

## AIO-16 Noise detected on Same Card Mixes / Cross-Connects

Issue Severity:	Product(s) Affected:
<input type="checkbox"/> <b>High:</b> URGENT – Immediate Action Required  <input checked="" type="checkbox"/> <b>Medium:</b> Bosch Security Systems, Inc. strongly recommends you take the action(s) described below.  <input type="checkbox"/> <b>Low:</b> Advisory	<ul style="list-style-type: none"> <li>AIO-16 cards manufactured prior to October 2013</li> </ul>
Notification Applies To:	Access Restrictions:
<input checked="" type="checkbox"/> Technical Support (TSS) <input checked="" type="checkbox"/> Repair (ASA) <input checked="" type="checkbox"/> Sales (NSO / RSO)	<input type="checkbox"/> Internal Distribution <b><u>ONLY</u></b> <input checked="" type="checkbox"/> <b><u>No</u></b> Restrictions (Internal & External Distribution)

### 1.0 Issue

In August 2013, engineering became aware of customer reports of audible random noise on AIO-16 card ports. The levels of this noise vary and the noise is typically perceived as a low amplitude set of pops / ticks when listened to over a headset. The symptoms of this problem are as follows:

- Can occur in either ADAM or ADAM-M frame using AIO-16 cards
- Noise is random (not periodic) in nature
- Noise is heard only on ports that are looped back on the same card or on ports cross-connected on the same card. When connecting from a port on one AIO-16 to a different AIO-16 card, the noise will NOT be present.
- Noise has been verified as far back as AIO-16 cards manufactured in 2011 and as recently as 2013.
- Noise may be present on all 16 ports of AIO-16 card or only a subset of ports on the card. All channels / timeslots will not necessarily exhibit the problem.

If the above conditions are all satisfied, there is a high likelihood the noise is related to a timing margin issue present in the AIO-16 design.

Digital Audio data is transmitted between timeslots over the TDM (Time Division Multiplexed) backplane in the ADAM and ADAM-M. Correct transmission relies upon a minimum amount of delay to satisfy data sampling HOLD time requirements. It also relies upon a limit on the maximum amount of delay to satisfy data sampling SET-UP time requirements.

The root cause of this issue in timeslots cross-connected on the same card is that the data delay path is very low. HOLD time requirements are not satisfied for the TDM data being clocked back into the AIO-16 card. Data is improperly sampled and corrupt samples are passed through to the codecs and D/A converters. These are perceived as audible pops / clicks on the AIO-16 analog ports.

## 2.0 Resolution / Corrective Actions

The data HOLD time requirement for the AIO-16 is approximately 1.1 nsec. In units where the audible noise is detected, the HOLD time is measured to be less 1 nsec. There is a programmable clock generation IC on the AIO-16 (and the other ADAM cards) which is responsible for the generation of the various sampling clocks in the design. These clock generation ICs allow for the phase delay of the outputs to be adjusted by resistor settings.

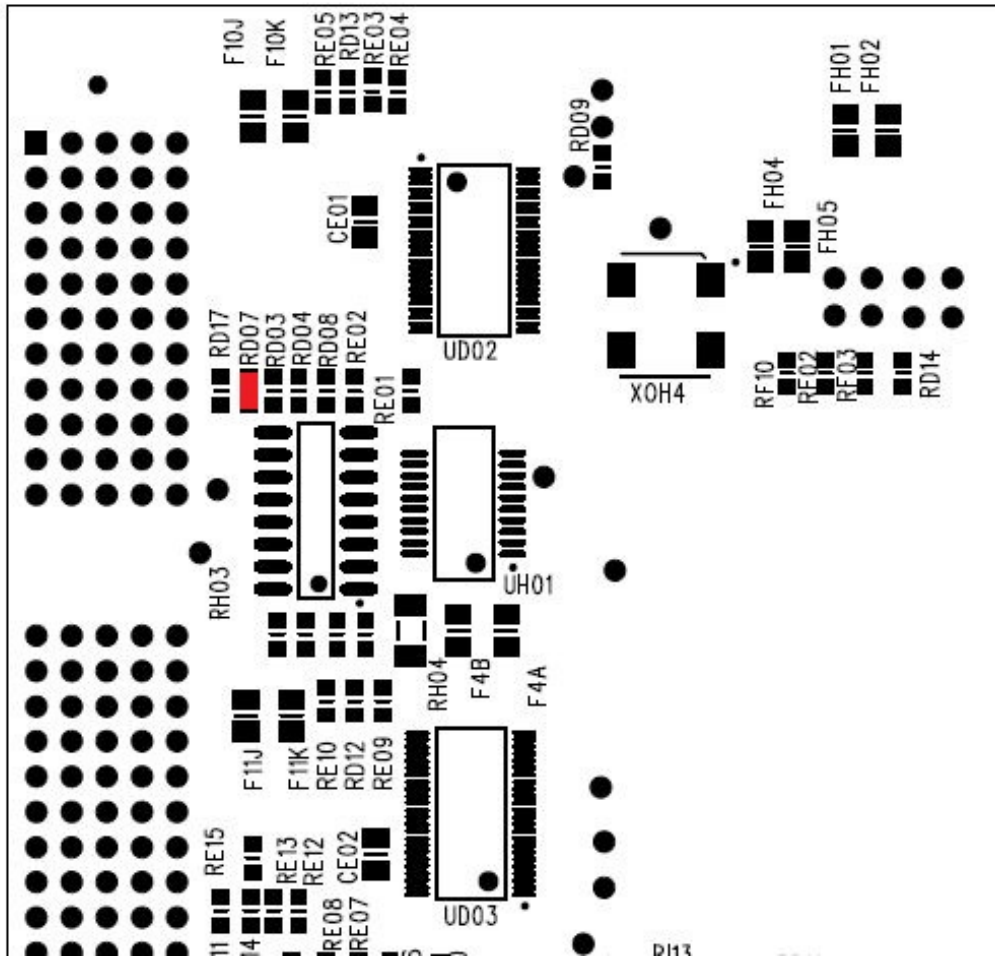
Specifically, installation of a zero Ohm 0603 size resistor (F.01U.162.707 or equivalent) in location RD07 will correct the problem. This produces a 2.8 nsec shift in the receive TDM sample clock and creates sufficient hold time to eliminate the improper sampling.

### List of parts required:

F.01U.162.767      RES SMD 0R 5% 100V 0.1W 0603 (1 per board)

### Instructions:

Install 0 Ohm resistor F.01U.162.767 in location RD07 (see diagram on following page). Note that this location should currently be unpopulated on an unmodified AIO-16. If the location already has a zero Ohm resistor, this indicates the card has already been corrected and re-tested.



Once the modification has been completed, the unit should be re-tested to insure the noise issue has been corrected and that the card is working properly.

This modification has been released via Engineering Change F03X014208 and will be present on all units shipping from October 2013 forward.

**NOTICE!**

This bulletin should also be read in conjunction with RTS-TB-022 and RTS-TB-023 which also address audible noise problems in the ADAM / ADAM-M frames.