



Instrument Manual

R&S[®] SLx8000 ADTV Transmitter Family

Band III / IV / V, Low Power

Only skilled personnel may perform the operations of the described instrument that are necessary for installing and putting it into operation as well as maintaining, troubleshooting and servicing it.

Printed in Germany

Instrument Manual
Transmitter Series SLx8000
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Qualitätszertifikat

Certificate of quality

Certificat de qualité

Certified Quality System
ISO 9001

Certified Environmental System
ISO 14001

Sehr geehrter Kunde,

Sie haben sich für den Kauf eines Rohde&Schwarz-Produktes entschieden. Hiermit erhalten Sie ein nach modernsten Fertigungsmethoden hergestelltes Produkt. Es wurde nach den Regeln unseres Qualitätsmanagementsystems entwickelt, gefertigt und geprüft. Das Rohde&Schwarz-Qualitätsmanagementsystem ist u.a. nach ISO 9001 und ISO 14001 zertifiziert.

Der Umwelt verpflichtet

- Energie-effiziente, RoHS-konforme Produkte
- Kontinuierliche Weiterentwicklung nachhaltiger Umweltkonzepte
- ISO 14001-zertifiziertes Umweltmanagementsystem

Dear Customer,

You have decided to buy a Rohde&Schwarz product. You are thus assured of receiving a product that is manufactured using the most modern methods available. This product was developed, manufactured and tested in compliance with our quality management system standards. The Rohde&Schwarz quality management system is certified according to standards such as ISO 9001 and ISO 14001.

Environmental commitment

- Energy-efficient products
- Continuous improvement in environmental sustainability
- ISO 14001-certified environmental management system

Cher client,

Vous avez choisi d'acheter un produit Rohde&Schwarz. Vous disposez donc d'un produit fabriqué d'après les méthodes les plus avancées. Le développement, la fabrication et les tests respectent nos normes de gestion qualité. Le système de gestion qualité de Rohde&Schwarz a été homologué, entre autres, conformément aux normes ISO 9001 et ISO 14001.

Engagement écologique

- Produits à efficience énergétique
- Amélioration continue de la durabilité environnementale
- Système de gestion de l'environnement certifié selon ISO 14001

Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish. We will take care that you will get the right information.

USA & Canada

Monday to Friday	(except US public holidays)
8:00 AM – 8:00 PM	Eastern Standard Time (EST)
Tel. from USA	888-test-rsa (888-837-8772) (opt 2)
From outside USA	+1 410 910 7800 (opt 2)
Fax	+1 410 910 7801
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- ◆ Service Locations
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**Für Betrieb im Europäischen Wirtschaftsraum (EWR)
und zivilem Einsatz.**

Hinweis gemäß dem Gesetz über "Funkanlagen und Telekommunikationsend-einrichtungen" (FTEG) und der Europäischen Richtlinie 1999/5/EG:

Dieses Produkt darf innerhalb des EWR nicht uneingeschränkt betrieben werden, da der verwendete Frequenzbereich auf nicht harmonisierten Bändern erfolgt. Nationale Vorschriften / Genehmigungen sind zu beachten.

Das Gerät ist 4 Wochen vor Inverkehrbringen bei der jeweils zuständigen nationalen Behörde für die Frequenzhoheit zu notifizieren. Informationen hierzu im Internet unter folgender Adresse: <http://europa.eu.int/comm/enterprise/rtte/spectr.htm>

**For operation in the European Economic Area (EEA)
and civil use.**

Note pursuant to the German Radio and Telecommunications Terminal Equipment Directive (FTEG) and the European R&TTE Directive 1999/5/EC:

Operation of this product within the EEA is subject to restrictions since the frequency bands used are not harmonised. National provisions / authorizations shall be complied with.

The product shall be notified to the competent national frequency management authority four weeks before the product is put on the market.

For more information refer to: <http://europa.eu.int/comm/enterprise/rtte/spectr.htm>



ROHDE & SCHWARZ

KONFORMITÄTSERKLÄRUNG gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE) Anhang V, zertifiziert durch die Benannte Stelle CETECOM ICT Services GmbH, Reg. Nr. Q812137N

DECLARATION OF CONFORMITY in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/EC (R&TTE Directive) Annex V, certified by the Notified Body CETECOM ICT Services GmbH Germany, Reg. No. Q812137N



Zertifikat-Nr.: / Certificate No.: 2007-53, Seite 1 von 2 / Page 1 of 2

Hiermit wird bescheinigt, dass die Funkanlage

This is to certify that the radio equipment

Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
SLX8000	2100.1000.20	Kleinleistungssender 2HE, Grundgerät digital Low Power Transmitter 2U, Basic Unit digital
SLX8000	2100.1000.30	Kleinleistungssender 3HE, Grundgerät digital Low Power Transmitter 3U, Basic Unit digital

Gerätekategorie: / Equipment class: 2.10 (Broadcast transmitters)

bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht.

complies with the essential requirements of §3 and the other relevant provisions of the FTEG (Article 3 of the R&TTE Directive), when used for its intended purpose.

- Gesundheit und Sicherheit gemäß § 3 (1) 1 (Artikel 3 (1) a))
- Health and safety requirements pursuant to § 3 (1) 1 (Article 3(1) a))
- Schutzanforderungen in Bezug auf die elektromagn. Verträglichkeit § 3 (1) 2, Artikel 3 (1) b))
- Protection requirements concerning electromagnetic compatibility § 3(1)(2), (Article 3(1)(b))
- Maßnahmen zur effizienten Nutzung des Funkfrequenzspektrums
- Measures for the efficient use of the radio frequency spectrum
- Luftschnittstelle bei Funkanlagen gemäß § 3(2) (Artikel 3(2))
- Air interface of the radio systems pursuant to § 3(2) (Article 3(2))

Angewendete harmonisierte Normen: / Harmonized standards applied:

EN 60950-1 : 2001
ETSI EN 301 489-1 V1.5.1 (2004-11)
ETSI EN 301 489-14 V1.2.1 (2003-05)
ETSI EN 302 296 V1.1.1 (2005-01)

Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards/Spezifikationen): Other means of proving conformity with the essential requirements (standards/specifications used):	ETSI EN 300 744 V1.5.1 (2004-11) RegTP SSB RU 005 Rec. 1999/519/EG; 26. BImSchV
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Anbringung des CE-Zeichens ab: 2007 / Affixing the EC conformity mark as from 2007

ROHDE & SCHWARZ GmbH & Co. KG
Mühldorfstr. 15, D-81671 München

München, den 22. August 2008
Munich, 2008-08-22

Zentrales Qualitätsmanagement MF-QZ / Radde
Central Quality Management



ROHDE & SCHWARZ

KONFORMITÄTSERKLÄRUNG gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE) Anhang V, zertifiziert durch die Benannte Stelle CETECOM ICT Services GmbH, Reg. Nr. Q812137N

DECLARATION OF CONFORMITY in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/EC (R&TTE Directive) Annex V, certified by the Notified Body CETECOM ICT Services GmbH Germany, Reg. No. Q812137N



Zertifikat-Nr.: / Certificate No.: 2007-53, Seite 2 von 2 / Page 2 of 2

Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
SLX8000B9	2100.4000.02	AC Netzteil 2HE / AC Power Supply 2U
SLX8000B10	2100.4022.02	DC Netzteil 2HE / DC Power Supply 2U
SLX8000B11	2100.4045.02	AC Netzteil 3HE / AC Power Supply 3U
SLX8000B12	2100.4068.02	DC Netzteil 3HE / DC Power Supply 3U
SLX8000B13	2100.3232.02	GPS-Empfängerkarte / GPS Receiver Board
SLX8000B14	2100.3355.10	Einbausatz für DVB-T/-H Sender-/Empfänger-Betrieb Kit for DVB-T/-H Re-Transmitter Operation
SLX8000B15	2100.3355.20	Einbausatz für DVB-T/-H Monitoring-Option Kit for DVB-T/-H Monitoring Option
SLX8000B35	2100.1252.02	VHF-Verstärker 25 W / VHF Power Amplifier 25 W
SLX8000B36	2100.1269.02	VHF-Verstärker 50 W / VHF Power Amplifier 50 W
SLX8000B42	2100.1169.02	UHF-Verstärker 2 W / UHF Power Amplifier 2 W
SLX8000B43	2100.1175.02	UHF-Verstärker 5 W / UHF Power Amplifier 5 W
SLX8000B44	2100.1181.02	UHF-Verstärker 10 W / UHF Power Amplifier 10 W
SLX8000B45	2100.1198.02	UHF-Verstärker 25 W / UHF Power Amplifier 25 W
SLX8000B46	2100.1200.02	UHF-Verstärker 50 W / UHF Power Amplifier 50 W
SLX8000B47	2100.1217.02	UHF-Verstärker 100 W / UHF Power Amplifier 100 W

München, den 22. August 2008
Munich, 2008-08-22

ROHDE & SCHWARZ GmbH & Co. KG
Mühldorfstr. 15, D-81671 München

Zentrales Qualitätsmanagement MF-QZ / Radde
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Zertifikat-Nr.: / Certificate No.: 2008-15, Seite 1 von 2 / Page 1 of 2

Hiermit wird bescheinigt, dass die Funkanlage
This is to certify that the radio equipment

Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
SLX8000A	2100.1000.21	Kleinleistungssender 2HE, Grundgerät analog/digital Low Power Transmitter 2U, Basic Unit analogue/digital
SLX8000A	2100.1000.31	Kleinleistungssender 3HE, Grundgerät analog/digital Low Power Transmitter 3U, Basic Unit analogue/digital

Gerätekategorie: / Equipment class: 2.10 (Broadcast transmitters)

bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht.
complies with the essential requirements of §3 and the other relevant provisions of the FTEG (Article 3 of the R&TTE Directive), when used for its intended purpose.

- Gesundheit und Sicherheit gemäß § 3 (1) 1 (Artikel 3 (1) a))
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- Schutzanforderungen in Bezug auf die elektromagn. Verträglichkeit § 3 (1) 2, Artikel 3 (1) b))
- Protection requirements concerning electromagnetic compatibility § 3(1)(2), (Article 3(1)(b))
- Maßnahmen zur effizienten Nutzung des Funkfrequenzspektrums
- Measures for the efficient use of the radio frequency spectrum
- Luftschnittstelle bei Funkanlagen gemäß § 3(2) (Artikel 3(2))
- Air interface of the radio systems pursuant to § 3(2) (Article 3(2))

Angewendete harmonisierte Normen: / Harmonized standards applied:

EN 60950-1 : 2001
ETSI EN 301 489-1 V1.5.1 (2004-11)
ETSI EN 301 489-14 V1.2.1 (2003-05)
ETSI EN 202 296 V1.1.1 (2005-01)
ETSI EN 302 297 V1.1.1 (2005-01)

Einhaltung der grundlegenden Anforderungen auf andere Art und Weise (hierzu verwendete Standards/Spezifikationen):
Other means of proving conformity with the essential requirements (standards/specifications used):

ETSI EN 300 744 V1.5.1 (2004-11)
RegTP SSB RU 003
RegTP SSB RU 005
Rec. 1999/519/EG; 26. BImSchV

Anbringung des CE-Zeichens ab: 2008 / Affixing the EC conformity mark as from 2008

ROHDE & SCHWARZ GmbH & Co. KG
Mühlldorfstr. 15, D-81671 München

München, den 22. August 2008
Munich, 2008-08-22

Zentrales Qualitätsmanagement MF-QZ / Radde
Central Quality Management



ROHDE & SCHWARZ

KONFORMITÄTSERKLÄRUNG gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE) Anhang V, zertifiziert durch die Benannte Stelle CETECOM ICT Services GmbH, Reg. Nr. Q812137N

DECLARATION OF CONFORMITY in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/EC (R&TTE Directive) Annex V, certified by the Notified Body CETECOM ICT Services GmbH Germany, Reg. No. Q812137N



Zertifikat-Nr.: / Certificate No.: 2008-15, Seite 2 von 2 / Page 2 of 2

Gerätetyp Equipment Type	Materialnummer Stock No.	Benennung Designation
SLX8000B9	2100.4000.02	AC Netzteil 2HE / AC Power Supply 2U
SLX8000B10	2100.4022.02	DC Netzteil 2HE / DC Power Supply 2U
SLX8000B11	2100.4045.02	AC Netzteil 3HE / AC Power Supply 3U
SLX8000B12	2100.4068.02	DC Netzteil 3HE / DC Power Supply 3U
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SLX8000B45	2100.1198.02	UHF-Verstärker 25 W / UHF Power Amplifier 25 W
SLX8000B46	2100.1200.02	UHF-Verstärker 50 W / UHF Power Amplifier 50 W
SLX8000B47	2100.1217.02	UHF-Verstärker 100 W / UHF Power Amplifier 100 W

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München, den 22. August 2008
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Zentrales Qualitätsmanagement MF-QZ / Radde
Central Quality Management



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KONFORMITÄTSERKLÄRUNG gemäß dem Gesetz über Funkanlagen und Telekommunikationsendeinrichtungen (FTEG) und der Richtlinie 1999/5/EG (R&TTE) Anhang V, zertifiziert durch die Benannte Stelle CETECOM ICT Services GmbH, Reg. Nr. Q812137N

DECLARATION OF CONFORMITY in accordance with the Radio and Telecommunications Terminal Equipment Act (FTEG) and Directive 1999/5/EC (R&TTE Directive) Annex V, certified by the Notified Body CETECOM ICT Services GmbH Germany, Reg. No. Q812137N



Zertifikat-Nr.: / Certificate No.: 2008-50

Hiermit wird bescheinigt, dass die Funkanlage
This is to certify that the radio equipment

Gerätetyp
Equipment Type

Materialnummer
Stock No.

Benennung
Designation

SLX8000B16

2100.3455.02

Parallel-Fernschnittstelle
Parallel Interface

Gerätekategorie: / Equipment class: 1.4 (Wired data equipment)

bei bestimmungsgemäßer Verwendung den grundlegenden Anforderungen des § 3 und den übrigen einschlägigen Bestimmungen des FTEG (Artikel 3 der R&TTE) entspricht.

complies with the essential requirements of §3 and the other relevant provisions of the FTEG (Article 3 of the R&TTE Directive), when used for its intended purpose.

- Gesundheit und Sicherheit gemäß § 3 (1) 1 (Artikel 3 (1) a))
- Health and safety requirements pursuant to § 3 (1) 1 (Article 3(1) a))
- Schutzanforderungen in Bezug auf die elektromagn. Verträglichkeit § 3 (1) 2, Artikel 3 (1) b))
- Protection requirements concerning electromagnetic compatibility § 3(1)(2), (Article 3(1)(b))

Angewendete harmonisierte Normen:
Harmonized standards applied:

EN 60950-1 : 2003
ETSI EN 301489-1 V1.6.1 (2005-09)
ETSI EN 301489-11 V1.3.1 (2006-02)
ETSI EN 301489-14 V1.2.1 (2003-05)

Einhaltung der grundlegenden Anforderungen auf andere Art ---
und Weise (hierzu verwendete Standards/Spezifikationen):

Other means of proving conformity with the essential requirements
(standards/specifications used):

Anbringung des CE-Zeichens ab: 2008 / Affixing the EC conformity mark as from 2008

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München, den 25. Juli 2008
Munich, 2008-07-25

Zentrales Qualitätsmanagement MF-QZ / Radde
Central Quality Management

Transmitter name	SLV8002	SLV8005	SLV8010	SLV8025	SLV8050	SLV8100	SLV8005A	SLV8010A	SLV8025A	SLV8050A	SLV8025A	SLV8050A	SLV8100A
Comment	2 Watt UHF only digital TV	5 Watt UHF only digital TV	10 Watt UHF only digital TV	25 Watt UHF only digital TV	50 Watt UHF only digital TV	100 Watt UHF only digital TV	5 Watt UHF analog or digital TV	10 Watt UHF analog or digital TV	25 Watt UHF analog or digital TV	50 Watt UHF analog or digital TV	25 Watt VHF analog or digital TV	50 Watt VHF analog or digital TV	100 Watt UHF analog or digital TV
Power DVB-T/H [W]	2	5	10	25	50	100	5	10	25	50	25	50	100
Power ATSC [W]	3	8	16	40	80	150	8	16	40	80	40	80	150
Power Analog TV [W]	—	—	—	—	—	—	12.5	25	62.5	125	62.5	125	250
„Basic device“ [1] SLX8000(A)	2100.1000K20	2100.1000K20	2100.1000K20	2100.1000K30	2100.1000K30	2100.1000K30	2100.1000K21	2100.1000K21	2100.1000K31	2100.1000K31	2100.1000K31	2100.1000K31	2100.1000K31
K-MAT Number	2100.1000K20	2100.1000K20	2100.1000K20	2100.1000K30	2100.1000K30	2100.1000K30	2100.1000K21	2100.1000K21	2100.1000K31	2100.1000K31	2100.1000K31	2100.1000K31	2100.1000K31
Amplifiers													
SLX8000B42	X												
SLX8000B43		X					X	X					
SLX8000B44			X										
SLX8000B45				X					X				
SLX8000B46					X					X			
SLX8000B35				X							X		
SLX8000B36					X							X	
SLX8000B37													
SLX8000B38						X							X
SLX8000B47													
Power supplies													
SLX8000B8													
SLX8000B9	X	X	X				X	X					
SLX8000B10	X	X	X				X	X					
SLX8000B11				X	X	X			X	X	X	X	X
SLX8000B12				X	X	X			X	X	X	X	X
Internal GPS													
SLX8000B13	X	X	X	X	X	X	X	X	X	X	X	X	X
(2100.3232.02)													
DVB-T/H Rx													
SLX8000B14	X	X	X	X	X	X	X	X	X	X	X	X	X
(2100.3355.10)													
Potential free contacts													
SLX8000B16	X	X	X	X	X	X	X	X	X	X	X	X	X
(2100.3455.02)													
Air filter													
SLX8000B22		X	X				X	X					
(2100.3803.02)													
SLX8000B23				X	X	X			X	X	X	X	X
(2100.3803.03)													

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CHAPTER 1

SAFETY INSTRUCTIONS

Kundeninformation zur Batterieverordnung (BattV)

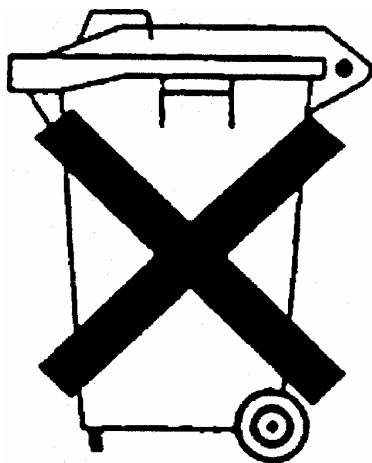
Dieses Gerät enthält eine schadstoffhaltige Batterie. Diese darf nicht mit dem Hausmüll entsorgt werden.

Nach Ende der Lebensdauer darf die Entsorgung nur über eine Rohde&Schwarz-Kundendienststelle oder eine geeignete Sammelstelle erfolgen.

Safety Regulations for Batteries (according to BattV)

This equipment houses a battery containing harmful substances that must not be disposed of as normal household waste.

After its useful life, the battery may only be disposed of at a Rohde & Schwarz service center or at a suitable depot.



Normas de Seguridad para Baterías (Según BattV)

Este equipo lleva una batería que contiene sustancias perjudiciales, que no se debe desechar en los contenedores de basura domésticos.

Después de la vida útil, la batería sólo se podrá eliminar en un centro de servicio de Rohde & Schwarz o en un depósito apropiado.

Consignes de sécurité pour batteries (selon BattV)

Cet appareil est équipé d'une pile comprenant des substances nocives. Ne jamais la jeter dans une poubelle pour ordures ménagères.

Une pile usagée doit uniquement être éliminée par un centre de service client de Rohde & Schwarz ou peut être collectée pour être traitée spécialement comme déchets dangereux.

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1 About this Manual

This manual is part of the documentation for the NX8000 family of transmitters from Rohde & Schwarz. Each transmitter and each transmitter component is described in a separate manual. The individual manuals of the family of transmitters are modular in structure and complement each other.

Structure

Each transmitter component is described in a separate manual and can thus be used as an individual component (where practical). The transmitter manual is the main document for the entire set of documentation. It describes all steps that are necessary to install a transmitter, put it into operation, operate and maintain it. Where applicable, the transmitter manual refers to the individual manuals for the various components. The component manuals, in turn, also refer to the transmitter manual whenever the component is to be used as a transmitter module.

Contents

The manuals for the family of transmitters describe all steps required to install the transmitter or one of its components, put them into operation, operate and maintain them, troubleshoot and service them. The Annex includes interface descriptions plus technical documents.

For convenience, all manuals are structured identically. Sections that are not relevant to the manual at hand are also included but are left blank.

Safety

All skilled personnel working with a transmitter or its components must read all relevant manuals and comply with the safety measures that are detailed in the chapter about safety and in the applicable sections in the manual. The transmitter and the individual transmitter components must be used only for their intended purpose. All operations involving the transmitter or individual transmitter components must be performed by skilled personnel. The manual will point out specifically if additional qualifications are required.

Symbols and Layout

The triangular warning symbol indicates danger. In addition to the triangular warning symbol, different key words indicate the level of potential danger.

Instructions are given in numbered steps or indicated by an "index finger" symbol to the left of the instruction text. The results of the performed instructions are indented.

The key word "Note" precedes notes. Notes contain additional information and tips to help facilitate the work at hand.

All other formatting options add structure to the text and are self-explanatory.

2 Safety Instructions for Transmitter Systems and Instruments



ATTENTION!

The safety instructions provided in this manual must be complied with!

Pay special attention to the following points:

- Only skilled personnel may perform electrical installation and electrical connection tasks.
- Always follow the relevant national and international safety rules and regulations when equipping operating areas and when setting up and operating electrical equipment.
These rules and regulations include for example:
 - Protective measures to prevent accidents
 - Protective measures to prevent overvoltage
 - Insulation status of electrical equipment
 - Grounding of electrical equipment
 - Physical properties and laying of electric lines and cables
 - Regulations applying to industrial premises and areas as well as to special facilities.
- When setting up the rack, observe the country-specific rules for accident prevention, for example with regard to:
 - Risk of getting crushed when working with loads suspended in the air
 - Risk of falling off ladders
 - Risk of injury when lifting heavy objects.
- Use your personal protective equipment for installation and repair work, i.e. wear protective clothing such as helmets, safety gloves and eye protection, depending on the task at hand.
- Operate the equipment and systems only when the cabinet is closed. If you have to open the cabinet for maintenance and repair work, comply with the applicable safety instructions.
- If the equipment and systems are removed from the AC power supply, all poles must be disconnected. Check for and remove any external power supply, i.e. all measuring cables, extension cables, multiple socket outlets (except for special service sockets). Wait for five minutes to ensure that any and all capacitors are sufficiently discharged.
- Additionally with liquid-cooled transmitters: When filling and installing the cooling system (pump unit and heat-exchanger unit), observe the rules for handling hazardous substances (cooling agents); see section "safety data sheets about hazardous substances" under "EU safety data sheet in accordance with 2001/58/EC Antifrogen".

3 General Safety Instructions

This section contains general safety instructions that apply to all products manufactured or distributed by Rohde & Schwarz.

In accordance with IEC 215 and EN 60215, transmitters and their auxiliary equipment must be operated only under the responsibility of skilled personnel. The EN 60215 standard ("Safety requirements for radio transmitting equipment") defines the minimum requirements for skilled electrical personnel.

Complying with all statutory provisions is a precondition for operating radiocommunications systems and equipment. The operator or the operator's authorized representative is responsible for ensuring compliance with these guidelines. They must also ensure that the operating personnel meets the applicable country-specific training requirements. These requirements also include any periodic training that is necessary.

Basic Safety Instructions

Always read through and comply with the following safety instructions!

All plants and locations of the Rohde & Schwarz group of companies make every effort to keep the safety standards of our products up to date and to offer our customers the highest possible degree of safety. Our products and the auxiliary equipment they require are designed, built and tested in accordance with the safety standards that apply in each case. Compliance with these standards is continuously monitored by our quality assurance system. The product described here has been designed, built and tested in accordance with the attached EC Certificate of Conformity and has left the manufacturer's plant in a condition fully complying with safety standards. To maintain this condition and to ensure safe operation, you must observe all instructions and warnings provided in this manual. If you have any questions regarding these safety instructions, the Rohde & Schwarz group of companies will be happy to answer them.

Furthermore, it is your responsibility to use the product in an appropriate manner. This product is designed for use solely in industrial and laboratory environments or, if expressly permitted, also in the field and must not be used in any way that may cause personal injury or property damage. You are responsible if the product is used for any intention other than its designated purpose or in disregard of the manufacturer's instructions. The manufacturer shall assume no responsibility for such use of the product.

The product is used for its designated purpose if it is used in accordance with its product documentation and within its performance limits (see data sheet, documentation, the following safety instructions). Using the product requires technical skills and a basic knowledge of English. It is therefore essential that only skilled and specialized staff or thoroughly trained personnel with the required skills be allowed to use the product. If personal safety gear is required for using Rohde & Schwarz products, this will be indicated at the appropriate place in the product documentation. Keep the basic safety instructions and the product documentation in a safe place and pass them on to the subsequent users.

Observing the safety instructions will help prevent personal injury or damage of any kind caused by dangerous situations. Therefore, carefully read through and adhere to the following safety instructions before and when using the product. It is also absolutely essential to observe the additional safety instructions on personal safety, for example, that appear in relevant parts of the product documentation. In these safety instructions, the word "product" refers to all merchandise sold and distributed by the Rohde & Schwarz group of companies, including instruments, systems and all accessories.

Symbols and safety labels

							
Notice, general danger location Observe product documentation	Caution when handling heavy equipment	Danger of electric shock	Warning! Hot surface	PE terminal	Ground	Ground terminal	Be careful when handling electrostatic sensitive devices

					
ON/OFF supply voltage	Standby indication	Direct current (DC)	Alternating current (AC)	Direct/alternating current (DC/AC)	Device fully protected by double (reinforced) insulation

Tags and their meaning

The following signal words are used in the product documentation in order to warn the reader about risks and dangers.



indicates a hazardous situation which, if not avoided, will result in death or serious injury.



indicates a hazardous situation which, if not avoided, could result in death or serious injury.



indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



indicates the possibility of incorrect operation which can result in damage to the product.

In the product documentation, the word ATTENTION is used synonymously.

These tags are in accordance with the standard definition for civil applications in the European Economic Area. Definitions that deviate from the standard definition may also exist in other economic areas or military applications. It is therefore essential to make sure that the tags described here are always used only in connection with the related product documentation and the related product. The use of tags in connection with unrelated products or documentation can result in misinterpretation and in personal injury or material damage.

