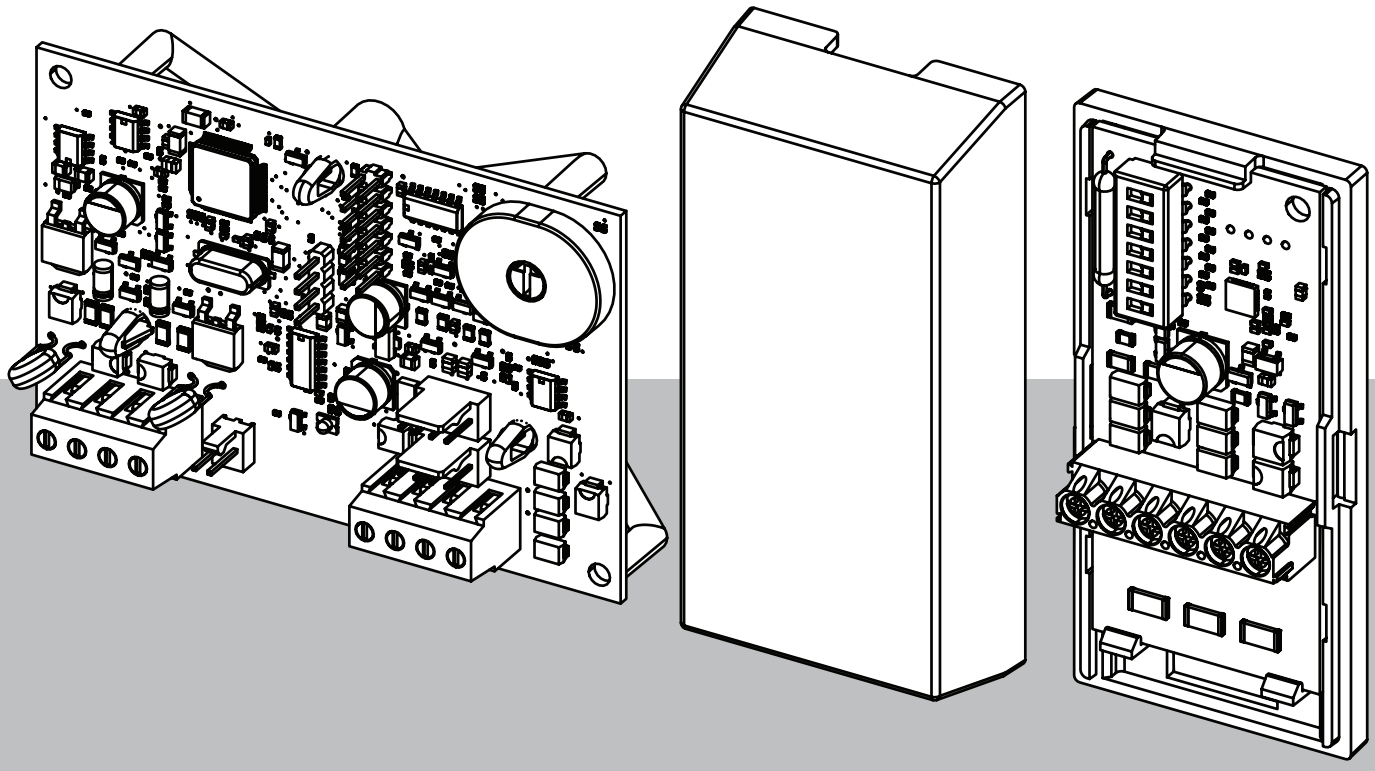
POPIT modules

POPIT



en Troubleshooting manual

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1 Safety

Caution!
Remove all power (AC and battery) before making any connections. Failure to do so might result in personal injury and/or equipment damage.

2 Introduction

The Point Identification System Validation Process provides a way to specify your system before installation and to resolve problems at sites with a history of missing and alarm reports for POPIT (Point Identification) Systems.
This process can take several hours to complete based on the following:
- System size and complexity
- Available troubleshooting tools
- Average knowledge level of Bosch Security Systems, B.V. equipment

2.1 Recommended Tools and Their Uses

Bosch Security Systems B.V. recommends that you use the following tools for the validation process:
- **Inductive Amplifier/Tone Generator Kit:** Isolates open wires on circuits and provides signal strength in areas where other wires or equipment create interference (noise).
- **Digital Multi-meter:** Recommend models comparable to Fluke Meters. Precise readings are critical.

2.2 Commands/Memory Log

Refer to the following sections for commands and memory log information.

2.2.1 History Information

Retrieve the history from the control panel and central station.

