

R&S®THR9 & DAB+ TRANSMITTER OPERATION MANUAL

14 July 2025

ROHDE & SCHWARZ

Make ideas real



COMPANY RESTRICTED

ROHDE & SCHWARZ Tx9 TRANSMITTERS OVERVIEW

Low power



R&S®TLV9 / TLU9
Single-box VHF / UHF
Transmitter

Medium power



R&S®TMV9evo
Air-cooled
VHF Transmitter



R&S®TMU9evo
Air-cooled
UHF Transmitters

High power



**R&S®THU9evo /
R&S®THV9evo**
Liquid-cooled
UHF/VHF Transmitter



R&S®THR9
Liquid-cooled
VHF Bd. II Transmitter



THR9 ROHDE & SCHWARZ FM HIGH POWER TRANSMITTER

R&S®THR9 SYSTEM ARCHITECTURE

► System components

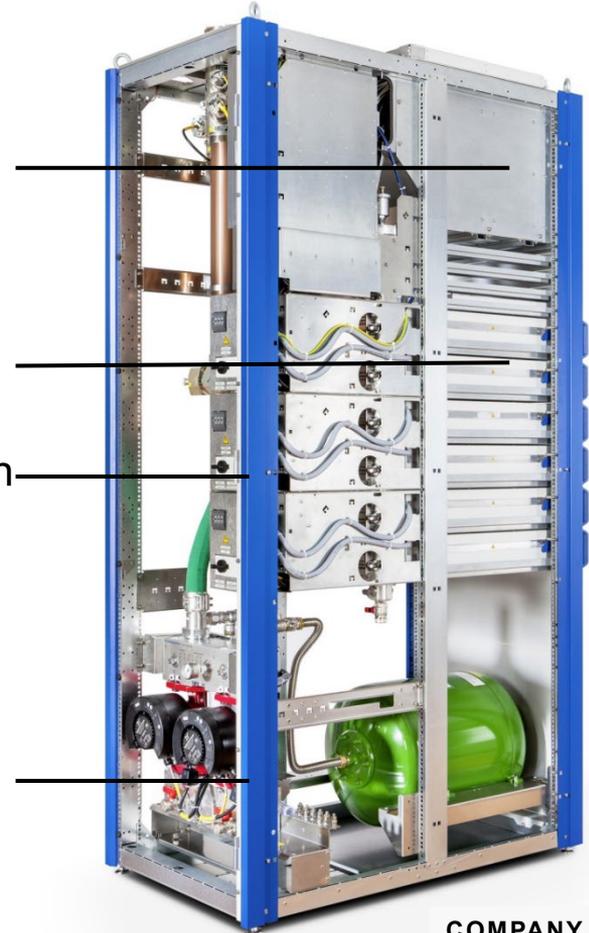
- Rack
- Pump unit / cooling system
- Mains distribution
- TCE900 platform

Control & signal
processing

PAs

Mains distribution

Pump unit



R&S®THR9 OVERVIEW



▶ **Highest output power per 19" rack**

- FM only: 5 .. 40 kW
- HD Radio™: 3 .. 24 kW (-10dB injection level)

▶ **Best-in-class energy efficiency**

- Up to 75% (FM only) resp. up to 70% (HD Radio™)

▶ **Minimize maintenance – minimized costs**

- Perfected liquid cooling outpacing air-cooling concepts

▶ **MultiTX: Several transmitters per rack**

- Up to four 10kW transmitters in one rack

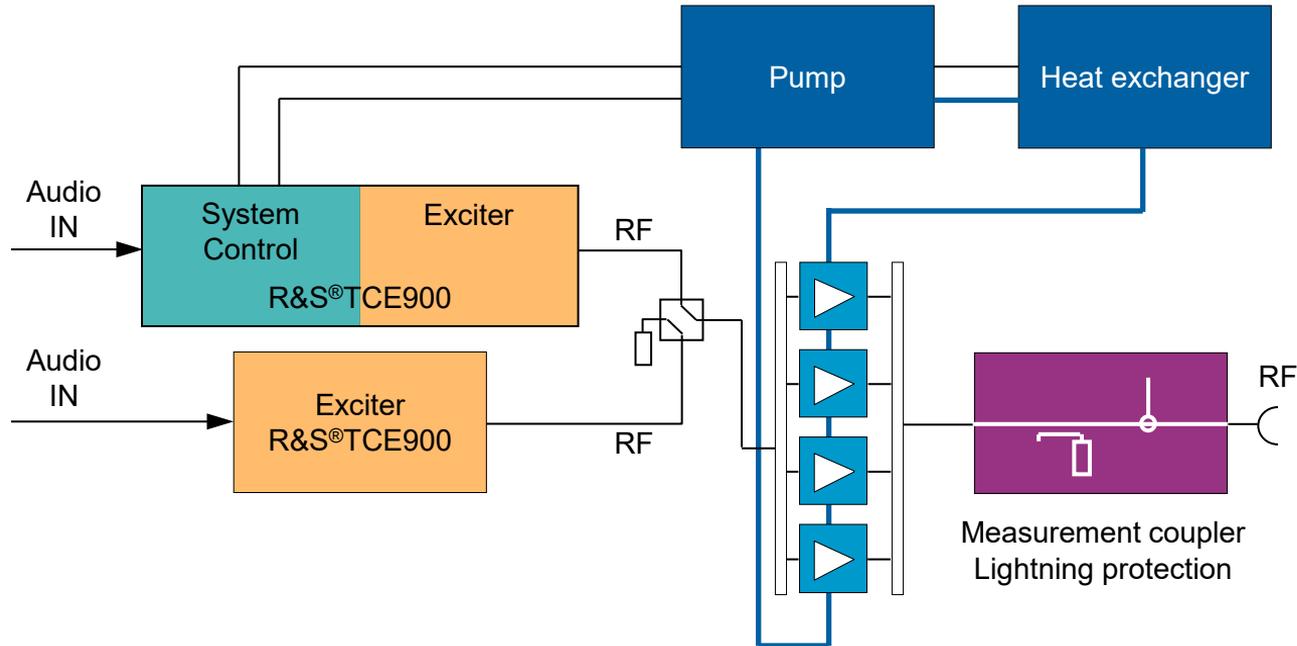
▶ **HD Radio™ 4th generation**

R&S®THR9

POWER CLASSES

Output power for FM and HD Radio™								
	Number of amplifiers							
	1	2	3	4	6	8	12	16
Analog FM mode	5.0 kW	10 kW	15 kW	20 kW	30 kW	40 kW	60 kW	80 kW
HD Radio™ (-14dB injection)	4.3 kW	8.4 kW	12 kW	17 kW	25 kW	33 kW	50 kW	66 kW
HD Radio™ (-10dB injection)	3.0 kW	6.1 kW	9.3 kW	12 kW	18 kW	24 kW	36 kW	48 kW
Size	1 x 19" rack						2 x 19" rack	

FM: BLOCK DIAGRAM SINGLE TX WITH BACKUP DRIVE

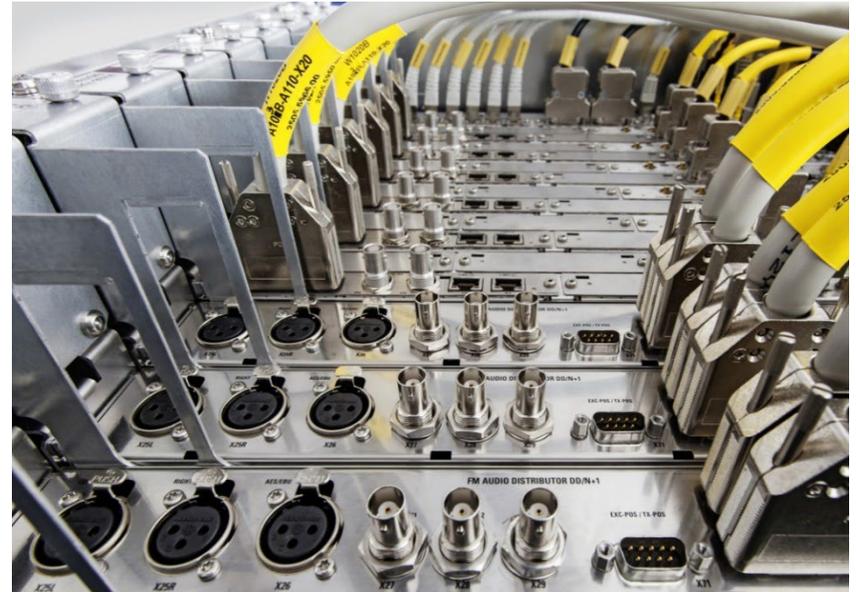


1...8 power amplifiers R&S®PHR901 per rack
with Harmonics filter integrated

R&S® TCE900 – TRANSMITTER CONTROL EXCITER

MAIN AND ADDITIONAL INTERFACE COMPONENTS

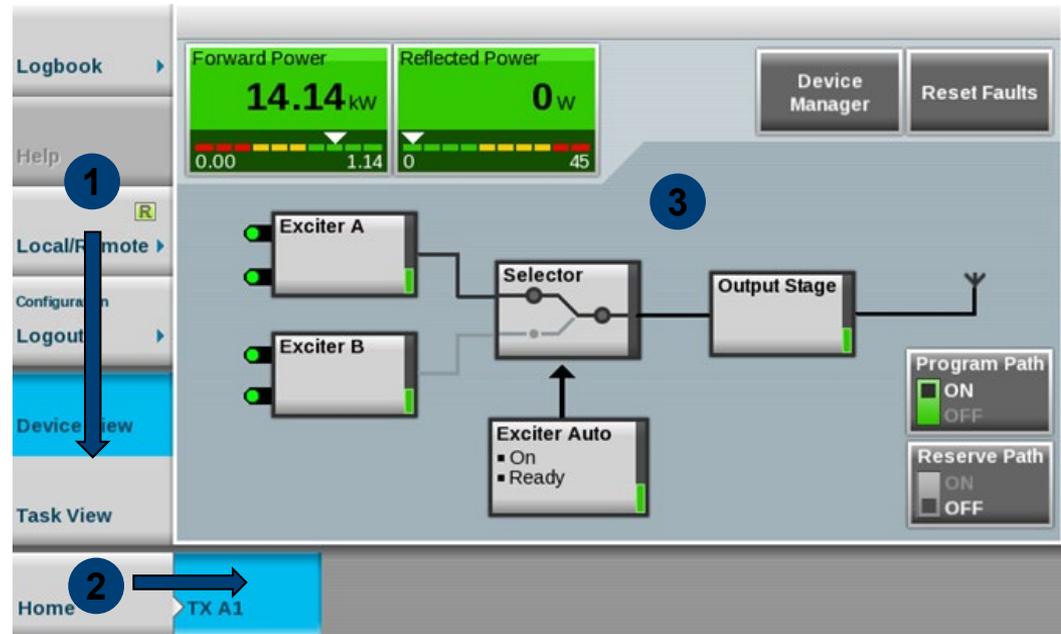
- ▶ Applications of TCE900:
 - Control for MultiTX and N+1
 - Control/Exciter for singleTX
 - Exciter in dual drive/backup drive
- ▶ Main components:
 - TCE900 Base unit
 - FM Coder board
 - RF board
 - Cooling/transmitter interfaces
- ▶ Additional interface components
 - Interfaces (L/R, AES, MPx, RDS)
 - Audio switch with XLR
 - Audio distribution to coder via SubD



