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**Police digital trunking communication system - General
technical specifications**

警用数字集群(PDT) 通信系统 总体技术规范

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Table of Contents

Foreword	4
Introduction	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
3.1 Terms and definitions	7
3.2 Abbreviations	9
4 System technical characteristics	9
4.1 Basic technical system	9
4.2 Basic system services	10
4.3 Basic protocols and signaling	11
4.4 System working modes	11
4.5 Call setup time	11
5 System configuration and functional requirements	12
5.1 System configuration	12
Figure 1 -- Schematic diagram of network infrastructure	12
5.2 Functional requirements	13
Table 1 -- Main functional requirements of PDT equipment	18
5.3 Other requirements	19
6 Frequency planning	20
6.1 Operating frequency band	20
6.2 Frequency number	20
Table 2 -- Single-band frequency numbering	21
Table 3 -- Dual-band frequency 1 numbering	21
Table 4 -- Dual-band frequency 2 numbering	22
6.3 Frequency grouping	22
7 Address and identification code	22
7.1 System parameters	22
Figure 2 -- Structure diagram of wireless location identifier LAI	23
Table 5 -- Provincial code (Zone) allocation	23
Table 6 -- Allocation of regional identification numbers for the entire network	24
7.2 User number and address definition	24
Table 7 -- Air interface address	24
Table 8 -- Address space occupied by MPT1327 users	25
Table 9 -- Address space occupied by PDT users	25
Figure 3 -- Hierarchical group call number	28
7.3 Internal wire number	28
8 Network management	29
8.1 Network management overview	29

8.2 Single-switching center network management.....	29
8.3 Multi-switching center network management.....	29
8.4 Basic functions of network management	29
8.5 Hierarchical architecture of network management	29
Figure 4 -- Virtual three-level management system	30
9 System Interconnection	30
9.1 Interconnection scope of PDT system.....	30
9.2 Interconnection between PDT systems	31
Figure 5 -- Fully peer-to-peer system interconnection network architecture	31
9.3 Interconnection between PDT and MPT 1327	31
Figure 6 -- PDT-MPT 1327 interconnection structure	32
9.4 Interconnection between PDT and other heterogeneous systems	32
10 Basic performance indicators of channel equipment.....	33
10.1 Overview of channel equipment	33
10.2 Overall performance indicators.....	33
Table 10 -- Overall performance indicators of channel equipment.....	33
10.3 Base station RF indicators.....	33
Table 11 -- RF specifications of base station transmitters and receivers.....	34
10.4 RF indicators of handheld station.....	34
Table 12 -- RF indicators of the transmitter and receiver of the handheld station	34
10.5 RF indicators of vehicle-mounted station	35
Table 13 -- RF indicators of the vehicle-mounted station's transmitter and receiver	35
11 Secure encryption.....	36
Figure 7 -- Security mechanism diagram	37
12 Electrical safety	37
13 Power adaptability	37
14 Mechanical structure safety.....	38
14.1 Structure	38
14.2 Surface temperature	38
15 Environmental and electromagnetic compatibility requirements.....	38
15.1 Environmental adaptability	38
15.2 Electromagnetic compatibility requirements.....	39
16 Reliability requirements.....	39
16.1 Channel equipment reliability	39
16.2 Reliability of control and link equipment.....	39
17 Transportation and packaging requirements	39

Police digital trunking communication system - General technical specifications

1 Scope

This Standard specifies the technical characteristics, system composition and functional requirements, operating frequency band, address and identification code, network management, basic performance indicators of channel equipment, AC power supply system, information security and confidentiality, environment and electromagnetic compatibility, reliability and other general requirements of the police digital trunking (PDT) communication system.

