

APPLICATION NOTE

Plena Voice Alarm System and the use of Dummy Loads

Introduction

The Plena Voice Alarm Systems offers a simple and ease to use way of loudspeaker surveillance based on impedance measurement. But although it surely has its benefits there are some limitations as well. These limitations do not affect the functioning of the system itself but might leave failure of the loudspeaker cable in parts of the line, in general the end of the line, undetectable. To avoid this:

- Limit the number of loudspeakers on the line to allow line supervision up to the last loudspeaker on the line.
- Reduce cable length to prevent masking of the measured impedance due to cable capacitance.

These limitations can be overcome by applying the Plena Dummy Load, so that larger numbers of loudspeakers and longer cable lengths can be used.

General

Fault detection of the loudspeaker lines through impedance measurement is triggered by an impedance change in excess of a configured threshold. By default this threshold is set at 15% impedance change. This means that the impedance at the end of the loudspeaker line should be more than 15% of the total impedance on the line to ensure that an open circuit at ANY position on the loudspeaker line will be detected.

To compensate for several sources of inaccuracy 20% is taken as a safe margin. This means that for real end of line supervision only 5 loudspeakers (of equal load) may be connected on the loudspeaker line. But this will still not take the effects of the cable capacity into account. In addition there will be a limit on the cable length to avoid masking of the impedance measurement by the cable capacitance. This maximum cable length will depend on cable length and on the connected impedance.

To avoid false errors at small loads an extra absolute margin is added, so that the threshold is more than 15% at small loudspeaker loads. This extra margin is also incorporated in the dummy load calculator described in this document.

The Dummy Load

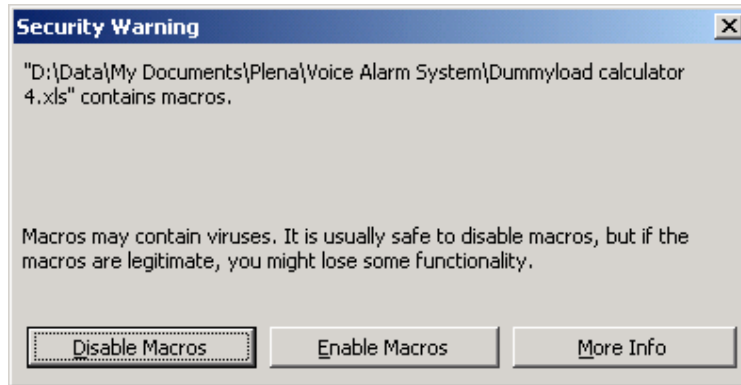
To improve the performance of the impedance measurement Bosch Security Systems introduced the Plena Dummy Load. It is designed to increase the loudspeaker load at the measurement frequency of 20 kHz while having a minor load in the normal audio frequency range.

When placed in parallel with the last loudspeaker on the line it will increase the percentage of impedance present at the end of the line and therefore allow more loudspeakers to be fitted in the line. At the same time it will also increase the margin for masking by cable capacitance and therefore allow for longer cable lengths.

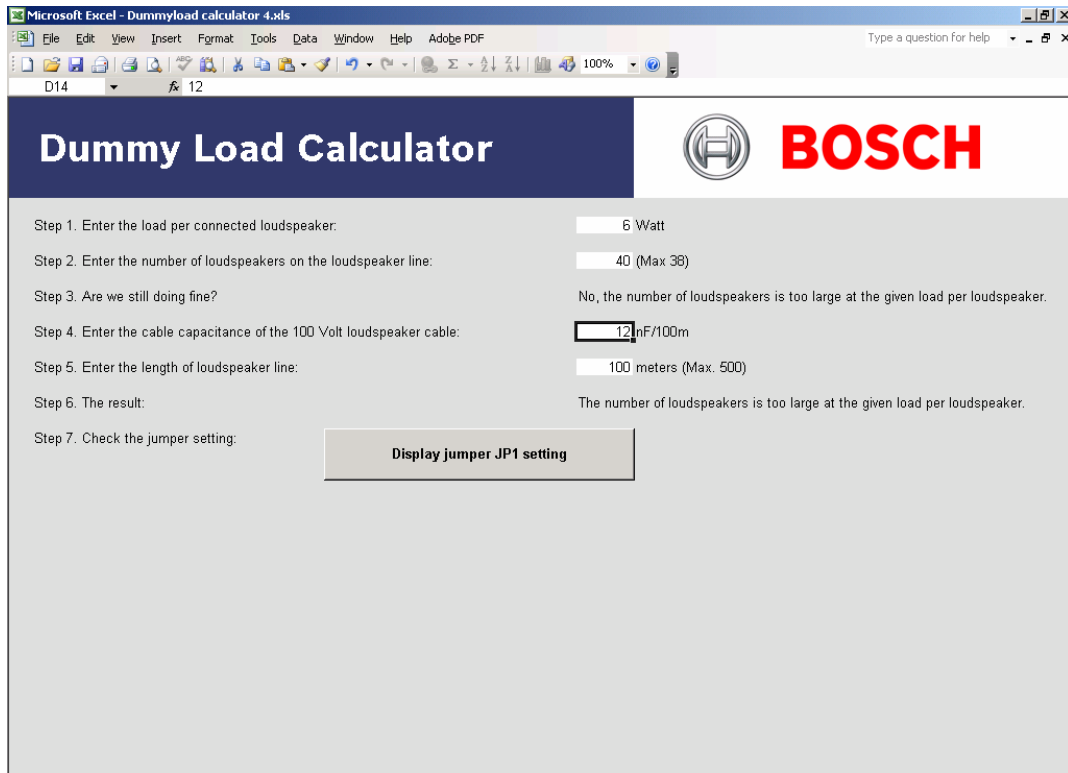
The Dummy Load has a jumper to set the load (at 20 kHz). It can be set at 8, 20 and 60 Watt.

