# Polar Plot (Outline ET250-3D Turntable)

Introduction

This sequence measures the polar response of a loudspeaker in both the vertical and horizontal planes. It is designed to work with the Outline ET250-3D turntable and contains all the necessary commands to automatically rotate the turntable's platter when the SoundCheck host PC is connected to the turntable via an Ethernet/LAN connection. The sequence uses a log sweep stimulus with the Time Selective Response algorithm so that the measurements can be made in a non-anechoic environment. Note that the analysis step's time window needs to be adapted to the user's measurement space. The ET250-3D custom control step will also need to be configured prior to running this sequence.

The sequence plays the stimulus and measures at 10 degree increments from 0 to 180 degrees. This process is repeated with the speaker positioned horizontally. The two results are mirrored to display full 360 degree polar plots for each axis. A directivity index curve is also calculated for each axis and is displayed at the end of the test.
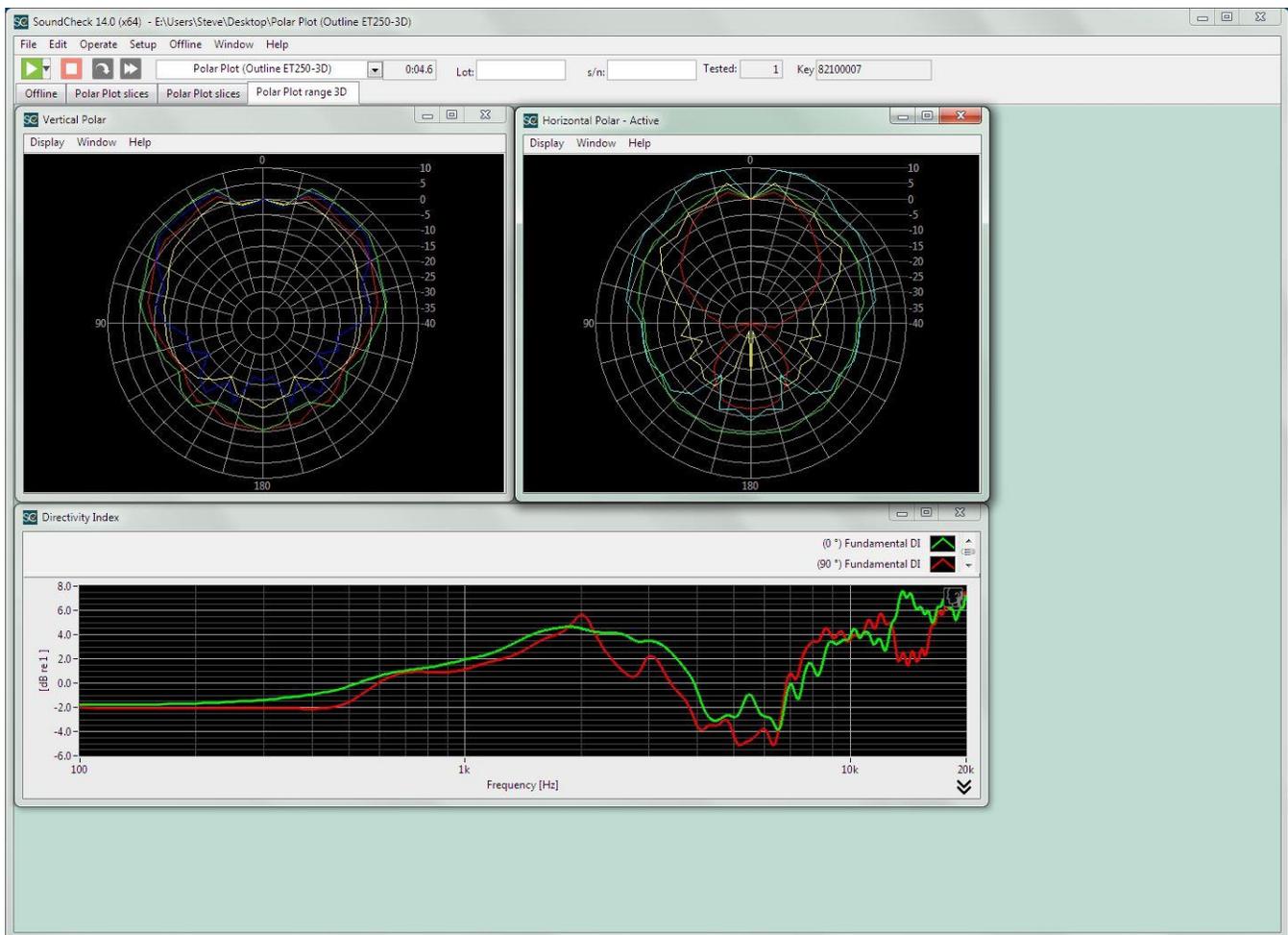
Final Display for *Polar Plot (Outline ET250-3D)* sequence

Installing the Outline Ethernet Custom VI

This custom VI is provided for SC15.0 64 bit Windows OS and macOS. Take care when installing these files that you are using the correct source folder.

