INTERFACING SECURITY SYSTEMS TO HOMEVISION

We receive a lot of requests about interfacing HomeVision to a security system. This article discusses the options in detail.

OVERVIEW

There are three main ways to interface HomeVision to a security system, listed in decreasing order of power and reliability:

1. Serial connection (i.e., RS-232 or RS-485)
2. Hardwired to HomeVision digital inputs/outputs
3. X10 interface

These are each discussed below.

SERIAL INTERFACE

The ideal way to interface a security system to HomeVision is with a serial port connection, either RS-232 or RS-485. Unfortunately, few security systems provide a serial port for this purpose. Worse, those which do often use a communications protocol that is impractical for an automation controller to handle, or they may not even provide the protocol to customers. For example, the Napco Gemini security system is quite popular, and it does have a serial communications option. However, its serial port requires the use of hardware flow control lines. Neither HomeVision nor most other home automation controllers support hardware flow control, meaning they can't be used with the Napco Gemini (the Napco Gemini generally must be connected to a PC).

The CADDX NetworX line of security systems is an exception, and *can* be interfaced to HomeVision. The CADDX NX-584 is an add-on module that provides as RS-232 serial port for connection to HomeVision. When used with together, the integrated system provides the following capabilities:

- HomeVision can arm or disarm the security system, switch between Home and Away modes, bypass zones, turn the keypad chime mode on and off, and more.

- HomeVision can track the status of the security system, detect alarm conditions, detect zone trouble conditions, and more.

- The HomeVision Security System video screen can display system and zone status on your TV, and also allow users to control the system with an infrared remote.

The specific HomeVision commands, events, and conditions that can be used with the CADDX alarm are listed below.

COMMANDS

- Arm partitions ### in Home mode
- Arm partitions ### in Away mode
- Disarm (or silence) partitions ###
- Toggle zone ## bypass
- Turn partitions ### chime mode on
- Turn partitions ### chime mode off
- Toggle partitions ### "instant" mode
- Sound partitions ### fire panic
- Sound partitions ### medical panic

- Sound partitions ### police panic
- Request all partitions status
- Request zones 1-16 status
- Request zones 17-32 status
- Request zones 33-48 status
- Request zones 48-64 status

<u>EVENTS</u>

- EVENT: Partition ## becomes manually armed
- EVENT: Partition ## becomes manually disarmed"
- EVENT: Partition ## alarms occurs

<u>CONDITIONS</u>

- If partition ## is disarmed
- If partition ## is armed in Home mode
- If partition ## is armed in Away mode
- If partition ## is armed (in Home or Away mode)
- If partition ## is ready to arm
- If partition ## is not ready to arm
- If partition ## has alarm condition
- If partition ## has no alarm condition
- If partition ## chime mode is on
- If partition ## chime mode is off
- If zone ## is faulted
- If zone ## is not faulted
- If zone ## is bypassed
- If zone ## is not bypassed
- If zone ## is in trouble condition
- If zone ## is not in trouble condition
- If zone ## has alarm in memory
- If zone ## does not have alarm in memory
- If any zone is faulted
- If any zone is bypassed
- If any zone is in trouble condition
- If any zone has an alarm in memory
- If security system communications is OK
- If security system communications error

HARD-WIRED INTERFACE

The second-best way to interface a security system to HomeVision is with hard-wiring (running wires between the security system and the HomeVision digital input and output ports). Here are the main interfaces typically provided by security systems (although not all security systems provide each of these):

- **ARM/DISARM CONTROL**

  Most alarms have a "keyswitch" closure input that toggles the alarm between ARMED and DISARMED. They typically require closing a contact (a switch or relay) for a second, then opening it. This can easily be done with HomeVision by connecting the alarm input to a relay driven by HomeVision. This could be a relay connected to Port A, or a relay on a

Sylva 8O8I board connected to HomeVision. A HomeVision output port "pulse" command can then toggle the alarm between ARMED and DISARMED. Some systems can be armed in different modes (like AWAY or SLEEP) based on how long the contact is closed. Note that since this is usually a toggle command, you must know the CURRENT state in order to put the system in it the desired state (see the next item).

- **ARM/DISARM STATUS, ALARM CONDITION STATUS, AND OTHER STATUS**

  Most alarms provide relay (or contact closure) outputs indicating whether the alarm is armed and whether there is currently an alarm condition. Some alarms provide additional outputs indicating "pre-arm", "ready", and similar status. Such outputs can be wired to directly to the HomeVision input ports (one side of the alarm output relay goes to HomeVision's ground, the other to any HomeVision input port).

  Other alarms provide a 12VDC output instead of a contact closure. There are two ways to connect these to HomeVision:

  1. Connected to HomeVision Port B (or Port D on the Multifunction Expansion Board), which is rated up to 30VDC. Note that for such security systems, if the alarm output is "open" (as opposed to grounded) when not at 12VDC, then the HomeVision input port will read both conditions as a "high". In this case, you will need to add a resistor between the input and ground to force an "open" condition to be read as a "low" by HomeVision (a resistor of 500 to 700 Ohms should be used, assuming the alarm can provide the necessary current of 15-25mA).