Dummy Load Calculator

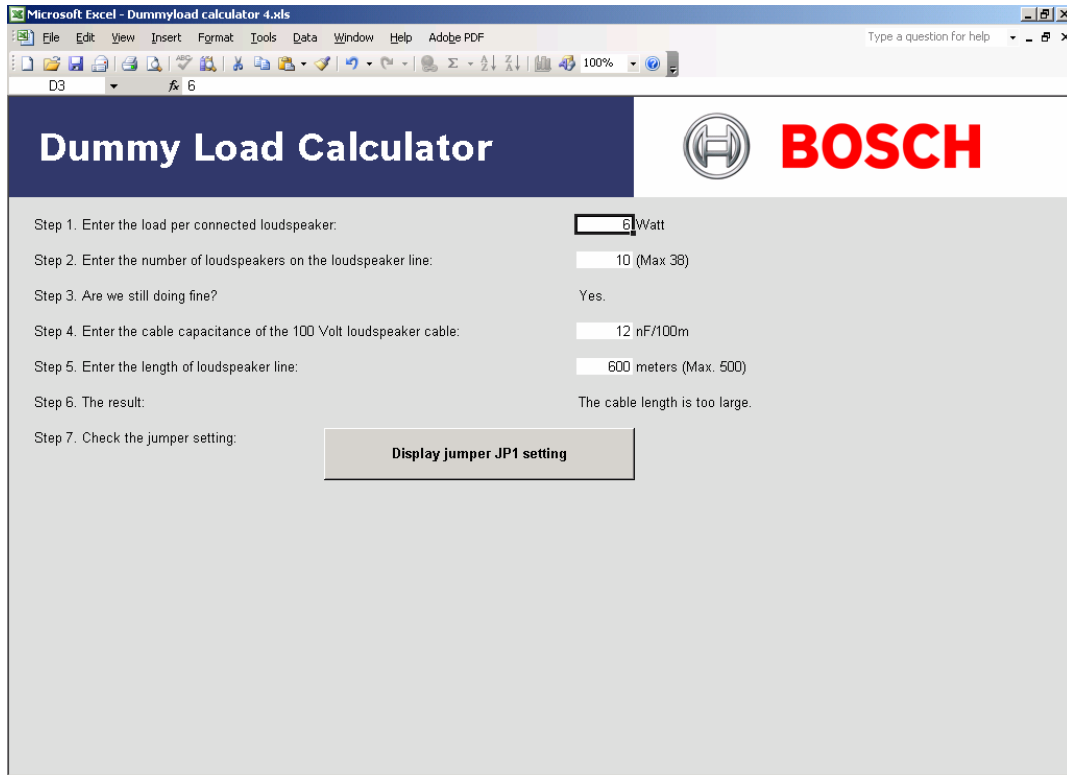
The object of the Dummy Load Calculator is to calculate whether the customers need can be fulfilled with a dummy load and what setting of the dummy load should be applied. The Dummy Load Calculator is an Excel worksheet and uses macros. Click on Enable Macros when the window below appears upon startup of the worksheet.



This will bring up the actual calculator sheet. It will take just a few steps to get the result. The first step is to enter the load per connected loudspeaker. The worksheet will immediately calculate the maximum number of loudspeakers you can reach with this load and the Dummy Load at the highest setting. Then next step is to enter the required number of loudspeakers on the line. If this exceeds the maximum a warning will show up in step 3 as you can see in the example below:

A screenshot of the Microsoft Excel application window titled "Microsoft Excel - Dummyload calculator 4.xls". The worksheet contains a form titled "Dummy Load Calculator" with the Bosch logo. The form has seven steps. Step 1: "Enter the load per connected loudspeaker:" with a text box containing "6 Watt". Step 2: "Enter the number of loudspeakers on the loudspeaker line:" with a text box containing "40 (Max 38)". Step 3: "Are we still doing fine?" with a message: "No, the number of loudspeakers is too large at the given load per loudspeaker." Step 4: "Enter the cable capacitance of the 100 Volt loudspeaker cable:" with a text box containing "12 nF/100m". Step 5: "Enter the length of loudspeaker line:" with a text box containing "100 meters (Max. 500)". Step 6: "The result:" with a message: "The number of loudspeakers is too large at the given load per loudspeaker." Step 7: "Check the jumper setting:" with a button labeled "Display jumper JP1 setting".