INTUITIVE AND USER-FRIENDLY GUI

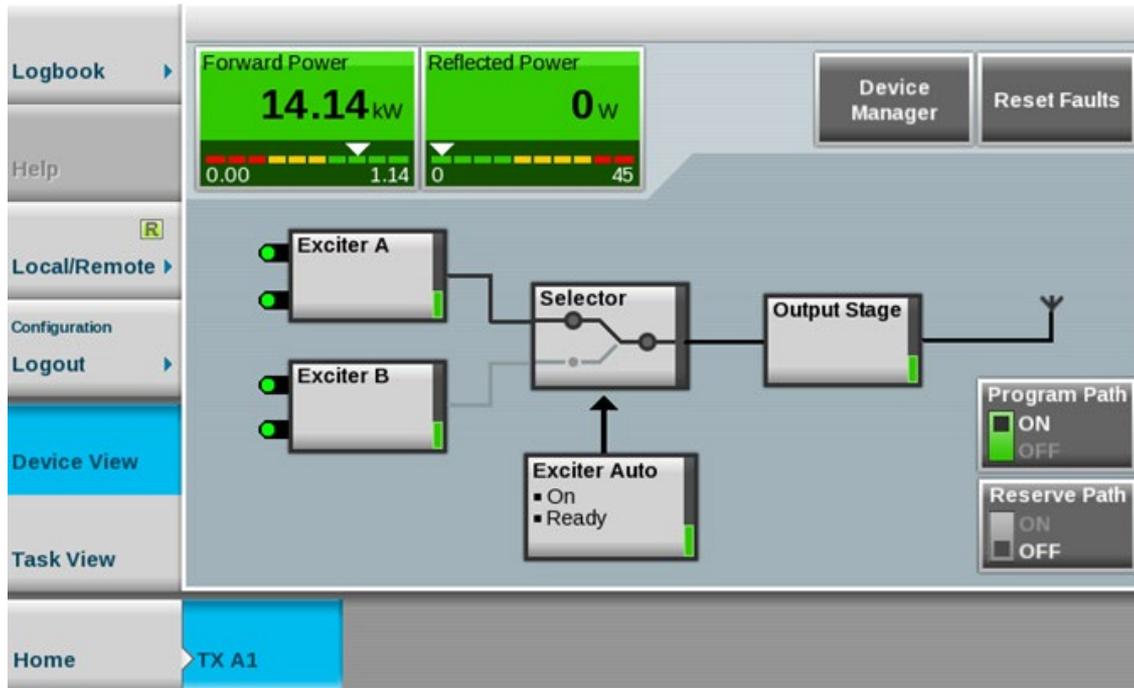
ELEMENTS OF GRAPHICAL USER INTERFACE

- 1 Menu bar** Access to most important functions
- 2 Path bar** Shows current position in menu structure and enables quick return to higher menu levels
- 3 Working area**
For various tasks and configuration steps are carried out



DEVICE-ORIENTED VIEWS

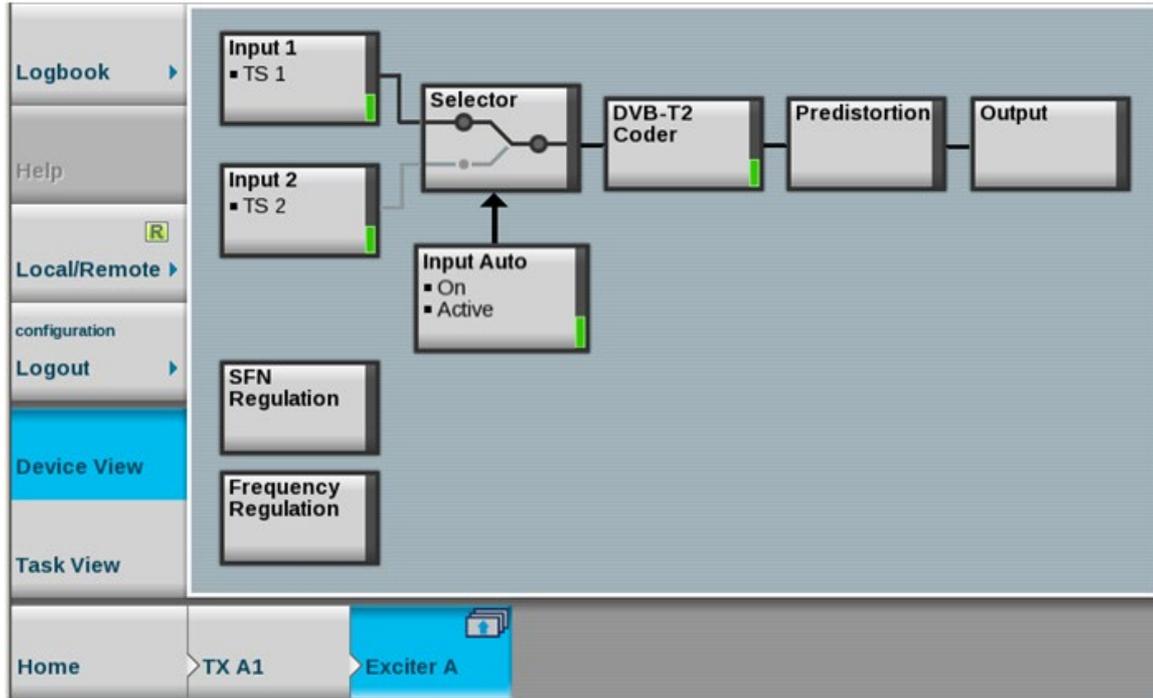
TRANSMITTER LEVEL: TRANSMITTER WITH DUAL DRIVE



- I Automatic switchover
- I Transmitter status
- I Output stage
- I Amplifiers
- I Rack

