk system. Audio appearing at this interface will be unencrypted.	SO	SO
5.1.4.6 Capability to Digitally Store Functional Characteristics	i	i
A Project 25 radio shall have the capability to digitally store functional characteristics, including, but not limited to, channel frequencies, minimum volume settings, and channel scanning patterns. The stored functional characteristics must be issued from an authorized field-programming device.	M	M
5.1.4.7 Duplex Individual Calls	i	i
Duplex call is available only to individual calls. This feature enables a properly equipped SU to listen to outbound audio while transmitting inbound audio.	i	SO
5.1.4.8 Full Duplex SU Power Control	i	i
The Full Duplex SU Power control feature uses the received power value from the base station to adjust a full duplex equipped subscriber unit's transmit power. This feature is intended to minimize adjacent channel interference for FNE receivers and conserve battery life in portable SUs. The signaling to the SU is done during the SU transmission and therefore requires full duplex radios.	i	SO
5.1.4.9 Emergency Alert Without Registration	i	i

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The Emergency alert without registration feature enables the FNE to accept an emergency alarm from a user in distress prior to registration and/or authentication with the target system. The SU then proceeds with the normal registration and/or authentication procedure. The system operator has the ability to disable this service if emergency alerts by unregistered or unauthenticated SUs are not desired.	i	i
5.1.4.9.1 Emergency Alert Without Registration shall be supported in conventional mode	M	M
5.1.4.9.2 Emergency Alert Without Registration should be supported in trunked mode	SO-R	SO-R
5.1.4.10 Emergency Alert Clear by SU	i	i
By depressing a "clear" button on the SU, a user can cancel an emergency. For emergency alert, only the SU that initiated the emergency alert is allowed to cancel the emergency alert. In addition, the SU's ID must be considered valid by the infrastructure.	i	i
5.1.4.10.1 Emergency Alert Clear by SU should be supported in conventional mode	SO	SO
5.1.4.10.2 Emergency Alert Clear by SU should be supported in trunked mode	SO	SO
5.1.4.11 DTMF Signaling	i	i
The subscriber units shall be capable of generating digital DTMF signals from the keypad.	SO	SO
5.2 Provide a Vehicular Repeater (VR) Capability	i	i
Provide a vehicular repeater capability.	SO	SO
5.2.1 General VR Capabilities	i	i
5.2.1.1 FDMA or TDMA Implementations	i	i
Vehicular repeater system requirements shall be met in frequency division (FDMA) or time division (TDMA) channel access methods, according to infrastructure system requirements.	SO-R	SO-R
5.2.1.2 Full Duplex Operation	i	i

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The vehicular repeater link channel shall provide two-way, full duplex operation to permit system control and handshake and to permit multiple associated subscriber units to operate on the same single link channel. A FDMA or two-slot TDMA vehicular repeater link will require two frequencies, one for each direction of communication. A four-slot TDMA vehicular repeater link will require a single frequency and employ alternate time slots, one for each direction of communication.	SO-R	SO-R
5.2.1.3 Direct Mode Operation	i	i
Direct mode operation shall support at least the following three modes:	i	i
5.2.1.3.1 Unit-to-unit direct.	SO-R	SO-R
5.2.1.3.2 Unit-to-unit repeated.	SO-R	SO-R
5.2.1.3.3 Unit-to-unit repeated and linked to the infrastructure.	SO-R	SO-R
5.2.1.4 In-Band Operation	i	i
Repeater link channel operation is desired in the same frequency band as the infrastructure channels, so that subscriber units can be used either direct to the infrastructure or through the vehicular repeater. A single antenna and a duplexer that incorporates appropriate filtering is desired for the vehicular repeater control link, with a separate antenna for the system mobile.	SO	SO
5.2.1.5 Manual or Automatic Channel Selection	i	i
Where a vehicular repeater system has multiple link channels available, the link channel to be used by a particular repeater may be selected manually or, as a standard option, may be selected automatically. Means shall be provided to "mark" an active repeater link channel as "in-use" on a first come, first served basis, so that other repeater units, within radio signal range, will not select that same channel.	SO-R	SO-R
5.2.1.6 Extended Range	i	i
The vehicular repeater unit shall provide the ability for a subscriber unit (typically a portable hand held unit) to operate with full feature capability in order to achieve extended signal coverage from/to the infrastructure or from/to other subscriber units. It shall be possible to repeat scanned channels of the system mobile receiver subject to personality programming.	SO-R	SO-R
5.2.1.7 In-Vehicle or Stand-Alone Implementation	i	i