2.2.2 B9512G, B8512G

- **Service Walk Test: View Untested:** Provides point status.
- **View Log:** Provides a history of the activity on site.

2.3 Getting Started

1. Identify each data loop wire with a wire tag. Make sure the POPEX modules are properly marked so when loop wires are reconnected, they are not connected to the wrong POPEX module.
2. Mark all the other wires in the enclosure for identification purposes.
3. Clean up and isolate all data wires from the control panel to the POPEX module, and from the POPEX module to the data loops. Coiled wires, especially twisted pair, can function as antennae and generate noise inside the enclosure.
4. Call the central station, or use CMD 44 - VIEW POINT STATUS for the following steps. These next steps isolate which points are on the loop.
   - a). Initiate a Reset on the control panel. Record which points are still missing and which points are restored. **Note:** start of the polling process is delayed for 30 seconds after reboot to allow control panel-powered motion detectors to stabilize before being polled.
   - b). Remove one side of a previously labeled data loop. Record which points go missing. Points that are not missing are not on that loop.
   - c). Repeat *Step b* until all the loops are removed, and you know exactly which points are connected to which pairs of wire.

5. Compare the history of missing points with the points on each point loop. This helps identify loops that require work as well as the ones that do not.
6. Clean up the control panel interior wiring.
7. Make sure that wires are properly secured and that terminal strips/connectors are not loose.

3 Troubleshooting

Refer to the following section for troubleshooting suggestions.

3.1 Wiring

For additional wiring information, refer to the control panel installation manual.

3.1.1 Wire Specification Guidelines

The wire should meet the following specifications:

- Stranded
- Unshielded
- Mid Capacitance (30 to 40 pF per 1,000 ft.)
- 14 to 22 AWG (18 AWG recommended)
- Equal to or less than 8 twists per foot

3.1.2 Wire Type Summary

Notice!
NFPA-72
As of August 1998, NFPA-72 requires the use of stranded wire on fire system data loops. However, the local authority having jurisdiction (AHJ) has final approval

- Low capacitance wire is recommended for excessively long wire runs.

3.1.3 Things to consider

- If shielded wire is used (even though not recommended) connect one end of the drain wire to the control panel's Earth Ground Terminal only (not to a common).
- Tape the drain wire at all other points (POPITs, J-boxes) to keep it from touching water or metal, as two ground references on the same drain wire effectively create a ground loop antenna, which attracts RFI (noise) that corrupts the Point Bus data

3.1.4 Wire Application, Control, and Organization

Documentation identifying the location of all POPITS on each data loop can save hours of troubleshooting time. If that is not possible, at least try to identify and document the last point number on each loop.
Do not use existing wiring unless you have verified its integrity with the Wire Validation Worksheet.
Check for shorts from point to point. Disconnect the point midway on the loop, and then measure resistance in both directions. Continue this process on the portion of the data loop on which resistance is noted until the lowest resistance reading leads you to the short.
Ensure that two loops running parallel do not have continuity between them by disconnecting both loops and checking for resistance between the two.
Use the table to confirm the maximum data loop distance. This table assumes that the maximum number of POPITs are installed on the control panel.

Data Loop Distance	
Wire Gauge	**Distance**
22 AWG (0.8 mm)	1800 ft (549 m)
20 AWG (1.0 mm)	2890 ft (881 m)
18 AWG (1.2 mm)	4600 ft (1402 m)
16 AWG (1.5 mm)	7320 ft (2231 m)
14 AWG (1.8 mm)	11650 ft (3551 m)

Refer to

– *Wire Application, Control, and Organization, page 7*

3.1.5 Wire Connection Methods

All wire connections not made on the POPIT terminal blocks must be located within an enclosure.

Notice!
Avoid wire nuts or wire crimps. These are not recommended for Digital Data Circuitry.

3.1.6 Noise Control

Noise includes RFI, EMI, and AC Inductance.

Notice!
Do not install the control panel in electrical or phone rooms without first ensuring a noise-free route for the wiring and a verified earth ground.

Avoid noise-generating devices. Typical noise generating devices include the following:

– Generators
– Transformers
– High voltage electrical panels
– Induction heaters
– Fluorescent light fixtures
– Electrical motors
– Medical equipment
– Factory machines/equipment
– High powered wireless transmitters

Move wires 6 ft. (1.82 m) away from noisy conduit and devices to prevent noise from being induced into the data line. When your data must inevitably cross the path of AC, intersect it in a perpendicular manner, not diagonally, to minimize the extent of interference.

