

## *I n t e l l i N o t e*

**DATE:** June 2001  
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**RE:** 7050E Family, Zone Input Explanation

### **Message**

This document assumes the reader has some familiarity with programming and wiring zone inputs on the AES 7050E family of subscribers. For additional information refer to the Subscriber's Installation manual.

About mid 2000, AES introduced Version 2 firmware for the AES 7050E family of subscribers. The AES 7050-E, 7450 and 7440 are all members of this family. New zone input features were added. The AES 7050E version 2 zone inputs add trouble or tamper reporting to the "End Of Line" resistor "Supervision". The purpose of this document is to provide the information you need to design or determine how to connect and program a 7050E family Subscriber to your control panels.

Although the 7750-F and 7750-F8's main board is based on the 7050-E, they include special purpose zone input interface boards. The 7750-F and 7750-F8's zone inputs function differently than those discussed in this document. The special purpose zone input boards utilize opto-electronics to isolate battery ground from earth ground, preventing ground faults.

There are now six types of zone input configurations available:

(O) NO or Normally Open	(C) NC or Normally Closed
(S) Supervised,	(B) Bypassed
(F) Fire supervised with trouble	(I) Inverted. Fire (or intrusion) with tamper*.

\*Trouble and tamper are considered the same. It is reported as a trouble.

Some 7050 history: The original 7050 Subscriber's zone inputs were 5 Volt TTL type inputs. With these you needed to connect to external contacts or switches either normally open or normally closed. Using a resistor voltage divider it is also possible to connect to voltage outputs of control panels. The function of the voltage divider is to limit the maximum voltage to less than 6 volts. AES developed the 7072 Multifunction board to, for one thing convert the 5 Volt TTL type inputs of the 7050 to a 4 to 30 Volt input that could be connected to NO, NC and Voltage type outputs. The 7072 inputs are connected to a CMOS driver and requires a positive voltage trip.

The 7050E was designed to incorporate some of the functions of the 7072 Multifunction board onto the main subscriber board. The zone inputs circuits of a 7050E measure the voltage applied to them. An A to D (analog to digital) converter is used to convert the voltage to data the processor can understand.

What is Normal: The program choices you make sets the Subscriber voltage range to be considered normal and the threshold to cause an alarm condition. Under no circumstances do you want to configure a zone input so that it is near the threshold when the zone is considered to be at the normal condition. This may produce erroneous or unpredictable alarm messages.

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**Bypassed:** When Bypass is the selected mode, the Subscriber will not transmit a change on that zone. This will lock a zone that is in an alarm condition to that condition. Press the reset button or send a reset command to properly register a Bypass condition.

**NO/NC voltage range:** When a 7050E zone is programmed Normally Open or Normally closed, a closed condition will be when the input voltage is below 1 volt. An open condition is when the input voltage is above 4 volts. The actual threshold is 2.5 volts, but as stated before you never want to be close to the threshold at normal condition.

**Open input:** With no connections or external resistors attached to a zone input, the voltage between the input terminal and battery minus or Ground will be about 12 volts. 12 volts is above 4, therefore the condition of the input will be interpreted as open. To cause an alarm the voltage must go below 1 volt.

**Closed input:** A connection between the zone input and ground will read as zero or close to it. Zero is below 1; therefore the input will be interpreted as Closed. To cause an alarm the voltage must go above 4 volts.

**Supplied resistor Warning:** The supplied 2.2K-ohm resistor is intended for use in an EOL Supervised configuration. When the 2.2K-ohm resistor is installed between the zone input and a Ground terminal, the input will be at about 2.3 volts. This is below the 2.5 trigger point and will be interpreted as a closed condition. 2.3 volts is very close to the 2.5-volt threshold. Do not program this configuration as normally closed as the voltage may momentarily transit the nearby 2.5 voltage threshold and cause an alarm message to be transmitted.

**Supervised:** When a 7050E zone is programmed for Supervised, a normal condition will be when the zone input is between 2 and 3 volts. The actual trigger points are 1.5 and 3.5 volts, but again you do not want to be near the trigger point at normal condition. Therefore, with the 2.2K-ohm resistor between the zone input and Ground, the voltage will be at about 2.3 volts. This is within the 2 to 3 volt range and will be interpreted as normal or non-alarm condition. Removing the resistor or shorting it will cause the voltage to go to about 12 volts or zero respectively and cause a not normal condition. Any other change to the resistor that causes the input voltage to go out of the normal range will also be interpreted as an alarm condition.

**Fire and Inverted Fire:** New to version 2 is the reporting of a zone trouble condition. A new packet type was created in version 2 Subscriber firmware. This packet is a Trouble packet. Two of the new zone programming options will utilize this new packet to report a trouble or tamper condition. If Fire program (F) is selected then an alarm will be transmitted if the EOL is shorted or the voltage goes below 1 volt and a Trouble will be transmitted if the resistor is opened or the voltage goes above 4 volts. Inverted Fire is the opposite where an open causes an alarm and a short causes a trouble, indicating a possible tamper condition.

**Receiver requirements:** Non UL AES receivers require at least firmware version 1.70 in the Central PCB. Version 2 or higher is recommended. AES 7701 with 7700 should have the latest software version. As of March 2001 Net77 was at version 1.48.6. All 7003 and 7703 recognize the trouble packet and do not require a firmware upgrade.

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Software requirements: To program the new modes you need software that has Fire supervision capability. Net7K version 3.2 or higher is needed. As of March 2001 Net7K it is at version 3.4. Net77 1.48.6 or higher is required to program the new modes with the 7701 receiver. The 7003 and 7703 use Net7K software.

