

Technology Assessment Program

**NIJ Standard
for
Direct Connect Police
Annunciator Panels**

NIJ Standard-0320.00

*A Voluntary National Standard Promulgated by the
National Institute of Justice*

**U.S. Department of Justice
National Institute of Justice**

**U.S. DEPARTMENT OF JUSTICE
National Institute of Justice**

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FOREWORD

This document, NIJ Standard-0320.00, Direct Connect Police Annunciator Panels, is an equipment standard developed by the Law Enforcement Standards Laboratory of the National Bureau of Standards. It is produced as part of the Technology Assessment Program of the National Institute of Justice. A brief description of the program appears on the inside front cover.

This standard is a technical document that specifies performance and other requirements equipment should meet to satisfy the needs of criminal justice agencies for high quality service. Purchasers can use the test methods described in this standard themselves to determine whether a particular piece of equipment meets the essential requirements, or they may have the tests conducted on their behalf by a qualified testing laboratory. Procurement officials may also refer to this standard in their purchasing documents and require that equipment offered for purchase meet the requirements. Compliance with the requirements of the standard may be attested to by an independent laboratory or guaranteed by the vendor.

Because this NIJ standard is designed as a procurement aid, it is necessarily highly technical. For those who seek general guidance concerning the selection and application of law enforcement equipment, user guides have also been published. The guides explain in nontechnical language how to select equipment capable of the performance required by an agency.

NIJ standards are subjected to continuing review. Technical comments and recommended revisions are welcome. Please send suggestions to the Program Manager for Standards, National Institute of Justice, U.S. Department of Justice, Washington, DC 20531.

Before citing this or any other NIJ standard in a contract document, users should verify that the most recent edition of the standard is used. Write to: Chief, Law Enforcement Standards Laboratory, National Bureau of Standards, Washington, DC 20234.

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NIJ STANDARD FOR DIRECT CONNECT POLICE ANNUNCIATOR PANELS

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NIJ STANDARD FOR DIRECT CONNECT POLICE ANNUNCIATOR PANELS

1. PURPOSE AND SCOPE

This standard establishes performance requirements and test methods for direct connect police annunciator panels intended for use in monitoring the status of intrusion alarm systems located at residential or commercial premises. The alarm signals are transmitted over leased telephone lines to the police department. The panel provides an audible and visible alarm to indicate a change in status of the intrusion alarm system at the premises being protected. The performance characteristics addressed are those that affect the reliability of the device with emphasis on those attributes that affect false alarm susceptibility and tamper resistance.

2. CLASSIFICATION

For the purposes of this standard, direct connect police annunciator panels are classified into two types based upon the method of connecting the incoming subscriber's alarm transmission lines to the system.

2.1 Type I—Discrete Self Contained Panels

Type I annunciator panels incorporate a separate input for each subscriber connection. The telephone transmission lines connect directly to the panel, which also contains a main power supply and a standby supply. The display and control function for subscriber connection may be one of the following: a separate alarm module with a status or indicator display and an acknowledge button; a separate status indicator lamp with a common alarm and acknowledge module for all connections; or a separate lamp-switch (acknowledge) control.

2.2 Type II—Consolidated Panels

Type II annunciator panels provide inputs for each subscriber connection in a remote receiver cabinet (not physically part of the display portion of the panel). These panels use a common alarm and acknowledge control for all subscriber connections and include a power supply and a standby supply. The panel may use a separate wire for each connection from the remote receiver cabinet to the individual status indicator lights, or the transmission of alarm signals from the remote receiver cabinet to the display panel, may be accomplished by means of time division multiplexing with each subscriber connection identified by a numerical electronic readout.

3. DEFINITIONS

3.1 Acknowledge

Action taken to indicate that the operator is aware of a change in status on the alarm panel. Normally this is done by pushing a button that usually silences the audible alarm.

3.2 Alarm Receiver Module

Circuitry usually packaged as an identifiable unit which accepts a subscriber's connection and converts the subscriber's electrical signals into the electrical signals required by the display portion of the annunciator panel. The alarm receiver module may include line supervision functions as well.

3.3 Alarm State

The condition of a sensor of an intrusion alarm system that causes a control unit in the secure state to transmit an alarm signal.

3.4 Annunciator Panel

An alarm system monitoring device that consists of a number of visible signals such as "flags" or lamps indicating the status of an alarm system or systems. Each circuit is usually labeled to identify the location and condition being monitored. In addition to the visible signal, an audible signal is usually associated with the device. When an alarm condition is reported, a signal is indicated visibly, audibly, or both. The visible signal is generally maintained until reset either manually or automatically.