DEVICE-ORIENTED VIEWS

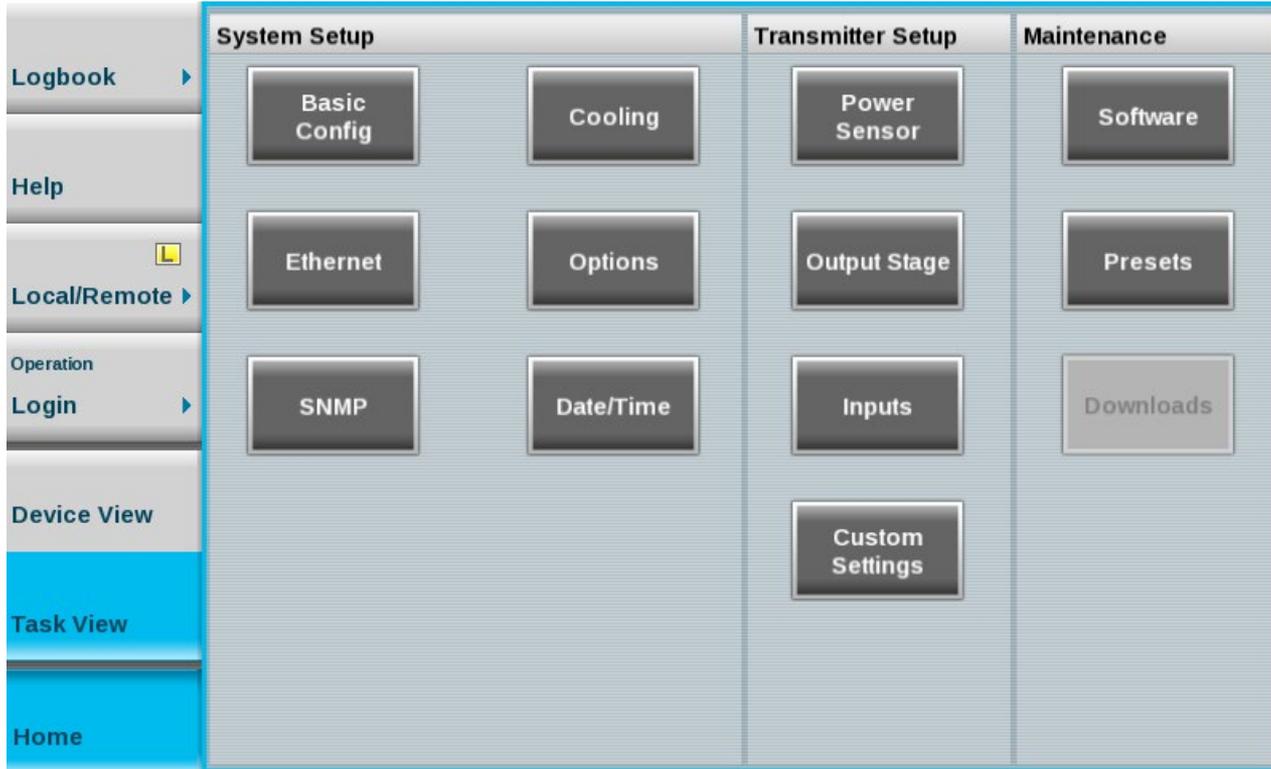
TRANSMITTER COMPONENTS LEVEL: EXCITER



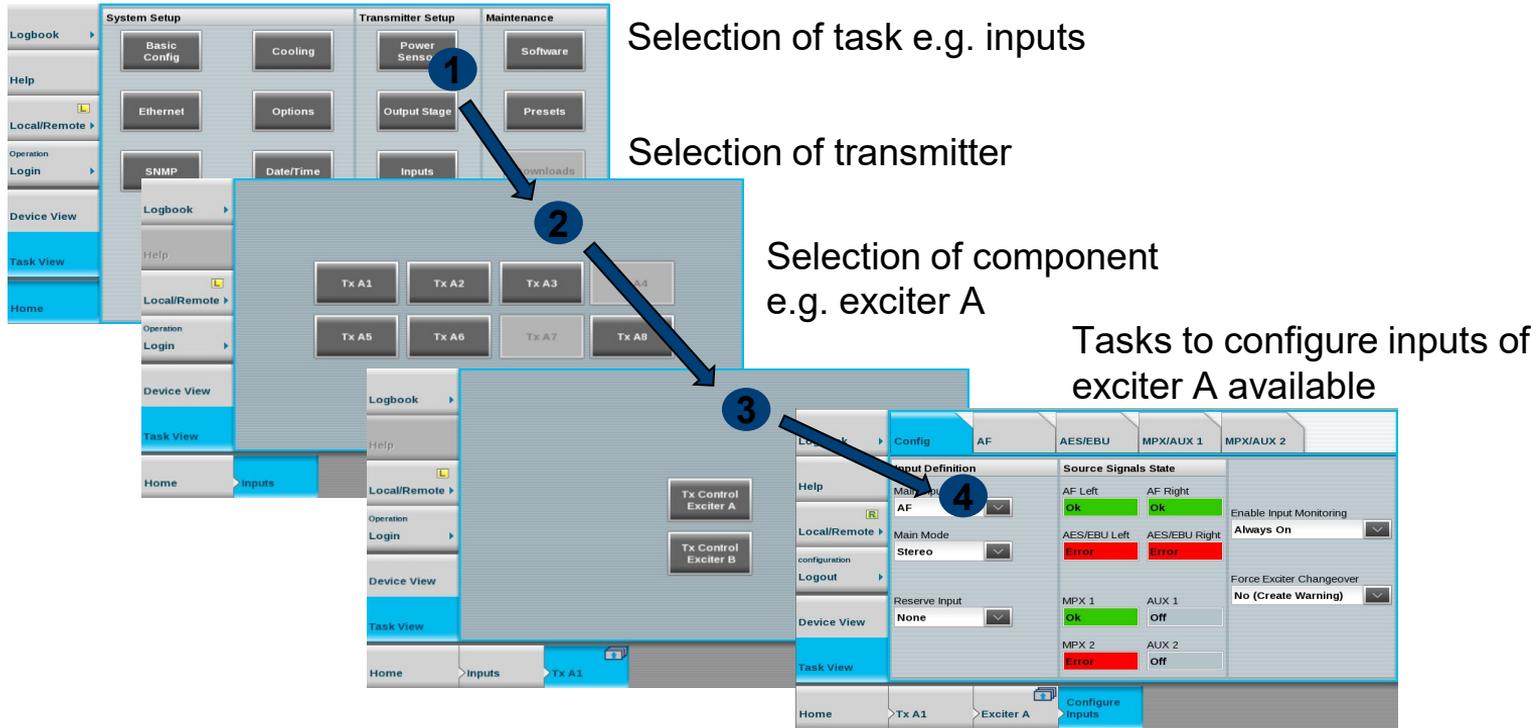
- I Coder configuration
- I Transmitting frequency and output power
- I Signal feed
- I Controlling time SFN
- I Frequency regulation
- I Precorrection
- I Predistortion
- I Output

TASK-ORIENTED VIEWS

TASK VIEW HOME WITH ALL TASKS



TASK-ORIENTED VIEWS HIERARCHICAL STRUCTURE



TASK-ORIENTED VIEWS

TASK CONFIGURE FM INPUTS

The screenshots illustrate the navigation path for configuring FM inputs:

- Screenshot 1:** Shows the main configuration menu with 'Config' highlighted. The 'Source Signals State' section displays:

Main Input	AF Left	AF Right
AF	Ok	Ok
Main Mode	AES/EBU Left	AES/EBU Right
Stereo	Error	Error
Reserve Input	MPX 1	AUX 1
None	Ok	Off
	MPX 2	AUX 2
	Error	Off
- Screenshot 2:** Shows the 'AF Left Input' configuration screen with 'AF' highlighted. The 'AF Settings' section displays:

State	State	Imp. Impedance	Input Fail Delay
Ok	Ok	>2k Oh	5 s
		Nominal Level	Input Recover Delay
		6.0 dBu	5 s
Current Level	Current Level	Threshold	
6.0 dBu	6.0 dBu	-20.0 dBu	
99.6 %	99.6 %	5.0 %	
- Screenshot 3:** Shows the 'AES/EBU Input levels' configuration screen with 'AES/EBU' highlighted. The 'AES/EBU Status' section displays:

Input Left	Input Right	Nominal Level	Sample Rate	Preemphasis
Error	Error	-9.0 dBFS	0.0 kHz	Unknown
Current Level	Current Level	Threshold	Audio Content	Channel Valid
-99.9 dBFS	-99.9 dBFS	-35.0 dBFS	Warning	Unknown
0.0 %	0.0 %	5.0 %	Fail Delay	Recover Delay
			5 s	5 s
			PCM Data	Parity/Biphase
			Unknown	Warning
				Clock
				Warning
- Screenshot 4:** Shows the 'MPX Input Config' configuration screen with 'MPX/AUX 1' highlighted. The 'MPX Input Config' section displays:

MPX Status	MPX	AUX Status	Name
Ok	Ok	Off	
Nominal Level	Nominal Level	Nominal Deviation	
6.0 dBu	-18.0 dBu	4.0 kHz	
Threshold	Current Level	Threshold	
-20.0 dBu	-18.0 dBu	-44.0 dBu	
5.0 %	6.3 %	5.0 %	
Fail Delay	Recover Delay	Fail Delay	Recover Delay
5 s	5 s	5 s	5 s

TASK-ORIENTED VIEWS

TASK BASIC CONFIGURATION OF R&S®TCE900

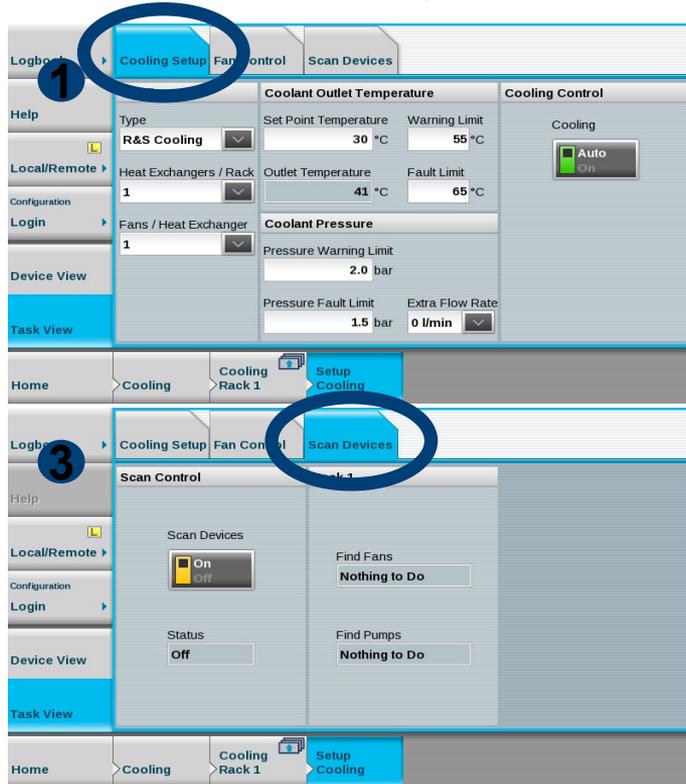
The image displays five sequential screenshots of the R&S TCE900 web interface, illustrating the navigation path for basic configuration. Each screenshot is annotated with a blue circle and a number:

- 1:** The 'Function' menu is selected in the top navigation bar.
- 2:** The 'Configuration' menu is selected in the top navigation bar.
- 3:** The 'Boards' menu is selected in the top navigation bar.
- 4:** The 'Racks' menu is selected in the top navigation bar.
- 5:** The 'Ethernet' menu is selected in the top navigation bar.

The screenshots show various configuration options such as System Control, Transmitters, Amplifier Type, Racks / Sys, Cooling Type, Rack Selector, Local/Remote IP Settings, and Remote IP Settings.