  2. Connected to the opto-isolated inputs on the Sylva 8O8I board. One wire goes from the alarm panel ground to the negative side of the opto-isolated input. A second wire goes from the alarm panel output to the positive side of the opto-isolated input.

- **ZONE STATUS**

  Some alarm systems provide the status of each zone as an output. This can be used by HomeVision for occupancy sensing and other home automation functions. The alarms that provide this capability usually require an add-on board with digital outputs. Other alarms may provide a few zones on the main unit, and require an add-on board for additional zones. Note that some systems do not output the zone status when the system is disarmed, limiting its usefulness for automation or occupancy sensing.

  Some alarms provide their status output as 0 and 5V signals. These can be directly connected to any of HomeVision's input ports. Other alarms provide contact closure or 12VDC outputs. These can be connected as described in the previous paragraph.

Sharing Sensors Between the Alarm System and HomeVision

When using hardwired systems, many users would like to connect their alarm sensors to both the alarm _and_ HomeVision at the same time. Although this will work with many alarms, **we strongly recommend against it**. Neither HomeVision nor most other home automation systems are UL approved for use as security systems. Connecting the same wiring to both systems usually violates UL standards. In addition, such interconnections can affect the performance of the security system if not done properly (note that the connections described above for arming and status are designed for this purpose and _do not_ pose a problem). Custom Solutions, Inc. will not be responsible for any consequences if you connect sensors to HomeVision and an alarm system. The data below is provided for informational purposes only.

One safe way to share a sensor is to use ones with dual outputs. Many motion sensors, and even some alarm switches, provide both "normally closed" and "normally opened" outputs (along with a ground line). One output can be connected to HomeVision and other to the alarm, and the ground connected to both (sharing ground lines is usually not a problem). This keeps the alarm system's zone input isolated from the HomeVision input. This setup requires running three wires to each sensor, plus power if required.

If you connect the _same_ sensor contact to HomeVision and the alarm, you have to be sure that the HomeVision connection doesn't interfere with the alarm's operation. Different alarm systems operate in different ways, so we can't give a universal solution. The difficulty is further compounded by the fact that most modern alarms sense _three_ different voltages from the sensor (one which indicates "OK", another which indicates "ALARM", and the third which indicates "FAULT"). Each condition has it's own voltage thresholds, which can vary depending on whether the zone is set up for fault monitoring, has an end-of-line resistor installed, or is set up as normally-opened or normally-closed. The voltages can also change slightly when operating from a battery instead of AC power. As you will see in the following discussion, connecting another device (like HomeVision) to such a zone is difficult. It requires a thorough knowledge of electronics, and detailed information on how the alarm works. Without this, you will probably not be able to make everything work together reliably. Therefore, we must once again recommend against trying to do any of the following.

- One approach is to connect the alarm sensor to HomeVision "opto-isolated" inputs using the Sylva 8O8I boards. The 8O8I input would be wired in series with the sensor. Note that the 8O8I board has a resistor (1500 Ohms the last time we checked) in series. This could affect the alarm system if the alarm is configured to use an end-of-line resistor. To make it work, you may have to either disable this option (on the security system), short across the 8O8I board's resistor; or reduce or eliminate the end-of-line resistor.

- Another approach is to connect the sensor directly to a HomeVision input port. The maximum sensor voltage is usually 15V (12V nominal), and only Port B can withstand this. However, Port B inputs are connected to 5V through a resistor, which could interfere with the alarm, so this is usually not recommended.

- Still another approach is to use a "resistor divider" to drop the sensor voltage to below 5V, then connect it to a Port C input. Port C draws much less current than Port B, so high-value resistors (10K to 50K Ohms) could be used, thereby eliminating any significant impact on the alarm system. However, the difficulty here is making sure that zone changes cause an input voltage change sufficient to cross the threshold from high to low. Refer to the HomeVision owner's manual for electrical details on the input ports.

- Yet another (and probably the best) approach is to use a "resistor divider" as described above, but connect it to an analog input on the HomeVision Multifunction Expansion Board. You can then read the analog voltage and use your own thresholds to determine the alarm state. This way, you could even distinguish between the three zone states of "OK", "ALARM", and "FAULT".

X10 INTERFACE

There are several security systems with X10 capability. Most of these transmit X10 signals when certain events occur. Although these may be the easiest to install, there are several potential problems with such systems:

- The X10 transmissions can collide with other transmissions in your home, degrading overall reliability of other X10 devices.

- The X10 collisions may prevent transmissions from the security system from reaching HomeVision. Thus, HomeVision may not always know the true alarm status.

- Most security systems can't be armed or disarmed via X10 commands. If they can be, then there's a security risk, as signals from outside the home may disarm your system.

From what we've heard from HomeVision users, many with an X10-compatible security system have chosen the Napco Gemini. The DSC Power 832 is another popular system, but does not report zone open/close status when the system is disarmed, nor does it send separate commands when a zone is opened or closed. Thus, the DSC Power 832 can't get the zone status information into HomeVision. The Napco Gemini doesn't have these limitations.