Step 4 will start calculating the influence of the cable capacity by entering the cable capacity per 100 meters. 12 nF/100m is a normal value for Fire Retardant loudspeaker cable, but it could very well be more. The worksheet will immediately calculate the maximum cable length you can reach with this cable capacity and the Dummy Load at the highest setting. Then next step is to enter the required cable length for the loudspeaker line. If this exceeds the maximum a warning will show up in step 6 as you can see in the example below:



Microsoft Excel - Dummyload calculator 4.xls

File Edit View Insert Format Tools Data Window Help Adobe PDF Type a question for help

D3 6

Dummy Load Calculator



Step 1. Enter the load per connected loudspeaker: Watt

Step 2. Enter the number of loudspeakers on the loudspeaker line: (Max 30)

Step 3. Are we still doing fine? Yes.

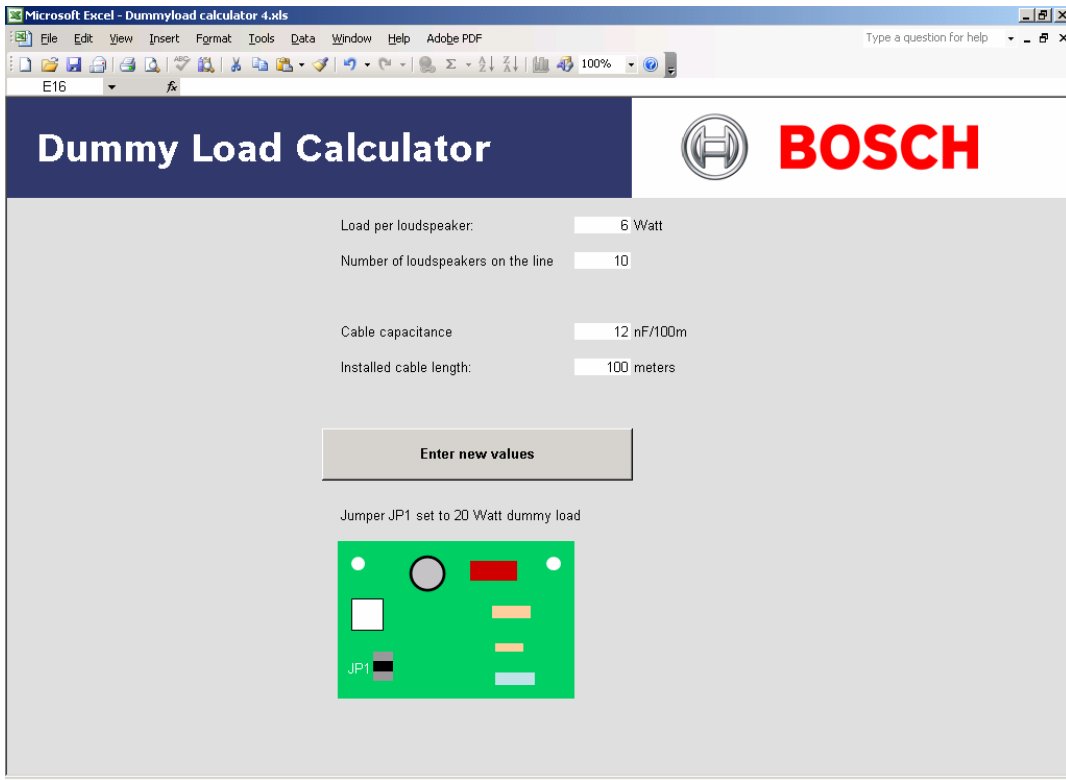
Step 4. Enter the cable capacitance of the 100 Volt loudspeaker cable: nF/100m

Step 5. Enter the length of loudspeaker line: meters (Max. 500)

Step 6. The result: The cable length is too large.

Step 7. Check the jumper setting:

If number and loudspeakers and cable length are both within the allowed range you will instead see the required Dummy Load setting. Now click on **Display jumper JP1 setting** to see how this jumper has to be set together with a summary of the entered values.



Click **Enter new values** to repeat steps 1 to 7.

Installing the Dummy Load

The Dummy Load should be connected in parallel to the last loudspeakers on the line. Connect the two leads onto the connection terminals of the loudspeaker. Mount the Dummy Load circuit board in a similar way as the Praesideo Line and Loudspeaker Supervision Boards. Please be aware that in some loudspeakers you can fit the Dummy Load only on one mounting stud, because the mounting studs in the loudspeaker are too far apart, which is fine for the Praesideo Line Supervision Board, but not for the Dummy Load.

Please refer to the Instructions for use of the loudspeakers for more details on the mounting instructions.