TASK-ORIENTED VIEWS

TASK SETUP LIQUID COOLING



1

Logbook > Cooling Setup > Fan Control > Scan Devices

Help

Type: R&S Cooling

Local/Remote > Heat Exchangers / Rack: 1

Configuration > Login > Fans / Heat Exchanger: 1

Device View

Task View

Coolant Outlet Temperature

Set Point Temperature: 30 °C

Warning Limit: 55 °C

Outlet Temperature: 41 °C

Fault Limit: 65 °C

Cooling Control

Auto On

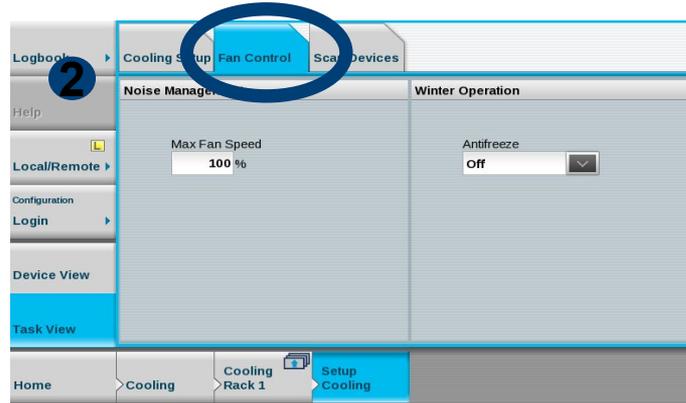
Coolant Pressure

Pressure Warning Limit: 2.0 bar

Pressure Fault Limit: 1.5 bar

Extra Flow Rate: 0 l/min

Home > Cooling > Cooling Rack 1 > Setup Cooling



2

Logbook > Cooling Setup > Fan Control > Scan Devices

Help

Local/Remote > Noise Management: Max Fan Speed 100 %

Configuration > Login > Winter Operation: Antifreeze Off

Device View

Task View

Home > Cooling > Cooling Rack 1 > Setup Cooling



3

Logbook > Cooling Setup > Fan Control > Scan Devices

Help

Local/Remote > Scan Devices: On

Configuration > Login > Find Fans: Nothing to Do

Device View: Status: Off

Task View: Find Pumps: Nothing to Do

Home > Cooling > Cooling Rack 1 > Setup Cooling

R&S®PHR901 – POWER AMPLIFIER BD. II

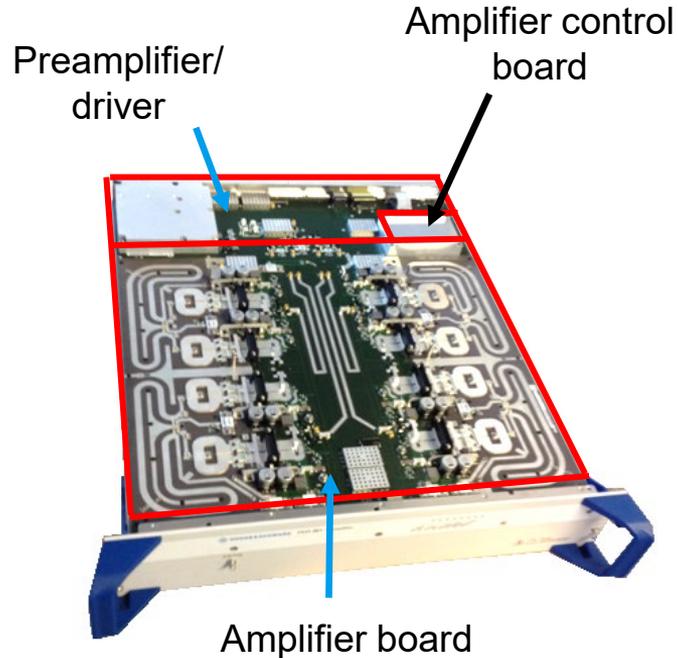
CHARACTERISTICS



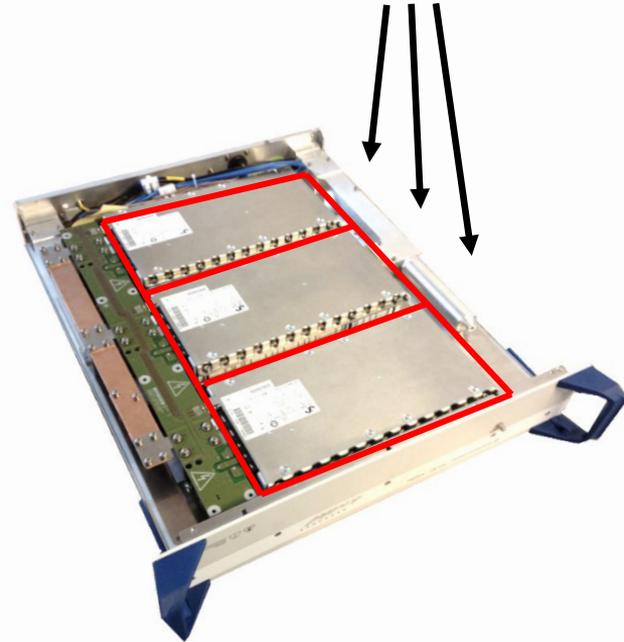
- ▶ Nominal power 5.2 kW analog FM resp. 3.5 kW HD Radio™ (FM + HD: -10dB)
- ▶ Completely controlled via CAN bus
- ▶ Integrated lightning protection and harmonics filter
- ▶ Operates in biasing mode C (for FM) or A/B (for HD Radio™)
- ▶ Voltage 3 x 230 V AC \pm 15% / 47 .. 63 Hz
- ▶ Transistor Latest 50 V LDMOS technology
- ▶ Weight 30 kg
- ▶ Dimensions H x D x W: 2.5 HU = 110 mm x 656 mm x 554 mm