Operating states and operating positions

The product may be operated only under the operating conditions and in the positions specified by the manufacturer, without the product's ventilation being obstructed. If the manufacturer's specifications are not observed, this can result in electric shock, fire and/or serious personal injury or death. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

1. Unless otherwise specified, the following requirements apply to Rohde & Schwarz products:
predefined operating position is always with the housing floor facing down, IP protection 2X, pollution severity 2, overvoltage category 2, use only indoors, max. operating altitude 2000 m above sea level, max. transport altitude 4500 m above sea level. A tolerance of $\pm 10\%$ shall apply to the nominal voltage and $\pm 5\%$ to the nominal frequency.
2. Do not place the product on surfaces, vehicles, cabinets or tables that for reasons of weight or stability are unsuitable for this purpose. Always follow the manufacturer's installation instructions when installing the product and fastening it to objects or structures (e.g. walls and shelves). An installation that is not carried out as described in the product documentation could result in personal injury or death.
3. Do not place the product on heat-generating devices such as radiators or fan heaters. The ambient temperature must not exceed the maximum temperature specified in the product documentation or in the data sheet. Product overheating can cause electric shock, fire and/or serious personal injury or death.

Electrical safety

If the information on electrical safety is not observed either at all to the extent necessary, electric shock, fire and/or serious personal injury or death may occur.

1. Prior to switching on the product, always ensure that the nominal voltage setting on the product matches the nominal voltage of the AC supply network. If a different voltage is to be set, the power fuse of the product may have to be changed accordingly.
2. In the case of products of safety class I with movable power cord and connector, operation is permitted only on sockets with an earthing contact and protective earth connection.
3. Intentionally breaking the protective earth connection either in the feed line or in the product itself is not permitted. Doing so can result in the danger of an electric shock from the product. If extension cords or connector strips are implemented, they must be checked on a regular basis to ensure that they are safe to use.
4. If the product does not have a power switch for disconnection from the AC supply network, the plug of the connecting cable is regarded as the disconnecting device. In such cases, always ensure that the power plug is easily reachable and accessible at all times (corresponding to the length of connecting cable, approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply network. If products without power switches are integrated into racks or systems, a disconnecting device must be provided at the system level.
5. Never use the product if the power cable is damaged. Check the power cable on a regular basis to ensure that it is in proper operating condition. By taking appropriate safety measures and carefully laying the power cable, you can ensure that the cable will not be damaged and that no one can be hurt by, for example, tripping over the cable or suffering an electric shock.
6. The product may be operated only from TN/TT supply networks fused with max. 16 A (higher fuse only after consulting with the Rohde & Schwarz group of companies).
7. Do not insert the plug into sockets that are dusty or dirty. Insert the plug firmly and all the way into the socket. Otherwise, sparks that result in fire and/or injuries may occur.
8. Do not overload any sockets, extension cords or connector strips; doing so can cause fire or electric shocks.
9. For measurements in circuits with voltages $V_{\text{rms}} > 30 \text{ V}$, suitable measures (e.g. appropriate measuring equipment, fusing, current limiting, electrical separation, insulation) should be taken to avoid any hazards.
10. Ensure that the connections with information technology equipment, e.g. PCs or other industrial computers, comply with the IEC60950-1/EN60950-1 or IEC61010-1/EN 61010-1 standards that apply in each case.
11. Unless expressly permitted, never remove the cover or any part of the housing while the product is in operation. Doing so will expose circuits and components and can lead to injuries, fire or damage to the product.
12. If a product is to be permanently installed, the connection between the PE terminal on site and the product's PE conductor must be made first before any other connection is made. The product may be installed and connected only by a licensed electrician.
13. For permanently installed equipment without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused in such a way that anyone who has access to the product, as well as the product itself, is adequately protected from injury or damage.

14. Use suitable overvoltage protection to ensure that no overvoltage (such as that caused by a bolt of lightning) can reach the product. Otherwise, the person operating the product will be exposed to the danger of an electric shock.
15. Any object that is not designed to be placed in the openings of the housing must not be used for this purpose. Doing so can cause short circuits inside the product and/or electric shocks, fire or injuries.
16. Unless specified otherwise, products are not liquid-proof (see also section "Operating states and operating positions", item 1. Therefore, the equipment must be protected against penetration by liquids. If the necessary precautions are not taken, the user may suffer electric shock or the product itself may be damaged, which can also lead to personal injury.
17. Never use the product under conditions in which condensation has formed or can form in or on the product, e.g. if the product has been moved from a cold to a warm environment. Penetration by water increases the risk of electric shock.
18. Prior to cleaning the product, disconnect it completely from the power supply (e.g. AC supply network or battery). Use a soft, non-linting cloth to clean the product. Never use chemical cleaning agents such as alcohol, acetone or diluents for cellulose lacquers.

Operation

1. Operating the products requires special training and intense concentration. Make sure that persons who use the products are physically, mentally and emotionally fit enough to do so; otherwise, injuries or material damage may occur. It is the responsibility of the employer/operator to select suitable personnel for operating the products.
2. Before you move or transport the product, read and observe the section titled "Transport".
3. As with all industrially manufactured goods, the use of substances that induce an allergic reaction (allergens) such as nickel cannot be generally excluded. If you develop an allergic reaction (such as a skin rash, frequent sneezing, red eyes or respiratory difficulties) when using a Rohde & Schwarz product, consult a physician immediately to determine the cause and to prevent health problems or stress.
4. Before you start processing the product mechanically and/or thermally, or before you take it apart, be sure to read and pay special attention to the section titled "Waste disposal", item 1.
5. Depending on the function, certain products such as RF radio equipment can produce an elevated level of electromagnetic radiation. Considering that unborn babies require increased protection, pregnant women must be protected by appropriate measures. Persons with pacemakers may also be exposed to risks from electromagnetic radiation. The employer/operator must evaluate workplaces where there is a special risk of exposure to radiation and, if necessary, take measures to avert the potential danger.
6. Should a fire occur, the product may release hazardous substances (gases, fluids, etc.) that can cause health problems. Therefore, suitable measures must be taken, e.g. protective masks and protective clothing must be worn.
7. If a laser product (e.g. a CD/DVD drive) is integrated into a Rohde & Schwarz product, absolutely no other settings or functions may be used as described in the product documentation. The objective is to prevent personal injury (e.g. due to laser beams).

Repair and service

1. The product may be opened only by authorized, specially trained personnel. Before any work is performed on the product or before the product is opened, it must be disconnected from the AC supply network. Otherwise, personnel will be exposed to the risk of an electric shock.
2. Adjustments, replacement of parts, maintenance and repair may be performed only by electrical experts authorized by Rohde & Schwarz. Only original parts may be used for replacing parts relevant to safety (e.g. power switches, power transformers, fuses). A safety test must always be performed after parts relevant to safety have been replaced (visual inspection, PE conductor test, insulation resistance measurement, leakage current measurement, functional test). This helps ensure the continued safety of the product.

Batteries and rechargeable batteries/cells

If the information regarding batteries and rechargeable batteries/cells is not observed either at all or to the extent necessary, product users may be exposed to the risk of explosions, fire and/or serious personal injury, and, in some cases, death. Batteries and rechargeable batteries with alkaline electrolytes (e.g. lithium cells) must be handled in accordance with the EN 62133 standard.

1. Cells must not be taken apart or crushed.
2. Cells or batteries must not be exposed to heat or fire. Storage in direct sunlight must be avoided. Keep cells and batteries clean and dry. Clean soiled connectors using a dry, clean cloth.
3. Cells or batteries must not be short-circuited. Cells or batteries must not be stored in a box or in a drawer where they can short-circuit each other, or where they can be short-circuited by other conductive materials. Cells and batteries must not be removed from their original packaging until they are ready to be used.
4. Keep cells and batteries out of the hands of children. If a cell or a battery has been swallowed, seek medical aid immediately.
5. Cells and batteries must not be exposed to any mechanical shocks that are stronger than permitted.
6. If a cell develops a leak, the fluid must not be allowed to come into contact with the skin or eyes. If contact occurs, wash the affected area with plenty of water and seek medical aid.
7. Improperly replacing or charging cells or batteries that contain alkaline electrolytes (e.g. lithium cells) can cause explosions. Replace cells or batteries only with the matching Rohde & Schwarz type (see parts list) in order to ensure the safety of the product.
8. Cells and batteries must be recycled and kept separate from residual waste. Rechargeable batteries and normal batteries that contain lead, mercury or cadmium are hazardous waste. Observe the national regulations regarding waste disposal and recycling.

Transport

1. The product may be very heavy. Therefore, the product must be handled with care. In some cases, the user may require a suitable means of lifting or moving the product (e.g. with a lift-truck) to avoid back or other physical injuries.

2. Handles on the products are designed exclusively to enable personnel to transport the product. It is therefore not permissible to use handles to fasten the product to or on transport equipment such as cranes, fork lifts, wagons, etc. The user is responsible for securely fastening the products to or on the means of transport or lifting. Observe the safety regulations of the manufacturer of the means of transport or lifting. Noncompliance can result in personal injury or material damage.
3. If you use the product in a vehicle, it is the sole responsibility of the driver to drive the vehicle safely and properly. The manufacturer assumes no responsibility for accidents or collisions. Never use the product in a moving vehicle if doing so could distract the driver of the vehicle. Adequately secure the product in the vehicle to prevent injuries or other damage in the event of an accident.

Waste disposal

1. If products or their components are mechanically and/or thermally processed in a manner that goes beyond their intended use, hazardous substances (heavy-metal dust such as lead, beryllium, nickel) may be released. For this reason, the product may only be disassembled by specially trained personnel. Improper disassembly may be hazardous to your health. National waste disposal regulations must be observed.
2. If handling the product releases hazardous substances or fuels that must be disposed of in a special way, e.g. coolants or engine oils that must be replenished regularly, the safety instructions of the manufacturer of the hazardous substances or fuels and the applicable regional waste disposal regulations must be observed. Also observe the relevant safety instructions in the product documentation. The improper disposal of hazardous substances or fuels can cause health problems and lead to environmental damage.

Informaciones elementales de seguridad

Es imprescindible leer y observar las siguientes instrucciones e informaciones de seguridad!

El principio del grupo de empresas Rohde & Schwarz consiste en tener nuestros productos siempre al día con los estándares de seguridad y de ofrecer a nuestros clientes el máximo grado de seguridad. Nuestros productos y todos los equipos adicionales son siempre fabricados y examinados según las normas de seguridad vigentes. Nuestro sistema de garantía de calidad controla constantemente que sean cumplidas estas normas. El presente producto ha sido fabricado y examinado según el certificado de conformidad adjunto de la UE y ha salido de nuestra planta en estado impecable según los estándares técnicos de seguridad. Para poder preservar este estado y garantizar un funcionamiento libre de peligros, el usuario deberá atenerse a todas las indicaciones, informaciones de seguridad y notas de alerta. El grupo de empresas Rohde & Schwarz está siempre a su disposición en caso de que tengan preguntas referentes a estas informaciones de seguridad.

Además queda en la responsabilidad del usuario utilizar el producto en la forma debida. Este producto está destinado exclusivamente al uso en la industria y el laboratorio o, si ha sido expresamente autorizado, para aplicaciones de campo y de ninguna manera deberá ser utilizado de modo que alguna persona/cosa pueda sufrir daño. El uso del producto fuera de sus fines definidos o sin tener en cuenta las instrucciones del fabricante queda en la responsabilidad del usuario. El fabricante no se hace en ninguna forma responsable de consecuencias a causa del mal uso del producto.

Informaciones elementales de seguridad

Se parte del uso correcto del producto para los fines definidos si el producto es utilizado conforme a las indicaciones de la correspondiente documentación del producto y dentro del margen de rendimiento definido (ver hoja de datos, documentación, informaciones de seguridad que siguen). El uso del producto hace necesarios conocimientos técnicos y ciertos conocimientos del idioma inglés. Por eso se debe tener en cuenta que el producto solo pueda ser operado por personal especializado o personas instruidas en profundidad con las capacidades correspondientes. Si fuera necesaria indumentaria de seguridad para el uso de productos de Rohde & Schwarz, encontraría la información debida en la documentación del producto en el capítulo correspondiente. Guarde bien las informaciones de seguridad elementales, así como la documentación del producto, y entréguelas a usuarios posteriores.

Tener en cuenta las informaciones de seguridad sirve para evitar en lo posible lesiones o daños por peligros de toda clase. Por eso es imprescindible leer detalladamente y comprender por completo las siguientes informaciones de seguridad antes de usar el producto, y respetarlas durante el uso del producto. Deberán tenerse en cuenta todas las demás informaciones de seguridad, como p. ej. las referentes a la protección de personas, que encontrarán en el capítulo correspondiente de la documentación del producto y que también son de obligado cumplimiento. En las presentes informaciones de seguridad se recogen todos los objetos que distribuye el grupo de empresas Rohde & Schwarz bajo la denominación de "producto", entre ellos también aparatos, instalaciones así como toda clase de accesorios.

Símbolos y definiciones de seguridad

							
Aviso: punto de peligro general Observar la documentación del producto	Atención en el manejo de dispositivos de peso elevado	Peligro de choque eléctrico	Advertencia: superficie caliente	Conexión a conductor de protección	Conexión a tierra	Conexión a masa	Aviso: Cuidado en el manejo de dispositivos sensibles a la electrostática (ESD)

					
Tensión de alimentación de PUESTA EN MARCHA / PARADA	Indicación de estado de espera (Standby)	Corriente continua (DC)	Corriente alterna (AC)	Corriente continua / Corriente alterna (DC/AC)	El aparato está protegido en su totalidad por un aislamiento doble (reforzado)

Palabras de señal y su significado

En la documentación del producto se utilizan las siguientes palabras de señal con el fin de advertir contra riesgos y peligros.



PELIGRO identifica un peligro inminente con riesgo elevado que provocará muerte o lesiones graves si no se evita.



ADVERTENCIA identifica un posible peligro con riesgo medio de provocar muerte o lesiones (graves) si no se evita.



ATENCIÓN identifica un peligro con riesgo reducido de provocar lesiones leves o moderadas si no se evita.



AVISO indica la posibilidad de utilizar mal el producto y, como consecuencia, dañarlo.

En la documentación del producto se emplea de forma sinónima el término CUIDADO.

Las palabras de señal corresponden a la definición habitual para aplicaciones civiles en el área económica europea. Pueden existir definiciones diferentes a esta definición en otras áreas económicas o en aplicaciones militares. Por eso se deberá tener en cuenta que las palabras de señal aquí descritas sean utilizadas siempre solamente en combinación con la correspondiente documentación del producto y solamente en combinación con el producto correspondiente. La utilización de las palabras de señal en combinación con productos o documentaciones que no les correspondan puede llevar a interpretaciones equivocadas y tener por consecuencia daños en personas u objetos.

Estados operativos y posiciones de funcionamiento

El producto solamente debe ser utilizado según lo indicado por el fabricante respecto a los estados operativos y posiciones de funcionamiento sin que se obstruya la ventilación. Si no se siguen las indicaciones del fabricante, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte. En todos los trabajos deberán ser tenidas en cuenta las normas nacionales y locales de seguridad del trabajo y de prevención de accidentes.

1. Si no se convino de otra manera, es para los productos Rohde & Schwarz válido lo que sigue: como posición de funcionamiento se define por principio la posición con el suelo de la caja para abajo, modo de protección IP 2X, grado de suciedad 2, categoría de sobrecarga eléctrica 2, uso solamente en estancias interiores, utilización hasta 2000 m sobre el nivel del mar, transporte hasta 4500 m sobre el nivel del mar. Se aplicará una tolerancia de $\pm 10\%$ sobre el voltaje nominal y de $\pm 5\%$ sobre la frecuencia nominal.
2. No sitúe el producto encima de superficies, vehículos, estantes o mesas, que por sus características de peso o de estabilidad no sean aptos para él. Siga siempre las instrucciones de instalación del fabricante cuando instale y asegure el producto en objetos o estructuras (p. ej. paredes y estantes). Si se realiza la instalación de modo distinto al indicado en la documentación del producto, pueden causarse lesiones o incluso la muerte.
3. No ponga el producto sobre aparatos que generen calor (p. ej. radiadores o calefactores). La temperatura ambiente no debe superar la temperatura máxima especificada en la documentación del producto o en la hoja de datos. En caso de sobrecalentamiento del producto, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

Seguridad eléctrica

Si no se siguen (o se siguen de modo insuficiente) las indicaciones del fabricante en cuanto a seguridad eléctrica, pueden producirse choques eléctricos, incendios y/o lesiones graves con posible consecuencia de muerte.

1. Antes de la puesta en marcha del producto se deberá comprobar siempre que la tensión preseleccionada en el producto coincida con la de la red de alimentación eléctrica. Si es necesario modificar el ajuste de tensión, también se deberán cambiar en caso dado los fusibles correspondientes del producto.
2. Los productos de la clase de protección I con alimentación móvil y enchufe individual solamente podrán enchufarse a tomas de corriente con contacto de seguridad y con conductor de protección conectado.
3. Queda prohibida la interrupción intencionada del conductor de protección, tanto en la toma de corriente como en el mismo producto. La interrupción puede tener como consecuencia el riesgo de que el producto sea fuente de choques eléctricos. Si se utilizan cables alargadores o regletas de enchufe, deberá garantizarse la realización de un examen regular de los mismos en cuanto a su estado técnico de seguridad.
4. Si el producto no está equipado con un interruptor para desconectarlo de la red, se deberá considerar el enchufe del cable de conexión como interruptor. En estos casos se deberá asegurar que el enchufe siempre sea de fácil acceso (de acuerdo con la longitud del cable de conexión, aproximadamente 2 m). Los interruptores de función o electrónicos no son aptos para el corte de la red eléctrica. Si los productos sin interruptor están integrados en bastidores o instalaciones, se deberá colocar el interruptor en el nivel de la instalación.
5. No utilice nunca el producto si está dañado el cable de conexión a red. Compruebe regularmente el correcto estado de los cables de conexión a red. Asegúrese, mediante las medidas de protección y de instalación adecuadas, de que el cable de conexión a red no pueda ser dañado o de que nadie pueda ser dañado por él, p. ej. al tropezar o por un choque eléctrico.
6. Solamente está permitido el funcionamiento en redes de alimentación TN/TT aseguradas con fusibles de 16 A como máximo (utilización de fusibles de mayor amperaje solo previa consulta con el grupo de empresas Rohde & Schwarz).
7. Nunca conecte el enchufe en tomas de corriente sucias o llenas de polvo. Introduzca el enchufe por completo y fuertemente en la toma de corriente. La no observación de estas medidas puede provocar chispas, fuego y/o lesiones.
8. No sobrecargue las tomas de corriente, los cables alargadores o las regletas de enchufe ya que esto podría causar fuego o choques eléctricos.
9. En las mediciones en circuitos de corriente con una tensión $U_{\text{eff}} > 30 \text{ V}$ se deberán tomar las medidas apropiadas para impedir cualquier peligro (p. ej. medios de medición adecuados, seguros, limitación de tensión, corte protector, aislamiento etc.).
10. Para la conexión con dispositivos informáticos como un PC o un ordenador industrial, debe comprobarse que éstos cumplan los estándares IEC60950-1/EN60950-1 o IEC61010-1/EN 61010-1 válidos en cada caso.
11. A menos que esté permitido expresamente, no retire nunca la tapa ni componentes de la carcasa mientras el producto esté en servicio. Esto pone a descubierto los cables y componentes eléctricos y puede causar lesiones, fuego o daños en el producto.

12. Si un producto se instala en un lugar fijo, se deberá primero conectar el conductor de protección fijo con el conductor de protección del producto antes de hacer cualquier otra conexión. La instalación y la conexión deberán ser efectuadas por un electricista especializado.
13. En el caso de dispositivos fijos que no estén provistos de fusibles, interruptor automático ni otros mecanismos de seguridad similares, el circuito de alimentación debe estar protegido de modo que todas las personas que puedan acceder al producto, así como el producto mismo, estén a salvo de posibles daños.
14. Todo producto debe estar protegido contra sobretensión (debida p. ej. a una caída del rayo) mediante los correspondientes sistemas de protección. Si no, el personal que lo utilice quedará expuesto al peligro de choque eléctrico.
15. No debe introducirse en los orificios de la caja del aparato ningún objeto que no esté destinado a ello. Esto puede producir cortocircuitos en el producto y/o puede causar choques eléctricos, fuego o lesiones.
16. Salvo indicación contraria, los productos no están impermeabilizados (ver también el capítulo "Estados operativos y posiciones de funcionamiento", punto 1). Por eso es necesario tomar las medidas necesarias para evitar la entrada de líquidos. En caso contrario, existe peligro de choque eléctrico para el usuario o de daños en el producto, que también pueden redundar en peligro para las personas.
17. No utilice el producto en condiciones en las que pueda producirse o ya se hayan producido condensaciones sobre el producto o en el interior de éste, como p. ej. al desplazarlo de un lugar frío a otro caliente. La entrada de agua aumenta el riesgo de choque eléctrico.
18. Antes de la limpieza, desconecte por completo el producto de la alimentación de tensión (p. ej. red de alimentación o batería). Realice la limpieza de los aparatos con un paño suave, que no se deshilache. No utilice bajo ningún concepto productos de limpieza químicos como alcohol, acetona o diluyentes para lacas nitrocelulósicas.

Funcionamiento

1. El uso del producto requiere instrucciones especiales y una alta concentración durante el manejo. Debe asegurarse que las personas que manejen el producto estén a la altura de los requerimientos necesarios en cuanto a aptitudes físicas, psíquicas y emocionales, ya que de otra manera no se pueden excluir lesiones o daños de objetos. El empresario u operador es responsable de seleccionar el personal usuario apto para el manejo del producto.
2. Antes de desplazar o transportar el producto, lea y tenga en cuenta el capítulo "Transporte".
3. Como con todo producto de fabricación industrial no puede quedar excluida en general la posibilidad de que se produzcan alergias provocadas por algunos materiales empleados, los llamados alérgenos (p. ej. el níquel). Si durante el manejo de productos Rohde & Schwarz se producen reacciones alérgicas, como p. ej. irritaciones cutáneas, estornudos continuos, enrojecimiento de la conjuntiva o dificultades respiratorias, debe avisarse inmediatamente a un médico para investigar las causas y evitar cualquier molestia o daño a la salud.
4. Antes de la manipulación mecánica y/o térmica o el desmontaje del producto, debe tenerse en cuenta imprescindiblemente el capítulo "Eliminación", punto 1.

5. Ciertos productos, como p. ej. las instalaciones de radiocomunicación RF, pueden a causa de su función natural, emitir una radiación electromagnética aumentada. Deben tomarse todas las medidas necesarias para la protección de las mujeres embarazadas. También las personas con marcapasos pueden correr peligro a causa de la radiación electromagnética. El empresario/operador tiene la obligación de evaluar y señalar las áreas de trabajo en las que exista un riesgo elevado de exposición a radiaciones.
6. Tenga en cuenta que en caso de incendio pueden desprenderse del producto sustancias tóxicas (gases, líquidos etc.) que pueden generar daños a la salud. Por eso, en caso de incendio deben usarse medidas adecuadas, como p. ej. máscaras antigás e indumentaria de protección.
7. En caso de que un producto Rohde & Schwarz contenga un producto láser (p. ej. un lector de CD/DVD), no debe usarse ninguna otra configuración o función aparte de las descritas en la documentación del producto, a fin de evitar lesiones (p. ej. debidas a irradiación láser).

Reparación y mantenimiento

1. El producto solamente debe ser abierto por personal especializado con autorización para ello. Antes de manipular el producto o abrirlo, es obligatorio desconectarlo de la tensión de alimentación, para evitar toda posibilidad de choque eléctrico.
2. El ajuste, el cambio de partes, el mantenimiento y la reparación deberán ser efectuadas solamente por electricistas autorizados por Rohde & Schwarz. Si se reponen partes con importancia para los aspectos de seguridad (p. ej. el enchufe, los transformadores o los fusibles), solamente podrán ser sustituidos por partes originales. Después de cada cambio de partes relevantes para la seguridad deberá realizarse un control de seguridad (control a primera vista, control del conductor de protección, medición de resistencia de aislamiento, medición de la corriente de fuga, control de funcionamiento). Con esto queda garantizada la seguridad del producto.

Baterías y acumuladores o celdas

Si no se siguen (o se siguen de modo insuficiente) las indicaciones en cuanto a las baterías y acumuladores o celdas, pueden producirse explosiones, incendios y/o lesiones graves con posible consecuencia de muerte. El manejo de baterías y acumuladores con electrolitos alcalinos (p. ej. celdas de litio) debe seguir el estándar EN 62133.

1. No deben desmontarse, abrirse ni triturarse las celdas.
2. Las celdas o baterías no deben someterse a calor ni fuego. Debe evitarse el almacenamiento a la luz directa del sol. Las celdas y baterías deben mantenerse limpias y secas. Limpiar las conexiones sucias con un paño seco y limpio.
3. Las celdas o baterías no deben cortocircuitarse. Es peligroso almacenar las celdas o baterías en estuches o cajones en cuyo interior puedan cortocircuitarse por contacto recíproco o por contacto con otros materiales conductores. No deben extraerse las celdas o baterías de sus embalajes originales hasta el momento en que vayan a utilizarse.
4. Mantener baterías y celdas fuera del alcance de los niños. En caso de ingestión de una celda o batería, avisar inmediatamente a un médico.
5. Las celdas o baterías no deben someterse a impactos mecánicos fuertes indebidos.

6. En caso de falta de estanqueidad de una celda, el líquido vertido no debe entrar en contacto con la piel ni los ojos. Si se produce contacto, lavar con agua abundante la zona afectada y avisar a un médico.
7. En caso de cambio o recarga inadecuados, las celdas o baterías que contienen electrolitos alcalinos (p. ej. las celdas de litio) pueden explotar. Para garantizar la seguridad del producto, las celdas o baterías solo deben ser sustituidas por el tipo Rohde & Schwarz correspondiente (ver lista de recambios).
8. Las baterías y celdas deben reciclarse y no deben tirarse a la basura doméstica. Las baterías o acumuladores que contienen plomo, mercurio o cadmio deben tratarse como residuos especiales. Respete en esta relación las normas nacionales de eliminación y reciclaje.