3.5 Direct Connection (Also Police Connection or Circuit)

The direct link by which an alarm system is connected to an annunciator installed in a police station. An example of a direct connection is a leased telephone line.

3.6 Electromagnetic Interference (EMI)

The impairment of the reception of a wanted electromagnetic signal or the creation of a spurious electromagnetic signal by an electromagnetic disturbance. This can be caused by radiative electromagnetic interference sources, such as lightning or radio transmitters, or conducted electromagnetic interference transmitted through power lines from other electrical devices.

3.7 End-of-Line Resistance

A technique of monitoring the transmission line and the status of an alarm system control unit connected to an annunciator panel. The alarm signal transmission line is terminated at the alarm control unit with one resistance to indicate a secure state and a different resistance to indicate an alarm state. Other resistances, including an open or short circuit, indicate line trouble or tampering.

3.8 Interrogation and Reply Transmission System

An alarm transmission system used to achieve inherent line supervision. The transmitter at one end of the signal transmission line sends out a coded interrogation signal to a device or control unit; the device or control unit must reply with a properly coded transmission signal within a specified period of time.

3.9 Line Supervision (Line Security)

Electronic protection of an alarm transmission line accomplished by sending a continuous or coded signal through the circuit. A change in the circuit characteristics, such as a change in impedance due to the circuit's having been tampered with, will be detected by a monitoring circuit. The monitoring circuit initiates an alarm if the change exceeds a predetermined amount.

3.10 Monologue Transmission Systems

A transmission system that transmits a coded transmission signal in one direction only.

3.11 Polarity Reversal Transmission

A commonly used technique of transmitting alarm system control unit status information from a subscriber to the monitoring station using a dc signal over a two-conductor alarm signal transmission line. In the secure state, one line is positive with respect to the other. In the alarm state, the lines change polarity with respect to each other. Line trouble is indicated when line current drops below a certain level.

3.12 Pulse Transmission

A technique for transmitting alarm unit status information over a two-conductor alarm signal transmission line (e.g., leased telephone lines) using low-frequency pulses (1-20 Hz). An alarm signal is indicated by a change in the pulse rate. Line trouble is indicated by the absence of any pulses.

3.13 Remote Receiver Cabinet

A portion of a type II annunciator panel that provides terminals for alarm signal receiving and processing.

3.14 Reset

To restore a device to its original (normal) condition after an alarm or trouble signal.

3.15 Secure State

The condition of an alarm system in which all sensors and control units are ready to respond to an intrusion.

3.16 Subscriber's Equipment

For the purposes of this standard, the subscriber's equipment is that portion of an alarm system usually installed at the protected premises that transmits the alarm signal and interfaces with one or more sensor devices and any transmission line supervision signals.

3.17 Tamper Switch

A switch that initiates an alarm signal if an attempt is made to gain access to the interior of a protected piece of equipment. This switch is usually activated by an attempt to remove the cover of the equipment.

3.18 Time Division Multiplexing

A technique of transmitting several channels of independent information over a single circuit on a time-sharing basis by sampling, at specific intervals, the data being transmitted and received.

4. REQUIREMENTS

4.1 Acceptance Criteria

The direct connect police annunciator panel meets the requirements of this standard if the annunciator panel display portion and all of the alarm receiver modules defined in section 5.1 of this standard pass all of the tests required by this standard.

4.2 User Information

The following information shall be supplied to the user by the manufacturer or distributor:

- (a) Nominal operating voltage.
- (b) Type of transmission signals the panel will accept.
- (c) Classification (sec. 2).
- (d) Complete installation, wiring, and adjustment procedures, including any installation restrictions.
- (e) Operating instructions.
- (f) Standby power requirements, including battery identification, and minimum period of standby operation that is guaranteed using the specified battery.
- (g) For rechargeable batteries, the minimum time to fully recharge the batteries if the equipment includes an integral battery charging unit.
- (h) The operation of transmission line features including the maximum input current for end-of-line resistance alarm receiver modules and equipment tamper protection features.
- (i) Certification of compliance with this standard.

4.3 Material and Configuration

The materials, parts, and components of the direct connect police annunciator panel and any required ancillary equipment shall comply with the requirements of Underwriters' Laboratories, Standard UL 365 "Police Station Connected Burglar Alarm Units and Systems" [1]¹, sections 4 through 12.

¹ Numbers in brackets refer to references in appendix A.