Alarm panel voltage outputs with Supervised programming: The 7050E zones, programmed for Supervised, can in some configurations be connected to voltage outputs or open collector outputs of control panels. The Supervised mode functions best and is easiest to understand when connecting to a switch or relay that will either open up the circuit or short the resistor. Your control panel's voltage output can be connected to the Supervised input of a 7050E, if it meets either of the following two conditions. 1) A normal condition of your panel's output puts little to no load on the 7050E input and the voltage output in alarm condition is above 4 volts. 2) The control panel's open collector output in a normal condition puts little to no load on the 7050E input, and causes a connection to ground or below 1 volt on alarm condition.

What does that mean? It is common for a control panels to have circuitry or components to protect the panel's output from damage. These components can cause a load on the circuit they are connecting to. If the control's output puts a load on the 7050E - zone input and causes the voltage to go out of normal range or close to the threshold, you should not use Supervised mode. There are ways, but it is out of the scope of this document and is not typically recommended. You should use either Normally Open or Normally Closed mode.

Test your control panel's output for compatibility with the Supervised 7050E input: Program the 7050E zone or zones you want to test to Supervised. Install the provided 2.2K-ohm resistor(s) between those zone inputs and a G terminal. All G terminals are electrically the same. Connect one of your Control Panel's battery minus or Common terminals to one of the 7050E G terminals. Confirm that the ALM Led on the 7050E is flashing steady and not indicating a zone in alarm. Measure the voltage between the 7050E G terminal and a zone you are testing. It should be approximately 2.3 volts. While observing the voltage attach a wire from your Control panel's output to the same 7050E-zone input. If the voltage does not change significantly there is little to no load being applied. If the voltage drops below 2 volts or goes above 3 volts the load produced by the Control panel's output is too great. Now cause the Control Panel's output to go into alarm condition. The voltage must go significantly below 1 or significantly above 4 volts to cause the zone to trigger. If your voltage measurements come to close to the thresholds you may end up with unpredictable results. You may get false alarms for apparently no reason at all. A slight swing in the panel's or the subscriber's voltage could cause alarm conditions. If the test results are acceptable then you should be able to use the 7050E zone inputs in the Supervised mode with End of Line resistors.

NO or NC for voltage output of alarm panel: To use voltage trigger you must determine the normal and alarm voltages produced by your Control Panel. Some panels will float their outputs. These are usually open collector or emitter follower types of outputs. Others will close a relay contact to provide voltage or ground output. Other possibilities are for the output to swing between a low voltage to a high voltage or a high voltage to a low voltage.

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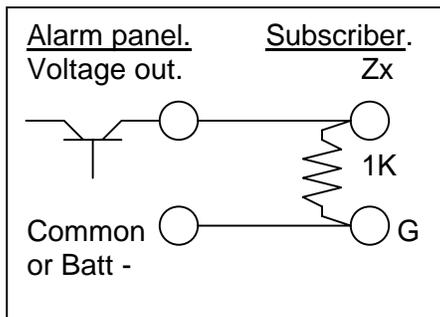
Connecting to open collector outputs: An open collector output uses a transistor as an electronic switch. When the switch is activated by the control, the electronic switch closes and causes a connection to ground. You should be able to connect the Panel's minus or common to a 7050E G terminal and the open collector output to a 7050E zone input. When the output of the panel is not active you should measure about 12 volts at the unloaded 7050E input. The voltage must be above 4 volts. If the voltage drops below 12 volts it may be due to loading of the circuit. When the output is active the voltage should drop to below 1 volt causing an alarm condition. The Supervised mode with the 2.2K EOL is an option in this configuration. Refer to the "TYPICAL WIRING DIAGRAMS: / INPUT TYPE: OPEN COLLECTOR – Alarm occurs when voltage is pulled to ground," in the Subscriber manual.

Connecting to emitter follower outputs: An emitter follower output uses a transistor to switch a positive voltage output. The output should cause no load when inactive. The output will usually provide 12 volts when it is active. The circuitry of the unloaded 7050E input is at about 12 volts. When the panel's output goes active it will also be at about 12 volts. There is no voltage difference to detect. In this case you must provide the near zero voltage or a closed condition in the not active condition. Installing a 1K-ohm resistor between the zone input and a G terminal will usually provide the closed voltage condition below 1 volt. Do not use the provided 2.2K-ohm resistor, as it will be too close to the 2.5-volt threshold.

A relay type positive voltage output: This type of output will function the same as the emitter follower outputs mentioned above. You will need to use a 1K pull down resistor in the case of a relay providing a positive output voltage. The 1K resistor provides the closed condition that will be overridden by the positive voltage output.

The bottom line: In some instances you may be able to use a Supervised mode with EOL resistors for your voltage outputs. Test your compatibility. If the panel adds too great of a load, you should instead use Normally Open or Normally Closed programming.

Most common Voltage or Bell output configuration:  
Program for Normally Closed.



### Voltage Reference Table:

#### Supervised voltage levels:

Optimal normal	2.5
Normal range	2.0 to 3.0
Actual trigger	1.5 and 3.5
Recommended Trigger	1 and 4

#### Normally Open voltage levels:

Optimal normal	12 or above
Normal range	above 4
Actual trigger	2.5
Recommended Trigger	below 1

#### Normally Closed voltage levels:

Optimal normal	0
Normal range	below 1
Actual trigger	2.5
Recommended Trigger	above 4