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The vehicular repeater unit may be a vehicle mounted mobile system or it could be a totally self-contained portable system. As a vehicle mounted mobile system, it is desired that it be an integrated vehicular repeater/mobile radio package.	SO	SO
5.2.1.8 Operational Control	i	i
The vehicular repeater unit shall be controlled by appropriate control words transmitted by the controlling subscriber unit. Such control words may include Network Access Codes, and source and destination IDs. System control functions may be operated manually from within the vehicle.	SO-R	SO-R
5.2.1.9 One-To-One Operation	i	i
A single subscriber unit shall be able to operate exclusively through its companion vehicular repeater unit ("repeat unit") and be able to remotely control the mobile operating channel in a conventional infrastructure, or the mobile system and talk group in a trunking infrastructure. Within the limitations of system implementation, all other subscriber unit functions shall operate transparently through the vehicular repeater system. Using digital signaling with handshaking for a positive acknowledgement, control functions shall be communicated over the link channel.	SO-R	SO-R
5.2.1.10 More Than One Operation	i	i
One or more portable radio units shall be able to operate through a single vehicular repeater unit. Subscriber unit access may be permitted by the use of Network Access Codes, including the receiver NAC $F7F for multiple subscribers from different groups. Additional subscriber units arriving within range of this single vehicular repeater shall be capable of manually selecting the "in-use" link channel for this repeater ("repeat group").	SO-R	SO-R
5.2.1.11 Any Emergency In One-To-One Operation	i	i
It shall be possible to pair a vehicular repeater unit and its associated subscriber unit so that only control commands and functions from that subscriber unit are recognized by the associated vehicular repeater control system, except that any unit operating through this vehicular repeater in "repeat group" mode may transmit an emergency status. It shall be possible to pair a subscriber unit and a vehicular repeater in the field without special programming equipment. The command set for this option shall include the capability for the controlling subscriber unit to place the vehicular repeater unit into the "repeat unit" or "repeat group" modes.	SO-R	SO-R
5.2.1.12 Vehicle Repeater Activation	i	i

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Activation of vehicular repeater mode operation shall be provided by both front panel control and by remote activation (e.g. seat switch, vehicular charger socket insertion switch, etc). Remote activation shall be accomplished by contact closure, voltage sensing or current sensing, and be isolated from vehicle power and ground to permit implementation flexibility.	SO-R	SO-R
5.2.1.13 Single Control Capability	i	i
Vehicle control systems shall use a single control head, loudspeaker and microphone for all functions of the vehicular repeater/mobile radio system when they are an integrated unit.	SO-R	SO-R
5.2.1.14 Ease of Operation	i	i
Control systems of portable and vehicular equipment shall provide simple, easy to understand and operate functions. Legends and status displays shall be easy to view in all lighting conditions likely to be encountered in public safety applications. Displays shall provide operational information (e.g. talk group/channel currently being received or selected for scan priority/transmit). When display of control functions is required, the display shall temporarily display necessary information and then after a programmable time delay revert back to normal operational information.	SO-R	SO-R
5.2.1.15 Full Control or Covert Installation	i	i
A full-function control and display can be offered in a remote speaker/microphone assembly that can be used with mobile units where a concealed installation is required.	SO-R	SO-R
5.3 Capability to Operate as Analog	i	i
5.3.1 Phase 1 Subscriber Units	i	i
5.3.1.1 Phase 1 Subscriber Equipment	i	i

