

# Application Note 218



## **AutoWave with PA5840** (V1.0) **Test Application**

**- LV 124 & others**

**Test simulator:**  
**PA 5840**



## Preamble

This application note is based on the following standards:  
 - any standard, that exceeds the NSG5600's memory

It enables owners of the Teseq PA5840 to use their investment in battery simulators to be used with an AutoWave.

Technical modifications reserved.

## Content

<b>1.</b>	<b>Content</b> .....	<b>3</b>
1.1.	PA5840 .....	3
1.2.	AutoWave .....	3
1.3.	autowave.control .....	3
<b>2.</b>	<b>Applications and standards</b> .....	<b>4</b>
2.1.	OEM LV124 Rev.2.2 (2013-02)d .....	4
2.2.	EMC-CS-2010JLR (2012-06) .....	4
2.2.1.	CI265 – Immunity to Low Voltage Transients .....	4
2.2.2.	CI 250 Transients - Immunity to Ground Voltage Offset .....	4
<b>3.</b>	<b>Wiring the components</b> .....	<b>5</b>
3.1.	Connection diagram .....	5
<b>4.</b>	<b>Creating a standards test with autowave.control</b> .....	<b>6</b>
4.1.	Overview .....	6
4.2.	Setting an external source .....	7
4.3.	Setting the AutoWave .....	8
4.4.	Setting the ExternalSource (1) .....	9
<b>5.</b>	<b>Loading a standards test in autowave.control</b> .....	<b>10</b>
<b>6.</b>	<b>Further information</b> .....	<b>11</b>

## 1. Content

This application note is for demonstrating and explaining how to use an AutoWave with AutoWave.control – provided by EMTes (Switzerland) GmbH – for control of the PA5840-series which is provided by Teseq AG. Furthermore it will show, how some tests can be performed by using an AutoWave in combination with the PA5840, instead as in combination with AutoStar (which can't perform them).

### 1.1. PA5840

The PA 5840 range of battery simulators are high performance power amplifiers providing a stable and rugged power source for laboratory applications. The amplifiers have been designed specifically to simulate battery supplies such as 12, 24 and 48 V vehicle electrical systems. They may be used on their own or integrated with the Teseq Automotive EMC Test and AutoStar Software. The amplifiers are offered in three frame sizes with nominal output currents of 75, 150 and 300 A (peak values).

Types of testing include supply voltage variations, dips and drops, ISO pulses 2b and 4, load dump pulse, starting profiles, power cycling, battery recovery, reset behavior, fuel pump transient, conducted sine waves, ground shift, jump start and over voltage, as well as providing a programmable DUT power source during all phases of testing.

The output is programmable over a voltage range from -15 to + 60 V which allows the simulation of a large range of pulses and voltage variations.

For convenience, voltage and current control and monitoring interfaces have been included. **BNC connectors are provided for general purpose connection to signal generators** and an integrated control D-type connector for direct connection to the Teseq NSG 5000 series.

This application note uses this BNC connector to control the PA5840 with an AutoWave.

### 1.2. AutoWave

The AutoWave is a portable solution to generate voltage variations in the range of -10V to +10V. It is equipped with either two or four output channels (CH1 & CH2 / CH1 – CH4). These channels can be used to control the PA5840.

In combination with the AutoWave the PA5840 perform a wider range of standards, specifically including the LV124.

### 1.3. autowave.control

This is the software tool necessary for remote controlling the AutoWave.

The capabilities of the software are:

- Creation and editing of test waves for the AutoWave generator.
- Creation of point waves with a very large memory (hard disc space).
- Creation, editing and running of conducted and radiated immunity tests.
- Controlling the AutoWave generator.
- Running a test with up to four channels.
- Import of data files from text or Excel files
- Recording signals via the two AutoWave input channels.

Further information about technical data and equipment can be found in the respective manuals. For gaining access to such documents please contact your local dealer or sales person.

## 2. Applications and standards

Mainly, this combination of the EMTest AutoWave (with the required software autowave.control) and a PA5840 made by Teseq serves to enable the customer to use his PA5840 to perform that parts of the LV-124 standard which are not doable per AutoStar operation.

The reason for these limitations which occur with an NSG5600 is simply a lack of memory (max. 50k-Samples). On the other hand, the AutoWave has significantly more memory at its disposal. A single test file can be as big as 1GB and work with a sampling rate of 5kS/s...100kS/s for two or four channel play. By using only one channel, the sampling rate can be raised even higher to max. 500kS/s.

This allows the AutoWave to generate even those standards, which would exceed the NSG5600's capabilities.

Some examples of such standards are shown below.