This Standard applies to the overall planning, network design, equipment development, production, engineering construction and acceptance of the police digital trunking (PDT) communication system.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 7610-1987, *Characteristics of pulse code modulation for voice-frequencies*

GB/T 13426-1992, *Reliability requirements and test methods for digital communication equipment*

GB/T 14013-1992, *Mobile communication equipment -- Transport package*

GB/T 15540-2006, *EMC specification and test methods for land mobile communication equipment*

GB/T 15844.3-1995, *Reliability requirements and test methods for radio transceiver employing F3E emission used in the mobile services*

GB/T 17626.2-2006, *Electromagnetic compatibility (EMC) -- Testing and measurement techniques -- Electrostatic discharge immunity test*

GA 176-1998, *Police automatic network scheme -- One of mobile communications for public security*

GA/T 1057-2013, *Police digital trunking communication system. Technical*

- b) Wireless dispatch station: a dispatch station connected to the network infrastructure through an air interface.

5.2 Functional requirements

5.2.1 Functional definition

5.2.1.1 Registration

Registration is the process of a mobile station initiating a network access request and confirming it to the trunking system. Authentication may be required during registration.

5.2.1.2 Deregistration

Deregistration is the process in which the mobile station sends a notification to the trunking system to exit the system.

5.2.1.3 Authentication

The process of verifying the legitimacy of the identities of the parties involved in a communication.

5.2.1.4 Roaming

In a system consisting of multiple base stations connected to the Internet, a mobile station registers with a base station other than its home base station and continues to use the services provided by the system.

5.2.1.5 Voice private call

A voice private call is a point-to-point two-way voice call established between a mobile station and other user terminals. The participants of a call are only the caller and the called party. There are two types of voice private calls between mobile stations: FOACSU and OACSU.

5.2.1.6 Voice group call

A voice group call is a point-to-multipoint voice call initiated by a mobile station or dispatch station and involving multiple mobile stations.

5.2.1.7 Group call late entry

After a group call is established and before it ends, the control channel periodically broadcasts the establishment information of the group call to ensure that mobile stations that have just been turned on, roamed to this base station from other base stations, or released from other talk groups can participate in the group call that has not yet ended.

5.2.1.8 Group call merge

After a group call is established but before it ends, if a mobile station calls the established call group, the system will add the mobile station as the called party to the established group call.

5.2.1.9 Broadcast call

Broadcast call is a special voice group call. After the call is established, only the caller has the right to transmit on the service channel, and the called user has only the right to receive. This can effectively prevent the called user from interfering with the caller's transmission process.

5.2.1.10 Emergency call

An emergency call is a special call initiated by a user in an emergency situation. It has the highest priority. When there are no channel resources, the system will release channel resources of other low-level calls for emergency calls.

5.2.1.11 Priority call

Priority calls are calls that are given priority to obtain resources when the system is busy. The way to obtain resources can be to seize the channel of low-priority calls or to jump the queue in the queue.

5.2.1.12 Alarm

An alarm is when a user presses a special button on a mobile station device in an emergency, sending a predefined status message to a pre-set destination (mobile station or dispatch station) on the system control channel to notify other mobile stations or dispatch stations that the user is in an emergency state.

5.2.1.13 Environmental monitoring

Environmental monitoring is a special call initiated by the dispatch station to the mobile station to monitor the environmental sounds around the mobile station. The called mobile station automatically turns on the transmitter and MIC on the traffic channel specified by the system and sends the ambient sound to the dispatch station. During the entire environmental monitoring process (monitoring establishment, monitoring transmission, and monitoring termination), the human-machine interface status of the mobile station, such as display, speaker, prompt tone, indicator light, etc., shall be exactly the same as when in idle standby mode. During the environmental monitoring process, if the mobile station user makes an outgoing call (including sending a short message, etc.), the environmental monitoring shall be automatically terminated and return to the control channel. The dispatch station can terminate an environmental monitoring call established by it at any time.

5.2.1.14 Monitoring

Monitoring refers to the process of authorizing a user terminal to obtain voice on a

station. A remotely stunned mobile station can be resurrected through the air interface.

5.2.1.23 Resurrection

Resurrection is the process of using air interface signaling to unblock a remotely stunned mobile station. The authorized network management terminal or dispatching station can perform the resurrection operation to restore the mobile station to normal working state.