Transporte

1. El producto puede tener un peso elevado. Por eso es necesario desplazarlo o transportarlo con precaución y, si es necesario, usando un sistema de elevación adecuado (p. ej. una carretilla elevadora), a fin de evitar lesiones en la espalda u otros daños personales.
2. Las asas instaladas en los productos sirven solamente de ayuda para el transporte del producto por personas. Por eso no está permitido utilizar las asas para la sujeción en o sobre medios de transporte como p. ej. grúas, carretillas elevadoras de horquilla, carros etc. Es responsabilidad suya fijar los productos de manera segura a los medios de transporte o elevación. Para evitar daños personales o daños en el producto, siga las instrucciones de seguridad del fabricante del medio de transporte o elevación utilizado.
3. Si se utiliza el producto dentro de un vehículo, recae de manera exclusiva en el conductor la responsabilidad de conducir el vehículo de manera segura y adecuada. El fabricante no asumirá ninguna responsabilidad por accidentes o colisiones. No utilice nunca el producto dentro de un vehículo en movimiento si esto pudiera distraer al conductor. Asegure el producto dentro del vehículo debidamente para evitar, en caso de un accidente, lesiones u otra clase de daños.

Eliminación

1. Si se trabaja de manera mecánica y/o térmica cualquier producto o componente más allá del funcionamiento previsto, pueden liberarse sustancias peligrosas (polvos con contenido de metales pesados como p. ej. plomo, berilio o níquel). Por eso el producto solo debe ser desmontado por personal especializado con formación adecuada. Un desmontaje inadecuado puede ocasionar daños para la salud. Se deben tener en cuenta las directivas nacionales referentes a la eliminación de residuos.
2. En caso de que durante el trato del producto se formen sustancias peligrosas o combustibles que deban tratarse como residuos especiales (p. ej. refrigerantes o aceites de motor con intervalos de cambio definidos), deben tenerse en cuenta las indicaciones de seguridad del fabricante de dichas sustancias y las normas regionales de eliminación de residuos. Tenga en cuenta también en caso necesario las indicaciones de seguridad especiales contenidas en la documentación del producto. La eliminación incorrecta de sustancias peligrosas o combustibles puede causar daños a la salud o daños al medio ambiente.

4 Special Danger Warnings

4.1 Hazards due to AC Supply Voltage

There is a risk of electric shock with any $V_{\text{rms}} > 30 \text{ V AC}$ or $V > 60 \text{ V DC}$ voltage. Appropriate measures must be taken to prevent exposure to any danger when working with voltages that bear the risk of electric shock. Never work on live parts unless specifically required and only if the special safety precautions are complied with.

4.1.1 AC Power Supply

- Before connecting the equipment to the AC power supply, make sure that the AC supply data specified on the system or equipment matches the rated data of the local AC supply. The supply circuit must be protected by fuses against overloading and short circuits at all times.
- Miniature modules have neutral conductor fuses. As a result, the power supply may still be connected even after interruption of the circuit by a fuse.

4.1.2 Replacing Fuses

- Replace the safety fuses accessible in the operator area only if no voltage is being applied to the instruments. The safety fuses may be replaced only by fuses with identical electric data, identical switching characteristics and identical switch-off capacity.
- Motor and line circuit breakers accessible in the transmitter's operator area may be operated. If their response range is selectable, do not change the settings made by the manufacturer. If the settings are accidentally changed, reset them by using the correct values specified in this documentation.

4.2 Hazards due to High-Energy Circuits

The instruments include low-voltage circuits which can be fed from an extremely low-impedance voltage source (e.g. amplifier operating voltage). These circuits conduct dangerously large amounts of energy. We handle these circuits in the same manner as circuits with voltages that bear the risk of electric shock. They are usually covered and thus protected against accidental contact. The cover comes with a warning label.

Practical experience has repeatedly shown that a short circuit caused by metal tools can cause severe burns. For safety reasons, high-energy circuits are protected by covers and are thus not accessible within the operator area of the instruments.

- If you need to measure low-impedance voltages, during repair work for example, exercise the same caution as when measuring operating voltages that bear the risk of electric shock.
Wear protective clothing if necessary.
- Before you open an instrument or remove its cover, switch off the operating voltage and wait for five minutes to ensure that any and all capacitors are sufficiently discharged.
- Do not short-circuit capacitors to discharge them.

4.3 RF Hazards

4.3.1 Mandatory Training

- Operators must instruct their personnel on how to use this transmitter or instrument in accordance with EN 60215 and IEC 215. This periodic training must cover the radio-frequency hazards of the individual transmitter or instrument. Only after such training has been provided and documented may the operating personnel handle switching and operating tasks.

High-energy RF circuits within the transmitter or the instrument are routed via conventional detachable RF connectors (e.g. N). Depending on the output power, the transmitter or instrument outputs come with screw-in or pluggable RF lines or ducts.

If RF lines or modules conduct high power, the connection point or the entire module is marked with the standard warning symbol (yellow triangle with black exclamation mark).

4.3.2 RF Shielding

Transmitters and instruments from Rohde & Schwarz are shielded in such a manner that RF radiation does not pose any danger even in the immediate vicinity if all RF lines are closed. This statement is based on the ordinance for electromagnetic fields as defined in German law:

The 26th ordinance for the Federal Emission Protection Law dated December 16, 1996 defines limit values for radio-frequency equipment for electric and magnetic field strengths.

4.3.3 Rules for Operating an Amplifier

Opening RF lines during operation may cause electric arcs. This can cause burns and eye injuries.

- Operate the amplifier only if an antenna or dummy antenna is connected.
- Never undo RF lines during amplifier operation.
- Never open amplifiers or modules during amplifier operation.
- Never put amplifiers into operation if RF lines are open.

4.3.4 Rules for Working with an Open Amplifier

Operating the instrument with RF power is not permitted if the instrument has been opened or its covers removed.

4.4 Hazards due to Beryllium Oxide (BeO) Ceramics

Note *Instruments and modules with components containing beryllium oxide (BeO) ceramics are marked accordingly. The following applies:*

If handled correctly, parts or components containing BeO ceramics are not hazardous to health.

If used improperly, however, BeO dust may be released. BeO dust causes chronic lung disease (berylliosis); inhaling large amounts over an extended period of time is toxic, causing respiratory paralysis and death.

4.4.1 Rules for Handling BeO Ceramics

- Parts or components containing BeO ceramics must not be opened, mechanically processed or destroyed.
- Above all, these parts or components must not be scratched, broken, ground, tempered and sandblasted, not even under exhaust hoods.

4.4.2 Marking Parts or Components Containing BeO Ceramics

Rohde & Schwarz marks all parts or components containing BeO ceramics in the electric parts list, the circuit diagram and the transmitter.

The *electric parts list* contains the following text:

Beryllium oxide	Hinweise beachten	Observe instructions
-----------------	-------------------	----------------------

The *circuit diagram* includes the full warning:

Achtung! Hinweise zur Sicherheit beim Umgang mit Teilen aus Berylliumoxid-Keramik beachten! Attention! Observe safety instructions for handling parts made from beryllium oxide ceramics!

In the *transmitter*, all components containing parts made from beryllium oxide ceramics are marked with a warning symbol and a label:



BERYLLIUMOXID / BERYLLIUM OXIDE

Sicherheitshinweise beachten

Observe safety instructions

4.4.3 Measures in Case of Breakage and Waste Disposal

If BeO dust has been caused by breakage or other mechanical or electrical destruction, wipe away the dust using moist cloths and seal them in plastic bags together with the broken pieces. Wear protective gloves.

Mark the bags with the danger symbol and text:



Skull and crossbones
danger symbol

Berylliumoxid-Staub
Beryllium oxide dust

The bags must be disposed of separately in accordance with national waste disposal laws.

Desoldered components containing BeO ceramics must also be disposed of in this way. All manufacturers of parts or components containing BeO ceramics that are known to Rohde & Schwarz gladly take back defective parts free of charge.

CHAPTER 2

DESIGN AND CHARACTERISTICS

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1 Device Purpose and Overview

The R&S SLx8000 low-power transmitters are used to transmit digital or analog TV signals. The signals are transmitted in the UHF or VHF frequency range in compliance with the modulation standards DVB(-T/-H) and ATSC (DTV) or B/G, M/N, I (ATV).

Note *The transmitter characteristics comply with the relevant standard specifications and EN standards thus meeting international requirements.*

The transmitters, which are integrated in a compact 19" housing, have been designed for low-maintenance and uncomplicated operation. All parts inside the instruments are maintenance-free. Automatic functions such as loading previously stored precorrection curves make operation extremely easy when the channel is changed. Precorrection by the user is unnecessary.



Fig. 1 R&S SLV8010 – front view



Fig. 2 R&S SLV8050 – front view



Fig. 3 R&S SLV8010 – rear view



Fig. 4 R&S SLV8050 – rear view

DTV and ADTV hardware models

The transmitters are available as DTV and ADTV models. Whereas the DTV model supports only digital television, the ADTV model also has connectors which allow analog TV signals to be transmitted. To be able to use ATV, however, the appropriate software option must also be installed.

Power classes

The R&S SLx8000 transmitter family comprises instruments with the following power classes.

Transmitter	Amplifier option	TV standard	Nom. output power	Band	HU
R&S SLV8002	SLX8000B42	DVB-T/-H	2 W	UHF IV / V	2
		ATSC	3 W		
R&S SLV8005	SLX8000B43	DVB-T/-H	5 W		
		ATSC	8 W		
R&S SLV8005A	SLX8000B43	Analog TV	12 W sync peak		
R&S SLV8010	SLX8000B44	DVB-T/-H	10 W		
		ATSC	16 W		
R&S SLV8010A	SLX8000B44	Analog TV	25 W sync peak		

Transmitter	Amplifier option	TV standard	Nom. output power	Band	HU
R&S SLV8025	SLX8000B45	DVB-T/-H	25 W	UHF IV / V	3
		ATSC	40 W		
R&S SLV8025A	SLX8000B45	Analog TV	62 W sync peak		
R&S SLV8050	SLX8000B46	DVB-T/-H	50 W		
		ATSC	80 W		
R&S SLV8050A	SLX8000B46	Analog TV	125 W sync peak		
R&S SLV8100	SLX8000B47	DVB-T/-H	100 W		
		ATSC	150 W		
R&S SLV8100A	SLX8000B47	Analog TV	250 W sync peak		
R&S SLW8025	SLX8000B35	DVB-T/-H	25 W	VHF III	
		ATSC	40 W		
R&S SLW8025A	SLX8000B35	Analog TV	62 W sync peak		
R&S SLW8050	SLX8000B36	DVB-T/-H	50 W		
		ATSC	80 W		
R&S SLW8050A	SLX8000B36	Analog TV	125 W sync peak		
R&S SLW8100	SLX8000B37	DVB-T/-H	100 W		
		ATSC	150 W		
R&S SLW8100A	SLX8000B37	Analog TV	250 W sync peak		

Note The specified nominal powers only apply to the **POWER OUT** connector (X7).

User interface

The instrument is operated locally by means of a keypad and display. Important operating states are also signaled by LEDs in the front panel. The integrated Ethernet interfaces also allow the transmitter to be operated using a PC and web browser both locally and remotely by means of access over the Internet.

2 Modules and Components

The transmitter consists of the following modules and components:

- ADTV coder with
 - Control unit
 - Display and keyboard interfaces
 - Instrument interfaces
 - Slot for CompactFlash memory card
- RF board with amplifier control unit
- Amplifier with 2, 5, 10, 25, 50 or 100 W DVB power output (depending on the variant)
- Front panel: White-on-blue display, 200 x 48 pixels
- Power supply unit
- Fan

Only the modules or components relevant to the user are described below.

2.1 Connectors

The connectors are all on the rear panel of the instrument (with the exception of the RF monitoring socket). The connectors listed here depend on the hardware variant (DTV or ADTV) and hardware options that may be installed (e.g. GPS).

Connectors on rear panel (DTV and ADTV)

No.	Label	Type	Connection
X7	POWER OUT	N female	RF output
X21	TS 1	BNC, female, 75 Ω	Transport stream input 1 (main signal; with hierarchy: HP stream)
X22	TS 2	BNC, female, 75 Ω	Transport stream signal 2 (standby signal; with hierarchy: LP stream)
X23	EXT 1 PPS	BNC, female, 50 Ω	Input for seconds pulse from external reference
X24	EXT REF	BNC, female, 50 Ω	Reference input, 5 MHz or 10 MHz, -5 dBm to 20 dBm or TTL
X29	REF OUT	BNC, female, 50 Ω	Monitoring output for internal 1 PPS or 10 MHz signal
X30	ETHERNET LOCAL	RJ45, female	Connection of a PC for local operation; preset address at X30: – IP address: 192.168.57.253 – Subnet mask: 255.255.255.0

No.	Label	Type	Connection
X31	ETHERNET REMOTE	RJ45, female	Network connection for remote access; preset address at X31: – IP address: 192.168.58.253 – Subnet mask: 255.255.255.0
X32	TX CONTROL	D-Sub, female (9-contact)	RF loop and CAN bus; connection for parallel remote-control interface or N+1 system
X8		Low-temperature connector or DC connection	AC voltage feed

Connectors on rear panel (additional connectors for ADTV)

No.	Label	Type	Connection
X20	VF	BNC, female, 75 Ω	Analog video input
X25	BTSC	BNC, female, 75 Ω	Analog audio input to BTSC standard (M, N)
X26	NICAM DATA	BNC, female, 50 Ω	Digital data input for NICAM 728
X27	AUDIO 1	XLR, female, 600 Ω	Analog audio input AF1
X28	AUDIO 2	XLR, female, 600 Ω	Analog audio input AF2

Connectors on rear panel (depending on hardware option)

No.	Label	Type	Connection
X1	RECEIVER	N female, 50 Ω	Antenna input for DVB-T receiver option (retransmitter)
X2	GPS ANTENNA	N female, 50 Ω	Connection for optional GPS antenna
X3	RECEIVER AUX	N female, 50 Ω	Second antenna input for DVB-T monitor option

Connector on front panel

No.	Label	Type	Connection
	RF MONITOR	SMA, female, 50 Ω	RF test output

2.2 Elements on Front Panel

2.2.1 Display

Local operation of the instrument allows all the main information calls for the most important system parameters and their settings, complete with intuitive graphical menus. The instrument is operated locally via display menus using control keys and cursor keys.



Fig. 5 Display of R&S SLx8000

2.2.2 Keys and Indicators

A number of keys on the front panel are assigned two functions. The following applies:

- Press the key briefly = The function indicated on the key is executed
- Press the key longer = The function indicated above the key is executed



Fig. 6 Keys and LEDs of the R&S SLx8000

Menu keys

Key	Meaning / function
OK / MENU	OK: – Confirms an entry or selection MENU: – In system overview: Starts the menu control function – From a menu: Calls the context menu
BACK / HOME	BACK: – In a setting window: Cancels the entered value, provided that it has not yet been confirmed with OK – In the general menu: Goes back one step to the last selected menu HOME: – Returns from the menu tree to the system overview.
CURSOR KEYS	↔↕↖↗ : Navigation in the menu tree ↔↔ : Navigation to a digit in an entered value ↕↕ : Increments or decrements a number

Function keys and displays

Key	Meaning / function
RF ON/OFF	Switches transmission mode ON or OFF. If transmission mode is free of interference, the instrument produces RF power.
LOCAL	Switches between local and remote operation With <i>local operation</i>, settings are entered either on the front panel of the instrument or via a PC which is connected to X30 (ETHERNET LOCAL). With <i>remote operation</i>, settings are made via a logged-on network client which is connected to the X31 interface (ETHERNET REMOTE).

LED	Meaning
RF ON/OFF	LED (green) signals transmitter operation. If the instrument is producing power, the RF PRESENT LED also lights.
LOCAL	LED (yellow) signals local operation. The instrument can no longer be operated remotely.
RF PRESENT	LED (green) signals that RF is present at the output. The LED goes out if the output power drops below a fixed threshold.
WARNING	LED (yellow) signals a general warning from the instrument.
FAULT	LED (red) signals a cumulative fault on the instrument.

2.3 CompactFlash Card

The settings for the instrument operating parameters are written to a CompactFlash memory card. The parameters can be transferred quickly from one device to another (e.g. a replacement device) by simply swapping the memory card.



ATTENTION!

The CompactFlash card can only be inserted into another R&S SLx8000 and must never be inserted into a card reader. The latter will render the card unusable for the R&S SLx8000.

2.4 Fan

The instrument has a fan which draws in cool air via the ventilation openings in the front panel and blows the warm air out via the rear panel.

The fan is mounted on the outside of the rear panel and can therefore be changed without opening the cover on the instrument.

If a fan fails a warning message is generated. If the temperature then increases too much, a fault message is output and the instrument is shut down in order to prevent the electronics from overheating.

2.5 Options

2.5.1 Power Supply Units

Different power supply units are used depending on the power class and intended use of the transmitter.

AC power supply units

Transmitter variant	HU	Power supply unit
Var. 20	2	SLX8000B9: 150 W
Var. 30/31	3	SLX8000B11: 1000 W

DC power supply units

Transmitter variant	HU	Power supply unit
Var. 20	2	SLX8000B10: 150 W
Var. 30/31	3	SLX8000B12: 1000 W

2.5.2 GPS Receiver (SLX8000B13)

The optional integrated GPS receiver provides the transmitter with a frequency and time reference, e.g. for SFN operation.

2.5.3 DVB-T/-H Receiver (SLX8000B14) / DVB-T/-H Monitor (SLX8000B15)

The DVB-T/H Receiver option (receiver module) enables the transmitter to be configured as a retransmitter. Alternatively the receiver module can be used to monitor the transmitter output signal (signal output coupling on the monitoring output from the transmitter output).

Up to two receiver modules may be integrated. The following possible applications are available:

- Retransmitter and/or radiated signal monitoring
- Retransmitter with hierarchy (LP and HP are demodulated by one receiver module each)

3 Specifications

3.1 General Data

TV standards

Variants 20, 30 and 31	DTV: DVB-T, ATSC
Variant 31	Analog TV: B/G, D/K, M, M1 (M + FM dual sound standard), N, I, I1

Frequency ranges	170 MHz to 250 MHz (band III) 470 MHz to 860 MHz (band IV/V)
------------------------	---

Step size for frequency adjustment	1 Hz
--	------

Environmental conditions

Operating temperature range	+1 °C to +45 °C (device complies with specifications)
Permissible temperature range	0 °C to +50 °C (data not guaranteed)
Max. permissible humidity	95%, non-condensing

Power supply

Input voltage (AC options)	100 V to 240 V AC, $\pm 10\%$ (100 V to 240 V, $\pm 10\%$ for SLV8100A in analog TV mode)
Power frequency	47 Hz to 63 Hz, single-phase
Input voltage (DC options)	+38 V to +72 V DC
Power consumption	
DVB-T 10 W	~ 130 W
Analog TV 250 W:	~ 800 W

Mechanical resistance

Vibration, sinusoidal	5 Hz to 150 Hz, max. 2 g at 55 Hz, max. 0.5 g from 55 Hz to 150 Hz, meets DIN EN 60068-2-6
Vibration, random	10 Hz to 300 Hz, acceleration 1.2 g (rms), meets DIN EN 60068-2-64
Shock	20 g shock spectrum, meets DIN EN 60068-2-27 and MIL-STD-810E

EMC	ETSI EN 301489-1 / -14 ETSI EN 302296 / 302297 Rec. 1999/519/EC
Immunity to radiated interference	Up to 10 V/m
Safety	EN 60950-1: 2001 CSA C22.2 No. 60950-1: 2003 UL 60950-1: 2003
Dimensions	
Model 20	19", 2 HU
Models 30, 31	19", 3 HU
Weight	
Models 20, 21	6 kg
Models 30, 31	12 kg

3.2 Specific Data: SLx8000 DTV

3.2.1 Supported Modulation Parameters

Length of transport packet 188 or 204 bytes

DVB

Coding and modulation	In line with EN 300744 with following parameters:
IFFT length	2 k or 8 k (plus 4 k for DVB-H)
Modulation	QPSK, 16QAM or 64QAM
Guard interval	1/4, 1/8, 1/16 or 1/32 of useful symbol period
Inner code rate	1/2, 2/3, 3/4, 5/6 or 7/8
Hierarchy	$\alpha = 1, 2$ or 4
Channel bandwidth	6, 7, 8 MHz
SFN function	In line with TS 101 191
TPS and TX automatic	In line with TS 101 191 (MIP) with MFN and SFN

ATSC

Coding and modulation	In line with ATSC Doc. A/53
Bandwidth	6 MHz

3.2.2 Input Processing

- All ASI modes (continuous, packet, burst) in line with DIN EN 500083-9
- Input FIFO: 8 k → ± 20 transport packets, burst
- Input switchover, manual and automatic
- Seamless input switchover
- Input monitoring
- MFN with stuffing and PCR correction
- FIFOs as buffers for dynamic delay changes
- MIP evaluation in compliance with TS 101 191 (DVB)

3.2.3 Precorrection

- Manual linear precorrection (up to 350 ns group delay, up to 2 dB frequency response)
- Manual nonlinear precorrection
- Nonlinear frequency response
- Limiter function
- Precorrection of amplifier asymmetry

3.2.4 Quality Data

SNR	> 37 dB, typ. 40 dB
MER	> 33 dB, typ. 40 dB
Shoulder attenuation	> 37 dB, typ. 40 dB
Frequency response	< ±0.5 dB
Group delay	< 10 ns
Carrier suppression	< -50 dBc referenced to transmitter RMS power
Sideband suppression	< -50 dBc referenced to transmitter RMS power

Phase noise

Frequency/carrier offset	dBc/Hz:
10 Hz	< -65
100 Hz	< -90
1 kHz	< -95
10 kHz	< -100
100 kHz	< -112
1 MHz	< -130

Frequency stability	10^{-7} / year
---------------------------	------------------

3.2.5 Nonharmonics and Harmonics


ATTENTION!

To comply with national standards on the antenna interface, the transmitter must only be operated with an output bandpass!

– **Harmonics:**

Transmitter	2nd harmonic (1st harmonic)	$\geq$ 3rd harmonic ($\geq$ 2nd harmonic)
UHF, 100 W	Ch 21 to Ch 34: < -20 dBc Ch 35 to Ch 69: < -40 dBc	< -55 dBc
UHF, 50 W	Ch 21 to Ch 34: < -15 dBc Ch 35 to Ch 43: < -25 dBc Ch 44 to Ch 69: < -35 dBc	3rd harmonic: Ch 21 to Ch 34: < -40 dBc Ch 35 to Ch 43: < -50 dBc Ch 44 to Ch 69: < -60 dBc $\geq$ 4th harmonic: < -60 dBc
UHF, 25 W	Ch 21 to Ch 34: < -15 dBc Ch 35 to Ch 43: < -25 dBc Ch 44 to Ch 69: < -35 dBc	3rd harmonic: Ch 21 to Ch 34: < -40 dBc Ch 35 to Ch 43: < -50 dBc Ch 44 to Ch 69: < -60 dBc $\geq$ 4th harmonic: < -60 dBc
UHF, 10 W	Ch 21 to Ch 30: < -10 dBc Ch 31 to Ch 43: < -20 dBc Ch 44 to Ch 69: < -50 dBc	< -60 dBc
UHF, 5 W	Ch 21 to Ch 30: < -10 dBc Ch 31 to Ch 43: < -20 dBc Ch 44 to Ch 69: < -50 dBc	< -60 dBc
UHF, 2 W	Ch 21 to Ch 34: < -30 dBc Ch 35 to Ch 43: < -40 dBc Ch 44 to Ch 69: < -50 dBc	< -55 dBc
VHF, 100 W	Ch 05 to Ch 08: < -30 dBc Ch 09 to Ch 15: < -40 dBc	< -55 dBc $\geq$ 4th harmonic: < -60 dBc
VHF, 50 W	Ch 05 to Ch 08: < -30 dBc Ch 09 to Ch 15: < -40 dBc	< -55 dBc $\geq$ 4th harmonic: < -60 dBc
VHF, 25 W	Ch 05 to Ch 08: < -30 dBc Ch 09 to Ch 15: < -40 dBc	< -55 dBc $\geq$ 4th harmonic: < -60 dBc

– **Out-of-band emissions:** < -37 dB (due to shoulder attenuation)

– **Nonharmonics:** < -60 dB

3.3 Specific Data: SLx8000 Analog TV

3.3.1 Supported Video and Audio Standards

TV standards B/G, M/N, D/K and I

Audio coding Mono, IRT dual sound, BTSC, optional NICAM

3.3.2 Video Functions

- Input monitoring (sync-pulse width, period and amplitude)
- Black-level retention
- Evaluation of data line (audio mode)
- Amplitude control (using white pulse)
- Sync-pulse regeneration
- Receiver pre-equalization
- Vestigial sideband filtering

3.3.3 Audio Functions

- Input level adaptation
- Matrixing
- FM modulation
- Precorrection of audio phase (only with FM carrier, depending on video signal)

With NICAM model

- Coding and modulation in line with EN 300 163
- Single sideband filtering

3.3.4 Precorrection

- Manual linear precorrection (up to 250 ns group delay, up to ± 2 dB frequency response)
- Manual nonlinear precorrection
- Nonlinear frequency response
- Dynamic adjustment of nonlinear precorrection depending on video content
- Precorrection of amplifier asymmetry

3.3.5 Quality Data

3.3.5.1 With Standard Factory Precorrection

3.3.5.2 With Manual Postcorrection

Video

S/N ratio	≥ 63 dB (> 200 kHz, < 5 MHz, CCIR-weighted)
Differential phase	$\leq \pm 3^\circ$
Differential amplitude	$\leq \pm 5\%$
VF frequency response	$\leq \pm 0.5$ dB
VF group delay	$\leq \pm 25$ ns

Audio

FM signal-to-noise ratio $\leq$	-60 dB (CCIR weighted)
AF frequency response	< 0.2 dB (preemphasis and deemphasis OFF)
AF total harmonic distortion	< 0.5% (at ± 30 kHz deviation)

3.3.5.3 Miscellaneous

Carrier suppression (with respect to vision carrier) $\leq$ -50 dBc

Phase noise

Frequency/carrier offset	dBc/Hz:
10 Hz	< -65
100 Hz	< -90
1 kHz	< -95
10 kHz	< -100
100 kHz	< -112
1 MHz	< -130
Frequency stability	10^{-7} / year

3.3.6 Nonharmonics and Harmonics


ATTENTION!

To comply with national standards on the antenna interface, the transmitter must only be operated with an output bandpass!