### 2.1. OEM LV124 Rev.2.2 (2013-02)

This standard considers general requirements, tests and test conditions for electrical and electronic components in motor vehicles up to 3.5 tons

By combining a PA5840 with an AutoWave there are various tests that can be performed, although some may require additional equipment!

The table below shall show where some complementary devices/equipment is needed.

E01 – E09 E11 & E12	This test can be performed by using only an AutoWave and a PA5840 (autowave.control for remote control)
E10, E13 & E14	complementary equipment needed, consult corresponding documents

### 2.2. EMC-CS-2010JLR (2012-06)

These parts of the standard also cannot be performed with an NSG5600 and require an AutoWave to work.

#### 2.2.1. CI265 – Immunity to Low Voltage Transients

- Waveform A (Fast Transients Burst Noise)

#### 2.2.2. CI 250 Transients - Immunity to Ground Voltage Offset

- Sequence 1 to 4

### 3. Wiring the components

The PA5840 needs two distinct control signals for operation. One controls the voltage and one sets the current limit.

The U-INPUT is the driving voltage of the battery simulator.

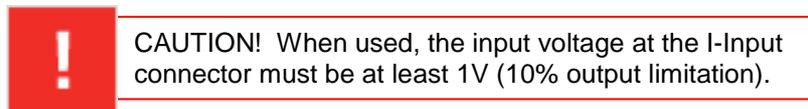
The output of the battery simulator can be described as:  **$U \text{ OUTPUT} = U \text{ INPUT} \times \text{GAIN}$**

For controlling – and generating – the voltage the AutoWave is to be used. That channel actually generates the waveform for the test.

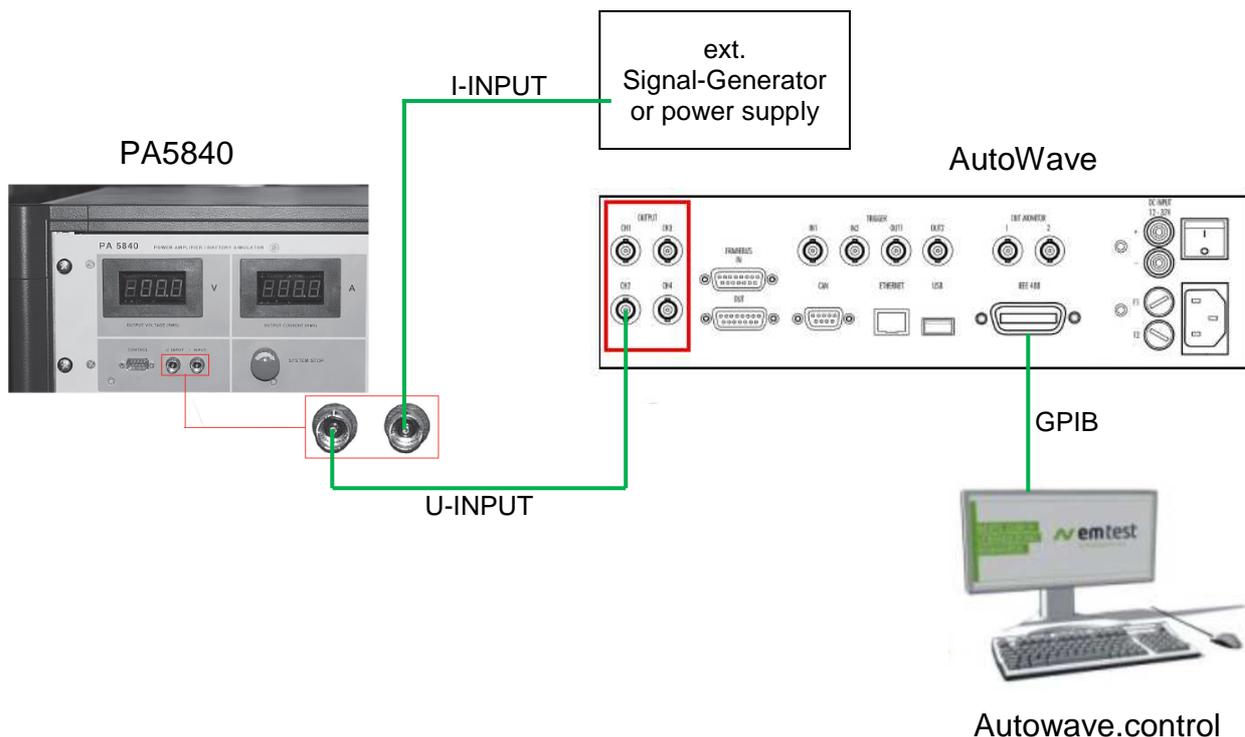
I INPUT is the analog control of the current limit. It is only used for setting the current limit.