Use a minimum 22 AWG (0.8 mm) stranded wire
(18 AWG (1.2 mm) recommended for longer wire runs), preferably quad with two twisted pairs, so the extra wires can be connected to the control panel’s Common terminal to supplement the noise reduction.

3.1.7 Applications

When Points Are Grouped Together

- Grouping POPITs reduces the amount of data wire, which reduces the chances of long-wire-run issues.
- Make sure that non-tampered POPITs are located at least one half inch apart, and tampered POPITs three inches apart. A minimum of six inches of data wire must be looped (no 90-degree bends) between any two POPITs.
- Reduce wire stress to decrease the chance of high impedance problems that result in random current loss that is undetectable with a voltmeter. Bend solid wire before closing enclosure covers. Mount the points, and then bend the wire.
- An ideal application is to run up to 40 detection loops to a centrally located metal enclosure, which can hold up to 40 POPITs:
  - The metal enclosure provides an extra layer of protection against RFI.
  - Locking and tampering the enclosure prevents tampered POPITs.
  - The locked enclosure ensures that only authorized technicians can access the POPIT address dip switches.
  - POPITs mounted in ground level enclosures are less likely to be affected by adverse temperature, humidity, and other environmental conditions.
  - Service, when needed, can be performed more efficiently since the enclosure is mounted in service-accessible locations.
  - Grouping the POPITS in numerical sequence within an enclosure makes polling more efficient.
  - Grouping the POPITs within an enclosure ultimately means shorter data distances, and avoids mounting POPITs near the perimeter of the premises where they are most vulnerable to radio interference.

T-Tapping

Use the following information to determine if data loop T-tapping is acceptable:

- T-tapping allows an installer to run data with less wire. It should be done in break-out boxes with terminal blocks for best results.
- T-tapping is "adding" outputs from the control panel by creating more terminals for the data runs to connect to.
- Never extend a single T-tap more than 200 ft.
  (61 m) from the main data cable connecting to the B299.
- Never T-tap off another T-tap. Loops originating from the B299 are not considered T-Taps.
- Calculate additional data distance for each T-tap as follows: add the length of the T-tap, plus the distance from the point of the T-tap back to the B299.
  For example, a 100 ft. (30 m) T-tap 800 ft. (244 m) from the B299 adds 900 ft (274 m) in data distance.

Notice!

T-tapping increases the possibility of noise.

Environmental Issues

- Do not install POPITs in locations that exceed the UL specification for humidity or temperature documented on the POPIT datasheet.
- Do not install POPITs outside, or in an indoor environment where the temperature and humidity are not controlled.
- Do not install points in freezers, as this environment is beyond the controlled tolerance. Instead, run the detection loop wire to a POPIT outside the freezer.
- Underground conduit collects water. High-impedance earth grounded shorts are indicative of this. Use caution and plug the conduit so water does not collect. Refer to the conduit installation guidelines listed in NEC-70.
- Running data loops between separate buildings necessitate isolating the wire from conduit shorts and differential grounds. Minimize the distance of data loop runs between buildings. Connect to a terminal block at each end to facilitate servicing and metering. Spare wire pairs, if possible, are also recommended.

Parallel Fire and Intrusion Systems

- When you have separate fire and intrusion systems installed as required in many fire jurisdictions, make sure that data loops are isolated from each other, so that data from one system does not interfere with data from the other system. Missing and extra point reports result from failure to accomplish this isolation.
- Make sure any "remote" auxiliary power supply or any other interfaced device (for example, an access control system or separate fire system) is connected by a wire between the common of the power supply and the common of the control panel.

Notice!
Do not use existing equipment terminals that are not a part of the security system to ground the control panel.

4 Tests and Installations

Refer to the following information to test and verify the POPITs.

4.1 Normal Voltage on Data Loop

The following table shows the acceptable voltages when tested with a voltmeter.

Electrical differences

One of the differences between the old and new versions is that the sensor loop voltage is different as shown in the chart below. This shift of voltages is expected and is taken care of in the POPIT.

	Loop state		
	Short	Normal	Open
New POPIT	0V-1.85V (VDC)	2.25V-2.48V (VDC)	2.88V-3.30V (VDC)
Old POPIT	0V-2.40V (VDC)	2.60V-7.30V (VDC)	8.80V-12.0V (VDC)
Note: Voltages not in chart are hysteresis for state transitions.			

SAP numbers

CTN	Old POPIT material number	New POPIT material number
D9127T	4998125942	F01U418014
D9127U	4998800196	F01U418013

Use the voltmeter’s min/max setting to verify the exact and average readings. The voltage oscillates approximately every half-second.