1. Copy the three files Outline Ethernet.vi, Outline Ethernet Editor.vi and Outline Ethernet Control.lvlibp to your SoundCheck 15.x > System > Custom VIs folder

2. Launch SoundCheck and open the Sequence Editor (File > New or open an existing sequence)

3. In the Step Template Library (left hand side of the Sequence Editor) click on the Custom template group heading so it is highlighted and then right click it and select "New…"

4. In the subsequent text entry dialog, enter the name **Outline Ethernet** and click OK

5. The Outline Ethernet custom VI user interface will then open. Click OK to close it.

6. The custom VI template is now installed.

Connect the Turntable to the SoundCheck Host Computer

1. For a LAN connection, connect both the Outline turntable and the SoundCheck PC to your LAN using appropriate network cables.

2. For a direct connection, connect the Ethernet port on the Outline turntable to the Ethernet port on your SoundCheck host computer using an appropriate network cable. When using a direct connection, you will need to configure the host computer's IP address in order to pair it with the turntable as follows:

   a. The turntable's IP address can be accessed by holding down the Stop button while powering the unit on. The address will be displayed on the turntable's 4 digit alphanumeric display. Write this number down.

   b. The computer's IP address can be configured as follows:

      i. Windows: Open Network and Sharing Center. Click on Local Area Connection > Properties > Internet Protocol 4 > Properties > Use The Following IP Address. Manually enter the same IP address as the turntable with the exception of the last digit (make sure the last digit is different).

      ii. macOS: Open System Preferences > Network > Advanced > TCP/IP > Configure IPv4: Manually. Enter the same IP address as the turntable with the exception of the last digit (make sure the last digit is different) and make sure the subnet mask ends with 0 (zero).

Configuring the Outline Ethernet Custom VI

There are two configurable parameters in the Outline Ethernet custom VI: network address and movement.

Network Address

This parameter can be configured manually or automatically. Automatic is the recommended method

Automatic

Open the Outline Ethernet custom VI editor and in the Address Selection section, select Scan Network and then click the Scan Network button. SoundCheck will search for the turntable and automatically populate the address information into the Detected Units table. If the host computer is on both a LAN and wireless network, multiple instances of the turntable may be visible in the Detected Units table.

Manual

Open the Outline Ethernet custom VI editor and in the Address Selection section select User Entry. Enter the host computer's Ethernet IP address in the Network Adapter field and the turntable's address in the IP address field.

An example of a manual entry use case would be if you are writing a sequence which will be used at another location and you wish to enter the known address values of the destination site.

Movement

There are three configurable parameters for turntable Movement: Type, Direction and Wait Until Rotation Stops.

Type

The movement type options are Move to Angle and Move in Angled Steps.

In Move to Angle, the user inputs a specific target angle into the Angle entry box. An example of this use case would be entering 0° to return the turntable to its Home position.

In Move in Angled Steps, the user inputs the desired angular increment of rotation into the Angle entry box. An example of this use case would be entering 10° in order to move the turntable in 10° increments for measurement of polar data.

Direction

Direction allows you to specify clockwise or counter-clockwise rotation of the turntable

Wait Until Rotation Stops

The Wait until rotation stops checkbox will cause the Sound Check sequence to pause and wait until the turntable stops moving before continuing on to the next step.
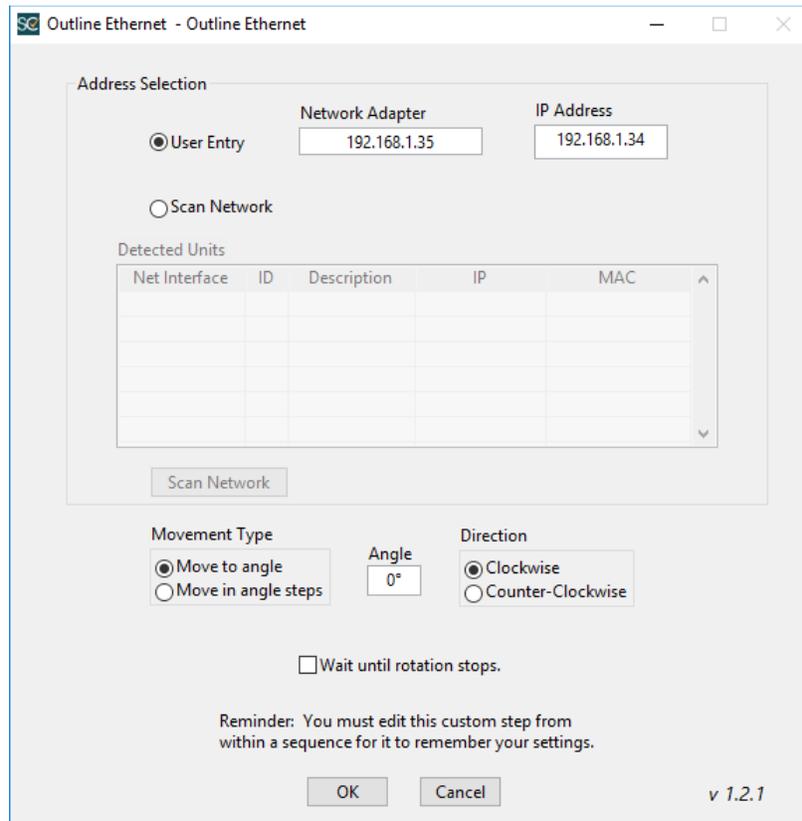
Hardware Setup & Calibration