The input limitation is 1-10 V as a ratio of the available current limit where  **$1 \text{ V} = 10\%$  and  $10 \text{ V} = 100\%$  current limit.**

*For example, for a PA 5840-150, which has a maximum constant current of 50 A, a 5 V input will set a current limit of 25 A, and a maximum peak current of 75 A (when the “CURRENT LIMITATION” selection is set to “3x I CONTROL”!).*



#### 3.1. Connection diagram



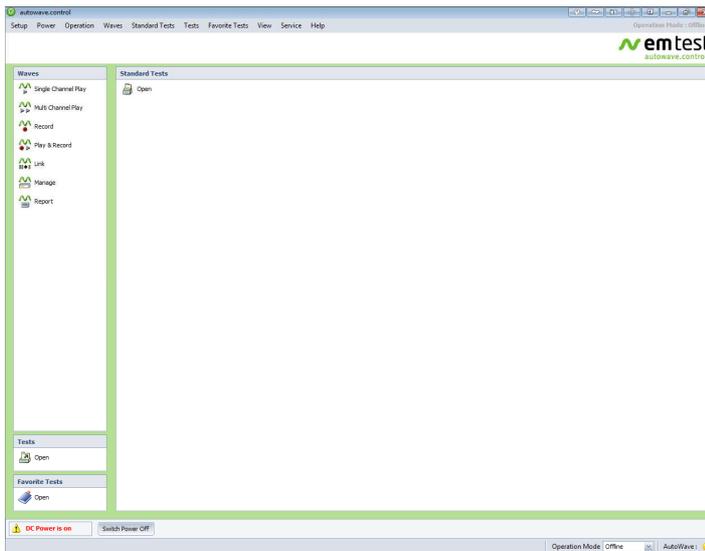
## 4. Creating a standards test with autowave.control

This chapter aims to explain the process of how to create a test file with the autowave.control for use with a PA5840.

First, you need to have the required autowave.control software running on your test computer.

### 4.1. Overview

The first look at the software shows already that there are many possibilities of using the autowave.control.



→ For a detailed description of all its features please consult the autowave.control manual. It can be requested by your local dealer and/or sales person.

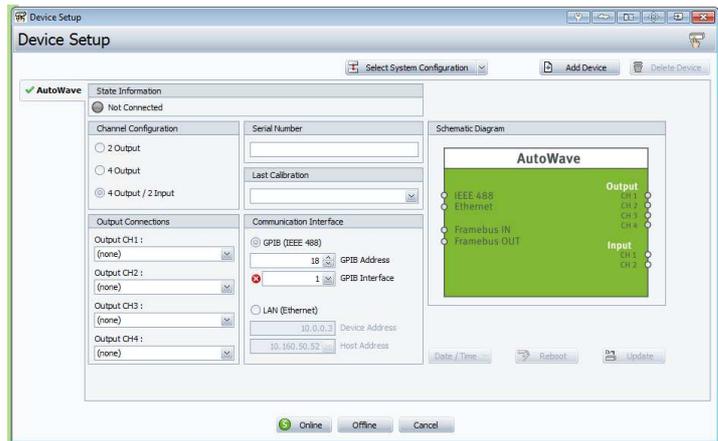
## 4.2. Setting an external source



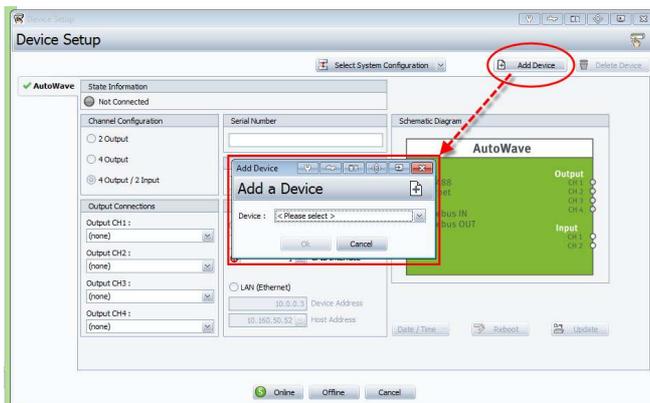
Since the idea is to control a device with the AutoWave the user needs to define that specific device in the setup.

Therefore accessing the device setup is required.

This menu is accessed by firstly clicking on “Setup” in the Taskbar and then on “Device” in the dropdown list.