– **Harmonics:**

Transmitter	2nd harmonic (1st harmonic)	$\geq$ 3rd harmonic ($\geq$ 2nd harmonic)
UHF, 250 W	Ch 21 to Ch 34: < -20 dBc Ch 35 to Ch 69: < -40 dBc	< -55 dBc
UHF, 125 W	Ch 21 to Ch 34: < -15 dBc Ch 35 to Ch 43: < -25 dBc Ch 44 to Ch 69: < -35 dBc	3rd harmonic: Ch 21 to Ch 34: < -40 dBc Ch 35 to Ch 43: < -50 dBc Ch 44 to Ch 69: < -60 dBc $\geq$ 4th harmonic: < -60 dBc
UHF, 62 W	Ch 21 to Ch 34: < -15 dBc Ch 35 to Ch 43: < -25 dBc Ch 44 to Ch 69: < -35 dBc	3rd harmonic: Ch 21 to Ch 34: < -40 dBc Ch 35 to Ch 43: < -50 dBc Ch 44 to Ch 69: < -60 dBc $\geq$ 4th harmonic: < -60 dBc
UHF, 25 W	Ch 21 to Ch 30: < -10 dBc Ch 31 to Ch 43: < -20 dBc Ch 44 to Ch 69: < -50 dBc	< -60 dBc
UHF, 12 W	Ch 21 to Ch 30: < -10 dBc Ch 31 to Ch 43: < -20 dBc Ch 44 to Ch 69: < -50 dBc	< -60 dBc
VHF, 250 W	Ch 05 to Ch 08: < -30 dBc Ch 09 to Ch 15: < -40 dBc	< -55 dBc $\geq$ 4th harmonic: < -60 dBc
VHF, 125 W	Ch 05 to Ch 08: < -30 dBc Ch 09 to Ch 15: < -40 dBc	< -55 dBc $\geq$ 4th harmonic: < -60 dBc
VHF, 62 W	Ch 05 to Ch 08: < -30 dBc Ch 09 to Ch 15: < -40 dBc	< -55 dBc $\geq$ 4th harmonic: < -60 dBc

– **Out-of-band emissions:** < -30 dB

– **Nonharmonics:** < -60 dB

3.4 Specific Data: Options

3.4.1 GPS Receiver (SLX8000B13)

Minimum level -128 dBm

3.4.2 DVB-T/-H Receiver (SLX8000B14) / DVB-T/-H Monitor (SLX8000B15)

Frequency ranges 170 MHz to 250 MHz (band III)
470 MHz to 860 MHz (band IV/V)

Input sensitivity -80 dBm to 20 dBm ¹

¹ To be able to achieve the full dynamic range, the step attenuator setup must be optimized using TV Settings > Input > Receiver / Receiver AUX > Setup > RF Attenuation Antenna.

CHAPTER 3

INSTALLATION

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1 Unpacking and Setting Up

1.1 Equipment Supplied

The following items are supplied as standard:

- R&S SLx8000 low-power transmitter in one of the following versions:
 - R&S SLV8002: 2 HU, band IV/V
 - R&S SLV8005(A): 2 HU, band IV/V
 - R&S SLV8010(A): 2 HU, band IV/V
 - R&S SLV8025(A): 3 HU, band IV/V
 - R&S SLW8025(A): 3 HU, band III
 - R&S SLV8050(A): 3 HU, band IV/V
 - R&S SLW8050(A): 3 HU, band III
 - R&S SLV8100(A): 3 HU, band IV/V
 - R&S SLW8100(A): 3 HU, band III
- Power cable (DC options: non-assembled at one end)
- Short-circuit connector for **X32**
- This user manual

Note *The performance data for these transmitter variants is given in the section "Power Classes" in the chapter "Design and Function".*

1.2 Unpacking Instrument

- ☞ Carefully remove the instrument from the carton and check the delivery for completeness against the delivery note.

1.3 Setting Up Instrument

The instrument can stand on its feet or be built into a 19" rack. Depending on which model is selected, 2 or 3 height units are required for installation in a 19" rack.

Note *Make sure the instrument is standing in a stable position and there is sufficient ventilation. Make sure in particular that the flow of air through the inlets on the front panel and the outlets on the rear panel (fan) is not obstructed.*

2 Connecting Cables



WARNING!

Always make sure that the power supply is disconnected before connecting any devices. This will prevent injuries and damage to the devices.

2.1 Overview of Connectors



Fig. 1 Connectors on rear panel of R&S SLV8010



Fig. 2 Connectors on rear panel of R&S SLV8050

Connectors on rear panel (DTV and ADTV)

No.	Label	Type	Connection
X7	POWER OUT	N female	RF output
X21	TS 1	BNC, female, 75 Ω	Transport stream input 1 (main signal; with hierarchy: HP stream)
X22	TS 2	BNC, female, 75 Ω	Transport stream signal 2 (standby signal; with hierarchy: LP stream)
X23	EXT 1 PPS	BNC, female, 50 Ω	Input for seconds pulse from external reference
X24	EXT REF	BNC, female, 50 Ω	Reference input, 5 MHz or 10 MHz, -5 dBm to 20 dBm or TTL
X29	REF OUT	BNC, female, 50 Ω	Monitoring output for internal 1 PPS or 10 MHz signal
X30	ETHERNET LOCAL	RJ45, female	Connection of a PC for local operation; preset address at X30: – IP address: 192.168.57.253 – Subnet mask: 255.255.255.0
X31	ETHERNET REMOTE	RJ45, female	Network connection for remote access; preset address at X31: – IP address: 192.168.58.253 – Subnet mask: 255.255.255.0
X32	TX CONTROL	D-Sub, female (9-contact)	RF loop and CAN bus; connection for parallel remote-control interface or N+1 system
X8		Low-temperature connector or DC connection	AC voltage feed

Connectors on rear panel (additional connectors for ADTV)

No.	Label	Type	Connection
X20	VF	BNC, female, 75 Ω	Analog video input
X25	BTSC	BNC, female, 75 Ω	Analog audio input to BTSC standard (M, N)
X26	NICAM DATA	BNC, female, 50 Ω	Digital data input for NICAM 728
X27	AUDIO 1	XLR, female, 600 Ω	Analog audio input AF1
X28	AUDIO 2	XLR, female, 600 Ω	Analog audio input AF2

Connectors on rear panel (depending on hardware option)

No.	Label	Type	Connection
X1	RECEIVER	N female, 50 Ω	Antenna input for DVB-T receiver option (retransmitter)
X2	GPS ANTENNA	N female, 50 Ω	Connection for optional GPS antenna
X3	RECEIVER AUX	N female, 50 Ω	Second antenna input for DVB-T monitor option



Fig. 3 RF test output on front panel of R&S SLx8000

Connector on front panel

No.	Label	Type	Connection
	RF MONITOR	SMA, female, 50 Ω	RF test output

2.2 Connecting Input Signals

Inputs for digital TV

The input signals can be fed in ASI or SMPTE format.

1. Connect the first transport stream to **X21 (TS 1)**. With hierarchical coding (DVB only), **X21** is the input for the HP stream.
2. If signal standby is required, connect a second transport stream to **X22 (TS 2)**. With hierarchical coding, **X22** is the input for the LP stream.

Inputs for analog TV

1. Connect the video signal to **X20 (VF)**.
2. Feed audio signals according to signal type:
 - a) AF signals: Connect AF1 to **X27 (AUDIO 1)** and AF2 to **X28 (AUDIO 2)**.
 - b) NICAM: If an external NICAM coder is used, additionally connect the NICAM 728 data stream to **X26 (NICAM DATA)**.
Separate feed of the NICAM 728 data stream is unnecessary if the NICAM coder integrated in the transmitter is used.
 - c) BTSC: As an alternative to a) and b), connect a multiplex signal to **X25 (BTSC)**.

Optional: Inputs for DVB-T/-H receiver and DVB-T/-H monitor

☞ Depending on the options selected, connect the receive system to **X1** and/or **X3**.

2.3 Connecting External Reference Sources

1. To increase frequency accuracy, connect an external reference source (5 MHz or 10 MHz) to **X24 (EXT REF)**.

Note

*Alternatively, the seconds pulse of an external 1 pps signal (at **X23**) or of the optional internal GPS receiver (GPS antenna at **X2**) can be used as the frequency reference.*

2. For SFN operation, additionally feed a 1 pps signal to allow time synchronization:
 - a) If the optional internal GPS receiver is used, connect the GPS antenna to **X2 (GPS ANTENNA)**.
 - b) Alternatively, feed the 1 pps signal of an external reference source via **X23 (EXT 1 PPS)**.

2.4 Connecting Antenna System


WARNING!

Risk of RF burns. Before connecting the antenna cable, make sure that the instrument cannot output RF at the output.


ATTENTION!

For EMC reasons, only cables with double shielding are to be used at the RF output.

☞ Connect the antenna system to **X7 (POWER OUT)**.

2.5 Preparing RF Loop


WARNING!

Risk of RF burns. Before putting the instrument into operation, make sure that the available interlock loop systems are in use.

☞ Prepare the interlock loop system (if available) for connection to **X32 (TX CONTROL)**.

☞ If no interlock loop devices are available in the transmitter system (only permissible with low power), have the supplied short-circuit connector at the ready.

Note *The interlock loop is only closed after (!) startup (see next chapter) via **X32 (TX CONTROL)**, after which the instrument can then produce RF.*

Note *To avoid unwanted electromagnetic emissions via the external interlock loop, the interlock loop should be connected via the optional filter adapter (5302.6575.00).*

2.6 Connecting User Interface

A PC or laptop can be connected for a more user-friendly way of operating the instrument locally. Furthermore, it is also possible to connect the transmitter to a remote monitoring network. An Ethernet link is used for connection.

Rohde & Schwarz recommends the use of an RJ-45 cable which complies with the CAT 7 specification.

Connecting a PC for local operation

☞ Connect the PC to the interface **X30 (ETHERNET LOCAL)**.

Connecting to a remote monitoring network

- ☞ Connect the IP network to the interface **X31 (ETHERNET REMOTE)**.

2.7 Connecting AC Power Supply

The instrument is available with various power supply units:

- Option SLX8000B9: 100 V to 240 V AC +10 %, 150 W (24 V secondary)
- Option SLX8000B10: 48 V DC (38 V to 76 V DC), 150 W (24 V secondary)
- Option SLX8000B11: 100 V to 240 V AC +10 %, 1000 W (32 V secondary)
- Option SLX8000B12: 48 V DC (38 V to 76 V DC), 1000 W (24 V secondary)



ATTENTION!

The instrument can be damaged by an overvoltage. Make sure that the AC supply voltage provided by your local power supply network complies with the specifications of the power supply unit installed in your instrument.

Check the power cable for damage.

Instrument with AC power supply unit SLX8000B9/SLX8000B11

1. Set the power switch on the rear of the instrument to 0 (OFF).
2. Connect the instrument to the power supply using the supplied power cable.

Instrument with AC power supply unit SLX8000B10/SLX8000B12

Note

Since the instrument does not have its own power switch for disconnection from the AC supply, the plug of the connecting cable must be regarded as the disconnecting device. It must be ensured that the plug is easily reachable and accessible at all times (length of connecting cable approx. 2 m). Functional or electronic switches are not suitable for providing disconnection from the AC supply. If the transmitter is integrated in racks or systems, a disconnecting device must be provided at system level.

1. Actuate the external power disconnecting device (set to OFF position).
2. Connect the instrument to the power supply using the supplied power cable.

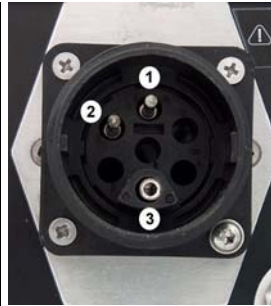
Pin assignment of DC options

SLX8000B10 (2 HU)

SLX8000B12 (3 HU)



- 1) Negative, GND (-)
- 2) Protective conductor (PE)
- 3) Positive (+)



- 1) Positive (+)
- 2) Negative, GND (-)
- 3) Protective conductor (PE)

CHAPTER 4

COMMISSIONING

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1 General Information

This chapter describes the settings needed to generate the required RF signal with the correct frequency and correct level at the output of the exciter.

Transmitters are put into operation using the transmitter graphical user interface.

1.1 Preparations

Before you can put a transmitter into operation, it must first have been fully installed. Therefore, before switching on the instrument, check the following list to ensure that all connections have been made correctly:

1. Check whether the transmitter has been connected correctly (signal feed, reference sources, remote-control interfaces; see the chapter "Installation").
2. Check whether the transmitter has been connected correctly to the AC supply (see the chapter "Installation").
3. Also check the following points:
 - a) At RF output

Output network (antenna/dummy antenna, matrix, directional-coupler filter, channel filter) connected correctly? Terminating resistor 50 Ω and power-handling capacity $P >$ nominal transmitter power?
 - b) Interlock loop

In order to prevent inadvertent transmission while putting the transmitter into operation, make sure that the interlock loop at **X32** is *not yet (!)* closed.
4. Check that all cable connections are fitted securely.

1.2 Preparing for Local Operation

The instrument can be operated locally in two ways:

- using the display and the menu keys on the front panel of the instrument
- using a web browser and PC which is connected to **X30** (remote operation)

Note

In the following descriptions, it is assumed that the transmitter is operated locally from the front panel. Detailed information on remote operation can be found in the chapter "Operating".



ATTENTION!

The instrument starts up with the most recently set parameters. In order to prevent damage resulting from an incorrect frequency setting, transmission must be avoided while the transmitter is being put into operation:

Therefore do not close the interlock loop (see the section "Preparations").

1. Switch on the transmitter using the toggle switch (position I) on the rear of the instrument.

The transmitter boots up. After a few seconds, the system overview appears on the display.

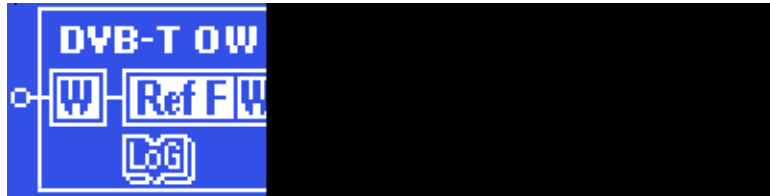


Fig. 1 System overview on R&S SLx8000 display

2. Press the **Local** key so that the associated LED lights up.

The transmitter is now in Local mode and can be operated locally. You are automatically logged on with the user ID "Operation".

Since operation rights do not permit you to set basic transmitter parameters, you must change the user ID.

1.3 Changing User ID

You must have configuration rights to configure the instrument fully.

1. Press the **MENU** key (press and hold down) to call the context menu.
2. In the context menu, select the menu item **Change User**.

The **Logon** window opens. The current user ID is displayed to the right of **Select user from list**.

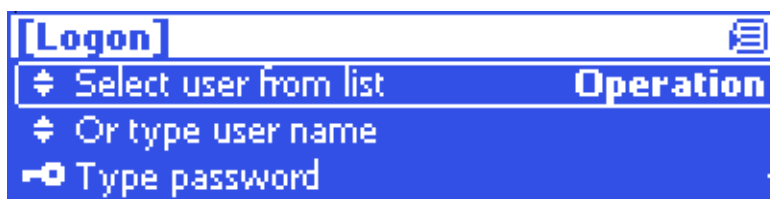


Fig. 2 Changing user at display in local operation mode

3. Under **Select user from list**, select the user ID **Configuration**.

After confirming with **OK**, you are logged on again with configuration rights.

Note

No password needs to be entered in the case of local operation using the display and menu keys (after factory setting).

1.4 Operating Transmitter

Note Detailed information on operating the transmitter can be found in the chapter "Operating".

2 Configuring Transmitter

The following steps are the minimum requirement for correct transmitter operation:

- Setting the date/time (basic settings)
- Selecting the TV standard and parameterizing the coding
- Configuring the input interfaces
- Selecting and adjusting the reference sources
- Setting the transmission frequency
- Setting the output power
- Activating RF

Whereas the coding settings and input interface settings vary depending on the used TV standard, the other steps are the same irrespective of the TV standard.

2.1 Entering Basic Settings

2.1.1 Setting Date and Time

1. Select **System Setup > Date | Time**.

The **Date | Time** window opens.



2. At first set the UTC time offset.
3. Afterwards set the current date and local time.

Setting item	Description
Date	For setting the current date

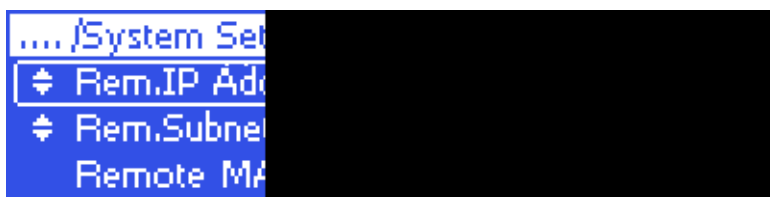
Setting item	Description
Local Time	For setting the local time Local time means the time of day or zone time at the station concerned. <i>Compared to world time (UTC = universal time coordinated), each time zone has a positive offset (for zones east of Greenwich) or a negative offset (for zones west of Greenwich). This offset is predetermined by the time zone and is always a multiple of a full hour, or occasionally of half an hour.</i> <i>In some countries clock time is advanced by one hour in summer. The time offset relative to UTC then changes accordingly.</i>
UTC Time Offset	For entering the time offset between local time and UTC

2.1.2 Configuring Remote Connection

If a remote Ethernet connection is to be used, you must configure the interface **X31 (ETHERNET REMOTE)** in such a way that it is in the subnet of your remote monitoring system.

1. Select **System Setup > Ethernet**.

The **Ethernet** window opens.



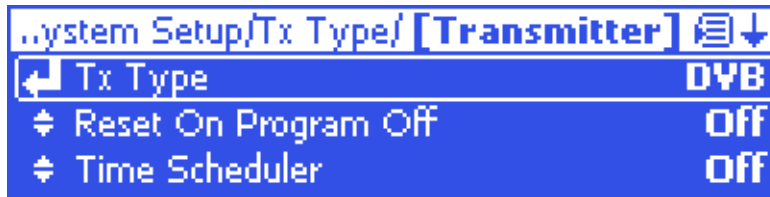
2. Under Rem.IP Address and Rem.Subnet mask, set the appropriate IP address and subnet mask.
3. If a gateway is used, configure its IP address too.
4. Perform a reboot of the instrument.

2.2 Making Specific Settings for a TV Standard

2.2.1 Selecting TV Standard: DVB, ATSC or Analog TV

1. Select **System Setup > Tx Type > Transmitter**.

The **Transmitter** window opens.



- Under **Tx Type**, select the required TV standard **DVB**, **ATSC** or **ATV** (Analog TV).
The transmitter reboots automatically if the TV standard is changed.

2.2.2 DVB(-T/H): Basic Settings, Coding, Signal Feed

2.2.2.1 Entering Basic Settings

- Select **TV Settings > DVB > Common**.

The **Common** window opens.



- Under **Digital Standard**, select the **DVB-T** or **DVB-H** mode.
- Under **Network Mode**, select the required network mode **MFN** or **SFN**.
- Under **TPS Source**, you determine whether the DVB parameters are to be read out from the MIP or set manually.
- Enter the other settings listed in the table below:

Setting item	Explanation
Digital Standard	Used to select the digital TV standard: DVB-T or DVB-H
Network Mode	Used to select the network operating mode: SFN or MFN
TPS Source	Used to set the source for the TPS parameters: MIP or manual presets <i>The TPS source can also be set in the TV Settings > DVB > TPS menu window.</i>
Cell ID Enable	Used to switch cell ID signaling on or off in the TPS The cell ID itself is set in the TV Settings > DVB > TPS menu window. It can also be retrieved from the MIP. The Cell ID can only be retrieved from the MIP if Tx Automatic is activated and the Tx address is correctly set.

Setting item	Explanation
Tx Address	Used to set the transmitter address; address range: 0 to 65535 Setting the transmitter address is a precondition to reading Tx information (transmitter-specific settings) from the MIP. However, the information is only used if Tx Automatic is enabled.
Tx Automatic	Used to switch Tx Automatic on or off If Tx Automatic is activated (and the transmitter address is set), the following Tx parameters are retrieved from the MIP: Time Offset, Frequency Offset and Cell ID

Display	Explanation
Amplifier Control	Indicates the status of amplifier control

2.2.2.2 Setting TPS Parameters Manually

Note You can only configure the TPS parameters manually if the **Manual Presets** setting is selected for **TPS Source**.

1. Select **TV Settings > DVB > TPS**.

The **TPS** window opens.



2. Set the following TPS parameters: Signal bandwidth, IFFT Length, Guard Interval and modulation mode (Constellation).
3. Enter the other settings listed in the table below:

Setting item	Explanation
TPS Source	Used to set the source for the TPS parameters: MIP or manual presets

Display/ setting item	Explanation of active or manually set TPS parameters
Bandwidth	Signal bandwidth Display/setting: 5, 6, 7 or 8 MHz

Display/ setting item	Explanation of active or manually set TPS parameters
FFT Length	IFFT length Display/setting: 2k or 8k; also 4k for DVB-H
Guard Interval	Guard interval Display/setting: 1/4, 1/8, 1/16 or 1/32
Constellation	Modulation mode Display/setting: QPSK, 16QAM or 64QAM <i>With hierarchical coding</i> , the value refers to the sum of constellation points from HP and LP Stream; possible values are therefore: 16QAM or 64QAM
Alpha	<i>Hierarchical parameter α</i> Display/setting: – No Hier: no hierarchical coding – 1 H: hierarchical coding with $\alpha = 1$ – 2 H: hierarchical coding with $\alpha = 2$ – 3 H: hierarchical coding with $\alpha = 3$ 1 H, 2 H or 3 H activates the hierarchical coding mode. However, this is only possible if Constellation is set to 16QAM or 64QAM.
Cell ID	Cell ID Display/setting: 0x0000 to 0xFFFF The cell ID can only be retrieved from the MIP if Tx Automatic is activated and the Tx address is correctly set in the TV Settings > DVB > Common menu. For the purpose of signaling in the output signal (TPS), the Cell ID Enable parameter must also be activated in the TV Settings > DVB > Common menu.
Interleaver	Interleaver Display/setting: – nat: Default setting ("native") with standard function for DVB-T – in depth: 8k interleaving for DVB-H with IFFT lengths of 2k and 4k to improve transmission reliability (<i>DVB-H parameter</i>)
Code Rate [HP/LP]	Internal code rate (separate for HP and LP stream) Display/setting: 1/2, 2/3, 3/4, 5/6 or 6/7
Time Slicing [HP/LP]	Time slicing flag (<i>DVB-H parameter</i>) Display/setting separate for HP and LP stream: – OFF: Default setting; no signaling via flag – ON: A flag is set in the broadcast DVB signal. This flag informs the receiver that at least one service in the DVB-H data stream uses time slicing.
MPE FEC [HP/LP]	MPE FEC flag (<i>DVB-H parameter</i>) Display/setting separate for HP and LP stream: – OFF: Default setting; no signaling via flag – ON: This flag informs the receiver that at least one service in the DVB-H data stream uses the forward error correction for MPE (Multi Protocol Encapsulation).

Display/ setting item	Explanation of active or manually set TPS parameters
Req. Data Rate [HP/LP]	Displays the data rate required at the input for the currently active TPS settings (see the TV Settings > Input > TS1(HP) menu and the TV Settings > Input > TS2(LP) menu)

2.2.2.3 Checking Delays under SFN Delay — SFN Mode Only

1. Select **TV Settings > DVB > SFN Delay**.

The **SFN Delay** window opens.



... /TV Settings/DVB/ [SFN Delay]	
Processing Delay	3 100.8 us
Static Delay	0.0 us
Dynamic Delay	0.0 us

2. If necessary, enter a **Static Delay** and check whether the **Dynamic Delay** is between **0** and **1** second (if this is not the case, the single-frequency condition is violated).

Detailed information is given in the table below:

Display	Explanation
Maximum Delay	Time taken for the signal to travel from the playout center (MIP inserter) to the transmitter antenna for regular transmission. This delay is set in the MIP inserter and is the default for all transmitters of the SFN.
Network Delay	Time taken for the signal to travel from the playout center (MIP inserter) to the input of the exciter. This delay depends on the used transmission path.
Processing Delay	Minimum turnaround time of the signal by the exciter. This delay depends on the DVB transmission parameters.
Dynamic Delay	Time by which signal processing is delayed artificially in order to achieve the required time of transmission.
Total Delay	Actual turnaround time of the signal by the exciter. This time is the sum of Processing Delay plus Dynamic Delay.
Tx Offset Delay	Positive or negative offset (transferred in the MIP for the individual transmitter location) of the time of transmission relative to the regular time of transmission preset under Maximum Delay. This delay is only displayed and activated if Tx Automatic has been activated and the Tx address of the transmitter is correct. <i>If Tx Offset Delay and Static Delay are present at the same time, their effects are added together.</i>

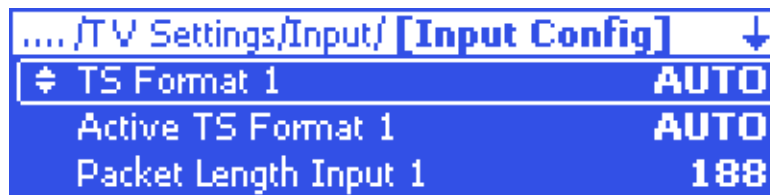
Setting item	Explanation
Static Delay	Positive or negative offset (set manually for the individual transmitter location) of the time of transmission relative to the regular time of transmission preset under Maximum Delay. The Static Delay is used to compensate differences between transmission systems from different manufacturers. <i>If Static Delay and Tx Offset Delay are present at the same time, their effect is added together.</i>
Max Deviation Time	Maximum deviation in the calculated time of transmission which can be corrected without interrupting transmission. Default setting: 10 µs

2.2.2.4 Configuring Input Interfaces and Automatic Input Selection

Setting signal source and data format for transport streams

1. Select **TV Settings > Input > Input Config**.

The **Input Config** window opens.



2. Under **Source 1**, set the signal source for transport stream 1:
 - a) Select **BNC** if transport stream 1 is fed via the instrument socket for **TS1**.
or
 - b) Select **Rx** if transport stream 1 comes from the internal receiver module (DVB-T/H receiver option).
3. Under **TS Format 1**, select the data format for transport stream 1. If **AUTO** is selected, the data format is detected automatically.

Note *With hierarchy, the first signal source supplies the HP stream.*

4. If necessary (signal standby, LP stream with hierarchy), configure a second transport stream accordingly under **Source 2** and **TS Format 2**.

Note *Transport stream 2 can be fed via either the instrument socket for **TS2** or a (second) optional receiver module.*

Setting automatic input switchover (not with hierarchy)

The following settings are used to preselect the operating input and to configure the behavior of the automatic input switchover.

1. Select **TV Settings > Input > Input Automatic**.

The **Input Automatic** window opens.