1. Calibrate the reference microphone as instructed in the SoundCheck manual.
2. Calibrate the amplifier as instructed in the SoundCheck manual.
3. Connect the output of the microphone power supply to Input 1 of your audio interface.
4. Connect Output 1 of your audio interface to the input of the amplifier.
5. Connect the output of the amplifier to your loudspeaker.
6. Position your reference microphone at the desired test distance from the loudspeaker, and connect it to the microphone power supply.

You are ready to start the sequence.

Required Optional SoundCheck Modules

2006 – Time Selective Response

2011 – Polar Plot

System diagram
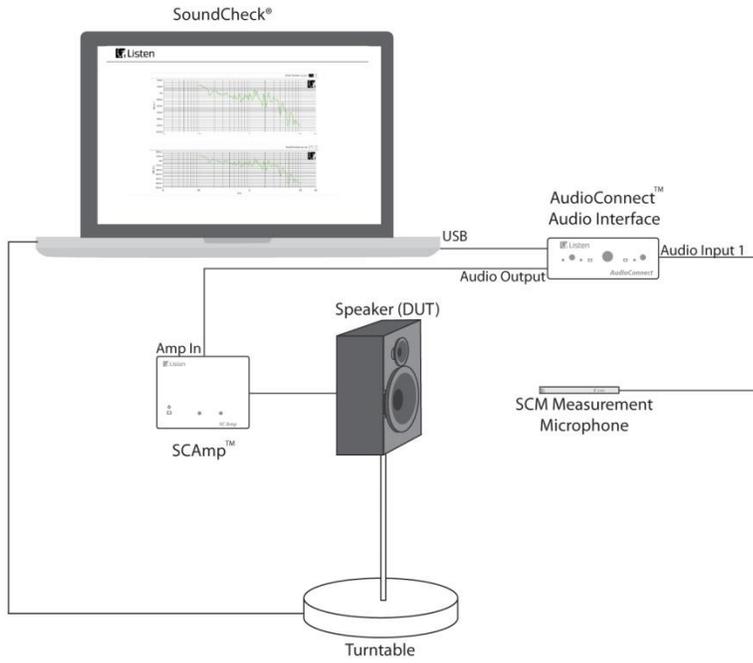
Sequence Logic

Type	Step Name	#	Out	In	
Mes	Recall data	1			
Rec	Recall curves - automatic	2			
Sti	Log Sweep (100 - 20k) Outline - Zero Turntable	3	Amp ch 1		
Mes	Warning	4			
Cus	Outline Ethernet	5			// Return to Zero
Acq	Play & Record	6	Amp ch 1	Reference Mic	
Ana	TSR polar	7			
Pos	First Iteration curve copy	8			// Creates a copy of the first curve, on-axis response
Pos	On-Axis Normalization	9			// Compares the current measurement to the on-axis (normalizes)
Pos	First Iteration curve copy	10			
Cus	Outline Ethernet	11			
Acq	Play & Record	12	Amp ch 1	Reference Mic	
Ana	TSR polar	13			
Lim	Azimuth for display	14			
Dis	Polar Plot slices	15			// Displays vertical polar
Dis	Polar Plot slices	16			// Displays horizontal polar
Mes	Rotate Speaker	17			// Just a logic step for looping
Mes	Home Prompt	18			
Cus	Outline Ethernet	19			
Mes	Zero Confirmation	20			
Mes	Rotate Speaker	21			// Prompt to rotate speaker on its azimuth
Pos	Directivity Index	22			// for vertical
Pos	Directivity Index	23			// for horizontal
Dis	Polar Plot range 3D	24			// Final display

Further sequence development

This sequence has been designed for simplicity. Ways in which you could modify or further develop the sequence include:

- This sequence is currently setup to test a loudspeaker, but it could easily be modified to test other devices.
- If an anechoic chamber is present, the sequence could be edited to use a stepped sine sweep rather than a log sweep stimulus.
- Other turntables and their associated commands could be swapped out, replacing the ET250-3D