R&S®PHR901 – POWER AMPLIFIER BD. II

COMPONENTS

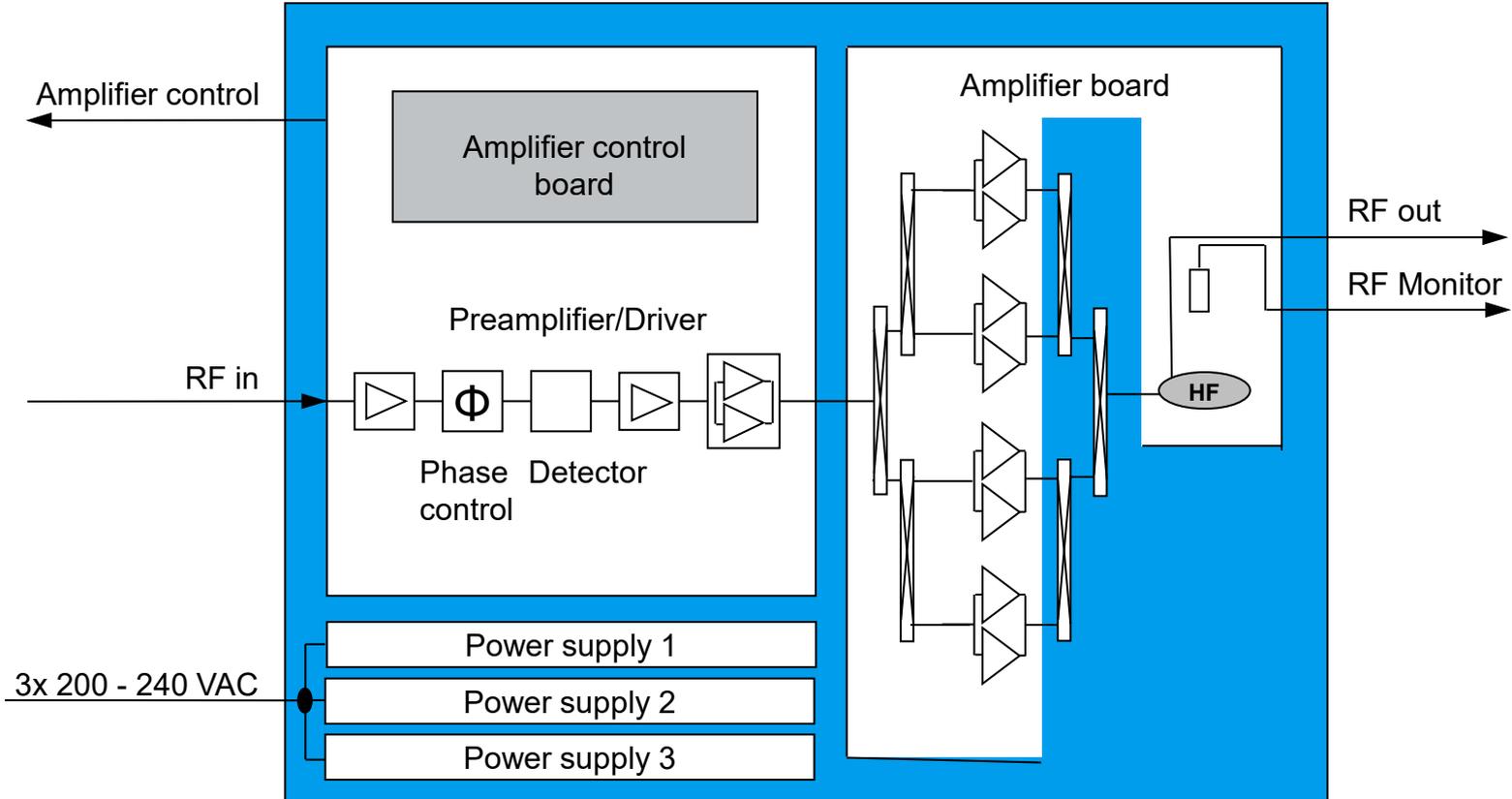


Three separate single phase power supplies instead of one

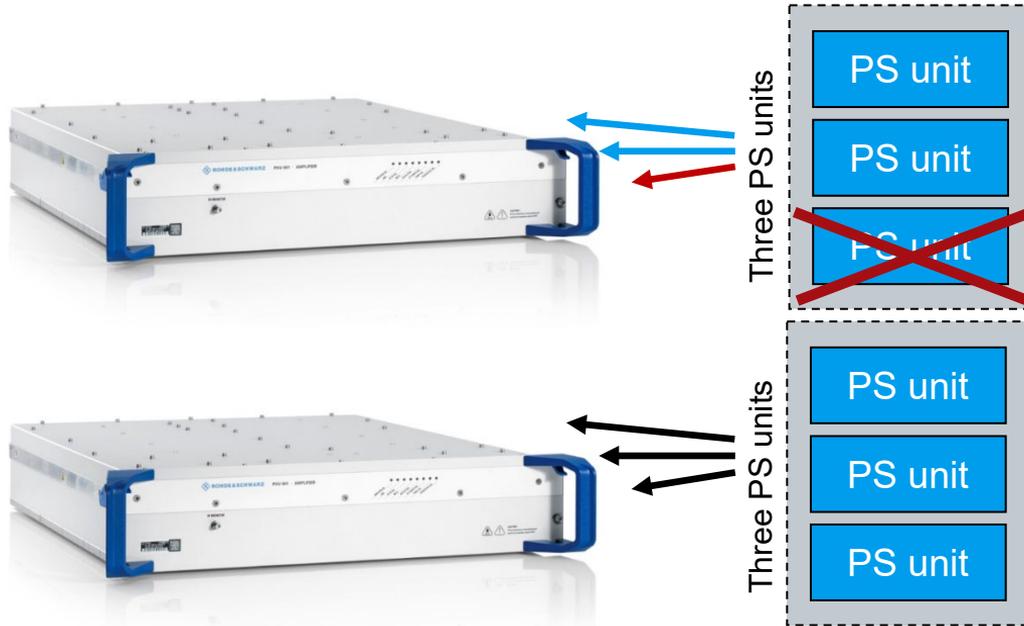


R&S®PHR901 – POWER AMPLIFIER BD. II

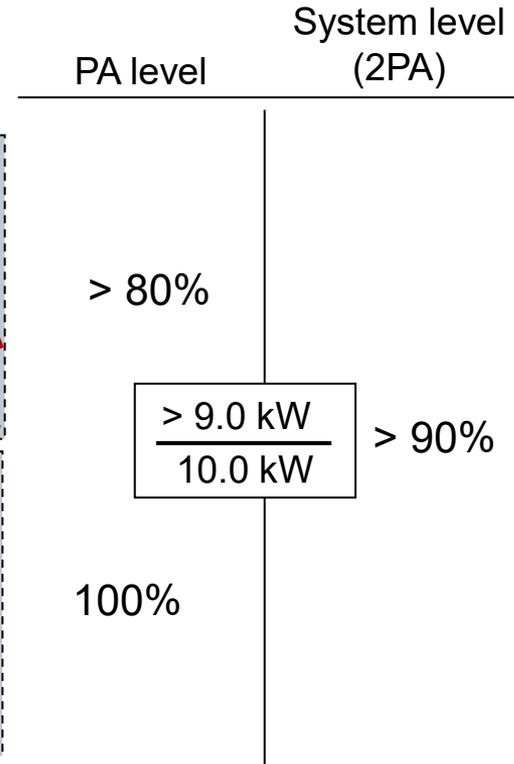
BLOCK DIAGRAM



R&S®PHR901 – REDUNDANCY INSIDE POWER SUPPLY FAILURE



Example: R&S®THR9 10kW



SYSTEM OVERVIEW

R&S®TLV9



- ▶ Adaptive non-linear pre-distortion (ADE)
- ▶ SFN - Full capability
- ▶ Integrated signal analysis function for DAB+
- ▶ Robust transmitter architecture
- ▶ ETI/EDI full support
- ▶ Up to 30% efficiency

POWER CLASSES (DAB+ AND DTV)

R&S[®]TLV9

► TLV9 Output Power

P_{out} *)	Width	Height	Depth
50 W	19"	2 HU	450 mm
150 W			
300 W			

*) Before bandpass filter

THE R&S[®]TMV9evo

TECHNICAL OVERVIEW



- ▶ **DAB+/DAB transmitter**
- ▶ **VHF 170 – 255 MHz**
- ▶ **350W – 8.5kW**
- ▶ **Air-cooled**

THE R&S® THV9evo TECHNICAL OVERVIEW

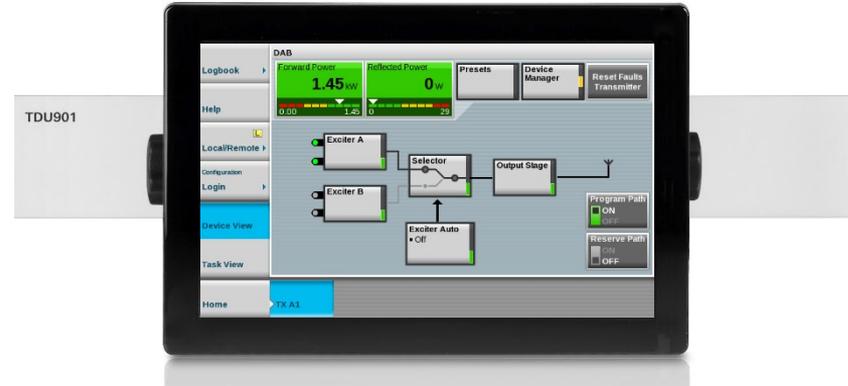
- ▶ DAB+/DAB transmitter
- ▶ VHF 170 – 255 MHz
- ▶ 1.3 kW – 30.0kW
- ▶ Liquid-cooled



TX9 USER INTERFACES



- ▶ Status LEDs and buttons
 - For main operation tasks
- ▶ Easy and quick information about transmitter status



- ▶ Comfortable graphical access to Tx & system configuration
 - Full information and configuration
 - Via TDU90x and Web-Interface



DAB

Logbook ▶

Help

Local/Remote ▶

Configuration

Login ▶

Device View

Task View

Forward Power **1.45 kW**

Reflected Power **0 W**

Presets

Device Manager

Reset Faults Transmitter

Exciter A

Exciter B

Selector

Exciter Auto

- On
- Ready

Output Stage

Program Path

ON

OFF

Reserve Path

ON

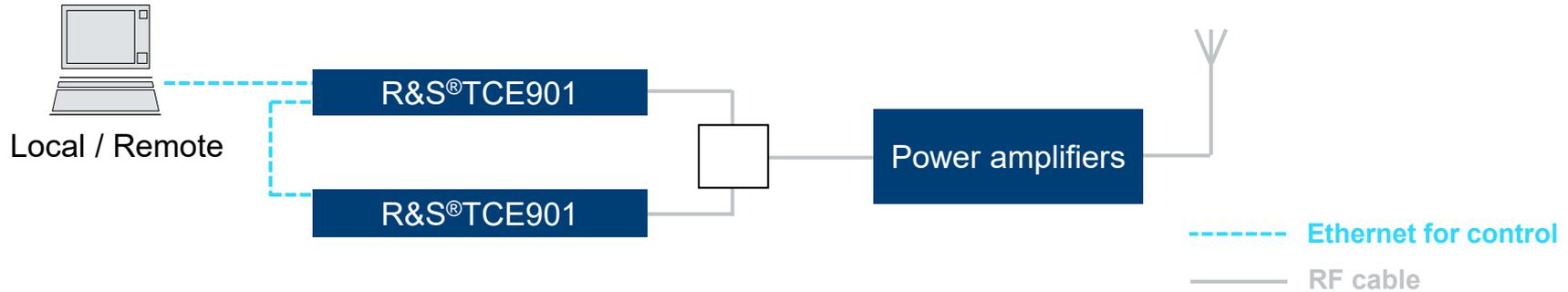
OFF

OPERATIONAL AND CONFIGURATION

R&S®TX9EVO

BACKUP DRIVE

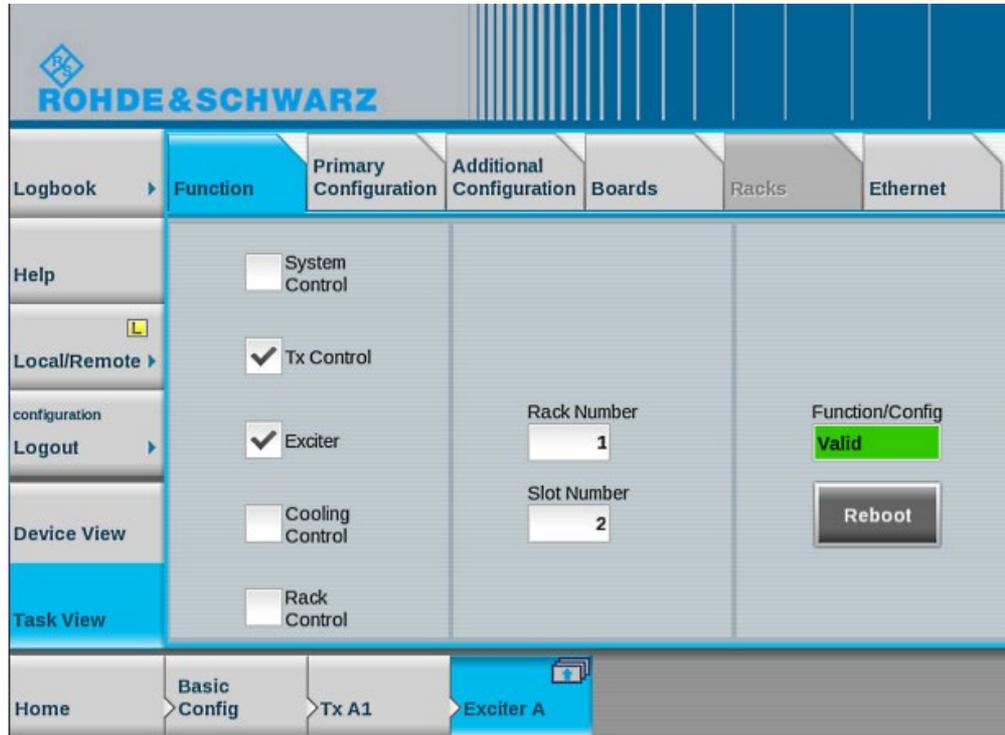
R&S®TMV9evo / R&S®THV9evo



- ▶ Equal to TCE900 Backup Drive
- ▶ No additional hardware for system control
- ▶ Automatic synchronization of settings
- ▶ Single IP address to access both TCE901 via WebInterface or SNMP

BASIC CONFIGURATION OF TCE901 FOR DAB STANDARD

R&S®TX9EVO



Task View>Home>Basic Config>Tx A1>Exciter A>Function

- ▶ With a high-power backup drive transmitter, the check marks for "System Control", "Cooling Control" and "Rack Control" must also be set.
- ▶ With a medium-power backup drive transmitter, the check marks "TX Control" and "Exciter" must be set; if a cooling system is present, the check marks for "System Control" and/or "Cooling Control" may also need to be set

BASIC CONFIGURATION OF TCE901 FOR DAB STANDARD

R&S®TX9EVO

The screenshot displays the configuration interface for the R&S TX9EVO transmitter. The top navigation bar includes 'Logbook', 'Function', 'Primary Configuration' (selected), 'Additional Configuration', 'Boards', 'Racks', and 'Ethernet'. The left sidebar contains 'Help', 'Local/Remote', 'configuration', 'Logout', 'Device View', and 'Task View'. The main configuration area is divided into several sections:

- System Variant:** Single/Multi Tx (dropdown)
- Transmitters:** 1 (dropdown)
- Tx Number:** A1 (dropdown)
- Exciter:** A (dropdown)
- Redundancy:** Dual Drive (dropdown)
- Modulation:** DAB (dropdown)
- 2nd. Modulation:** None (dropdown)
- Amplifier Mode:** Doherty (dropdown)
- Amplifier Type:** PHV902 (dropdown)
- Amplifiers:** 2 (text input)
- Number of RackControls:** 1 (dropdown)
- Racks / Sys:** 0 (text input)
- Cooling Type:** ---- (dropdown)
- Racks / RackControl:** 1 (dropdown)
- Racks / Tx:** 1 (dropdown)

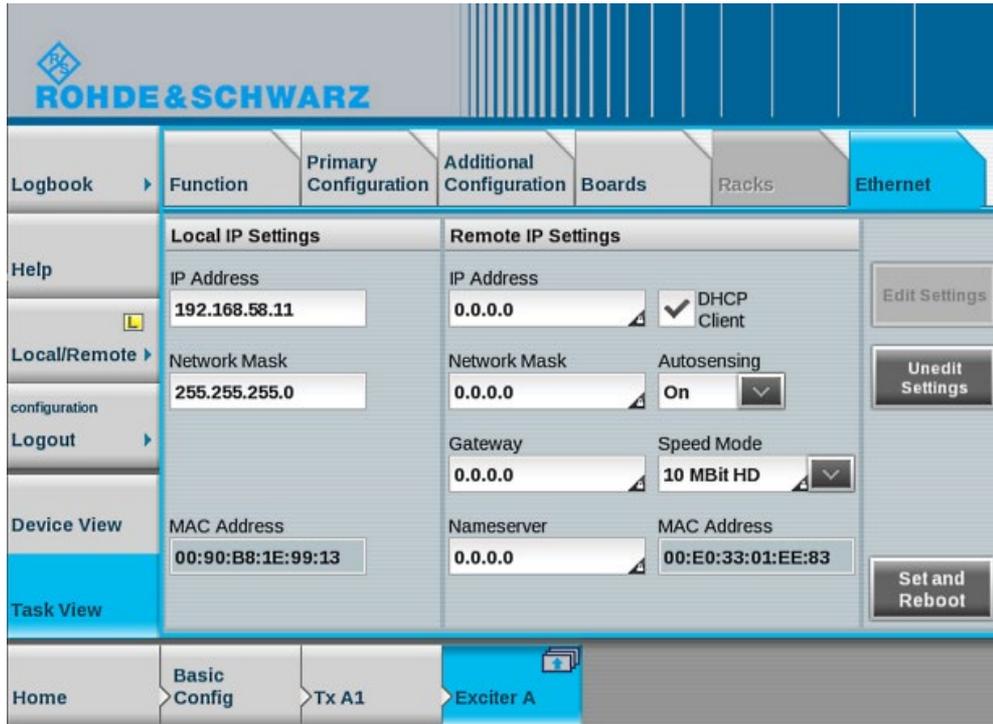
The bottom navigation bar shows 'Home', 'Basic Config', 'Tx A1', and 'Exciter A' (selected).

Task View>Home>Basic Config>Tx A1>Exciter A>Primary Configuration

- ▶ Configure "System Variant", "Transmitters", "TX Number", "Exciter", "Redundancy", "Amplifier Mode", "Amplifier Type", "Amplifiers", "Number of Rackcontrols", "Racks / Sys", "Racks / Rackcontrol" and "Racks / TX" according to the composition of the system.
- ▶ Set "Modulation" to DAB. In the case of a backup drive transmitter with cooling system, select "Cooling Type".

BASIC CONFIGURATION OF TCE901 FOR DAB STANDARD

R&S®TX9EVO



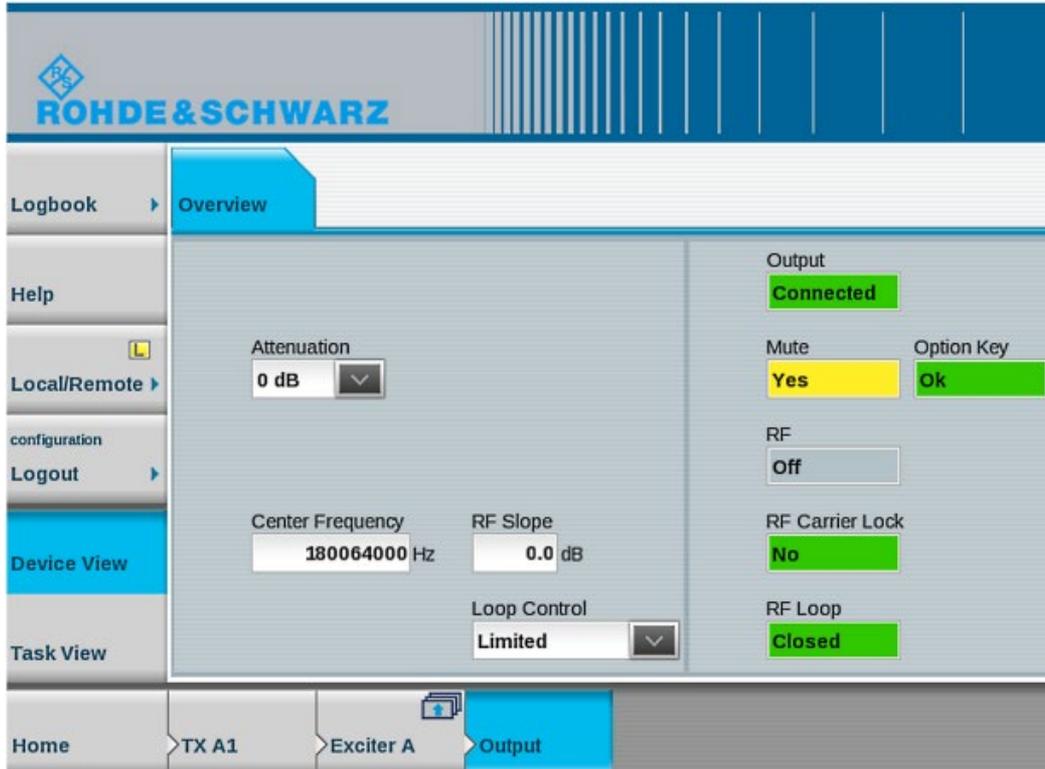
Task View>Home>Basic Config>Tx A1>Exciter A>Ethernet

- Opens the tab for configuring the IP address. In the "Local IP Settings" tab, enter the IP address corresponding to the installation position; see Table below.

Exciter A	192.168.58.11
Exciter B	192.168.58.12

SETTING TRANSMIT FREQUENCY

R&S®TX9EVO



Device View>Home>TX A1>Exciter A>Output under "Center Frequency".

- ▶ If the transmitter has only one amplifier, 9 dB must be set under "Attenuation", otherwise always 0 dB

INPUT CONFIGURATION

R&S®TX9EVO

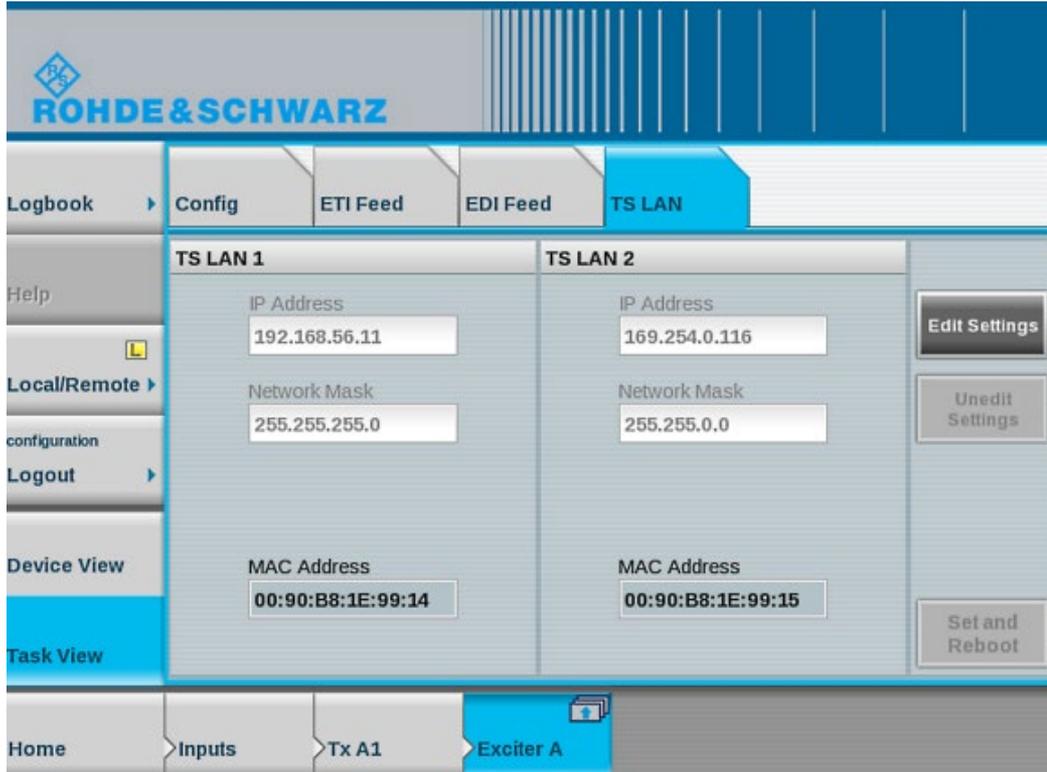


Task View>Home>Inputs>Tx
A1>Exciter A

- Configure the inputs. With the TV variant of the TCE901, only EDI inputs can be configured for DAB.

INPUT CONFIGURATION

R&S®TX9EVO



Task View>Home>Inputs>Tx
A1>Exciter A>TS LAN

- ▶ In the "TS LAN" tab, configure the IP addresses and the subnet masks for the EDI interfaces of the transmitter. The IP addresses can be edited by clicking the "Edit Settings" button.
- ▶ Then click the "Set and Reboot" button to restart the TCE901.