2. Select the active input and enter the other settings listed in the table below.

Setting item	Description
Preselect Input	For preselecting the active input – INPUT 1: Operating input is TS 1. – INPUT 2: Operating input is TS 2.
Autoswitch	Activates and deactivates <i>automatic input switchover</i> In the event of a failure on the active operating input, the automatic system switches the input signal over automatically to the standby input. The automatic switchover mode is defined by the following parameter settings.
Seamless Switching (DVB only)	Switches seamless input switchover on or off – ON: In the event of a failure, input switchover takes place without a break in transmission, provided that the data streams are synchronized at the operating and standby inputs. – OFF: The Seaml. Switching function can be deactivated to allow the automatic input switchover to be tested. <i>The function has no effect when automatic input switchover is deactivated.</i>
Priority	– EQUAL: The preselected operating input and standby input have the same priority. Once a switchover has taken place the system does not normally switch back to the previously faulty operating input. – PRIO: The preselected operating input is the priority input. Once a switchover has taken place the system switches back to the preselected operating input as soon as the signal reappears. <i>The function has no effect when seamless switching is active.</i>
Automatic Ready After Change Over	Sets the behavior after switchover to the standby input – ON: The automatic input signal system stays active after every switchover and can return to the formerly perturbed input. – OFF: Switches over to the standby input once. The automatic system must be reset to "ready" manually by pressing the Reset Fault key. The preselected operating input then becomes active again.
Check Time Forward	For setting a delay time (0 to 60 s) which must elapse before the switchover to the standby input takes place in the event of a failure on the operating input <i>The function has no effect when seamless switching is active.</i>

Setting item	Description
Check Time Back	For setting a delay time (0 to 60 s) which must elapse before switching back to the preselected operating input after switching over from the standby input (which is no longer active) <i>The function has no effect when seamless switching is active and/or the priority mode is set to EQUAL.</i>
On Loss Of Input	For setting the behavior in the event of a defective input signal (synchronization error) – No Mute: The output signal is not suppressed (only effective with MFN) – Mute: The output signal is suppressed if the data rate is incorrect (this feature always applies to SFN)
Type Of Loss Of Input	Selection: – Warning: If the input signal fails, only a warning will be generated. – Fault: If the input signal fails, an additional sum fault will be generated after the time set under Fail Delay Time has elapsed. In the case of transmitter standby, switchover to the second transmitter takes place.
Fail Delay Time	For setting a delay time which must elapse after an input signal dropout before a sum fault is generated.

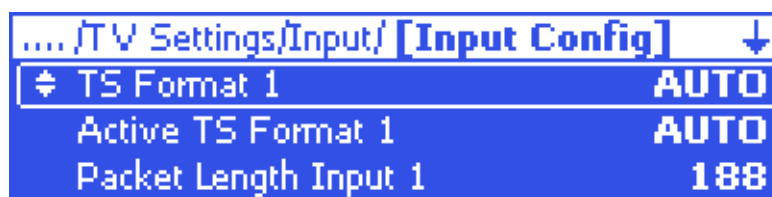
2.2.3 ATSC: Signal Feed

2.2.3.1 Configuring Input Interfaces and Automatic Input Selection

Setting data format for transport streams

1. Select **TV Settings > Input > Input Config.**

The **Input Config** window opens.



2. Under **TS Format 1**, select the data format for transport stream 1. If **AUTO** is selected, the data format is detected automatically.
3. Under **TS Format 2**, select the data format for transport stream 2 if a second signal feed (signal standby) is used. If **AUTO** is selected, the data format is detected automatically.

Setting automatic input switchover

The following settings are used to preselect the operating input and to configure the behavior of the automatic input switchover:

1. Select **TV Settings > Input > Input Automatic**.

The **Input Automatic** window opens.



2. Select the active input and enter the other settings listed in the table below.

Setting item	Description
Preselect Input	For preselecting the active input – INPUT 1: Operating input is TS 1. – INPUT 2: Operating input is TS 2.
Autoswitch	Activates and deactivates <i>automatic input switchover</i> In the event of a failure on the active operating input, the automatic system switches the input signal over automatically to the standby input. The automatic switchover mode is defined by the following parameter settings.
Seamless Switching (DVB only)	Switches seamless input switchover on or off – ON: In the event of a failure, input switchover takes place without a break in transmission, provided that the data streams are synchronized at the operating and standby inputs. – OFF: The Seaml. Switching function can be deactivated to allow the automatic input switchover to be tested. <i>The function has no effect when automatic input switchover is deactivated.</i>
Priority	– EQUAL: The preselected operating input and standby input have the same priority. Once a switchover has taken place the system does not normally switch back to the previously faulty operating input. – PRIO: The preselected operating input is the priority input. Once a switchover has taken place the system switches back to the preselected operating input as soon as the signal reappears. <i>The function has no effect when seamless switching is active.</i>
Automatic Ready After Change Over	Sets the behavior after switchover to the standby input – ON: The automatic input signal system stays active after every switchover and can return to the formerly perturbed input. – OFF: Switches over to the standby input once. The automatic system must be reset to "ready" manually by pressing the Reset Fault key. The preselected operating input then becomes active again.
Check Time Forward	For setting a delay time (0 to 60 s) which must elapse before the switchover to the standby input takes place in the event of a failure on the operating input <i>The function has no effect when seamless switching is active.</i>

Setting item	Description
Check Time Back	For setting a delay time (0 to 60 s) which must elapse before switching back to the preselected operating input after switching over from the standby input (which is no longer active) <i>The function has no effect when seamless switching is active and/or the priority mode is set to EQUAL.</i>
On Loss Of Input	For setting the behavior in the event of a defective input signal (synchronization error) – No Mute: The output signal is not suppressed (only effective with MFN) – Mute: The output signal is suppressed if the data rate is incorrect (this feature always applies to SFN)
Type Of Loss Of Input	Selection: – Warning: If the input signal fails, only a warning will be generated. – Fault: If the input signal fails, an additional sum fault will be generated after the time set under Fail Delay Time has elapsed. In the case of transmitter standby, switchover to the second transmitter takes place.
Fail Delay Time	For setting a delay time which must elapse after an input signal dropout before a sum fault is generated.

2.2.4 Analog TV: Basic Settings, Video and Audio

2.2.4.1 Entering Basic Settings

1. Select **TV Settings > ATV > Common**.

The **Common** window opens.



Detailed information is given in the table below:

Setting item	Explanation
TV Standard	Used to select the ATV standard
IRT-NICAM	Setting: IRT or NICAM (for standards B G, D K, I, I1) – IRT: Second sound subcarrier is frequency-modulated – NICAM: Second sound subcarrier is modulated according to the NICAM specification

Setting item	Explanation
NICAM Mode	Used to select the NICAM mode (for standards B G, D K, I, I1): – Coder: AF signal feed of AF1 and AF2 via the inputs AUDIO 1 and AUDIO 2 as well as coding and modulation in the transmitter – Modulator: Signal feed as NICAM 728 data stream via the digital input NICAM DATA
NICAM Rolloff	Used to set the NICAM rolloff (for standards B G, D K, I, I1): – Auto: NICAM rolloff is automatically set according to the selected TV standard and in compliance with the NICAM specifications (<i>recommended setting !</i>) – 40% / 100%: Manual setting of the NICAM rolloff
Sound Select	Used to select the number of sound subcarriers (for standards B G, D K, I, I1, M1): – Single Carrier: One sound subcarrier – Dual Carrier: Two sound subcarriers
FM Input	Setting: AF 1 or BTSC (for standards M, N) – AF 1: MONO audio mode, signal feed via input AUDIO 1 – BTSC: BTSC audio mode, signal feed via input BTSC

2.2.4.2 Performing Video Control

1. Select **TV Settings > ATV > Vision > White Control**.

The **White Control** window opens.



2. Make the required settings:

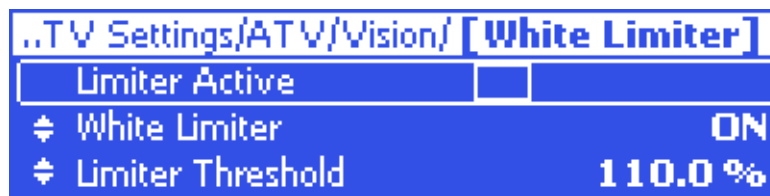
Setting item	Description
Automatic	Switches <i>white control</i> on or off.
Testline	Selects the test line for the white pulse. The test line can be in the first or second field.
Gain Source	Selection of the source for fixed video gain in case <i>offailure of the white pulse</i> with white control simultaneously switched on. The options are as follows: – MANUAL: For the gain, the manual settings under Manual Gain apply. – MEMORY: The gain uses the most recently saved value for white control.
Manual Gain	Manual setting of the video gain The value which is set is the gain of the actuator as a percentage referred to gain 1.

Display	Description
Memory Gain	Display of the last value saved by the <i>white control</i> which can be used for fixed video gain. The value which is displayed is the gain of the actuator as a percentage referred to gain 1.
Current Gain Source	Display of the active source for the video gain: – Manual: Manual setting (see Gain Source) – Memory: Memory for the white control (see Gain Source) – Automatic: White control
White Amplitude Input	Measured value for the white amplitude input
White Amplitude Output	Measured value for the white amplitude output
White Pulse Monitoring	Status display for the white pulse monitoring: – NONE: The test line with the white pulse was not found – OK: White pulse found and level OK – < -40% / < -30% / > +30% / > +40%: The level of the white pulse deviates from the nominal value by the displayed value.

2.2.4.3 Setting White Limiter

1. Select **TV Settings > ATV > Vision > White Limiter**.

The **White Limiter** window opens.



2. Make the required settings:

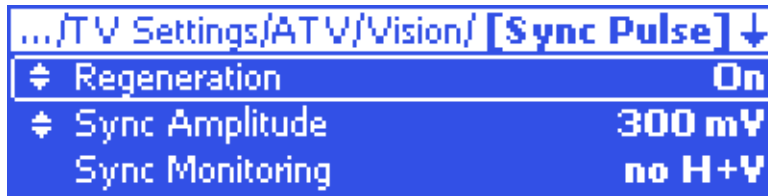
Setting item	Description
Limiter	Switches the <i>white limiter</i> on or off.
Threshold	Sets the threshold for the <i>white limiter</i> .

Display	Description
Limiter Active	Status display for indicating if the white limiter responds.

2.2.4.4 Setting Sync-Pulse Regeneration

1. Select **TV Settings > ATV > Vision > Sync Pulse**.

The **Sync Pulse** window opens.



2. Make the required settings:

Setting item	Explanation
Regeneration	Used to switch <i>sync-pulse regeneration</i> on or off
Sync Amplitude	Used to set the amplitude of the regenerated sync pulse (with regeneration switched on)

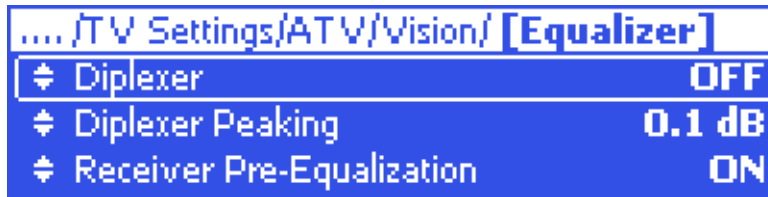
Display	Explanation
Sync Monitoring	Indicates the status of sync-pulse monitoring of the input signal. The following may be displayed: – OK: A standard input signal is being applied – no V: No V-pulse frame detected – no H+V: No V and H-pulse frame detected – too low: Sync-pulse amplitude is less than 50% of the nominal sync-pulse amplitude; the processed signal is, however, available at the encoder output
Sync Amplitude Input	Displays the measured input amplitude [mV] of the sync pulse. If the selected scanning line is not found in the input signal, the measurement value 0 mV is displayed.
Sync Amplitude Output	Displays the measured output amplitude in [mV] of the sync pulse

2.2.4.5 Performing Receiver Pre-Equalization and Diplexer Peaking

Note Use of the diplexer peaking function is recommended only after level control has been completed.

1. Select **TV Settings > ATV > Vision > Equalizer**.

The **Equalizer** window opens.



2. Make the required settings:

Setting item	Explanation
Diplexer	Used to switch the <i>diplexer pre-equalization</i> (diplexer peaking) on or off
Diplexer Peaking	Used to set the peaking in the range 0.1 dB to 2.5 dB at the band limit of the upper sideband
Receiver Pre-Equalization	Used to switch the <i>receiver pre-equalization</i> on or off

2.2.4.6 Adjusting AF Nominal Level and Level Adaptation to NICAM Coder

The functions available for sound adjustment depend on the selected audio standard.

1. Select **TV Settings > Input > Sound >**
 - a) **Input B|G, D|K, I, M1** for IRT dual sound
 - b) **Input M, N** for FM mono sound
 - c) **Input M, N BTSC** for BTSC dual sound
 - d) **Input NICAM Mod** for FM mono sound with NICAM, Modulator mode (NICAM 728 data stream fed from an external source)
 - e) **Input NICAM Cod** for FM mono sound with NICAM, Coder mode (NICAM 728 data stream generated in the transmitter itself)

The associated input window opens.



2. Make the required settings:

Note The table shows all settings and displays, some of which are not available with all audio standards.

Setting item	Explanation
Nominal Level [AF1 / AF2 / BTSC]	Used to set the nominal input level for the AF signal AF1 and AF2 or a BTSC signal
Gain Adjustment NICAM [AF1 / AF2]	Used to adapt the nominal input level for the AF signal AF1 or AF2 which is fed to the integrated NICAM coder
Preemphasis [FM]	Used to switch the pre-emphasis required by the respective TV standard (50 μ s or 75 μ s) on or off for FM sound
Preemphasis [NICAM]	Used to switch the pre-emphasis required by the TV standard on or off for NICAM sound
Lowpass [FM]	Used to switch a low-pass filter on or off for FM sound

Display	Explanation
Current Input Level [AF1 / AF2 / BTSC]	Indicates the current input level at the FM sound modulator for the signal AF1, AF2 or BTSC as a percentage of the maximum drive level
Current Input Level NICAM [AF1 / AF2]	Indicates the current input level at the NICAM coder for the AF signal AF1 and AF2 as a percentage of the maximum drive level
Input Clipping FM [AF1 / AF2]	If the AF signal AF1 or AF2 exceeds the maximum permissible input level, the amplitude is limited. This is signaled by the Input Clipping status display.
Input Clipping BTSC	If the BTSC signal exceeds the maximum permissible <i>input level</i> , the amplitude is limited. This is signaled by the Input Clipping status display.
Input Clipping NICAM [AF1 / AF2]	If the AF signal AF1 or AF2 is amplified beyond the permissible input level at the NICAM coder, the amplitude is limited. This is signaled by the Input Clipping NICAM status display.

2.2.4.7 Setting Audio Mode of Coder and Switching On Pilot Tone

1. Select **TV Settings > ATV > Sound > FM Audio Mode**.

The **FM Audio Mode** window opens.



2. Make the required settings:

Setting item	Description
Coder Mode	Setting of the <i>audio mode</i>. The following settings are possible: Off, Mono, Stereo, Dual and Auto (Dataline). The selected TV standard determines the assignment of the audio inputs to the FM sound subcarriers. The following settings have a special meaning: – Off: Dual sound is set as the audio mode – Auto (Dataline): The audio mode is read from the <i>audio data line</i> in the picture signal.
Dataline	Selects the <i>audio data line</i> present in the picture signal; this is necessary for the Coder Mode > Auto setting.
Pilot	Switches the <i>pilot signal</i> on or off; not active in conjunction with NICAM.
Pilot Gain	Sets the level for the <i>pilot signal</i> ; not active in conjunction with NICAM.

Display	Description
Dataline Info	Display of the indication of the <i>audio mode</i> present in the audio data line (N/A means there is no indication in the selected audio data line).
Current Audio Mode	Display of the <i>audio mode</i> that is currently set.
Current Pilot Deviation	Display of the FM deviation for the <i>pilot signal</i> .

2.2.4.8 Setting Sound Carrier/Nominal Deviation and Deviation Limiter

1. Select **TV Settings > ATV > Sound > FM Carrier**.

The **FM Carrier** window opens.



2. Make the required settings:

Setting item	Explanation
Carrier 1/Carrier 2	Used to set the mode for FM sound subcarrier 1 or 2; the following settings are possible: – Carrier OFF: Switches off the sound subcarrier – Modulation OFF: Switches on the sound subcarrier without modulation – ON: Switches on the sound subcarrier with modulation
Nom. Deviation [Carrier 1/Carrier 2]	Used to set the nominal <i>FM deviation</i> for sound subcarrier 1 and 2
Deviation Limiter	Used to switch the deviation limiter for the FM sound subcarrier on or off
Limiter Threshold	Used to set a threshold at which the deviation limiter is triggered
Warning Above	Used to set a threshold at which the deviation limiter warning is activated <i>In most cases, it is recommendable for Limiter Threshold and Warning Above to have the same value.</i>

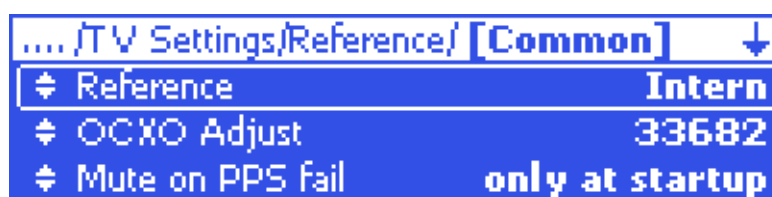
Display	Explanation
Current Deviation [Carrier 1/Carrier 2]	Indicates the current FM deviation for sound subcarrier 1 and 2
Limitation [Carrier 1/Carrier 2]	Status display which indicates whether the deviation limiter has triggered

2.3 Selecting and Adjusting Reference Sources

2.3.1 Selecting Reference Frequency Source and Determining Response on Failure

1. Select **TV Settings > Reference > Common**.

The **Common** window opens.



2. Under Reference, select a reference frequency source and determine how the transmitter is to respond if a reference source fails.

Detailed information is given in the table below:

Setting item	Description
Reference	Selects the reference frequency source. The following settings are possible: – Internal: Operation without external reference frequency source – External 5 MHz: Operation with external 5 MHz reference applied – External 10 MHz: Operation with external 10 MHz reference applied – External 1pps: Operation with external time reference (1 pps) – Internal GPS: Operation with optional internal GPS receiver
Monitoring Output	For selecting the signal which will be delivered via the REF OUT monitor socket on the rear panel of the instrument. The following settings are possible: – Off: Monitoring output disabled – 10 MHz: OCXO stabilized 10-MHz frequency – 1 PPS Generated: Internally generated PPS – 1 kHz: 1-kHz signal – 1 PPS Input: – If reference = Internal/external xx: External PPS – If reference = Internal GPS: PPS from GPS receiver
OCXO Adjust	Setting for adjusting the internal OCXO frequency (for "Internal" mode)
Mute on PPS Fail	Used to determine the behavior in SFN mode in the event of failure of the external time reference. The following settings are possible: – off: The output signal is not suppressed – only at startup: The output signal is suppressed at startup until a valid 1 pps signal is detected; if the 1 pps signal fails after successful synchronization, the output signal is no longer suppressed – after fail delay time: The output signal is suppressed if the 1 pps signal fails for longer than the period specified under Fail Delay Time. This is the recommended setting for operation in SFN mode.
Mute on Ref. Fail	Used to determine the behavior in SFN and MFN mode in the event of failure of the external reference frequency source. The following settings are possible: – off: The output signal is not suppressed – only at startup: The output signal is suppressed at startup until a valid reference source is detected; if the reference source fails after successful synchronization, the output signal is no longer suppressed – after fail delay time: The output signal is suppressed if the reference source fails for longer than the period specified under Fail Delay Time. This is the recommended setting for operation in SFN mode.
Fail Delay Time	If a reference source fails, the time specified here must elapse before the output signal is suppressed. The setting is effective if "after fail delay time" is set under Mute on PPS Fail or Mute on Ref. Fail. Selection: 0 to 24 hours; 0 hours = no delay time

2.3.2 Setting Antenna Type for Internal GPS Receiver

Note The following setting is only necessary if you use the optional internal GPS module.

1. Select **TV Settings > Reference > GPS > Status**.

The **GPS > Status** window opens.

.... /TV Settings/Reference/ [GPS]		↓
Satellites used		0
Satellites in view		0
Antenna state		init

2. Under Antenna type, select the connected antenna type:
 - a) active: The active antenna is supplied with 5 V DC from the GPS module.
 - b) passive: The antenna is not supplied with DC voltage from the GPS module.

Note Longer cables can be used with active antennas.

2.4 Setting Transmit Frequency

1. Select **TV Settings > RF Out > Synthesizer**.

The **Synthesizer** window opens.

.... /TV Settings/RF Out/ [Synthesizer]	
Frequency	802 601 000 Hz
Frequency Offset	0

2. Under **Frequency**, set the transmitter frequency.

2.5 Setting Output Power

Note The transmitter has an internal power test point which means that in most cases a separate measuring instrument is not necessary.

1. Select **TV Settings > RF Out > Amplifier**.

The **Amplifier** window opens.



2. Under **Output Power**, set the required output power.
3. If necessary, set a warning threshold for low output power under **RF Fail Limit**.

Detailed information is given in the table below:

Setting item	Explanation
Output Power	Used to set the required output power of the transmitter (the output power should not exceed the specified nominal power)
RF Fail Limit	Used to set a threshold value in dB for low RF output power. The threshold is referenced to the power output set under Output Power. If the power drops below the set threshold value, an RF Fail fault is generated. Default setting: -3 dB

Display	Symbol	Explanation
Actual Power Status	OK	Power display is valid
	W	Power display is invalid The internal power meter of an amplifier is overloaded; the actual output power may be above the displayed power.
RF Fail	- OFF -	RF power at the output of the output stage OK or transmitter switched off
	F	RF power is below the threshold specified under RF Fail Limit
Amplifier	OK	No warning at the output stage
	W	Output stage signals a sum warning

Display	Explanation
Actual Power	Current forward power of the transmitter

2.6 Activating RF

1. Switch off transmission mode by pressing the **RF ON/OFF** key.
2. Connect available interlock loop systems to **X32 (TX CONTROL)**

or with low power

if no interlock loop system is provided, short-circuit **X32 (TX CONTROL)** using the supplied short-circuit connector.

3. Switch transmission mode on again by pressing the **RF ON/OFF** key.

Both the **RF ON/OFF** LED and the **RF PRESENT** LED should now light up to indicate that the transmitter is delivering power at the output.

2.7 Checking Status Displays and Clearing Logbook Entries

The status displays can be used to check installation and configuration of the transmitter. If a transmitter is ready to operate, no warnings or faults will be indicated.

Furthermore, it is also recommended to clear existing logbook entries after the transmitter has been put into operation.

1. Check the status menus of your transmitter according to the TV standard you have set.
 - a) For DVB, select **Status > TV DVB > Device Status** and then **Status > TV DVB > Input Status**.
 - b) For ATSC, select **Status > TV ATSC**.
 - c) For Analog TV, select **Status > TV ATV**.
2. Select **Logbook > Summary**.

The **Summary** window opens.

.... /Logbook/ [Summary]				
42		Exciter ON		
41		Exciter ON		
40		Local		

3. In the context menu, select the item **Clear logbook**.
All logbook entries are cleared.

CHAPTER 5

OPERATING

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1 Introduction to Operation

The R&S SLx8000 transmitter can be operated in the following ways:

- Local operation via the display and menu keys on the front panel of the device
- Operation via the web browser
- Monitoring and control via SNMP

If the device is operated via the web browser of a connected PC/client computer, two modes are possible:

- Remote operation via a directly connected PC
- Remote control via a remote network client

1.1 Local and Remote Operation



Fig. 1 LOCAL key (with LED) for switching between local and remote operation

Local operation

To allow on-site configuration, the instrument must be set to *local*. In local operation mode, the user can enter parameter settings using the instrument keys or using a PC connected to **ETHERNET LOCAL (X30)**. In this mode, remote access is restricted to value queries.

To switch to local operation, press the **LOCAL** key (the associated LED lights up).

Remote operation

To allow remote operation, the instrument must be set to *remote*. In remote operation mode, settings can be changed via the **ETHERNET REMOTE** interface (**X31**). On-site configuration (using the keypad or via **X30**) is not possible in this operating mode.

To deactivate local operation, press the **LOCAL** key again (the associated LED goes out).

1.2 Local Operation (Using Display and Keypad)

1.2.1 System Overview



Fig. 2 System overview on instrument display (front panel)

- 1) Display indicating which input is active
- 2) TV standard
- 3) Nominal power
- 4) Status of active input
- 5) Status of reference input
- 6) Sum warning display
- 7) Sum fault display
- 8) Muting display
- 9) Display indicating new logbook entries
- 10) Display indicating connection to higher-level R&S NetCCU800 switchover unit
- 11) Forward (F) and reflected (R) power, voltage standing wave ratio (VSWR)
- 12) Display indicating whether transmitter is delivering power

Note In the system overview, the TV standard/nominal power and the transmitter name are displayed alternately.

Status displays in system overview

Status	Message	Meaning
Active input	Ok	Valid signal is present at the active input
	W	Signal at the active input is invalid or not detected
	F	Signal at the active input is faulty
Reference input	- OFF -	External reference frequency is present and is OK – or – External reference frequency is not present (it is not required)
	Re	External reference frequency is faulty and the fail delay time set in the Reference menu has expired
Sum warning	W	One or more warnings are active
Sum fault	F	One or more faults have occurred
Muting display	M	RF output signal is disabled by the signal processing unit; the RF PRESENT LED does not light up even with RF ON

Status	Message	Meaning
Logbook entries	LoG	New entries have been made in the logbook since the logbook was last opened
NSU connect	Co	Transmitter is connected to a higher-level R&S NetCCU800 switchover unit (NSU)
Status of transmitter output	RF	Transmitter is delivering power
	- OFF -	RF output has been deactivated by the user (RF OFF)
	F	Transmitter is not delivering any power although the RF output is enabled (RF ON)

1.2.2 Menu Keys



Fig. 3 Menu operation

Key	Meaning / function
OK / MENU	OK: – Confirms an entry or selection MENU: – In system overview: Starts the menu control function – From a menu: Calls the context menu
BACK / HOME	BACK: – In a setting window: Cancels the entered value, provided that it has not yet been confirmed with OK – In the general menu: Goes back one step to the last selected menu HOME: – Returns from the menu tree to the system overview.
CURSOR KEYS	↔↑↓ : Navigation in the menu tree ↔ : Navigation to a digit in an entered value ↑↓ : Increments or decrements a number

A number of keys are assigned two functions. The following applies:

- Press the key briefly = The function indicated on the key is executed
- Press the key longer = The function indicated above the key is executed

1.2.3 Operating Structure

1.2.3.1 Activating Local Operation

In order to enter settings on the instrument locally, enable local mode.

☞ Press the **Local** key so that the associated LED lights up.

Note Various authorization levels protect against unauthorized access to critical system settings. In local operation via keyboard and display you work by default with the factory preset user ID **Operation** (which authorizes you to make settings that directly affect transmitter operation). The section "Change User ID (Authorization)" shows how you can log on using another user ID.

1.2.3.2 System Overview — Top Menu Level

Display the system overview as follows:

☞ Press and hold down the **HOME** key.

1.2.3.3 Navigation in Menu System

This is how you navigate within the menu system:

1. Press and hold down the **MENU** key.

The context menu for the system overview is called.