The annunciator panel or display panel shall have the capability of being mounted in a 48.26-cm (standard 19 in) rack or cabinet in accordance with EIA Standard RS-310-B "Racks, Panels, and Associated Equipment" [2]. This requirement may be satisfied by providing special adaptors or conversion kits for a unit designed for wall mounting or desk-top use.

4.4 Functional Requirements

All Type I and II annunciator panels shall meet the requirements of sections 4.4.1 through 4.4.4 for each type of transmission signal that is used. Type I and II annunciator panels that incorporate holdup alarm circuits shall meet the requirements of section 4.4.5. In addition to the above requirements Type II annunciator panels shall meet the requirements of sections 4.4.6 and 4.4.7 as appropriate for the item under test.

4.4.1 Alarm/Secure Indication

When tested in accordance with section 5.6.1, the annunciator panel shall indicate an alarm state for the alarm receiver circuit being tested. An audible signal shall be generated in conjunction with the visible indication. Operating the acknowledge switch shall silence the audible signal, but a visible indication of the alarm shall remain until reset after the alarm signal source has been returned to the secure state.

4.4.2 Line Trouble

When tested in accordance with section 5.6.2, the annunciator panel shall indicate line trouble for the alarm receiver circuit being tested with a different visible indication than for an alarm condition. An audible signal shall be generated in conjunction with the visible indication. Operating the acknowledge switch shall silence the audible signal, but the visible indication shall remain until reset after the line trouble has been corrected.

4.4.3 AC and DC Power On Indication

When tested in accordance with section 5.6.4, the annunciator panel or power supply shall give a visible and audible indication that ac power has been lost and that the panel is working on standby batteries. Operating the acknowledge switch shall silence the audible signal only. The panel shall automatically switch back to the ac power supply when power is restored. Restoration of ac power shall be signalled with a visible and an audible indication.

4.4.4 Manual Disable

When the annunciator panel is tested in accordance with section 5.6.6, indications of intermittent line trouble shall be disabled for the alarm connection under test. Note: Only the line trouble indication shall be disabled. The alarm indication shall still operate if a valid alarm signal is received.

4.4.5 Holdup or Other Alarm Conditions

When tested in accordance with section 5.6.3, annunciator panels having a separate transmission signal for holdup shall have a visible holdup alarm indication which is different than for alarm and line trouble. An audible signal shall be generated in conjunction with the visible indication. Operating the acknowledge switch shall silence the audible signal, but a visible indication of the holdup alarm shall remain until reset after the alarm signal source has been returned to the secure state.

4.4.6 Annunciator System Status Alarm for Type II Panels

When tested in accordance with section 5.6.5, the annunciator panel display shall signal a system status alarm warning in response to each of the conditions listed in the test. A visible indication shall be accompanied by an audible warning signal. Operating the acknowledge switch shall silence the audible signal, but the visible indication shall remain until reset after the alarm signal source has been returned to the secure state.

4.4.7 Numerical Display for Type II Panels

When tested in accordance with section 5.6.5, annunciator panels that incorporate numerical displays shall provide the following display functions:

- (a) The panel shall be capable of continually displaying for at least 1 s each subscriber number with its status condition sequentially. The data shall be for acknowledged status changes. A change of status condition is either a new alarm, trouble indication, or restoration to a secure state.
- (b) The circuit number shall disappear from the continuous display sequence if restoration to a secure state has taken place.
- (c) The panel shall be capable of interrupting the display sequence described in (a) above for each subsequent status change until acknowledgment occurs.
- (d) The panel shall include a printer that automatically prints, as a minimum, the date, time, circuit or subscriber connection identification number, and status condition code for each change in status.

4.5 Alarm Signal Sensitivity

All direct connect annunciator panels shall accept polarity reversal alarm transmission signals. This requirement may be satisfied for annunciator panels designed specifically for use with other alarm signal transmission techniques by use of a separate alarm receiver module that accepts polarity reversal alarm signals.

All direct connect annunciator panels shall respond properly to alarm signals when operated with a maximum series line resistance of 5 k Ω per circuit. The alarm signal sensitivity requirements for each type of transmission are presented in the sections that follow.

4.5.1 Polarity Reversal Technique

When tested in accordance with section 5.7.1, polarity reversal equipment shall have a threshold current no greater than 5 mA.

4.5.2 End-of-Line Resistance Technique

When tested in accordance with section 5.7.2, end-of-line resistance equipment shall have a threshold current of from 5 to 10 mA inclusive in the normal secure state and a threshold current of from 10 to 20 mA in the alarm state (alarm resistor shorted).