INPUT CONFIGURATION

R&S®TX9EVO

The screenshot displays the 'EDI Feed' configuration page in the R&S TX9EVO web interface. The interface includes a sidebar on the left with navigation options: Logbook, Help, Local/Remote, Logout, Device View, and Task View. The main content area features a top navigation bar with tabs for Config, ETI Feed, EDI Feed (selected), and TS LAN. Below the tabs, there are sections for 'Encapsulation of DAB Interfaces 1' and 'Encapsulation of DAB Interfaces 2'. Each section contains fields for Streaming Mode (Multicast (ASM)), IP Address (239.2.3.20), Source IP Address (0.0.0.0), RJ45 Connector (TS LAN 1 (X30) and TS LAN 2 (X31)), Port (12344), Stream Status (Ok), and Sync Status (ETI-NI). A bottom navigation bar shows Home, Inputs, Tx A1, and Exciter A (selected).

- ▶ After the restart, set up the "EDI Feed" (signal source) in the menu Task View>Home>Inputs>Tx A1>Exciter A>EDI Feed.
- ▶ Here too, the settings for the network and gateway are customer-specific. After all settings have been made, the "Stream Status" and "Sync Status" fields should display OK (green).
- ▶ Repeat these steps for any additional exciters (e.g. exciter B)

SETTING TRANSMITTER POWER

R&S®TX9EVO

The screenshot displays the 'Power and Limits' configuration screen for the R&S TX9EVO transmitter. The interface is divided into several sections:

- Forward Power:** A green display shows 1.60 kW with a scale from 0.00 to 1.60.
- Reflected Power:** A green display shows 4 W with a scale from 0 to 403.
- Power Sensor:** Shows 'Link Connected' and 'Calibration Calibrated' in green boxes.
- Power Settings:** Power is set to 91.3 % and RF Fail Timeout is 7 s.
- Warning and Fail Limits:**

Warning Limit	Fail Limit	Warning Limit	Fail Limit
-1.0 dB	-3.0 dB	-18.0 dB	-6.0 dB

The bottom navigation bar shows 'Home > TX A1 > Power Limits'.

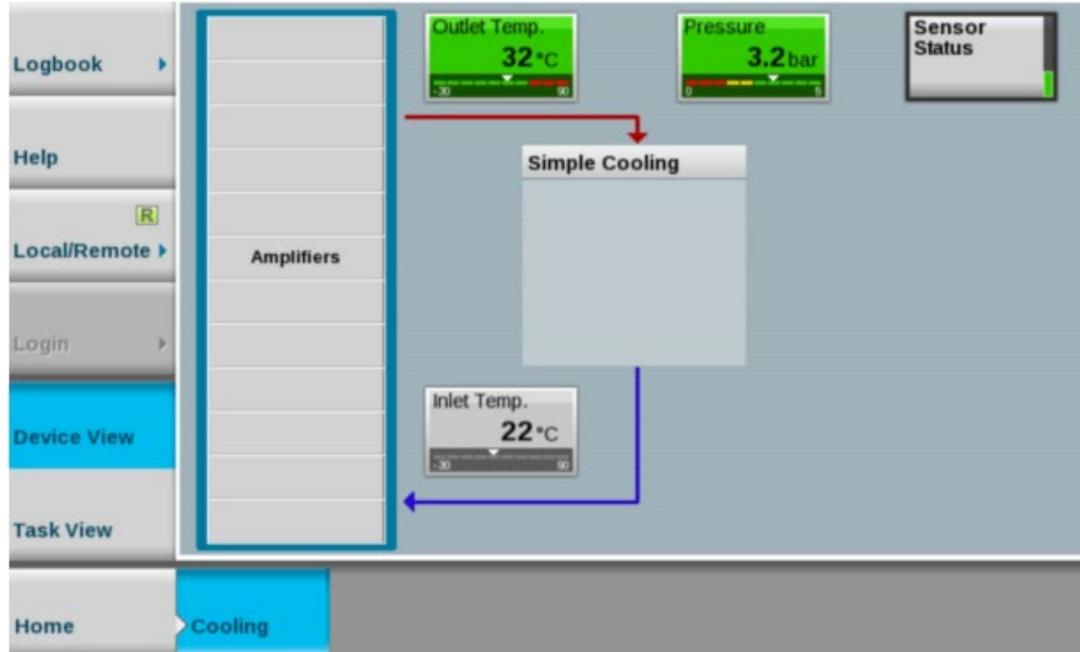
Setting the limits for the forward power monitoring:

Device View > Home > TxAn/TxB > Power Limits > Power and Limits

- ▶ Here too, the settings for the network and gateway are customer-specific. After all settings have been made, the "Stream Status" and "Sync Status" fields should display OK (green).
- ▶ Repeat these steps for any additional exciters (e.g. exciter B)

MONITORING OF PRESSURE AND TEMPERATURE

R&S®TX9EVO



- **Monitoring cooling system**
Device View (Home) > Cooling

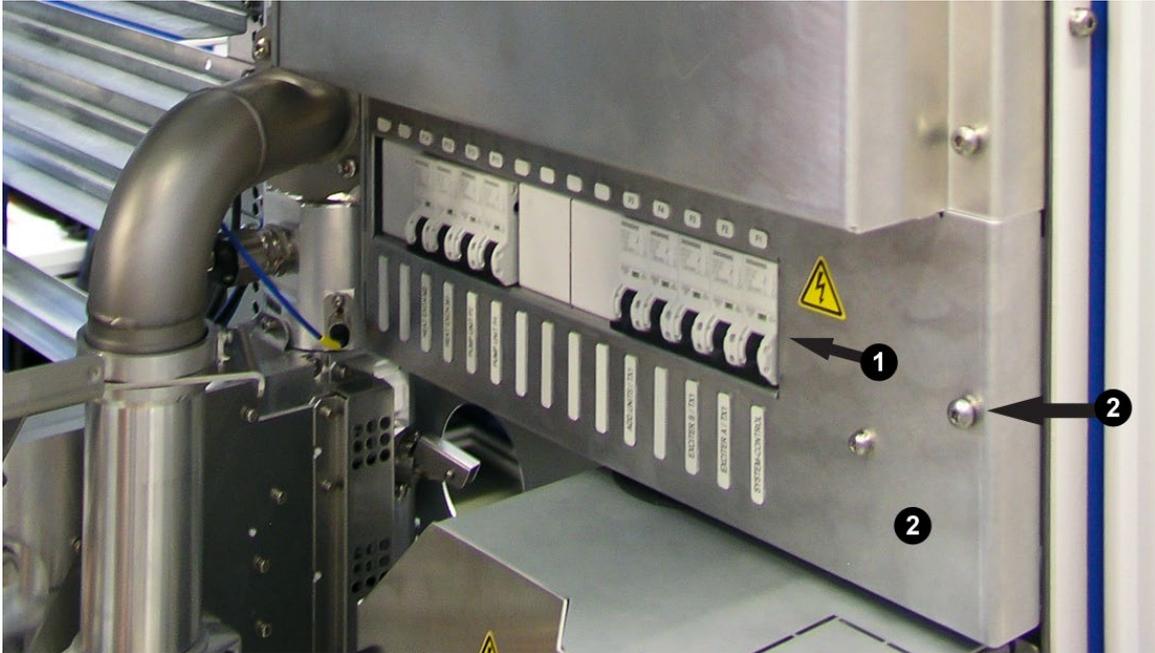


SOP AND TROUBLESHOOTING R&S®TX9EVO

COMPANY RESTRICTED

MENGHIDUPKAN PEMANCAR

R&S®TX9EVO

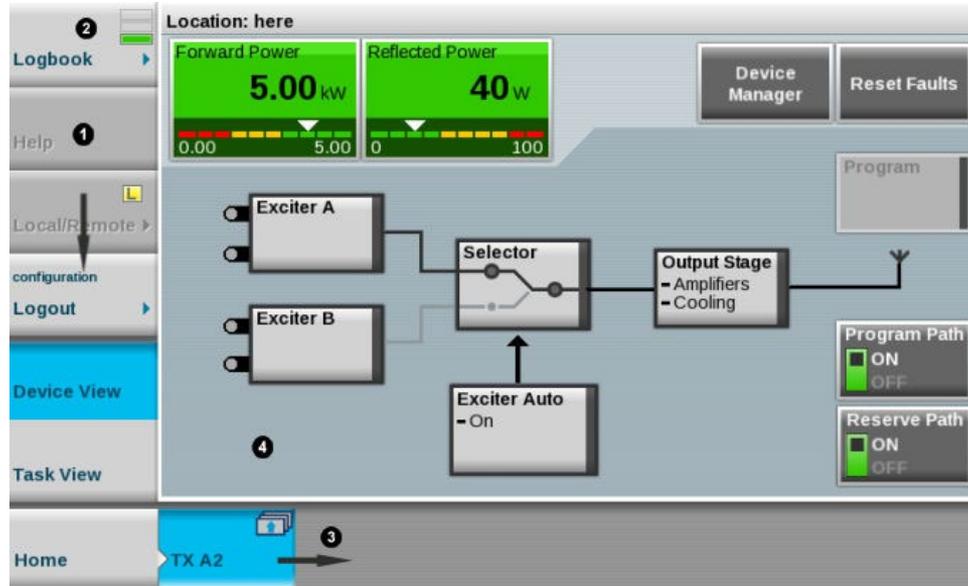


► SOP Menghidupkan Pemancar

1. Naikan **MCB** pemancar pada Panel Listrik
2. Naikan **MCB** perangkat **amplifier** dan **exciter** pada rak pemancar, posisi power distribusi ada dibagian belakang pemancar. Untuk lebih jelas dapat dilihat seperti gambar samping.
3. Kemudian **putar main breaker kearah kanan** untuk menghidupkan rak pemancar