The context menu for the system overview contains items used to call the **SLX** menu tree, to directly access individual menu paths (shortcuts such as **DVB**, **Logbook** or **System**) as well as the context commands **Reset Fault** for resetting stored error messages and **Change User** for changing the user ID.



Fig. 4 Context menu for system overview

- 1) Resets saved error messages
- 2) Opens the SLx menu tree
- 3) Shortcut to DVB menu path
- 4) Too many items to be displayed simultaneously (scroll down using the cursor keys to display other items)

2. In the context menu:

Use the cursor keys $\uparrow\downarrow$ to navigate to the required entry item and confirm with **OK**.

A directory menu with the selected menu tree or menu path is displayed.

Note The single arrow or double arrow in the top right-hand corner of the menu indicates the direction in which you can scroll the list.

3. Within the menu tree:

Use the cursor keys $\uparrow\downarrow$ to select a lower-level menu path or a menu window and confirm with **OK** or $\Rightarrow$.

Note Items **with** an arrow pointing to the right lead to lower-level menu paths. Items **without** an arrow symbol open menu windows for setting or displaying parameters.



Fig. 5 In menu tree

- 1) Path
- 2) Not all available items are shown on display (here: scroll direction DOWN)
- 3) Item opens a menu window
- 4) Item opens a further menu path

4. Within a menu window:

Use the cursor keys $\uparrow\downarrow$ to select a parameter and confirm with **OK** to adjust this parameter.

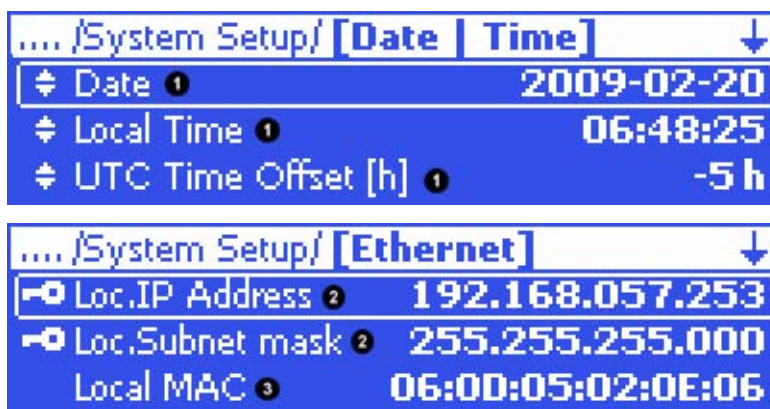


Fig. 6 Menu window (top: System Setup > Date/Time; bottom: System Setup > Ethernet)

- 1) Parameters with double arrow: setting can be changed.
- 2) Parameters with key symbol: setting not possible because user does not have appropriate authorization or transmitter is in remote operation mode
- 3) Parameters without symbol: display only, setting not possible

Use the **MENU** key to call a context menu for the currently displayed setting window.

Use the **BACK** key to go back one step in the menu structure (also from the Help windows); you can also use **BACK** to cancel an entered value as long as you have not already confirmed it with **OK**.

Use the **HOME** key to exit the menu structure and return to the system overview.

Alternative method of opening menus

By briefly pressing the **OK** key, you can call the **SLx** menu tree directly from the system overview.



Fig. 7 SLx menu tree

1.2.3.4 Selecting and Editing Settings

Note Only those parameters identified by a double arrow can be adjusted.

Locked and variable settings

Depending on the user rights concerned and the type of access (local or remote access) some or all processing parameters can be locked. These include restrictions arising from the actual constellation chosen. An appropriate symbol in front of the parameter value shows whether or not a parameter can be changed at this time.

Symbol	Meaning
	The present user can change the setting. A change takes effect straight away.
	The present user can change the setting. For the setting to take effect, a restart ^{a)} must be carried out.
	The setting cannot be changed at the present time. Possible reasons: – The user does not have the necessary rights. ^{b)} – Access is via the remote port whereas the instrument is in local mode. – Access is local whereas the instrument is in remote mode.
	Setting is not possible in this constellation.
- none -	This parameter value is for a display; it cannot be set.

a) To restart, run the Restart command from the System Setup > Tx Type > Transmitter context menu.

b) The Info command from the context menu gives information on the necessary user rights among other things.

Examples:

Parallel IO	1	↓ disabled
Inhibit Status	2	↕ yes

- 1) Setting can be changed, but the instrument needs to be restarted
- 2) Setting can be changed; a change takes effect straight away

- 1) Due to insufficient user rights, the selected parameter cannot be changed at this time
- 2) Operation access rights are needed in order to change this setting

Making a selection using the Selection Editor

Fig. 8 Selecting value

1. Select the setting using the cursor keys ↑↓.
2. Confirm the selection with OK.
Your setting is saved and displayed in the menu window.
3. Press the HOME key to finish menu editing.

Entering data via the Text Editor

Fig. 9 Entering values

- 1) Entry line
- 2) Selectable characters
- 3) Command line

1. Use the cursor keys to move the cursor to the entry position.
2. To enter characters, move to the required character using the cursor keys and then confirm with the **OK** key.

The selected character appears in the entry line at the cursor position.

or

To delete characters, set the cursor after the character you wish to delete, then use the cursor keys to select **Del char** and confirm with the **OK** key.

The character to the left of the cursor position is deleted.

3. To save changes (current entry in the entry line), select **Enter text** using the cursor keys and then confirm with the **OK** key.

This closes the editor, stores the changes and displays them in the menu window.

Note ***Enter text** will work only if the instrument is set to "local" and authorization to change parameters is held. Otherwise the only way to exit from the editor is to use **Discard**.*

or

To close the editor without saving the changes, select **Discard** using the cursor keys and then confirm with the **OK** key.

The editor closes and you return to the menu window. Your changes are not saved.

4. Press the **HOME** key to finish menu editing.

Note *If you select the **Fix Editor** command in the context menu (see section "Context Menu"), the editor will remain open until you close it by pressing the **Back** key.*

1.2.3.5 Context Menu

The context menu contains function- and content-oriented commands which can be applied to the currently displayed menu.

The context menu can be called from any position using the **MENU** key.



Fig. 10 Context menu

You can find the content-oriented commands in the description for the menu window concerned. The function-oriented commands are listed and described below:

Command	Explanation
Info	Help texts for the respective menu window/menu item
Open	Opens the editor or the selection window for setting the parameters (same effect as pressing the OK key)
Edit	Used to edit a menu item (alternative to the OK key)
Edit Offline	Used to edit a menu item offline; changes are only saved when Submit Changes (context menu) is selected
Submit Changes	Saves changes made offline
Edit Online	Used to edit a menu item online; standard setting which can only be changed by selecting Edit Offline
Function Menu	Not yet implemented
Change User	Used to change the user profile
Logbook	Calls the logbook
System	Not yet implemented
Enter Text	In editor only: For saving entries (alternative to the 'Enter text' command in the editor command line)
Discard	In editor only: For disregarding entries (alternative to the 'Discard' command in the editor command line)
Fix Editor	In numerical editor only: The editor remains open for further editing after entries have been saved or discarded
Live Mode	In numerical editor only: The set numerical value becomes active at once and not just after it is confirmed with the OK key

1.2.4 Changing User ID (Authorization)

Various authorization levels protect against unauthorized access to critical system settings. In local operation via keyboard and display you work by default with the factory preset user ID **Operation** (which authorizes you to make settings that directly affect transmitter operation).

Note *You can change, create or delete user profiles with the aid of the user administration facility, which you call up via the web browser (see section "User Administration").*

From the **Change User** context menu, you can log on in any menu under a different user ID. No password is required to change the user ID under local control (according to the factory default). You can also protect access to the display by entering a password.



Fig. 11 Changing user at display in local operation mode

You can select a user profile by clicking Select user from list.

The following factory-default user profiles are available for local operation:

User profile	Description	Password ^{a)}
Configuration	Authorization to set basic transmitter parameters, e.g. Setup	
Maintenance	Authorization to perform maintenance tasks, e.g. software updates	
Operation	Authorization to make settings that directly affect transmitter operation	
Query	Read-only authorization	
Config-Engl	Authorization to set basic transmitter parameters, e.g. setup; this ID also changes the menu language to English (irrespective of the preset language, e.g. Chinese)	

a) By default the password (factory setting 1234) is needed only for browser-based operation. Every user can change his/her own password via the user administration program.

Note In the event of a power failure, the instrument resets to the Operation authorization level.

Changing user at display without entering a password

In the following example a user profile "Schmidt" has been set up in user administration. The user has obtained authorization for local operation.

1. From the context menu, call the **Change User** command.
2. Use **Select user from list** to select the required user, e.g. **Configuration**, and confirm your choice with **OK**.



You are then locked on again with the rights of your chosen user. The Logon menu is automatically closed after a short while and the display once again shows the menu that was open before the change of user.

Change of user via the display by entering a password (example)

In the following example a user profile "Schmidt" has been set up in user administration. The user has obtained authorization for local control, but must enter a password.

1. From the context menu, call the **Change User** command.
2. Go to **Select user from list** and select the user **Schmidt <pw>**.

The "<pw>" in angle brackets tells you that a password is needed.



3. Select the **Type password** command.



4. Enter the password in the editor.
5. Use the **Logon** command from the context menu to log on.



User "Schmidt" is then logged on:



1.3 Remote Operation and Remote Control

You need a Web browser in order to operate the system from a PC or via remote control.

Note Depending on their rights, logged-on users can monitor the instrument or control all of its functions. There is no difference between PC control and remote control with respect to this functionality.

The instrument contains the network connections for operation by PC or remote control as standard.

1.3.1 Installation and Configuration

Connecting a PC/network

☞ **Remote operation:** Connect a PC to the **X30** interface (**ETHERNET LOCAL**) of the R&S SLx8000 using an RJ-45 cable.

- ☞ **Remote control:** Connect the remote monitoring network to the **X31** interface (**ETHERNET REMOTE**) of the R&S SLx8000 using an RJ-45 cable.

Setting IP addresses at transmitter

To allow the R&S SLx8000 to communicate with a local PC or a remote network client, the IP address of the used Ethernet interface of the transmitter must be in the IP subnet of the PC or remote monitoring network.

You can enter the address data required for communication directly via the SLx8000 display.

Note *Alternatively, you can also adapt the IP address of your PC to the subnet of the transmitter under Windows and retain the factory setting for the local network interface X30 (IP address = 192.168.57.253, network mask = 255.255.255.0). In this case, configure the network address of your PC to, for example, 192.168.57.100/255.255.255.0.*

1. On the instrument display, select the **System Setup > Ethernet** menu.



Fig. 12 Entering IP address data

2. Enter the address data for the local interface **X30** under **Loc.IP Address** and **Loc.Subnet mask**.
3. Enter the address data for the remote-control interface **X31** under **Rem.IP Address** and **Rem.Subnet mask**.

Note *The transmitter must be restarted if the network settings are changed.*

The following requirements must be fulfilled before you can operate the transmitter using your browser:

- Javascript must be activated
- "Java Platform Standard Edition" (min. version 1.5) must be installed and activated.

The next section uses Microsoft Internet Explorer to explain how you can check whether these conditions have been met or what changes you need to make.

Note *Please note that the settings described here need not match your current browser version one hundred percent.*



ATTENTION!

Please note that the modified settings described here may adversely affect the security of your Internet connections.

All necessary changes and settings can be found in the **Tools > Internet Options** menu of your Internet Explorer.

Checking and adapting settings for Java applets:

1. Select the **Security** tab.
2. For the Internet zone, select the **Adapt Level** option.
3. In the tree structure, go to **Scripting > Scripting of Java applets** and select the **Enable** option.

Installing Java (Sun) JRE if necessary; checking and adapting settings

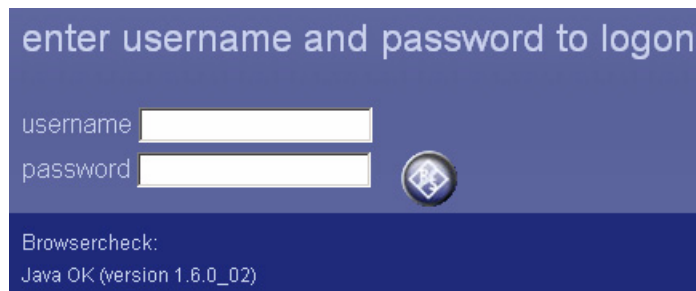
1. Select the **Advanced** tab.
2. Check whether the entry **Java (Sun) JRE ...** is present and enabled.
3. If necessary, download and install (standard installation) the Java Runtime Environment from the Sun website "www.java.com".
4. Then select the Internet Explorer's **Advanced** tab again and check whether the software is installed and enabled.

1.3.2 Login

Note *To be able to operate the instrument via a PC connected locally, the instrument must be set to local mode (press the **LOCAL** key so that the appropriate LED lights up).*

1. Start the browser on your PC or network client.
2. Enter the IP address of the Ethernet interface on the instrument with which you are making contact.

The login screen appears.



3. Enter the desired identification together with the password (see table) and click on the **Logon** button (R&S).

The web GUI opening screen appears.

Note *Logging on in this way starts a new session on the instrument web server.*

Factory-set user IDs

User ID	Authorization	Password
Configuration	Allows you to set basic transmitter parameters; e.g. setup	1234

User ID	Authorization	Password
Maintenance	Allows you to perform maintenance tasks; e.g. software update	1234
Operation	Allows you to make settings that directly affect transmitter operation	1234
Query	Read-only authorization	1234
Guest	Read-only authorization – see Query	1234
Config-Engl	Same as Configuration authorization; this ID also changes the menu language to English (irrespective of the preset language, e.g. Chinese)	1234
Superuser	For configuring, creating and deleting user profiles, and for displaying and deleting active sessions; no authorization for setting transmitter parameters – see Query	1234

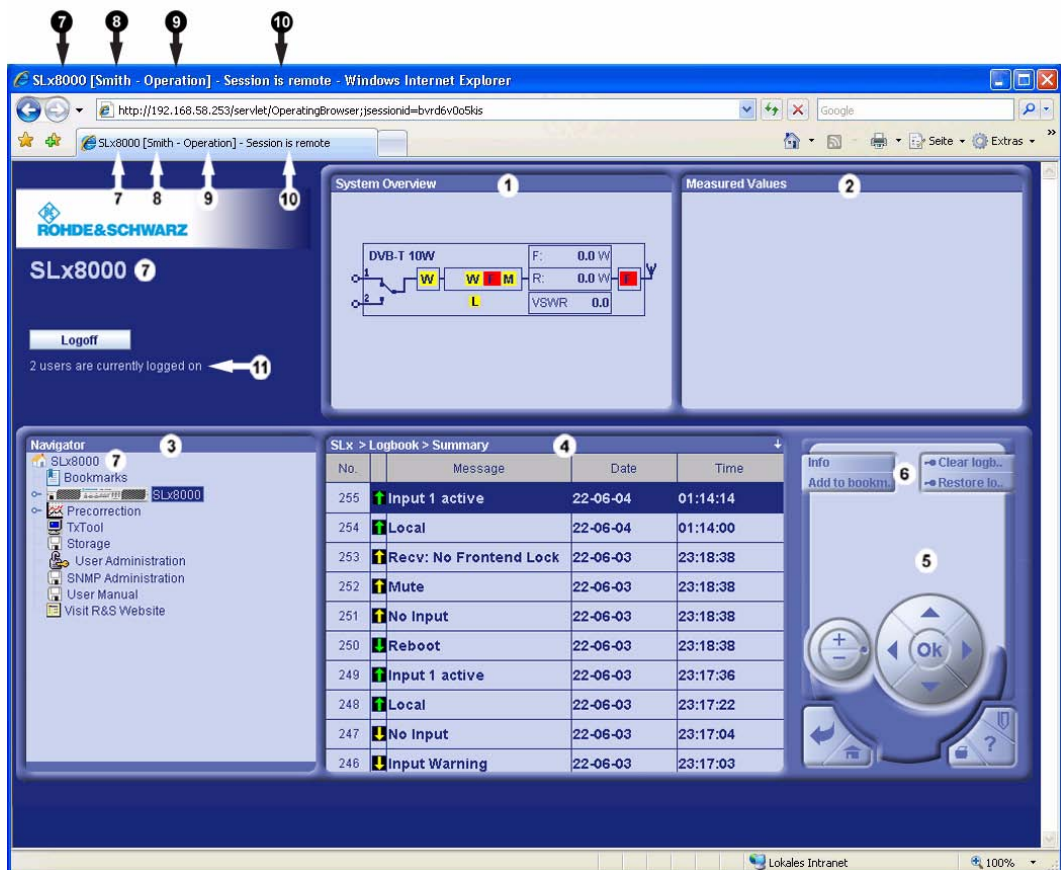
Can't log on?

Logging on can fail for the following reasons:

- Three other users already logged on via the web browser. The maximum permitted number of simultaneous sessions has been reached. On the other hand it is always possible to log on as Superuser.
- Incorrect ID and/or password entered.
After three failed attempts at logging on, the requesting IP address is prevented from logging on for 30 minutes.

1.3.3 Browser-Based Operation

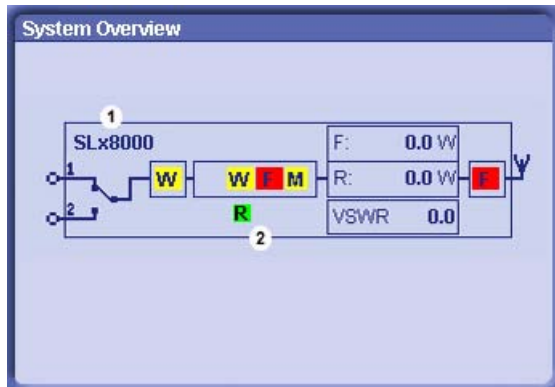
The following entry screen appears after logon:



- 1) System Overview: current transmitter status
- 2) Measure Values: displays the forward and reflected power
- 3) Navigator: display and navigation through the transmitter menus
- 4) Menu window: displays the menus selected in the Navigator
- 5) Control panel: elements for navigating within the menu system and for displaying and editing the menu entries
- 6) Context menu (in the example, the remotely logged-on user cannot execute commands (key symbol) because the instrument is set to local operation)
- 7) Transmitter name (default setting: SLx8000)
- 8) User name (as per login)
- 9) Group assignment (authorization level)
- 10) Session type: "Session is remote" indicates that logon took place via the remote Ethernet interface; "Session is local" indicates that the user logged on via the local Ethernet interface
- 11) Number of users logged on using web browser

System Overview

The **System Overview** window provides an overview showing the current status of the transmitter and its components.



- 1) Transmitter name and TV standard/nominal power displayed alternately
- 2) L/R = local/remote

Measure Values

The current forward power and reflected power are displayed in the **Measure Values** window.



Note The function is to be implemented in a future software release.

Navigator

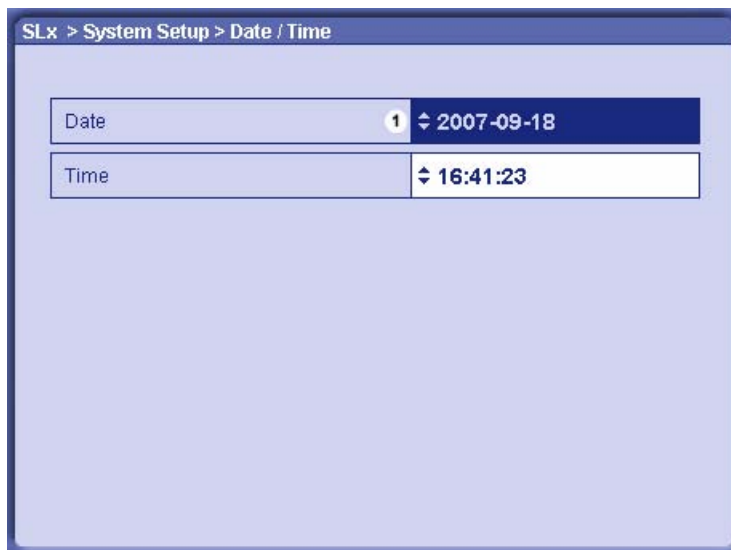
The navigator shows the tree structure of all transmitter menus. You can open the individual folders and menus by double-clicking with the mouse. The selected menus are displayed in the menu window.



- 1) Folder
- 2) Menu

Menu window

The menu window shows the menu selected in the **Navigator** window.



- 1) Double-arrow symbol: Entry can be changed

Control panel

You can use the control panel to navigate within the menu structure and menus and to change settings. You activate the individual control elements using the mouse or keyboard.



- 1) Used for switching between menu entries, for accessing editable values and for entering numeric values; clicking the cursor keys (up/down) increments or decrements a number (corresponds to the cursor keys on the keyboard)
- 2) Used for editing (switch to edit mode) and confirming settings (corresponds to Enter key on the keyboard)
- 3) Corresponds to the UP and DOWN cursor keys
- 4) Used for quickly switching between menu items, for quickly accessing editable values and for quickly entering numeric values; can be rotated using the mouse
- 5) Used to move one step back to the menu last selected; also used to cancel settings that have not yet been confirmed with OK
- 6) Back to Status menu
- 7) Displays the context menus for the current menu window or menu item (standard context menus: Info: help texts and, in the case of menu items, also indicates which user rights are required to allow changes to be made; Open: opens a menu or menu item; Edit: for editing the entry; Edit Offline: item can be edited without the change being applied immediately; Submit Change: submits an item edited offline); see also "Context Menu" under "Local Operation"
- 8) Not enabled in this software version

Locked and variable settings

Depending on the user rights concerned and the type of access (local or remote access) some or all processing parameters can be locked. These include restrictions arising from the actual constellation chosen. An appropriate symbol in front of the parameter value shows whether or not a parameter can be changed at this time.

Symbol	Meaning
	The present user can change the setting. A change takes effect straight away.
	The present user can change the setting. For the setting to take effect, a restart ^{a)} must be carried out.
	The setting cannot be changed at the present time. Possible reasons: – The user does not have the necessary rights. ^{b)} – Access is via the remote port whereas the instrument is in local mode. – Access is local whereas the instrument is in remote mode.
	Setting is not possible in this constellation.

Symbol	Meaning
- none -	This parameter value is for a display; it cannot be set.

- a) To restart, run the Restart command from the System Setup > Tx Type > Transmitter context menu.
- b) The Info command from the context menu gives information on the necessary user rights among other things.

Examples:

Parallel IO	1	↓ disabled
Inhibit Status	2	↕ yes

- 1) Setting can be changed; instrument must, however, be restarted
- 2) Setting can be changed; change becomes effective immediately

- 1) Selected parameter cannot be changed at present (due to insufficient user rights)
- 2) Operation rights are required to change the setting

1.3.3.1 End of Session

Use the **Logoff** button to log off from the system correctly. If you close the browser window without logging off, the session is automatically terminated after two minutes at most.

If the present connection was cut (e.g. because the unit was restarted), a popup window tells you that you need to log on again. Logging on again opens a new session.



1.4 User Administration

The user administration facility is available in conjunction with browser-based operation. The settings that you make in the user administration facility are (provided that no password is required) also valid for menu access via local operation.

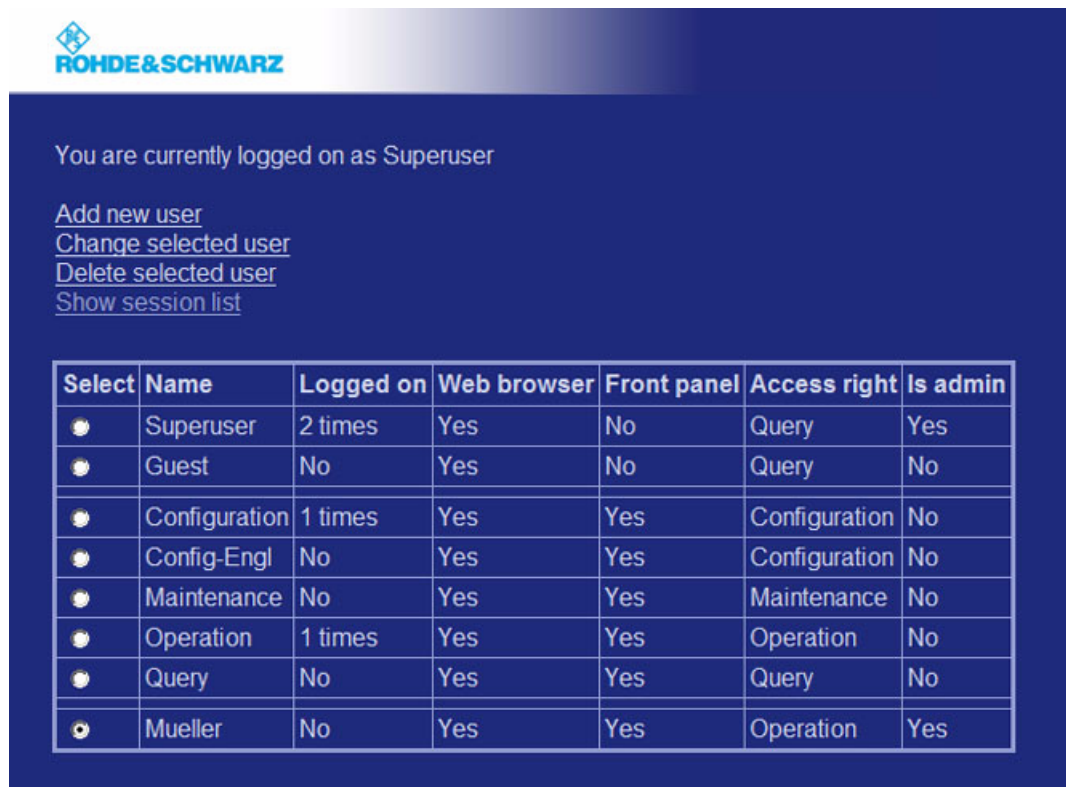
You can use the user administration facility to

- change user profiles (users and access rights)
- create new user profiles
- delete user profiles
- close active sessions

The ID **Superuser** with the factory-set password **1234** gives you extensive user administration rights.

1. Log on as Superuser.
2. Select **User Administration** in the **Navigator** window.

The processing options and a list of existing users are displayed.