4.2 Determining a Faulty POPIT

If a point is showing normal on the meter but faulted at the control panel, switch the point with a known good point before replacing it. The simplest way to do this is to swap DIP switch settings, then reset the devices and control panel.

When observing a group of POPITs that fail and then restore, assume that there is a wiring problem before assuming a POPIT problem. If it is a POPIT problem, review the reports to the central station or the control panel’s history log. If one point reports out of place, or is in the report all the time where others are not, this POPIT is suspect. Replace it, but do not throw it away until you are satisfied that this POPIT is faulty.

False alarms that are indicative of a detection loop fault rather than a missing condition are caused by bad detection loop devices or device connections rather than by data loop or POPIT issues.

4.3 POPIT Installation Guidelines

- Always use POPIT covers.
- Always use mounting screws. Do not let a point hang by its wires.
- Whenever possible, install the control panel toward the center of the system to reduce data loop distance.
- Install the points in a location that is easy to troubleshoot. Avoid installing the points in very high spots that require a forklift or tall ladder to access the points.

4.4 Power Supply

- Make sure the batteries are less than three years old, and that the control panel's yellow charging circuit status LED (CHG. STAT.) and red low battery LED (LOW BAT) are unlit.
- Make sure that the control panel is not drawing more than the specified amount of current.
- Marginal battery condition and/or incorrect or an improperly wired transformer will cause missing POPITs due to lack of power and have more vulnerability to noise.
- Always connect a common wire from the Auxiliary Power Supply common to a common terminal on the control panel. Doing so prevents differential grounds and keeps voltage fluctuations and spikes spread out evenly in the whole system, not just the control panel.

4.5 Verify Earth Ground to the Control Panel

Earth ground is the "main drain" for noise induced into the control panel and is a requirement of NEC-70, FCC, and the manufacturers' installation instructions.

Warning!
HIGH VOLTAGE WARNING! FATAL SHOCK POTENTIAL!
Consequences To avoid the risk of fatal electrical shock, observe all standard safety practices and procedures when dealing with energized electrical lines.

4.6 Wire Worksheet Instructions

The following tests make up the Point Validation Process, which allows the on-site technician to isolate causes of missing point conditions.
Document the test results on the worksheet provided in this document.

4.6.1 TEST A: Wire Identification Method

Purpose: Before you troubleshoot missing POPITs, identify which points are connected to which data loop pairs. After comparing the history of missing POPITs verified by the control panel's history log and the central station receiver records, with a confirmation of which points are connected to which pairs, you can narrow the troubleshooting effort to one wire pair.
Desired Results: All wires identified and labeled.

4.6.2 TEST B: Earth Short Validation

Use this test to make sure that the wires are isolated from other objects, for example, water or metal, that are referenced to Earth Ground.

Warning!
Use proper safety precautions when working with wires and voltage.

- **Setup:** Disconnect the wires from the control panel before taking the reading.
- **Meter Setting:** 0 to 10 kΩ
- **Lead Placement:**
  - **Black:** Earth Ground wire to control panel
  - **Red:** Data loop wiring
- **Desired Results:** A reading of Infinity between data wires and the earth ground wire. Any resistance reading indicates a wire is not ground-isolated.
- **Symptoms:** If there is a short on the loop, the system experiences missing conditions, missing alarms. “Runaway” (repeated “Missing”/”Restore” reports), typically related to a single data loop pair (unless, for example, the entire building has been flooded).

4.6.3 TEST C: Conduit Short Validation

If there is no conduit on the premises, skip this test.
Use this test to ensure that the wires are not shorted to the electrical conduit, and identify if the wiring is shorted to the building conduit. In most cases, the conduit is strapped to the building frame.

- **Setup:** Disconnect the wires from the control panel before taking the reading.
- **Meter Setting:** 0 to 10 k
- **Lead Placement:**
  - **Black:** Electrical conduit screw/clip
  - **Red:** Field wiring to the devices
- **Desired Results:** A reading of Infinity between the field wiring and conduit reference.
- **Symptoms:** If there is a short on the loop, the system experiences missing conditions, missing alarms. In addition, you might be able to relate missing conditions to occasions when the public address (PA) system, or similar devices which can feed noise back into nearby AC conduit and spread it throughout the building, are activated.

4.6.4 TEST D: AC Noise

AC noise is very common throughout any building and is usually not a sufficient problem to cause missing points if other noise issues are minimized.