5.2.1.24 Dynamic reorganization

Dynamic reorganization is the process of authorizing the network management terminal or dispatching station to temporarily add a talk group (dynamic group) to the target mobile station using air interface signaling. The newly added dynamic group of the mobile station is valid until the signaling to delete the dynamic group is received. The authorized network management terminal or dispatching station can also delete the dynamic group in the target mobile station using air interface signaling.

5.2.1.25 Call restriction

Call restriction is the system's control over the calling rights of the mobile station. By setting, its calling function is restricted. The mobile station can only make calls within the scope of authority. Calls beyond the scope of authority will be rejected by the system.

5.2.1.26 Status message

Status message refers to the process of transmitting 7-bit message code between mobile stations or between mobile stations and dispatch station using control channel. Status message can be point-to-point single call or point-to-multipoint group call.

5.2.1.27 Short message

Short message is the process of transmitting limited length message between mobile stations or between mobile stations and dispatch station by using control channel. Short message can be point-to-point single call or point-to-multipoint group call. In PDT system, the length of a single short message is 23 Chinese characters.

5.2.1.28 Satellite positioning information transmission

Satellite positioning information transmission refers to the process in which a mobile station uploads its satellite positioning information using air interface signaling.

5.2.1.29 Network management

Network management is to ensure the normal operation of the system by performing some parameter configuration, operation status monitoring, user profile management and other operations. Network management shall at least have a set of functions such as user management, configuration management, fault management, performance

management and security management.

5.2.1.30 End-to-end security

See GA/T 1059-2013.

5.2.1.31 Interconnection between PDT systems

The interconnection between PDT systems is to complete the information exchange between PDT switching control centers using the specified interconnection protocol, and realize functions such as inter-system roaming and call control.

5.2.1.32 Wired telephone calls

A wired telephone call is a call between a mobile station and wired telephones such as PABX and PSTN using air interfaces and system gateway equipment.

5.2.1.33 Power control

The system uses air interface signaling to adjust the transmit power of the mobile station to ensure communication quality and reduce the power consumption of the mobile station.

5.2.1.34 Inclusive call

An inclusive call is a call initiated by a mobile station on a service channel where a call has already been established, to pull other target mobile stations into the current service channel call.

5.2.1.35 Call forwarding

Call forwarding is a service that forwards incoming calls to other pre-set numbers. Call forwarding can be set and canceled by yourself or a third party. The forwarding conditions are divided into unconditional forwarding and conditional forwarding.

5.2.1.36 Busy queuing

Busy queuing is the process in which when all system traffic channel resources are busy, the system puts newly initiated calls into the call waiting queue and processes the calls in the waiting queue when the system has idle resources.

5.2.1.37 Grouping data

Grouping data is a business process that uses the system's traffic channel and follows the grouping data transmission protocol to achieve multi-user sharing of the traffic channel and perform data transmission.

5.2.1.38 Air interface security

The mobile station shall meet the following requirements:

- Support TMO, DMO, and RMO working modes;
- Support unique identification code and multiple group numbers;
- Support quick selection of talk groups;
- Adjustable ringing volume;
- Adjustable voice volume;
- Ringing and/or vibration prompts;
- Field strength indication;
- Battery indicator and low battery alarm prompt;
- Trunking mode working time is not less than 8 h (standard battery, rated high power, rated audio output power, with a reception: transmission: waiting time of 1:1:8 occupation cycle).

6 Frequency planning

6.1 Operating frequency band

There are three frequency bands at 350 MHz available for PDT use (other frequency bands are subject to the relevant regulations of the national radio management department):

- a) Single-band frequency: 358 MHz ~ 361 MHz, used for offline pass-through mode;
- b) Dual-band frequency 1: Uplink 351 MHz ~ 355 MHz (inclusive), downlink 361 MHz ~ 365 MHz (inclusive), used for trunking mode;
- c) Dual-band frequency 2: Uplink 355 MHz ~ 356 MHz, downlink 365 MHz ~ 366 MHz, used for signal forwarding or trunking mode.