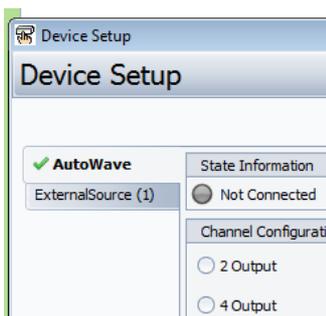
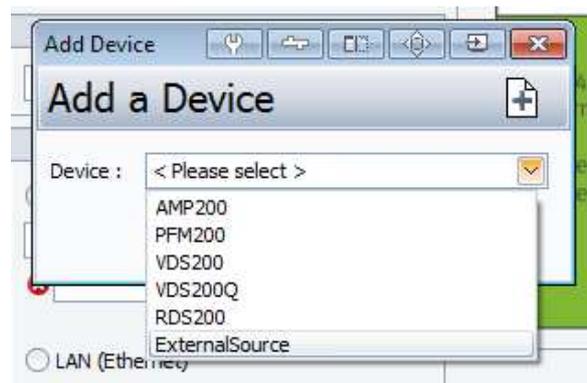


These steps will open a window, which allows get the necessary settings done.



Next, a click on the button labeled “Add Device” opens a window with a dropdown list of various sources.

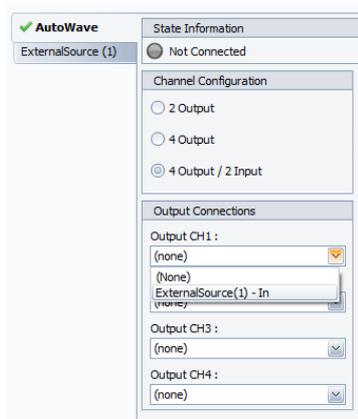
As the PA5840 is not an EMTtest device, the chosen item has to be “ExternalSource”.



After confirming the chosen source by clicking on “Ok”, there should be a second tab appearing on the left side of the device setup window. The label should state the general name of the source that has been chosen. In this case it will state “ExternalSource (1)”.

### 4.3. Setting the AutoWave

Obviously the AutoWave requires some tweaks too. Mainly to tell the software which hardware component needs to be addressed when running.

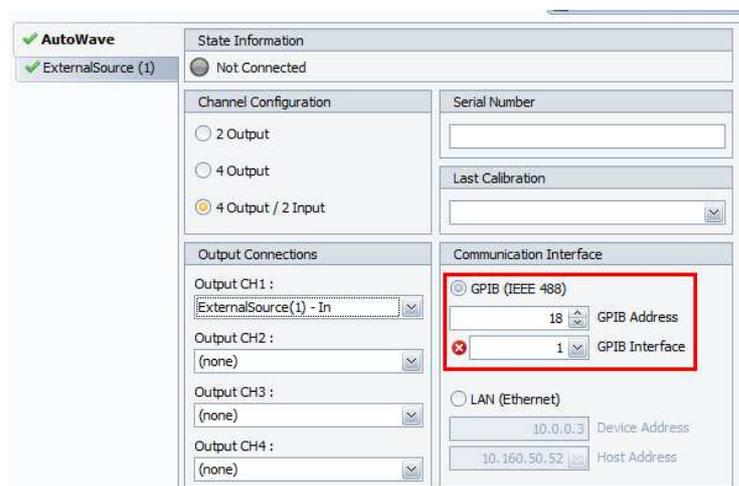


Now, that an external source has been defined it can also be chosen for the “Output Connection”.

That means, the “Output CH1” will be attached to the assigned source and therefore be providing the control signal for that device.

Not only is the source in need of an input which controls them, the AutoWave itself too, needs a way to communicate with an instance that decides what it has to do (e.g. what waveform to generate, etc.).

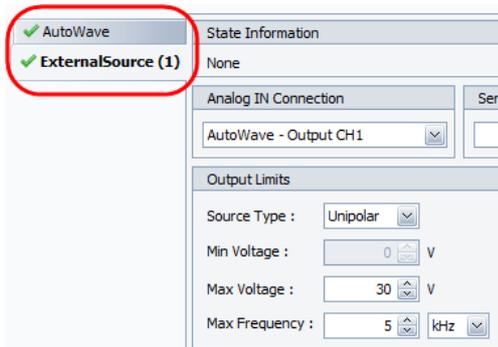
Generally the GPIB-Input will be used for communication between devices. Choosing the right GPIB-Address is critical for a proper communication between devices<sup>1</sup>.