- **Setup:** Disconnect data wires from the control panel before taking the reading.
- **Meter Setting:** 0 to 12 VAC
- **Lead Placement:**
  - **Black:** Connect to Common on control panel
  - **Red:** Connect to field wiring to data devices
- **Desired Results:** 0 V. Any voltage indicates that a potential source for power surges exists. Bosch Security Systems B.V.’s systems have worked with up to 10 V transient AC on the data loops; points were not reported “Missing” until devices on the AC circuit were switched on.

Notice!
If you have a data loop with points that are functioning properly, compare it to the data loop on which points have been reported as missing. If transient AC voltages are identical, you have confirmed that the existing AC is insufficient to cause missing points; otherwise, both loops would reflect such a history.
If you have two choices with a “problem” data loop:
Isolate and correct the other cause, so that the loop can function despite the AC,
OR
Isolate and correct the transient AC source, with the likelihood that the loop can then function despite the other cause(s).

– **Symptoms:** The system experiences erroneous missing and trouble conditions and false alarms. Multiple service calls occur even after replacing equipment. There might be runaway points at certain times of the day, which are often easy to isolate (for example, points go missing when the chicken feeder augers turn on). The pattern might be broader: points only go missing when the system or area is disarmed, but never when it is armed or when no one is at the site to switch the powered devices on.

Notice!
Reverse Method: Placing the black lead and the field wiring and then touching the transformer terminal should result in 0 VAC.

4.6.5 TEST E: Capacitance

Of all the noise issues, capacitance is one of the most confusing and hardest to isolate. It is also rare. A capacitance problem is related to long wire runs or wire runs shorted to a conduit (where the conduit is actually adding capacitance and being inadvertently used as a carrier since it is shorted directly to the wire conductors). If Tests A, B, C, D and F are completed properly, Test E is not necessary. Capacitance is also increased when shielded wire is used and the wiring is run with other wires in a conduit.

– **Setup:** Disconnect the wires from the control panel. Use a valid capacitance meter.
– **Meter Setting:** 0 to 10 mF
– **Lead Placement:** Touch black and red across each data loop one at a time. Add readings from all loops to calculate total system capacitance.
– **Desired Results:** 0.4 mF maximum.

Notice!
Group the POPITs to reduce data wire. Use a low capacitance wire on long wire run applications.
Wire the control panel in the shop prior to installing. Connect the wire reels together and do a pre-test on the emulated wire run. Review *Section Wire Specification Guidelines, page 7* *Wire Specification Guidelines, page 7* on page to calculate capacitance

Symptoms: In a capacitance scenario, three or four points go missing; and immediately restore or a single point might restore only after several minutes, hours, or days. Extra points (“ghost” points) are typically caused because capacitance affects the timing of legitimate point responses. There is a random frequency and pattern of the symptom.

Refer to
– *Wire Specification Guidelines, page 7*

4.6.6 TEST F: Data Loop Resistance

Setup: Disconnect the data loop wires from the control panel before taking the reading.

Notice!
Place a jumper across the data loop terminals of the last device on each data loop so that only the wire resistance is being read

- **Points:** Wire across the Data In and Data Out terminals.
- **Meter Setting:** 0 to 50 kΩ
- **Lead Placement:**
  - **Black:** Data out to data devices
  - **Red:** Data in from Data devices
- **Desired Results:** 1 ohm per 1000 feet of data wire.
- **Symptoms:** Low voltage at the last point(s) on the longest data loop. High voltage but low currents due to the high impedance open. Missing point conditions due to high resistance.
- **Pattern:** The most distant points go “Missing”.
  Keeping Ohm’s Law in mind, it might be simpler to supplement the control panel’s Auxiliary Power output than to clear resistance in the data loop wiring.

5 POPIT validation worksheet

Data	TEST A	TEST B	TEST C	TEST D	TEST E	TEST F	Notes
In	Tag #	K ohms:	K ohms:	VAC	mF:	K ohms:	
Out							
In	Tag #	K ohms:	K ohms:	VAC	mF:	K ohms:	
Out							
In	Tag #	K ohms:	K ohms:	VAC	mF:	K ohms:	
Out							
In	Tag #	K ohms:	K ohms:	VAC	mF:	K ohms:	
Out							
In	Tag #	K ohms:	K ohms:	VAC	mF:	K ohms:	
Out							
In	Tag #	K ohms:	K ohms:	VAC	mF:	K ohms:	
Out							
In	Tag #	K ohms:	K ohms:	VAC	mF:	K ohms:	
Out							
Max Allowed		0 ohms:	0 K ohms:	0 VAC	0.4 mF:	40K ohms:	
(-) Actual							
Totals							

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