6.2 Frequency number

6.2.1 Frequency numbering rules

The starting frequency of the single-band frequency is 358.0125 MHz. The starting frequency number is 1. The frequency interval is 12.5 kHz.

The starting frequency of dual-band frequency 1 is 351.0125 MHz/361.0125 MHz. The

The length of the short single call address code is 15 bits. It is expressed in decimal form as 0~32767, where 0 is a blank number; 1~32200 is a short single call user address, and 32201~32767 is a short special call address.

7.2.3.2 Segment single call number

The complete single call sign is 8 digits, expressed as: area code (NP, 3 digits) + single call team number (FIN, 2 digits) + single call sign (IN, 3 digits).

The 5-digit single call sign is expressed as: single call team number (FIN, 2 digits) + single call sign (IN, 3 digits).

A 3-digit single call sign is expressed as: single call sign (IN, 3 digits).

The range of the single call team number FIN is 20~89. There are 70 single call teams in each area code.

Each of the 20~41 individual call teams contains 700 individual call numbers. The value range is 200~899.

Each of the 42~89 individual call teams contains 350 individual call numbers. The value range is 200~549.

7.2.3.3 Relationship between the single call address code and the segment single call number

The same NP has the same segment team structure. The corresponding relationship between the single call team number FIN and the single call number IN and the short single call address code SSI is:

When FIN=20~41: $SSI = (FIN - 20) \times 700 + (IN - 200) + 1$

When FIN=42~89: $SSI = (FIN - 42) \times 350 + (IN - 200) + 15401$

7.2.4 Group call number

7.2.4.1 Short group call address code

The short group call address code is 15 bits long, expressed in decimal form as 0~32767, where 0 is a blank number; 1~17000 are group call user numbers, 32767 is a full call number, and other addresses are reserved.

PDT provides two types of group call number coding: segment group call coding and hierarchical group call coding.

7.2.4.2 Segment group call number

The complete group call sign is 8 digits, expressed as: area code (NP, 3 digits) + group call team number (FGN, 2 digits) + group call sign (GN, 3 digits).

The 5-digit group call sign is expressed as: group call team number (FGN, 2 digits) + group call sign (GN, 3 digits).

The 3-digit group call sign is expressed as: group call sign (GN, 3 digits).

The group call team number FGN ranges from 20~89. There are 70 group call teams in each area code (corresponding to the individual call team numbers).

The group call number GN ranges from 900~999. Each group call team contains 100 group call numbers.

The total number of group call user numbers within each area code is 7000.

The short group call address corresponding to the segment group call ranges from 1~7000.

7.2.4.3 Relationship between group call address code and segment group call number

The same NP has the same segment team structure. The corresponding relationship between the group call team number FGN, the group call number GN and the short group call address code SGI is:

$$SGI = (FGN - 20) \times 100 + (GN - 900) + 1$$

7.2.4.4 Hierarchical group call number

The hierarchical group call sign is a 5-digit decimal number. The first digit from the left is the hierarchical group call identification code. It is fixed to 9. The second digit is the level code divided by region. The value range is 0~5, 7~9. The last 3 digits are the group call sign within the corresponding level. The range is 000~999. Each level contains 1000 group call signs.

It is currently recommended to define four group call levels: 0 is the internal level; 7 is the city-wide level; 8 is the provincial level; 9 is the Ministry of Public Security level; 1 to 5 are reserved, see Figure 3.

8 Network management

8.1 Network management overview

Network management (abbreviated as "NM") can be divided into two types according to the basic network structure: single switching center NM and multi-switching center NM.

8.2 Single-switching center network management

The network management of a single-switching center is completed by the local network management organization.

8.3 Multi-switching center network management

The network management of multi-switching centers is completed by local network management and central network management organizations.

8.4 Basic functions of network management

The network management system shall have the following basic functions:

- User management;
- Performance management;
- Configuration management;
- Fault management;
- Security management.

8.5 Hierarchical architecture of network management

The PDT network uses a virtual three-level management architecture, see Figure 4.

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