The screenshot shows the Rohde & Schwarz logo at the top left. Below it, the text "You are currently logged on as Superuser" is displayed. Underneath, there are four links: "Add new user", "Change selected user", "Delete selected user", and "Show session list". At the bottom, there is a table with the following data:

Select	Name	Logged on	Web browser	Front panel	Access right	Is admin
☒	Superuser	2 times	Yes	No	Query	Yes
☐	Guest	No	Yes	No	Query	No
☐	Configuration	1 times	Yes	Yes	Configuration	No
☐	Config-Engl	No	Yes	Yes	Configuration	No
☐	Maintenance	No	Yes	Yes	Maintenance	No
☐	Operation	1 times	Yes	Yes	Operation	No
☐	Query	No	Yes	Yes	Query	No
☐	Mueller	No	Yes	Yes	Operation	Yes

Display	Meaning
Select	Selects the user to be processed
Name	User ID
Logged on	The user is not logged on (No) or is logged on once/several times (X times) at the system

Display	Meaning
Web browser	The user ID and authorization permit operation via the web browser (Yes, No)
Front panel	The user ID and authorization permit local operation (Yes, No)
Access right	Authorization to access transmitter parameters
Is Admin	Additional user administration authorization (configuration, creation and deletion of user profiles)

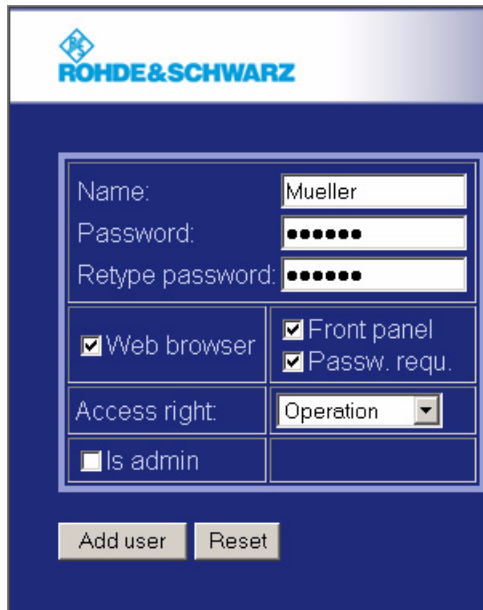
The following users are factory-set. Only the password can be changed for these users.

User ID	Authorization	Password
Configuration	Allows you to set basic transmitter parameters; e.g. setup	1234
Maintenance	Allows you to perform maintenance tasks; e.g. software update	1234
Operation	Allows you to make settings that directly affect transmitter operation	1234
Query	Read-only authorization	1234
Guest	Read-only authorization – see Query	1234
Config-Engl	Same as Configuration authorization; this ID also changes the menu language to English (irrespective of the preset language, e.g. Chinese)	1234
Superuser	For configuring, creating and deleting user profiles, and for displaying and deleting active sessions; no authorization for setting transmitter parameters – see Query	1234

1.4.1 Creating, Changing and Deleting Users

Creating users

1. Select **Add new user**.



2. Create the required user profile.

Entry/selection	Explanation
Name:	User ID (case-sensitive)
Password:	Must be at least 6 characters in length (case-sensitive)
Retype password:	Enter the password again (case-sensitive)
Web browser	The user ID permits menu access via the web browser
Front panel	The user ID permits local operation
Access right	Selects a factory-set authorization level
Is admin	The user is also given user administration rights (configuration, creation and deletion of users; no access to the user profiles Super-user and Guest)

3. Confirm your entries with **Add user**; clicking **Reset** discards your entries.

Changing users

Note *All users have the right to change their own password.*

1. Mark the required user.
2. Select **Change selected user**.


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Name:	Mueller
Password:	*****
Retype password:	*****
☒ Web browser	☒ Front panel
Access right:	Operation
☒ Is admin	

Change user Reset

3. Change the user profile in the way described under "Creating users".
4. Confirm your changes with **Change User**; clicking **Reset** discards your changes.

Deleting users

1. Mark the required user.
2. Select **Delete selected user**.

The user is deleted.

1.4.2 Closing Active Sessions

If you are logged on as Superuser, you can view detailed information on logged-on users and close active sessions.

1. After logging on, select **Show session list**.


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[Delete selected session](#)
[Show user list](#)

Select	User	Type	IP address	Logon time
☒	Superuser	Browser client	127.0.0.1	05.06.2007 13:31:50
☐	configuration	Browser client	127.0.0.1	05.06.2007 13:24:12

2. Mark the session (the user) that you want to close.
3. Select **Delete selected session**.

The marked session is closed.

4. Return to the previous browser window by clicking **Show user list**.

1.5 Monitoring and Control via SNMP

SNMP (Simple Network Management Protocol) is used for monitoring and controlling a wide variety of different units in a network. Detailed information about this topic can be found under <http://www.wikipedia.org/>.

A description of the unit - the MIB (Management Information Base) - must be loaded in the central unit ("manager") from which the transmitters are monitored.

A monitored unit contains a program ("agent") which can answer queries from the manager and execute commands. Furthermore, the agent may of its own accord generate a message and send it to the manager. In this way, the central unit can be informed of a fault.

1.5.1 Installation

The MIBs required for monitoring and controlling a transmitter are stored as a ZIP archive directly in the transmitter control unit and can be downloaded from there using any network-compatible unit. All of the information required for configuration is contained in the MIBs themselves.

When the transmitter is put into operation, both the agent in the transmitter and the manager must be configured. Additional steps may be necessary if the transmitter is connected via routers, firewalls or similar devices as they may block data packets.

- The XX8000 transmitter family supports the versions SNMPv1 and SNMPv2c.
- Alarms can be sent as v1Traps, v2Traps or v2Informs.
- Several destinations can be set for fault messages (alarm sinks).
- Several communities can be set with Read Only authorization and Read/Write authorization.

1.5.1.1 Settings on Transmitter Side

You can make settings yourself via the local display (if available), the web server or SNMP. The menu windows of the **SNMP** menu contain all the settings that are required for accessing a transmitter.

Note Changes to these settings are adopted immediately. The device does not need to be restarted.

... /System Setup/SNMP/ [General]	
◆ Port SET/GET	161
◆ Inhibit Status	Off
◆ Max. not transmitted	255



Note Detailed information about the individual parameters can be found in the descriptions of the respective menu windows.

1.5.1.2 Settings on Manager Side

To be able to monitor and control a transmitter with SNMP, the MIB of the device and a program which can interpret the MIB must be available on the manager side.

You can load all available MIBs from any device using a web browser.

1. Log on using the web browser and select the **SNMP Administration** menu.

MIBs from Rohde&Schwarz and IRT are available. MIBs from IRT allow transmitters to be linked using SNMP irrespective of the manufacturer. They are, however, limited with respect to their functionality. When using IRT MIBs, you can select the "Inhibit Status" for local operation (in the same way as for the parallel contacts). If this function is activated, no alarms/traps are sent when the transmitter is in local mode. You can activate/deactivate this function using **Inhibit Status** in the **SNMP > General** menu window.

The MIBs have the naming convention RS-XX8000-<TV/Radio Standard>-<Standby Concept/Option>-MIB. An example is RS-XX8000-ATV-TX-MIB for signal transmitters for analog TV.

Examples of MIBs and contents:

MIB	Description
RS-COMMON-MIB	Contains general Rohde&Schwarz definitions
RS-XX8000-COM-MON-MIB	Contains definitions which all XX8000 transmitters fulfill (e.g. type plate, configuration)
RS-XX8000-DVB-TX-MIB	Contains definitions for DVB single transmitters, passive exciter standby, active and passive output-stage standby
RS-XX8000-DVB-NP1-MIB	Contains definitions for DVB n+1 systems
RS-XX8000-DVB-NTX-MIB	Contains definitions that an R&S NetCCU800 provides as access for n different, independent DVB transmitters

MIB	Description
RS-XX8000-DVB-TX-REC-MIB	Contains definitions for the optional DVB receiver in a transmitter
RS-XX8000-DVB-NP1-REC-MIB	Contains definitions for the optional DVB receiver(s) in an n+1 system
RS-XX8000-FM-TX-MIB	Contains definitions for FM single transmitters with passive exciter standby and active and passive output-stage standby
RS-XX8000-FM-NP1-MIB	Contains definitions for FM n+1 systems
RS-XX8000-ATV-TX-MIB	Contains definitions for analog TV single transmitters with passive exciter standby and active and passive output-stage standby
RS-XX8000-ATV-NP1-MIB	Contains definitions for analog TV n+1 systems

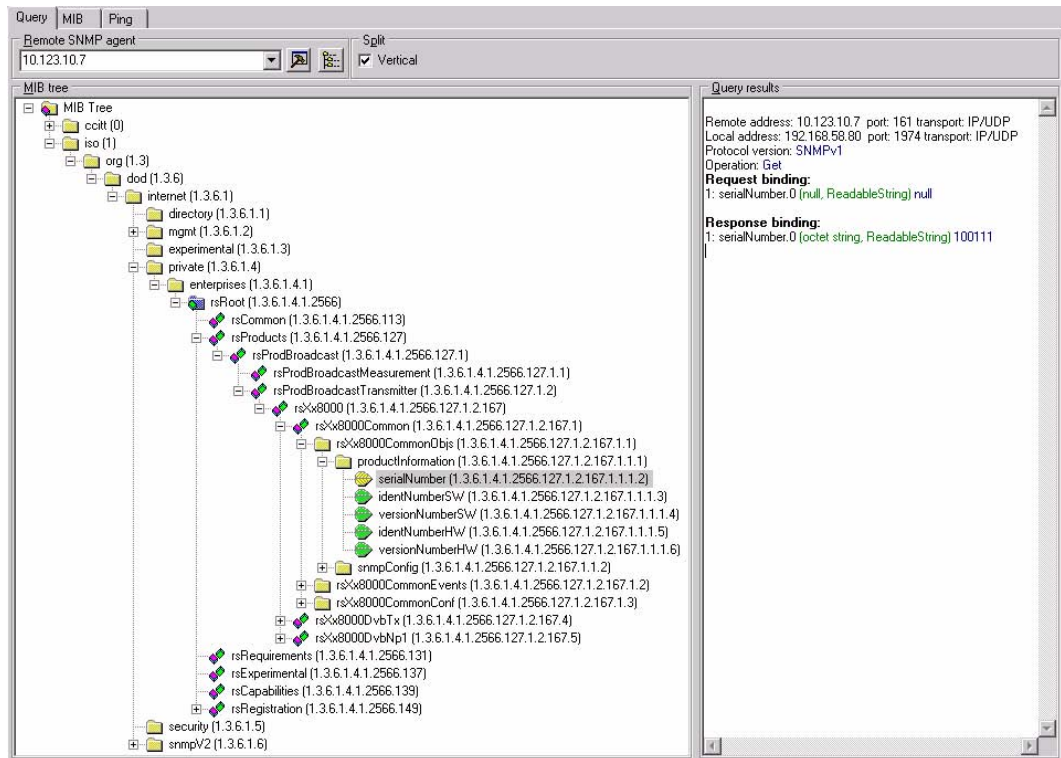
2. Save the required ZIP file to your PC.
3. Load the following MIBs:
 - a) RS-COMMON-MIB
 - b) RS-XX8000-COMMON-MIB
 - c) MIB of the standby concept or option

A detailed description of the MIBs, the information that they contain and the associated options is given below.

1.5.1.3 Testing SNMP Communications

SNMP communication is properly set up if you have loaded the MIBs in your program and you are using the correct IP address of the transmitter and the correct community. For queries and settings you must set the SNMP version in your manager; the transmitters detect the used protocol automatically.

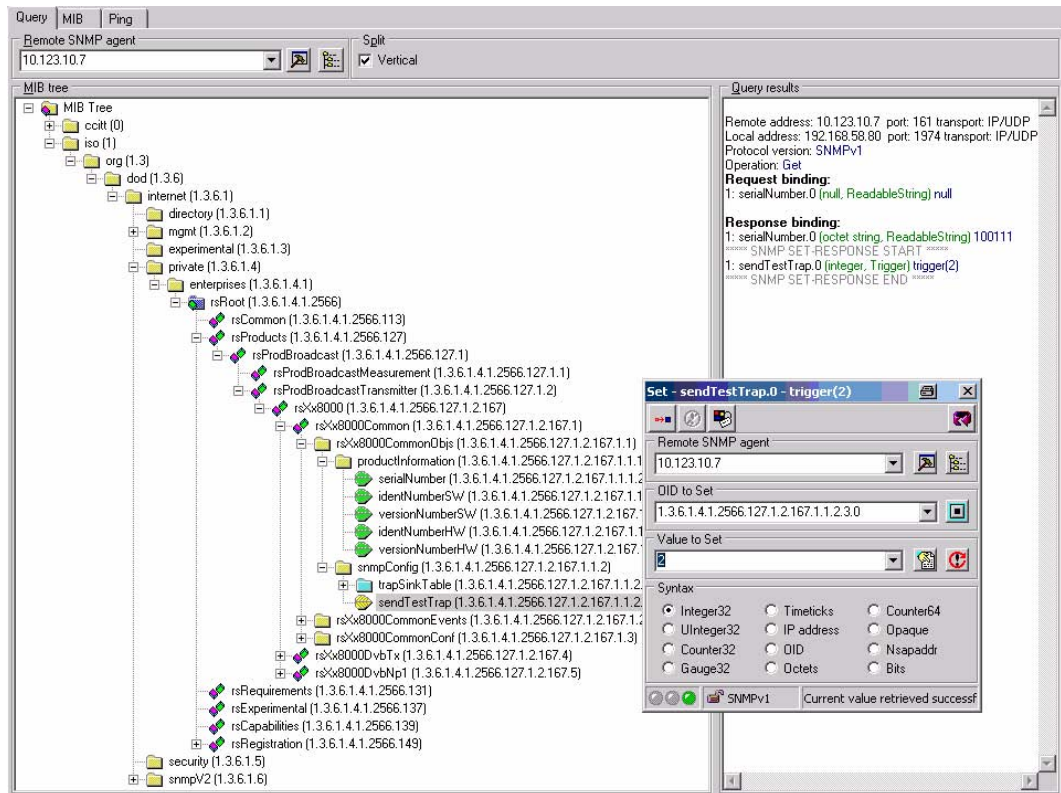
The following query can be used as a simple test:



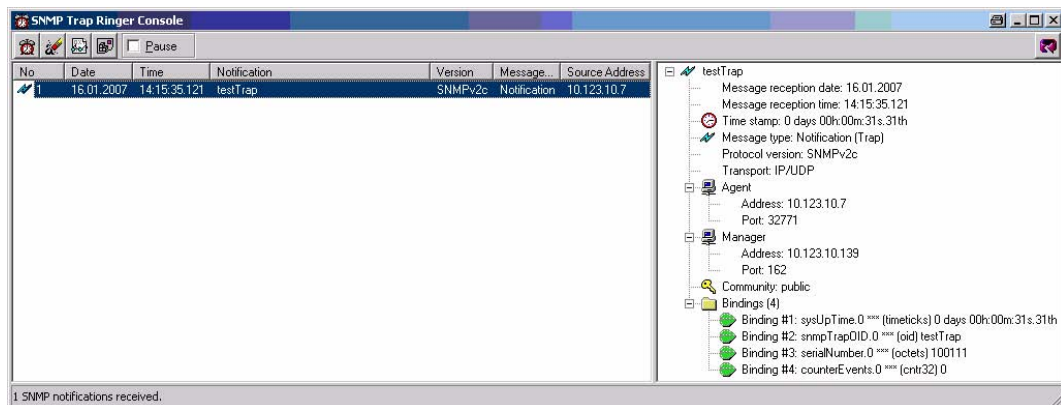
In the example above, a transmitter with the IP address 10.123.10.7 queries the OID (ObjectIdentifier: unique designation of a data point) **serialNumber** (1.3.6.1.4.1.2566.127.1.2.167.1.1.1.2). The reply from the agent is **100111**.

Using a further test, you can check whether the transmitter sends an alarm message in the event of an error and whether this message reaches the alarm destinations. To do so, set an OID **sendTestTrap** (1.3.6.1.4.1.2566.127.1.2.167.1.1.2.3) to the value **2**, which triggers a **testTrap** (1.3.6.1.4.1.2566.127.1.2.167.1.2.0.1). This alarm is sent to all receivers which have been entered for the alarms (Trapsinks, see above).

This type of fault message functions in a slightly different way than that used for querying and setting values (default: UDP Port 161 for SET/GET and UDP Port 162 for alarms).



The following illustration shows that the **testTrap** has been received correctly by the unit with the serial number **100111**.



Known problems

If querying the data does not work or if you do not receive an alarm, check the following:

- Has the network been connected correctly? Does the SNMP connection function exclusively via the remote Ethernet interface of the device (R&S NetCCU800: X5 – **NETLINK**, R&S Sx800/SX801: X2, R&S xLx8000: X32 – **ETHERNET REMOTE**)?
- Are the network settings (IP address, gateway) correct?
- Has the correct Community been entered for accessing the manager and the transmitter (case-sensitive)?
- Is a PC firewall blocking incoming SNMP packets?

- Has the program which receives alarms been started and correctly configured?
- In large networks: Is a router or firewall blocking the SNMP packets?
- Is message suppression (**Inhibit Status** in the **SNMP > General** menu) activated?

1.5.1.4 Configuration

This chapter provides an overview of the available properties.

RS-XX8000-COMMON-MIB

This MIB contains general data that supports every unit:

- type plate: serial number, software version, etc
- SNMP configuration: table for alarm destinations and alarm versions
- triggering of a test trap
- counter for counting the transmitted traps
- list of the alarm messages last transmitted
- parameters which are used in several other MIBs

This information always concerns the unit that is being monitored by means of SNMP, for example the NSU in an n+1 system.

RS-XX8000-DVB-TX-MIB

This MIB contains the parameters for:

- the standby concepts "single transmitter", "passive exciter standby", "active output-stage standby" and "passive output-stage standby"
- all power classes (low-power, medium-power and high-power)
- air-cooled and liquid-cooled transmitters

Different parameters are available depending on the system being queried. For example, **cmdTxOpModeExcAutomatic** (.1.3.6.1.4.1.2566.127.1.2.167.4.1.1.1.7) gives the reply **NoSuchName** if you query a single transmitter since this transmitter does not have an automatic exciter function. It is easy to find out which parameters are valid by checking the "module compliances" (e.g. under .1.3.6.1.4.1.2566.127.1.2.167.4.5.2).

Example: DVB configuration, passive exciter standby, medium power, optional DVB receiver module with two inputs.

Valid MIBs:

- RS-COMMON-MIB
- RS-XX8000-COMMON-MIB
- RS-XX8000-DVB-TX-MIB
- RS-XX8000-DVB-TX-REC-MIB

The valid OIDs for the transmitter are contained in the "Module Compliance" path. The OID contains references to the individual groups.

Name:	rsXx8000DVBDualDriveMP
Type:	MODULE-COMPLIANCE
OID:	1.3.6.1.4.1.2566.127.1.2.167.4.5.2.2
Full path:	iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).rsRoot(2566).rsProducts(127).rsProdBroadcast(1).rsProdBroadcastTransmitte
Module:	RS-XX8000-DVB-TX-MIB
Parent:	rsXx8000DvbTxCompl
Prev sibling:	rsXx8000DVBSingleTxMP
Next sibling:	rsXx8000DVBAActiveReserveMP
Status:	current
Modules:	
1. Module name:	RS-XX8000-DVB-TX-MIB
Mand. groups:	1: groupEvents 2: groupDualDriveMP 3: groupAlarmDualDriveMP
Description:	Reserve concept DualDrive for Medium Power consists of groupDualDrive and groupAlarmDualDrive.

Fig. 13 RS-XX8000-DVB-TX-MIB

- 1) Name and OID for DualDrive MediumPower
- 2) Reference to groupEvents - 1.3.6.1.4.1.2566.127.1.2.167.4.5.1.1
- 3) Reference to groupDualDriveMP - 1.3.6.1.4.1.2566.127.1.2.167.4.5.1.4
- 4) Reference to groupAlarmDualDriveMP - 1.3.6.1.4.1.2566.127.1.2.167.4.5.1.5

Name:	groupDualDriveMP
Type:	OBJECT-GROUP
OID:	1.3.6.1.4.1.2566.127.1.2.167.4.5.1.4
Full path:	iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).rsRoot(2566).rsProducts(127).rsProdBroadcast(1).rsProdBroadcastTransm
Module:	RS-XX8000-DVB-TX-MIB
Parent:	rsXx8000DvbTxGroups
Prev sibling:	groupAlarmSingleTxMP
Next sibling:	groupAlarmDualDriveMP
Status:	current
Objects:	1: cmdTxResetSumFault 2: cmdTxParametersetLoad 3: cmdTxParametersetSave 4: cmdTxParametersetReSave 5: cmdTxOperationModeProgram 6: cmdTxOperationModeReserve 7: cmdTxOpModeExcAutomatic 8: cmdTxPreselectExciter 9: cmdExcOpModeInputAutomatic 10: cmdExcPreselectInput

Fig. 14 List of parameters (excerpt) for groupDualDriveMP

- 1) Name and OID for DualTuner
- 2) Reference to groupDualTuner - 1.3.6.1.4.1.2566.127.1.2.167.2.5.1.3
- 3) groupAlarmDualTuner - 1.3.6.1.4.1.2566.127.1.2.167.2.5.1.5

The groups contain all valid OIDs. The valid OIDs for the receiver module are contained in the "Module Compliance" path of the RS-XX8000-DVB-TX-REC-MIB. The OID contains references to the individual groups. The groups contain all valid OIDs.

RS-XX8000-DVB-NP1-MIB

This MIB contains all the parameters required for any DVB n+1 system, irrespective of the following features of the individual transmitter:

- variant
- power class
- cooling system

Once again, unavailable parameters receive the reply **NoSuchName**, e.g. parameters from the transmitter A8 if only a 4+1 system is available (see module compliances under .1.3.6.1.4.1.2566.127.1.2.167.5.5.2).

Setting alarms

The transmitter-specific alarms offer an extensive range of configuration possibilities.

Depending on the available system, it is possible to set detailed alarms: for example, for every item of status information in every amplifier in every rack of every transmitter in a medium-power n+1 system. In addition, it is also possible to assign a freely selectable priority and to check the current status.

Instance	eventTxId(1, IDX)	eventTxBlk(2, IDX)	eventTxRack(3, IDX)	eventTxAmp(4, IDX)	eventTxName(5, IDX)	eventTxName(6)	eventTxMask(7)	eventTxPriority(8)	eventTxEvent(9)
1.1.1.3.91	Not accessible	Not accessible	Not accessible	Not accessible	Not accessible	txAmpTransistorFault(91)	disable(2)	1	inactive(2)
1.1.1.4.82	Not accessible	Not accessible	Not accessible	Not accessible	Not accessible	txAmpSumFault(82)	disable(2)	1	inactive(2)
1.1.1.4.83	Not accessible	Not accessible	Not accessible	Not accessible	Not accessible	txAmpSumWarning(83)	disable(2)	1	inactive(2)
1.1.1.4.84	Not accessible	Not accessible	Not accessible	Not accessible	Not accessible	txAmpPowerOn(84)	disable(2)	1	active(1)
1.1.1.4.85	Not accessible	Not accessible	Not accessible	Not accessible	Not accessible	txAmpDOH(85)	disable(2)	1	inactive(2)
1.1.1.4.86	Not accessible	Not accessible	Not accessible	Not accessible	Not accessible	txAmpACOH(86)	disable(2)	1	inactive(2)

In the illustration above, the following information is contained in the highlighted row (depending on the used MIB; here: DVB n+1 medium-power system):

Position of code number	Meaning of position	Value	Meaning of value
1	Transmitter	1	Transmitter TxB
2	Output stage	1	Output stage A
3	Transmitter rack	1	Transmitter rack No. 1
4	Amplifier	4	Amplifier No. 4
5	Event	84	Amplifier ON/OFF

Tab. 1 "Instance" column (1.1.1.4.84) in numeric order

Column	Meaning	Value	Explanation
eventTxName(6)	Designation of event	txAmpPowerOn(84)	Amplifier ON/OFF
eventTxMask(7)	Message for event	disable(2)	No alarm is sent
eventTxPriority(8)	Priority for event	Value freely selectable by customer	Default setting when supplied: 1
eventTxEvent(9)	Current status of amplifier	active(1) (inactive(2))	Amplifier ON (Amplifier OFF)

Tab. 2 Meaning of other columns

The columns containing the value **Not accessible** are "index" columns (identified by **IDX**). OIDs of these columns cannot be queried; they are used for internal purposes only.

Example: DVB, N+1, low power

Valid MIBs:

- RS-COMMON-MIB
- RS-XX8000-COMMON-MIB
- RS-XX8000-DVB-NP1-MIB

Valid OIDs in "Module Compliance" path for N+1 low power:

- Name: rsXx8000DVBNplus1LP
- OID: 1.3.6.1.4.1.2566.127.1.2.167.5.5.2.2

Groups:

- groupNsuLP - 1.3.6.1.4.1.2566.127.1.2.167.5.5.1.6
- groupAlarmNsuLP" - 1.3.6.1.4.1.2566.127.1.2.167.5.5.1.7
- groupTxLP - 1.3.6.1.4.1.2566.127.1.2.167.5.5.1.8
- groupAlarmTxLP - 1.3.6.1.4.1.2566.127.1.2.167.5.5.1.9
- groupEvents - 1.3.6.1.4.1.2566.127.1.2.167.5.5.1.5

2 Menu Structure

The transmitter software branches to different navigation areas. The areas SLx, Bookmarks and Parameter Set are also accessible via the SLx8000 display, whereas the other areas are only available using the web browser.

Navigation areas of transmitter software

- SLx
- Bookmarks
- Parameter Set
- Precorrection
- TxTool
- Storage
- User Administration
- SNMP Administration
- User Manual
- Visit R&S website

Note The following description of the menus in the SLx menu tree is based on local operation using the display and menu keys.

Certain menus are only visible if the software option for the respective TV transmission standard is activated.

