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Description:	This document describes the design of the PSS Switch for ESS.
Title:	PSS Switch Critical Design Report
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## 1. General description

The PSS switch will be responsible for cutting off the RF power in case of an alarm triggered by the PSS System. It is placed between the RF drive output of the LLRF control system and the input of a high power amplifier.

The block diagram of the module is presented in Figure 1.

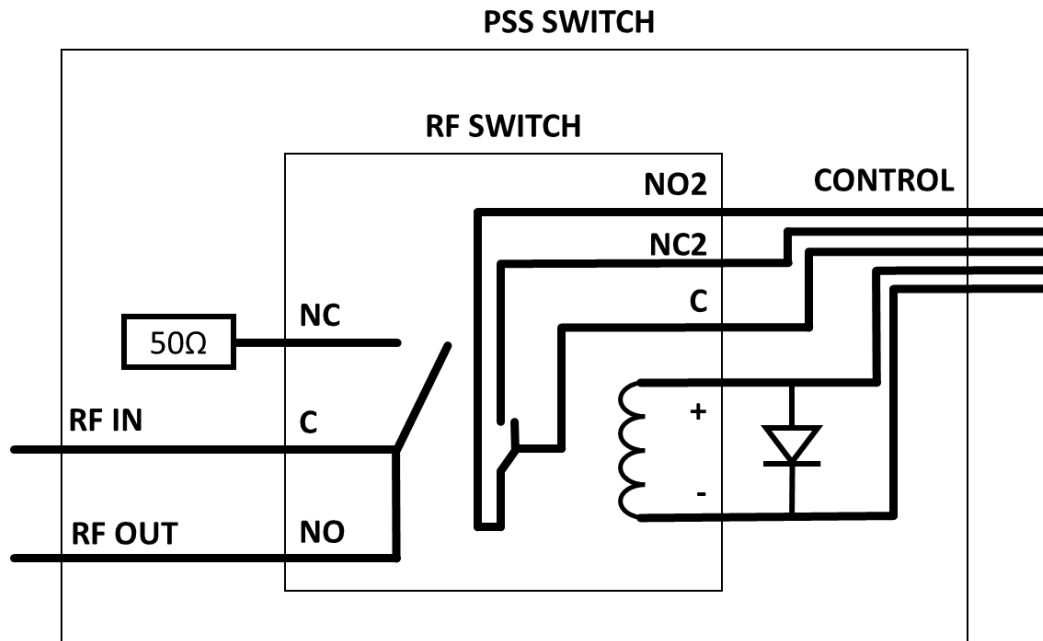


Figure 1 Block diagram of the PSS Switch

The design is based on Radial R570323000 RF Relay. It is controlled by remote +28V signal coming from the PSS System.

## 2. Mechanical Design

The PSS Switch is designed as 1U 19" module. The 3d visualization of the design is presented in Figure 2. The box will be painted in RAL2000 (Safety Orange) color.

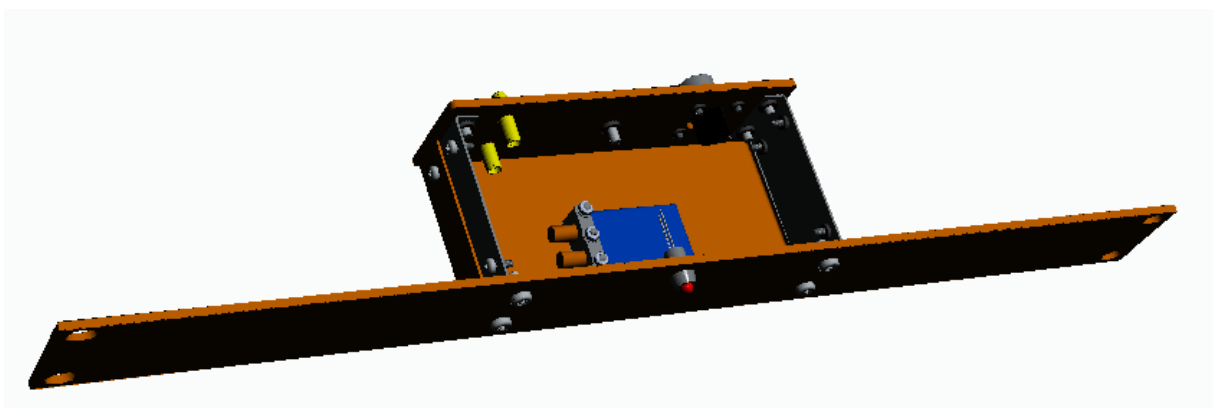


Figure 2 3D visualization of the PSS Switch.

In Figures 3 and 4 the front and back panels' silkscreens are presented.



Figure 3 Front panel silkscreen.