ON AIR PEMANCAR

R&S®TX9EVO

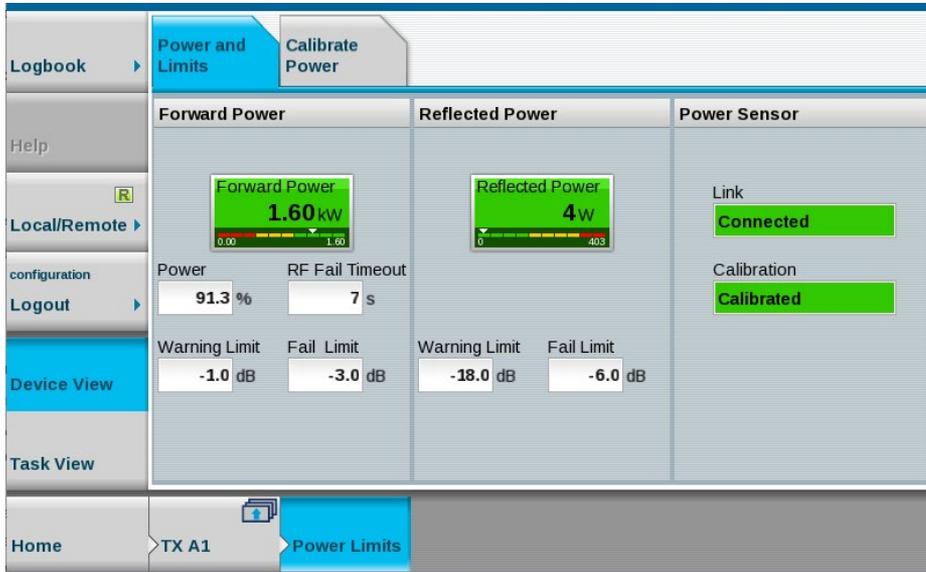


► SOP ON AIR Pemancar

1. Pastikan perangkat display, exciter dan amplifier sudah hidup dan tidak ada alarm.
2. Pastikan input dari headend sudah masuk ke exciter.
3. Untuk memastikan tahap 1 dan 2 bisa dilihat pada display pemancar dengan langkah sebagai berikut :**Menu: Device View > Home > TxA1**
4. Kemudian setting/atur persentase power yang diinginkan untuk dipancarkan
5. Selanjutnya tekan menu **Program Path** untuk ON Air pemancar, seperti pada tampilan pada gambar di samping.

SETTING POWER PEMANCAR

R&S®TX9EVO



► Setting Power Pemancar

1. Pada TDU/Display unit tekan menu **HOME**
2. Kemudian Pilih Menu **TxA1** pada Layar
3. Tekan Menu **Forward power** pada tampilan layer seperti gambar di samping.
4. Pilih kolom **Power** pada tampilan untuk menaikkan atau menurunkan power berdasarkan persentase.

Setting the limits for the forward power monitoring: *Device View > Home > TxAn/TxB > Power Limits > Power and Limits*

TROUBLESHOOTING

R&S®TX9EVO



Date	Event	Device	Time
2012-07-26	Input 2 Fail	ExciterA	15:48:01
	Input 1 Fail	ExciterA	15:47:46
	RF OK	ExciterA	15:47:35
	Output Mute	ExciterA	15:47:34
	Exciter	ExciterA	15:47:32
	Exciter	ExciterA	15:45:39
	Program On	ExciterA	14:51:41
	Input 2 Fail	ExciterA	14:27:33
	Input 2 Fail	ExciterA	14:27:29
	Input 2 Fail	ExciterA	14:26:41
	Input 2 Fail	ExciterA	14:26:10
	Exciter	ExciterA	14:16:02
2012-07-25	tx/DVBT/exc#/operation/state/p	ExciterA	10:01:57
	tx/DVBT/exc#/operation/state/	ExciterA	15:57:02
	tx/DVBT/exc#/operation/state/	ExciterA	15:57:01
	tx/DVBT/exc#/operation/state/	ExciterA	15:52:38
	tx/DVBT/exc#/operation/state/	ExciterA	15:52:38
	tx/DVBT/exc#/operation/state/	ExciterA	15:52:38
	tx/DVBT/exc#/operation/state/	ExciterA	15:52:37
	tx/DVBT/exc#/coder/control/st	ExciterA	15:52:37

- ▶ Apabila terjadi kerusakan atau alarm pada perangkat/pemancar bisa dilihat pada tampilan display dengan

Menu: *Device View > Home > TxA1*

- ▶ Pada display tersebut akan menunjukkan perangkat mana yang bermasalah atau rusak. Semua peristiwa atau kejadian pada system, dicatat dalam **Logbook**. Fungsi berikut tersedia untuk memudahkan troubleshooting dan analisa kerusakan pada perangkat

TROUBLESHOOTING

R&S®TX9EVO

- ▶ Setiap entri terdiri dari informasi berikut:
 - ▶ Untuk mengetahui lebih detail permasalahan yang terjadi dapat diketahui dengan memilih atau menyentuh kejadian yang terjadi pada layar, dengan hasil seperti pada gambar dibawah ini
- Alarm level
 -  Error
 -  Error no longer present/remedied
 -  Warning
 -  Warning no longer present
 -  Info
 - Error message text
 - System component (control, amplifier, exciter, etc.)
 - Time

TROUBLESHOOTING

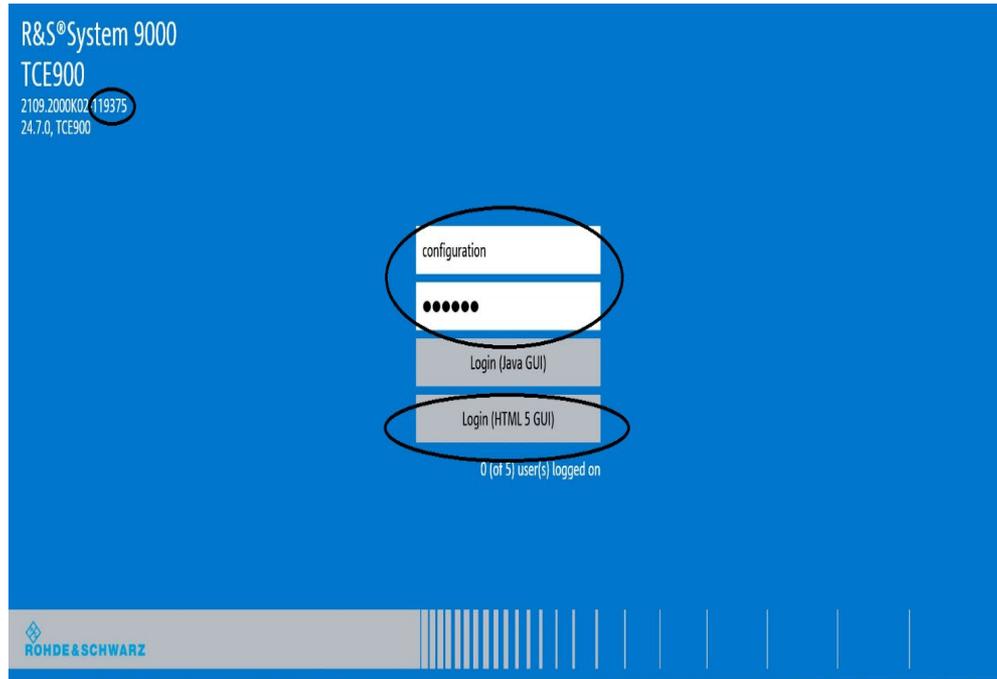
R&S®TX9EVO



- ▶ Untuk mengetahui lebih detail permasalahan yang terjadi dapat diketahui dengan memilih atau menyentuh kejadian yang terjadi pada layar, dengan hasil seperti pada gambar.

REMOTE PEMANCAR DENGAN PC/LAPTOP

R&S®TX9EVO

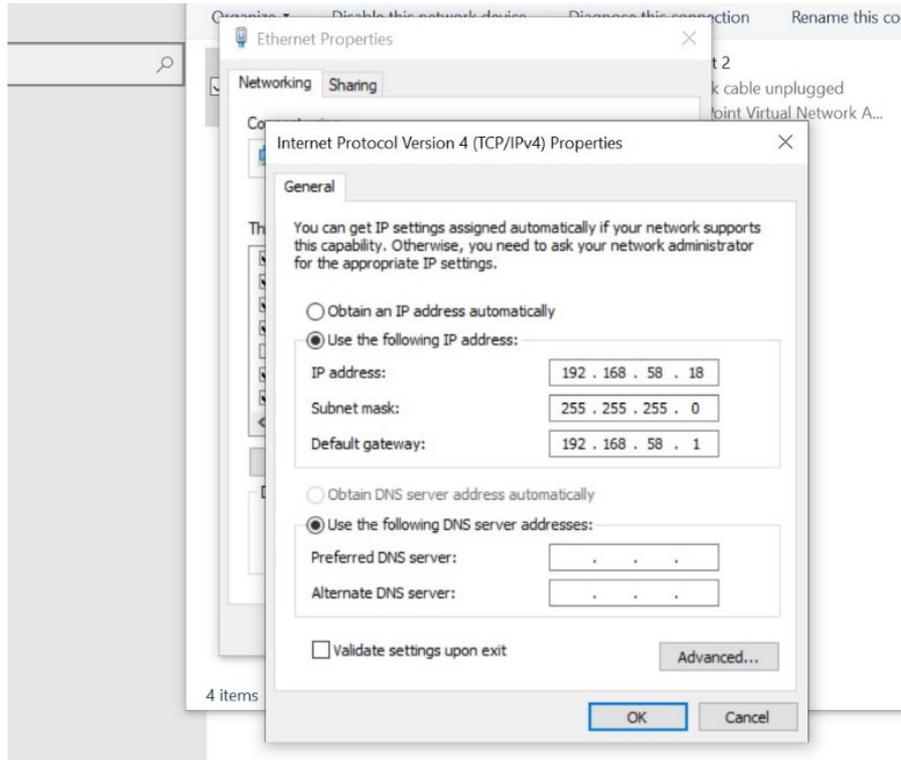


LOGIN

- ▶ Ip Address : 192.168.58.100 (Sys Ctrl)
- ▶ Ip Address : 192.168.58.11 (Exciter A)
- ▶ Ip Address : 192.168.58.12 (Exciter B)
- ▶ User : Configuration
- ▶ Pass : S/N Perangkat
- ▶ Login : Login HTML 5 GUI.

SETTING IP ADDRESS PC/LAPTOP

R&S®TX9EVO



SETTING IP ADDRESS

- ▶ IP address : 192.168.58.18
- ▶ Subnet Mask : 255.255.255.0
- ▶ Gateway : 192.168.58.1

THANK YOU FOR YOUR ATTENTION



ROHDE & SCHWARZ

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