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Phase 1 equipment[3], irrespective of the manufacturer, must have at least the capability to operate both as analog where permitted by applicable regulatory authority, employing standard signaling (TIA-603), and the standardized digital mode defined in the TIA 102 series. Manufacturers who presently provide analog or digital equipment with non-standard or proprietary capability must provide Phase 1 equipment that will operate in the analog mode and, as a standard option, in their own proprietary mode on a functional channel basis.	M	i
5.3.2 Phase 2 Subscriber Units	i	i
5.3.2.1 Phase 2 Subscriber Equipment in a Conventional Phase 1 System	i	i
Phase 2 equipment intended to replace conventional Phase 1 equipment must have the capability to operate in both conventional Phase 1 and Phase 2 modes on a functional channel basis.	M	M
5.3.2.2 Phase 2 Subscriber Equipment in a Trunked Phase 1 System	i	i
Phase 2 equipment intended to replace trunked Phase 1 equipment must have the capability to operate in both trunked Phase 1 and Phase 2 modes on a functional channel basis.	SO	SO
5.3.2.3 Phase 2 Subscriber Equipment in an Analog System	i	i
Analog capability (where permitted by applicable regulatory authority) for Phase 2 equipment shall be available.	i	SO
6.0 Interoperability	i	i
This section defines modes and supported features and services required for interoperability.	i	i
6.1 Infrastructure	i	i
6.1.1 This section defines modes and supported features and services required for infrastructure interoperability.	i	i
6.1.1.1 FDMA Phase 1 Interoperability Mode	i	i
The system shall support an interoperability mode via FDMA Phase 1 conventional operation.	M	M

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[3] As a Standard Option, a fixed station be capable of dual mode operation (not simultaneously) for analog (Phase 0) and digital (Phase I). This dual mode operation is required (simultaneously) for all subscriber equipment.

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6.2　Subscriber Units	i	i
6.2.1　This section defines modes and supported features and services required for subscriber unit interoperability.	i	i
6.2.1.1　Analog Interoperability for TDMA Subscribers	i	i
For interoperability purposes, TDMA subscriber equipment shall be capable of operating in a conventional 12.5 kHz analog mode as a standard option and in a conventional 25 kHz analog mode where permitted by applicable regulatory authority rules as a standard option. This is not intended to restrict any other modes of operation.	i	SO
6.2.1.2　Digital Interoperability for TDMA Subscribers	i	i
For interoperability purposes, TDMA subscriber equipment shall be capable of operating in a conventional digital mode that shall be fully compliant with the Project 25 Phase 1 (12.5kHz FDMA) Common Air Interface. This is not intended to restrict any other modes of operation.	i	M
7.0 Migration	i	i
7.1　Migration Aspects (General)	i	i
7.1.1　General Migration Requirements	i	i
7.1.1.1　Console Interface	i	i
The console interface shall provide for backward compatibility with that manufacturer's existing analog systems.	SO	SO
7.2　P25 Migration Aspects (Phase 0 to Phase 1)	i	i
7.2.1　Phase 0 to Phase 1 Migration Requirements	i	i
7.2.1.1　Phase 0 to Phase 1	i	i
Each manufacturer's systems (both conventional and trunked) shall provide for backward compatibility with that manufacturer's existing analog systems to facilitate a graceful and gradual migration from analog to digital. As a minimum, this shall include mobile and portable subscriber units. In addition, subscriber units shall include the ability to select and operate on available analog mutual aid channels for communications with the fixed network equipment as well as direct unit-to-unit.	M	i

Project 25 Statement of Requirements (December 11, 2013)	Phase 1, 12.5 kHz, FDMA	Phase 2, 12.5 kHz TDMA
7.3 P25 Migration Aspects (Phase 1 to Phase 2)	i	i
7.3.1 Phase 1 Conventional to Phase 2 Migration Requirements	i	i
7.3.1.1 Phase 2 SUs (Conventional Mode)	i	i
Phase 2 SUs in Phase 2 systems replacing Phase 1 conventional systems shall be capable of operating in Phase 1conventional mode.	i	M
7.3.2 Phase 1 Trunked to Phase 2 Migration Requirements	i	i
7.3.2.1 Phase 2 SUs (Trunked Mode)	i	i
Phase 2 SUs in Phase 2 systems replacing Phase 1 trunked systems shall be capable of operating in Phase 1 trunked mode.	i	M
7.3.2.2 Phase 2 Infrastructure	i	i
A Phase 2 system shall support Phase 1 channel modes enabling interoperability of Phase 1 SUs with Phase 2 infrastructures.	i	M

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