4.5.3 Low-Frequency Pulsar Technique

When tested in accordance with section 5.7.3, equipment using low-frequency pulse transmitters shall have a threshold current no greater than 2-mA peak.

4.5.4 Alternating-Current Line-Carrier Technique

When tested in accordance with section 5.7.4, the sensitivity of the receiver shall be such that the annunciator panel responds properly to alarm transmission signals at input signal levels down to one-tenth the amplitude (-20 dB) of the transmitted signal.

4.5.5 Interrogation and Reply Technique

When tested in accordance with section 5.7.5, the transmitter output signal level at the annunciator panel and subscriber's equipment shall be above 200 mV (-10 dBm) into a 600- Ω telephone line. The sensitivity of the receiver in the subscriber's equipment and the annunciator panel shall be such that the system responds properly to transmission signal levels at one-tenth the amplitude (-20 dB) of the transmitted signal level.

4.5.6 Combination of Two or More Transmission Techniques

When tested in accordance with section 5.7.6, each section of the alarm receiver module of annunciator panels that accepts two or more types of transmission signals for increased line security shall function properly and satisfy the requirements of the individual transmission techniques specified in the sections 4.5.1 through 4.5.5.

4.6 Receiver Alarm Time Delay

When tested in accordance with section 5.8, the annunciator panel shall not latch onto an alarm or line trouble indication lasting 1 s or less.

4.7 Stability Requirement

When tested in accordance with sections 5.9.1 through 5.9.7 the annunciator panel shall meet the requirements of sections 4.4.1, 4.4.2 and 4.4.4. There shall be no alarms other than those appropriate for each test.

4.8 Electromagnetic Susceptibility Requirement

When subjected to radiated electromagnetic fields, conducted interference and simulated lightning voltage surges on the transmission lines in accordance with section 5.10, the annunciator panel shall not indicate any alarms.

4.9 Tamper Switch

Each remote receiver cabinet for Type II panels, or any remotely located annunciator panel equipment shall incorporate tamper switch protection. When tested in accordance with section 5.11, the tamper switch shall not cause the system to signal an alarm until the cover or cover screw, whichever actuates the tamper switch, has moved at least 1.5 mm (0.06 in) and shall cause the panel to signal an alarm before the cover has moved a sufficient distance to permit a direct line-of-sight to electrical circuits or adjustment controls.

5. TEST METHODS

5.1 Sampling

Three alarm receiver modules for each type of transmission technique used with the annunciator panel shall be selected at random for testing. Three alarm receiver modules shall be of the polarity reversal type, and three additional modules for each additional transmission technique used. Each annunciator panel shall be complete including the power supply.

5.2 Test Conditions

Unless otherwise specified, all tests shall be performed with the annunciator panel operated at its specified nominal operating voltage and in a typical laboratory ambient environment. In all cases, the annunciator panel shall be allowed to warm up for a minimum of 5 min after being turned on, or as specified by the manufacturer, before any tests are performed.

5.3 Test Equipment

5.3.1 Alarm Signal Source

In the tests that follow, an alarm signal source is required for each type of transmission to be tested. It is necessary to use matching subscriber's equipment or manufacturer supplied test sources for tests of annunciator panels incorporating interrogation reply transmission techniques. For all other tests, matching subscriber's equipment or alarm signal source circuits may be used to generate the alarm signal providing that the source duplicates the manufacturer-specified transmission and line supervision signals.

5.3.2 Decade Resistors

The decade resistors shall have a variable resistance range from 0 to 9 k Ω with steps of 10 Ω . The values of the decade resistor shall have an uncertainty of less than 1 percent.

5.3.3 DC Milliammeter

The dc milliammeter shall have the capability of measuring current levels as high as 130 mA with an uncertainty of less than 3 percent.

5.3.4 Differential Input Oscilloscope

The oscilloscope shall have a high-impedance differential-input amplifier or plug-in amplifier with a bandwidth from dc to at least 1 MHz. Input resistance shall be 1 M Ω or higher while input capacitance shall be 50 pF or less. The common-mode rejection ratio shall be at least 500:1 for ac or dc signals. The

one side at a time, then move it uniformly until the tamper switch first actuates, and measure the movement of the cover. If the unit has a tamper switch actuated by the motion of a cover screw, retract the screw until the tamper switch is actuated, and measure the displacement of the screw.

In each case, examine the unit while the cover is lifted to the position just sufficient to actuate the tamper switch, and determine if there is a direct line of sight to any internal adjustment control or electrical circuitry.