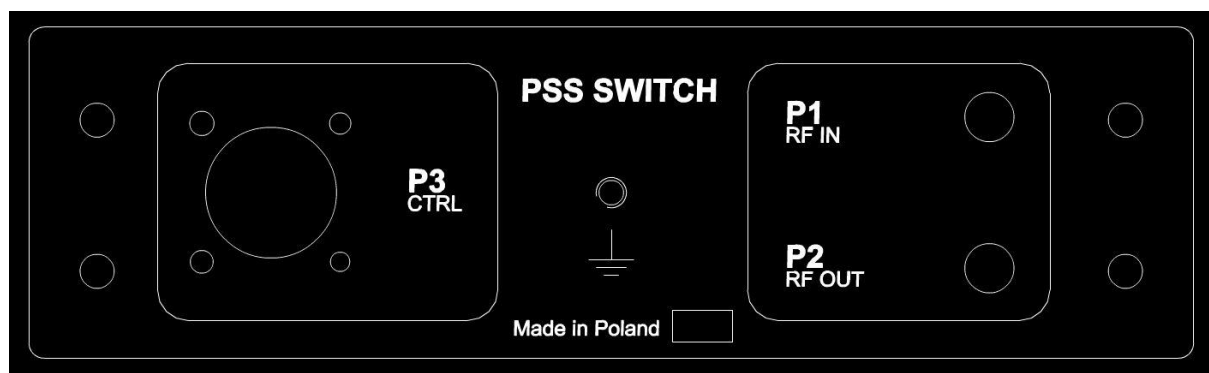


Figure 4 Rear panel silkscreen.

## 2.1. Control connector pinout

For the control connector the Amphenol RT0W0106SNH-K was selected. The proposed pinout for this connector is presented in Table 1.

Table 1. Control connector pinout.

Pin	Function
1	Switch +
2	Switch -
3	Confirmation NC
4	Confirmation NO
5	Confirmation Common
6	NC

## 3. Procurement, Production and delivery planning

According to the agreement between PEG and ESS ERIC the delivery of the PSS Switches shall be divided into two batches:

- 1<sup>st</sup> batch: 81 units delivered till 31.07.2018
- 2<sup>nd</sup> batch: 44 units delivered till 28.02.2021

It was decided to manufacture all units at once. The 2<sup>nd</sup> batch will be stored at PEG premises or, if needed, delivered to the ESS ERIC earlier.

### 3.1. RF Switches

Because of the long lead time (12 weeks) all Radial RF Switches had been already ordered and delivered to the PEG. No further procurement of the switches is expected.

### 3.2. Enclosures

The prototype was manufactured by the RJ Systems company. The procurement of the enclosures will start after the final validation of the design during CDR. The expected lead time for 125 units is 16 weeks. The enclosures will be delivered in 4 batches. The first batch is expected to be delivered after 6 weeks.

### 3.3. Control connector and other components

The Amphenol RT0W0106SNH-K control connector and other components (SMA Cables, RF loads, mechanical parts etc.) are available at many large distributors like Digikey, Mouser or TME. The lead time should not exceed several days. This components will be procured after successful project validation during CDR. If needed the components will be ordered at different distributors to minimize the lead time.

## 4. Factory Acceptance Test

Before shipping to the ESS each unit will be tested. The test will be performed by trained personnel. The block diagram of the test stand is presented in Figure 5. A simple PSS Switch Tester device will be designed and manufactured.

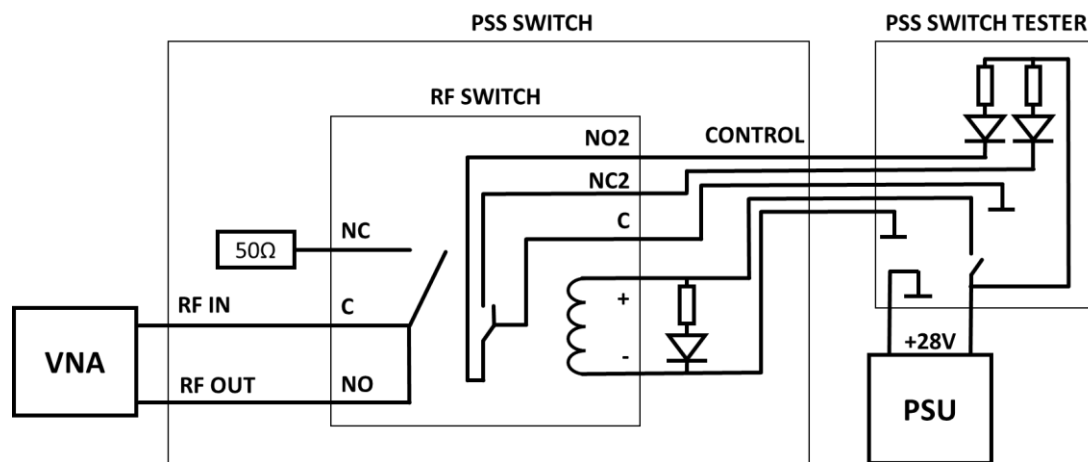


Figure 5 Block diagram of the PSS Switch

The results of the tests will be presented in an individual test report that will be shipped together with each unit. In addition, all test report will be available in a electronic form. Following parameters will be measured:

- PSS Switch current consumption in ON state.
- Scattering matrix at 352 MHz and 704 MHz in both switch states.
- The LED activity in both states.
- The NC and NO confirmation switches in both states.

## **5. Summary**

In this document the PEG part of the PSS project was presented. The mechanical design was prepared and first prototype was manufactured. After successful confirmation from ESS the procurement of the components for the final production will begin.