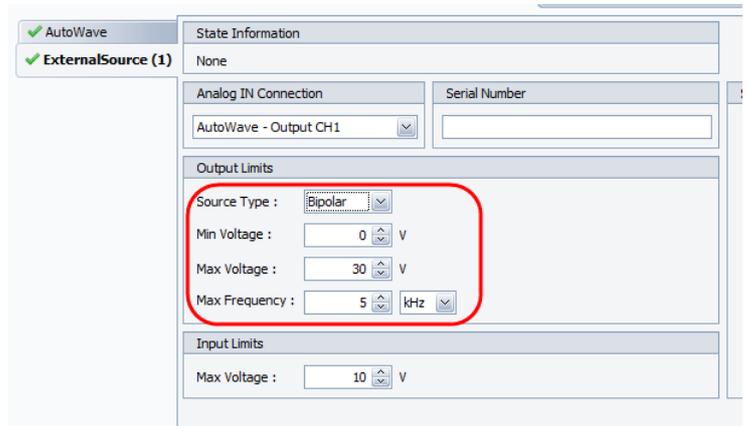
<sup>1</sup> If unfamiliar with how to get to know the GPIB address for the AutoWave, please consult the respective manual.

#### 4.4. Setting the External Source (1)

As soon as the AutoWave is ready the external source has to get its own tweaks.

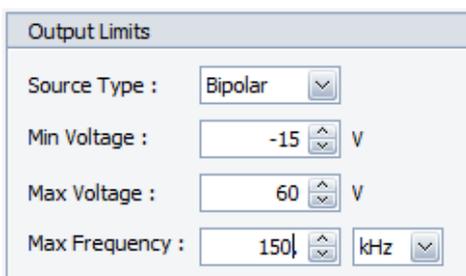


The first step consists in switching to the next device which shall be modified. That is done by clicking on the respective tab on the left side of the window.

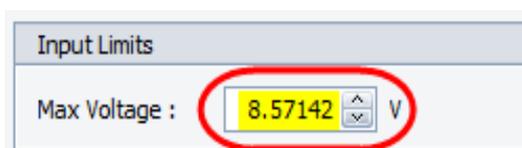


For every external source the output limits have to be edited.

In this case the external source is a PA5840. So the settings will need to be changed as shown in the picture below.



**Note:** The min. and max. voltage as well as the max. frequency will vary between the different models of the PA5840. These values should always be set according to the datasheet of the actual PA5840.



It is of utmost importance to set the max. voltage in the field "Input limits" to the exact value of **8.57142V!**

That is, because the PA5840 works with a gain ratio of seven. By setting the limit to 10V the software would assume a gain ratio of six ( $6 * 10V = 60$ ,  $7 * 8.57142V = \sim 60V$ ).

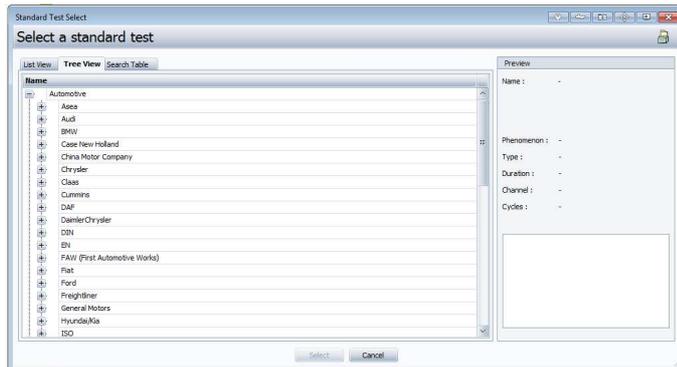
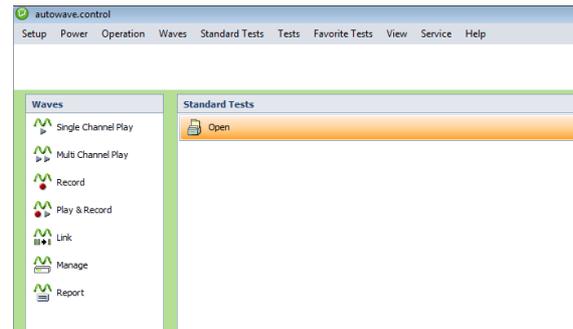
A gain ratio of six would not be suitable for PA5840 operations according to the devices specifications.



**CAUTION!** Make sure that the PA5840 is set to the proper mode(s) for running the defined tests. Especially the *bandwidth* and the *current limit* have to be set accordingly!

## 5. Loading a standards test in autowave.control

When all the necessary hardware setups are done, a test can be opened, or created as usual.



Just click “Open” in the “Standard Test”-table and choose the wanted standard from the database.

## 6. Further information

For any further information, please consult the respective manuals.

They can be found online on <http://www.teseq.com> or <http://www.emtest.com> (according to the product).

You may also contact your local dealer or sales person to equip you with all the needed documentation or in case of any uncertainty.