2.1 SLx Menu Tree



Level 1 >	Level 2 >	Level 3 >	Level 4 >	See section
Status >				
	Device Status			3.2 (DVB) 3.3 (ATV) 3.4 (ATSC)
	Input Status	Input Status		3.5 (DVB only)
Logbook >				
	Summary			4

Level 1 >	Level 2 >	Level 3 >	Level 4 >	See section
	Status			
	Warning			
	Fault			
TV Settings >				
Input >				
		Input Config		5.1
		Receiver / Receiver AUX		
			Setup	5.2.1
			TPS	5.2.2
			Status	5.2.3
		Input Automatic		5.3
		VF ^{a)}		5.4
Sound ^{a)} >				
			Input B G, D K, I, M1	5.5.3
			Input M, N	5.5.4
			Input M, N BTSC	5.5.5
			Input NICAM Mod	5.5.6
			Input NICAM Cod	5.5.7
RF Out >				
		Amplifier		6.1
		Synthesizer		6.2
		Output		6.3
		IQ Adjust		6.4
		Precorrection		6.5
DVB >				
		Common		7.1
		TPS		7.2
		SFN Delay		7.3
		Test Signals		7.5

Level 1 >	Level 2 >	Level 3 >	Level 4 >	See section
		Monitor / Monitor AUX		
			Setup	7.4.1
			TPS	7.4.2
			Status	7.4.3
	ATSC >			
		Common		8.1
	ATV >			
		Common		9.1
		Vision >		
			White Control	9.2.1
			White Limiter	9.2.2
			Sync Pulse	9.2.3
			Equalizer	9.2.4
		Sound >		
			FM Audio Mode	9.3.1
			FM Carrier	9.3.2
			FM Precorrection	9.3.3
			NICAM Audio Mode	9.3.4
			NICAM Carrier	9.3.5
	Reference >			
		Common		10.1
		GPS >		
			Status	10.2.1
			Satellites	10.2.2
System Setup >				
	Ethernet			11.1
	Com-Port			11.2

Level 1 >	Level 2 >	Level 3 >	Level 4 >	See section	
	SNMP >				
		General		11.3.1	
		Manager		11.3.2	
		Alarmsinks		11.3.3	
	Date Time			11.4	
	Option Keys > (web browser only)				
		Status		11.5.1	
		Install		11.5.2	
		Deactivations		11.5.3	
		HW Options		11.5.4	
	Tx Type				
		Transmitter		11.6.1	
		Configuration		11.6.2	
		Time Scheduler		11.6.3	
	Device Info >				
		Device		11.7.1	
		Boards >			11.7.2
			Coder		
			RF Board		
			Amplifier		
			GPS Board		
			Receiver/Monitor AUX		
			Receiver/Monitor		
			Par I/O Board		

a) Only visible if the software option for ATV is activated.

2.2 Bookmarks

The **Bookmarks** menu item leads to a list of bookmarks that you have previously set with the aid of **Add to bookmarks** (context menu).

Each bookmark forms a link to an actual menu window that you can call directly without having to navigate at great length through the menu tree.

2.3 Other Menu Paths (Web Browser Only)

2.3.1 Menu Item "Parameter Set"

Level 1 >	Level 2 >	Level 3 >	Parameter
Parameter Set >			Setting items: – Load settings from – Save settings to – Copy set x to y – Swap set x and y – Parameter Set 1 .. 8 Displays: – Loaded Set – Operation Stat – Current Set Changed

2.3.2 Menu Path "Precorrection"

The navigation area is the interface to the precorrector GUI (integrated software for transmitter precorrection with individual web interface).

Level 1 >	Level 2 >	Level 3 >	Parameter
Precorrection > ^{a)}			Setting items: – Start Precorrector-GUI

a) The precorrector GUI starts as a JAVA applet in its own window.

2.3.3 Menu Item "TxTool"

You can use this menu item to start a separate web application in order to forward logbook or instrument information to the PC. Operation of the TxTool is explained in the section "Saving transmitter information: TxTool menu item".

Level 1 >	Level 2 >	Level 3 >	Parameter
TxTool > ^{a)}			Separate web browser interface

a) When you double-click the menu item, depending on the browser used either a new window or a new tab will open.

2.3.4 Menu Item "Storage"

Level 1 >	Level 2 >	Level 3 >	Parameter
Storage > a)			Setting items: – Save parameter settings into file – Recall parameter settings from file

- a) When you double-click the menu item, depending on the browser used either a new window or a new tab will open.

2.3.5 Menu Item "User Administration"

Level 1 >	Level 2 >	Level 3 >	Parameter
User Administration > a)			Setting items for users with Superuser rights: – Add new user – Change selected user – Delete selected user – Show session list Setting items for all other users: – Change my password Displays: – List of available users

- a) When you double-click the menu item, depending on the browser used either a new window or a new tab will open.

2.3.6 Menu Item "SNMP Administration"

Level 1 >	Level 2 >	Level 3 >	Parameter
SNMP Administration > a)			Setting items: – Please click here to download MIBs (provided by IRT).

- a) When you double-click the menu item, depending on the browser used either a new window or a new tab will open.

2.3.7 Menu Item "User Manual"

Level 1 >	Level 2 >	Level 3 >	Parameter
User Manual > a)			Links to PDF download: – Deutsches Benutzerhandbuch – English User Manual

- a) Clicking the menu item opens a new browser window.

2.3.8 Menu Item "Visit R&S Website"

When you call this menu item the Rohde & Schwarz home page opens in a separate browser window.

3 Status of Transmitter: Status Menu

The **Status** menu provides an overview of faults, warnings and status messages relating to the individual components and functions of the transmitter.

The status displays can vary depending on the set TV standard.

The **Status** menu branches to the following menu windows:

- **Device Status:** Information about the current status of the transmitter (with ATV and ATSC: also information about the status of the ATV and DTV input interfaces)
- **Input Status** (DVB only): Information about the configuration and status of the DTV input interfaces

3.1 Status Displays, Warnings and Fault Messages

When warnings and fault messages occur, this usually means that transmission operation is impaired. Different displays are used to distinguish the severity of an impairment or the "quality" of a defect. The following applies:

	Front panel	Web user interface	
Status display	OK	OK [green]	There is no impairment.
Warning	W	W [yellow]	Although the instrument is functional, it is possible that external influences are disrupting transmission operation.
Error message	F	F [red]	A severe fault has occurred; transmission is usually impossible.

Note This type of "LED" display using abbreviations (OK, W, F, etc.) and color (web browser only) is used throughout the entire menu.

3.2 Status > Device Status (with DVB)

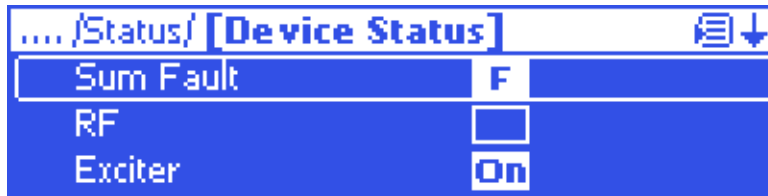


Display	LED	Description
Sum Fault	F	Sum fault message: One or more faults occurred

Display	LED	Description
RF	On	RF level at the exciter output is OK
	F	There is no RF level at the exciter output even though the RF output is enabled
	- OFF -	No RF level at the exciter output since the RF output is not enabled ("manually" disabled)
Exciter	On	RF output of the exciter is enabled There are a number of options for enabling the RF output: – using the setting item RF Output in the RF Out > Output menu – on the front panel of the instrument via the RF ON/OFF key
Loop	OK	RF carrier loop closed
	- OFF -	RF carrier loop not closed
Input	OK	Valid transport stream present on the active input <i>In the case of hierarchical coding, the input is OK if valid transport streams are present at both inputs (for HP stream and LP stream).</i>
	W	Invalid transport stream at the active input (associated with the setting Type of Loss of Input = <i>Warning</i> , see the section "TV Settings > Input > Input Automatic")
	F	Invalid transport stream at the active input (associated with the setting Type of Loss of Input = <i>Fault</i> , see the section "TV Settings > Input > Input Automatic")
FIFO	W	Overflow or underflow of the input buffer due to incorrectly configured DVB transmission parameters. Possible reasons: – incorrect data rate of the input data stream – variations in the input data rate are too great (bursts)
SFN Delay	W	Desired time of transmission in the SFN cannot be complied with. Possible reasons: – the maximum delay set at the MIP inserter is too small for the (current) transmission link – incorrect reference signal (GPS)
Reference	OK	External reference frequency present and OK
	W	External reference frequency not OK
	F	External reference frequency is not OK and the fail delay time set in the TV Settings > Reference > Common menu has expired
	- OFF -	External reference frequency not present, but not actually needed
PPS	OK	External 1 PPS source present and the reference frequency is synchronized with the 1 PPS

Display	LED	Description
	W	External 1 PPS source not present or the reference frequency not synchronized with the 1 PPS
	F	External 1 PPS source is not present or the reference frequency is not synchronized with the 1 PPS, and the fail delay time set in the TV Settings > Reference > Common menu has expired
	- OFF -	External 1 PPS source not present, but not actually needed
Option Key	OK	All necessary software options are enabled
	W	A temporary license code for a software option will expire shortly
	F	One or more necessary software options are not enabled
Sum Warning	W	One or more warnings are active
Self Test	OK	No hardware faults have been detected
	F	Hardware fault has occurred in one or more modules; detailed information about the fault is recorded in the logbook
Temperature	OK	Temperature of the modules is OK
	F	At least one module is overheating
Fan	OK	Fan is OK
	W	A fan has failed; there is a possibility of overheating
	F	Fan(s) has/have failed; there is an acute risk of overheating
Test Signal	W	Transmitter has been switched to test mode
Datarate	W	Wrong data rate on the active input <i>In the case of hierarchical coding, a warning is output if an incorrect data rate is present at one or both inputs.</i>
Mute	W	RF signal is disabled by the signal processing unit in the exciter
MIP fail	W	No MIP at the active input. Possible reasons: – In SFN: no MIP in the input data stream – In MFN: no MIP in the input data stream and the setting TPS Source > MIP has been selected in the TV Settings > DVB > TPS menu window <i>In the case of hierarchical coding, the LED lights up if both inputs (for the HP stream and LP stream) are affected.</i>

3.3 Status > Device Status (with ATV)

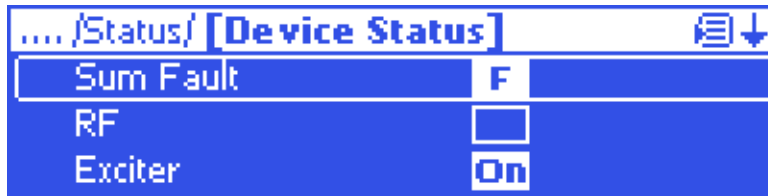


Display	LED	Description
Sum Fault	F	Sum fault message: One or more faults occurred
RF	On	RF level at the exciter output is OK
	F	There is no RF level at the exciter output even though the RF output is enabled
	- OFF -	No RF level at the exciter output since the RF output is not enabled ("manually" disabled)
Exciter	On	RF output of the exciter is enabled There are a number of options for enabling the RF output: – using the setting item RF Output in the RF Out > Output menu – on the front panel of the instrument via the RF ON/OFF key
Loop	OK	RF carrier loop closed
	- OFF -	RF carrier loop not closed
Video In	OK	Valid video signal is present at the input
	W	Invalid video signal at the input
	F	No video signal at the input
Option Key	OK	All necessary software options are enabled
	W	A temporary license code for a software option will expire shortly
	F	One or more necessary software options are not enabled
Sum Warning	W	One or more warnings are active
Test Mode	W	Transmitter has been switched to test mode
HW Error	F	Hardware fault has occurred in one or more modules; detailed information about the fault is recorded in the logbook
Temperature	OK	Temperature of the modules is OK
	F	At least one module is overheating
Fan	OK	Fan is OK

Display	LED	Description
	W	A fan has failed; there is a possibility of overheating
	F	Fan(s) has/have failed; there is an acute risk of overheating

Display	Status	Description
		Displays the set audio mode:
Audio Mode	Mono	Mono
	Stereo	Stereo
	Dual	Dual sound
Carrier 1	Off	Sound carrier 1 is not present in the RF output signal
	Mod Off	Modulation for sound carrier 1 has been switched off in the ATV > Sound > FM Carrier menu
	AF1+2	Carrier is modulated with the signals AF1 and AF2
	BTSC	Carrier is modulated with BTSC
	AF1	Carrier is modulated with the signal AF1
Carrier 2	Off	Sound carrier 2 is not present in the RF output signal
	Mod Off	Modulation for sound carrier 2 has been switched off in the ATV > Sound > FM Carrier menu
	AF1+2	Carrier is modulated with the signals AF1 and AF2
	N/A	Status unknown
	N/A	Status unknown
	AF1	Carrier is modulated with the signal AF1
	AF1-2	Carrier is modulated with the signals AF1 and AF2
	AF2	Carrier is modulated with the signal AF2
	AF1/P	Carrier is modulated with signal AF1 as well as the pilot tone
	AF1-2/P	Carrier is modulated with the signals AF1 and AF2 as well as the pilot tone
	AF2/P	Carrier is modulated with signal AF2 as well as the pilot tone
	N:AF1+0	NICAM carrier is modulated with the signal AF1 only
	N:AF1+2	NICAM carrier is modulated with the signals AF1 and AF2
	N:Digital	Carrier is modulated with a NICAM 728 data stream
	N:PRBS	Carrier is modulated with PRBS

3.4 Status > Device Status (with ATSC)



Display	LED	Description
Sum Fault	F	Sum fault message: One or more faults occurred
RF	On	RF level at the exciter output is OK
	F	There is no RF level at the exciter output even though the RF output is enabled
	- OFF -	No RF level at the exciter output since the RF output is not enabled ("manually" disabled)
Exciter	On	RF output of the exciter is enabled There are a number of options for enabling the RF output: – using the setting item RF Output in the RF Out > Output menu – on the front panel of the instrument via the RF ON/OFF key
Loop	OK	RF carrier loop closed
	- OFF -	RF carrier loop not closed
Input	OK	Valid transport stream present on the active input <i>In the case of hierarchical coding, the input is OK if valid transport streams are present at both inputs (for HP stream and LP stream).</i>
	W	Invalid transport stream at the active input (associated with the setting Type of Loss of Input = <i>Warning</i> , see the section "TV Settings > Input > Input Automatic")
	F	Invalid transport stream at the active input (associated with the setting Type of Loss of Input = <i>Fault</i> , see the section "TV Settings > Input > Input Automatic")
Input [1/2] Connect	OK	Input signal is present at the input TS 1/TS 2
	W	Input signal has not been detected
	- OFF -	Input is not present at the input TS 1/TS 2
Option Key	OK	All necessary software options are enabled
	W	A temporary license code for a software option will expire shortly

Display	LED	Description
	F	One or more necessary software options are not enabled
Reference	OK	External reference frequency present and OK
	W	External reference frequency not OK
	F	External reference frequency is not OK and the fail delay time set in the TV Settings > Reference > Common menu has expired
	- OFF -	External reference frequency not present, but not actually needed
Sum Warning	W	One or more warnings are active
Self Test	F	Hardware fault has occurred in one or more modules; detailed information about the fault is recorded in the logbook
Temperature	OK	Temperature of the modules is OK
	F	At least one module is overheating
Fan	OK	Fan is OK
	W	A fan has failed; there is a possibility of overheating
	F	Fan(s) has/have failed; there is an acute risk of overheating
Active Input	1	TS 1 is currently the active input
	2	TS 2 is currently the active input
Datarate	W	Wrong data rate on the active input
Test Mode	W	Transmitter has been switched to test mode

3.5 Status > Input Status (DVB Only)



Display	LED	Explanation
Automatic Ready		Indicates the status of automatic input signal switchover
	OK	Automatic switchover is switched on and ready to switch over from the preselected input to the standby input as soon as a signal fault occurs at the preselected input
	- OFF -	Automatic switchover is switched off or not ready because switchover to the standby input has taken place and automatic switching back to the operating input is not required (the setting Automatic Ready After Change Over > OFF is selected in the menu TV Settings > Input > Input Automatic)
Automatic changed over	W	Automatic switchover to the standby input has taken place
HP1 Connect	OK	Input signal is present at TS 1
	- OFF -	No input signal present at TS 1
HP1 Seamless		Indicates the status of seamless input switchover for TS 1 (seamless switching) <i>Seamless switching is activated/deactivated using the Seamless Switching switch in the TV Settings > Input > Input Automatic menu window.</i>
	On	Operating input and standby input are synchronized
	- OFF -	Inputs cannot be synchronized
HP1 Preselect	OK	TS 1 is the preselected operating input
	- OFF -	TS 1 is the standby input
HP1 Active	OK	TS 1 is currently the active input
	- OFF -	TS 1 is currently the inactive input
HP1 MIP fail	W	No MIP at input TS 1. Possible reasons: – In SFN: no MIP in the input data stream – In MFN: No MIP in the input data stream and the setting TPS Source > MIP has been selected in the TV Settings > DVB > TPS menu window
	- OFF -	MIP is present
LP1 Connect	OK	Input signal is present at TS 2
	- OFF -	No input signal present at TS 2

Display	LED	Explanation
LP1 Seamless		Indicates the status of seamless input switchover for TS 2 (seamless switching) <i>Seamless switching is activated/deactivated using the Seamless Switching switch in the TV Settings > Input > Input Automatic menu window.</i>
	On	Operating input and standby input are synchronized
	- OFF -	Inputs cannot be synchronized
LP1 Preselect	OK	TS 2 is the preselected operating input
	- OFF -	TS 2 is the standby input
LP1 Active	OK	TS 2 is currently the active input
	- OFF -	TS 2 is currently the inactive input
LP1 MIP fail	W	No MIP at input TS 2. Possible reasons: – In SFN: no MIP in the input data stream – In MFN: No MIP in the input data stream and the setting TPS Source > MIP has been selected in the TV Settings > DVB > TPS menu window
	- OFF -	MIP is present

4 Event Memory: Logbook Menu

The logbook records state changes (events) affecting the instrument.

Menu windows

The **Logbook** menu branches to the following menu windows:

- **Summary**: Complete logbook with all recorded data
- **Status**: Partial logbook with recorded status changes
- **Warning**: Partial logbook with recorded occurrences of warnings
- **Fault**: Partial logbook with recorded occurrences of error messages

4.1 Logbook > Summary/Status/Warning/Fault

.... /Logbook/ [Summary]				
42		Exciter ON		
41		Exciter ON		
40		Local		

The complete logbook and the partial logbooks are uniformly structured. The messages are numbered sequentially and contain the following information:

- Identification for occurrence  or disappearance  of an event
- Message: Brief description of the event
- Time: Time of day of the event
- Date: Date of the event

Date and time of an event in the instrument display

1. To display the date and time, select a message and call the info window by pressing **OK**.

Info: Logbook message no. 9	
Info - Reset at 17:38:02 22.10.07:	
Local	

2. Press **Back** to close the info window and to return to the normal logbook view.

Note The logbooks are sorted according to UTC.

4.2 Logbook Context Menu

Additional context functions are available in the menu windows for the complete logbook and the partial logbooks:

Function	Explanation
Clear logbook	Clears all entries in the current logbook; clearing individual logbook entries is not possible. <i>When you clear the complete logbook, the partial logbooks are also cleared. A Reset Fault is triggered at the same time.</i>
Restore logbook	Restores the cleared entries in the current logbook. <i>When you restore the complete logbook, the partial logbooks are also restored.</i>

5 Input Parameters: TV Settings > Input Menu

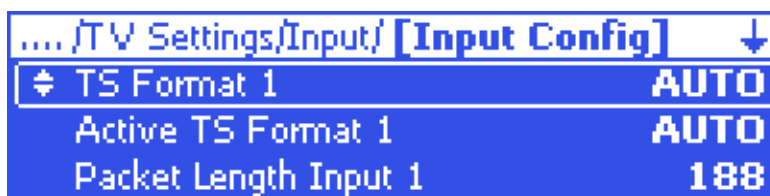
The menu windows in the **TV Settings > Input** menu are used to set the parameters for signal processing in the ADTV coder.

Menu windows/menu paths

The **TV Settings > Input** menu branches to the following menu windows and menu paths:

- **Input Config** (DTV only): Sets signal sources for transport streams 1 and 2 (BNC or Rx feed= DVB-T/H receiver); sets data format of the transport streams and displays data format, packet length and data rate; with hierarchical coding the following applies: TS1 = high priority stream, TS2 = low priority stream
- **Receiver X** or **Receiver AUX** menu path (DVB-T/H only when the DVB-T/H Receiver option is the installed receiver module): Receiver module parameterization and status reporting
- **Input Automatic** (DTV only): Used to preselect the operating input, configure the automatic input switchover and set the behavior in the event of failure of the input signal
- **VF** (ATV only): Used to set the video input
- Menu path **Sound** (ATV only): Used to set audio inputs

5.1 TV Settings > Input > Input Config (DTV only)



Setting item	Description
Source 1	Sets the signal source for transport stream 1 The options are as follows: – BNC: Transport stream 1 is present on the instrument socket for TS1 – Rx: Transport stream 1 comes from the DVB-T/H receiver
TS Format 1	Sets the data format for the data stream at input TS1 The options are as follows: – AUTO: Data format is detected automatically – ASI: Manual setting for an ASI transport stream – SMPTE: Manual setting for an SMPTE transport stream
Source 2	Sets the signal source for transport stream 2 The options are as follows: – BNC: Transport stream 2 is present on the instrument socket for TS2 – Rx: Transport stream 2 comes from the DVB-T/H receiver

Setting item	Description
TS Format 2	Sets the data format for the data stream at input TS2 The options are as follows: – AUTO: Data format is detected automatically – ASI: Manual setting for an ASI transport stream – SMPTE: Manual setting for an SMPTE transport stream

Display	Description
Active TS Format 1	Displays the data format detected or set at input TS1: – ASI: as described – SMPTE: as described – Auto: Auto is selected and no data stream is present
Packet Length 1	Displays the packet length detected at input TS1
Required Data Rate 1	Display for checking the measured data rate. The <i>maximum data processing rate</i> is displayed. Displayed in bits per second (bps)
Measured Data Rate 1	Displays the <i>measured data rate</i> at input TS1 without null packets Displayed in bits per second (bps)
Active TS Format 2	Displays the data format detected or set at input TS2: – ASI: as described – SMPTE: as described – Auto: Auto is selected and no data stream is present
Packet Length 2	Displays the packet length detected at input TS2
Required Data Rate 2	Display for checking the measured data rate. The <i>maximum data processing rate</i> is displayed. Displayed in bits per second (bps)
Measured Data Rate 2	Displays the <i>measured data rate</i> at input TS2 without null packets Displayed in bits per second (bps)

5.1.1 Checking Measured Data Rate

By comparing the displays **Measured Data Rate** and Required Data Rate, it is possible to check that the input buffers (FIFOs) are neither overflowing nor underflowing (both cases would result in transmission interruptions).

Maximum data processing rate in MFN mode

In MFN mode all null packets are first of all removed from the transport stream. The associated useful data rate is measured and displayed under **Measured Data Rate**. Trouble-

free operation is possible provided that this measurement value remains below the value for **Required Data Rate**.

Note *After the useful data rate has been measured, stuffing to the required data rate is performed, i.e. the difference between **Required Data Rate** and **Measured Data Rate** is compensated by inserting null packets.*

Required data rate in SFN mode

In SFN mode the incoming transport stream is passed to processing unchanged. The data rate is measured and displayed under **Measured Data Rate**. Trouble-free operation is possible provided that this measurement value matches the **Required Data Rate** (± 1 bps).

5.2 TV Settings > Input > Receiver / Receiver AUX Submenu (Only DVB-T/-H with Installed DVB-T/-H Receiver Option)

The menu windows in the **TV Settings > Input > Receiver** or **TV Settings > Input > Receiver AUX** menu are used to set the parameters and query the status of an optional receiver module (DVB-T/H Receiver). Separate submenus are available when operating with two receiver modules.

The menu windows

The **Receiver** or Receiver AUX menu branches to the following menu windows:

- **Setup**: For assigning parameters to the receiver module
- **TPS**: Displays the coding parameters (Code Rate, Guard Interval, FFT Length, etc.) detected by the DVB-T/H receiver
- **Status**: Displays the measured values (BER, PER, SNR, etc.) determined by the DVB-T/H receiver

5.2.1 TV Settings > Input > Receiver / Receiver AUX > Setup



Setting item	Description
Enable Hierarchy	Prepares receiver module for hierarchical coding mode <i>Two receiver modules are needed for the Retransmitter function with hierarchy. Module 1 analyzes the HP component in the RF input signal and transfers the associated high priority stream to the exciter. Module 2 (auxiliary) analyzes the LP component and delivers the low priority stream for the exciter.</i>
RF Frequency	Center frequency of the DVB-T/H signal fed to the antenna input of the receiver module.
Bandwidth	Channel bandwidth (6, 7 or 8 MHz)
RF Attenuation Antenna	Manual input attenuation (0 dB to 31 dB) This value should be adapted to suit the expected input level.
BER Threshold	Fault threshold for the bit error ratio (measured after the Viterbi decoder)
PER Threshold	Fault threshold for the packet error ratio

Display	Description
Rx OK	Status reporting for the DVB-T/H receiver: – W: Warning, receiver has no valid input signal – OK: Receiver has a valid input signal

5.2.2 TV Settings > Input > Receiver / Receiver AUX > TPS

If the receiver in the **TV Settings > Input > Receiver** (or **Receiver AUX**) > **Setup** menu displays **OK** in the **Rx OK** field, the DVB-T/H parameters it has determined are listed and valid at this point.



.... /TV Settings/Input/Receiver/ [TPS] ↓	
Hierarchy	off
DVB-Mode	DVB-T
Cell ID	0

5.2.3 TV Settings > Input > Receiver / Receiver AUX > Status

This menu displays the measured values of the associated receiver module.

.../TV Settings/Input/Receiver/ [Status] ↓	
Synchronized	No
Estimated S/N	0 dB
BER before Viterbi	0.000e+00

Display	Description
Synchronized	Shows whether the DVB-T/H receiver was able to synchronize with the incoming DVB-T/H signal.
Estimated S/N	Estimated (!) signal-to-noise ratio at the receiver input The maximum display comes to around 24 dB, even if the actual value is higher.
BER before Viterbi	Bit error ratio before the Viterbi decoder
BER after Viterbi	Bit error ratio after the Viterbi decoder
PER	Packet error ratio
IF AGC Input	Status information about the receiver module's automatic gain control.
RF Input Level	RF input level in dBμV
Gain Input	Status information about the receiver module's automatic gain control.

5.3 TV Settings > Input > Input Automatic (DTV Only)

.../TV Settings/Input/ [Input Automatic] ↓	
⚙ Preselect Input	INPUT 1
⚙ Autoswitch	ON
⚙ Seamless Switching	ON

Setting item	Description
Preselect Input	For preselecting the active input – INPUT 1: Operating input is TS 1. – INPUT 2: Operating input is TS 2.
Autoswitch	Activates and deactivates <i>automatic input switchover</i> In the event of a failure on the active operating input, the automatic system switches the input signal over automatically to the standby input. The automatic switchover mode is defined by the following parameter settings.

Setting item	Description
Seamless Switching (DVB only)	Switches seamless input switchover on or off – ON: In the event of a failure, input switchover takes place without a break in transmission, provided that the data streams are synchronized at the operating and standby inputs. – OFF: The Seaml. Switching function can be deactivated to allow the automatic input switchover to be tested. <i>The function has no effect when automatic input switchover is deactivated.</i>
Priority	– EQUAL: The preselected operating input and standby input have the same priority. Once a switchover has taken place the system does not normally switch back to the previously faulty operating input. – PRIO: The preselected operating input is the priority input. Once a switchover has taken place the system switches back to the preselected operating input as soon as the signal reappears. <i>The function has no effect when seamless switching is active.</i>
Automatic Ready After Change Over	Sets the behavior after switchover to the standby input – ON: The automatic input signal system stays active after every switchover and can return to the formerly perturbed input. – OFF: Switches over to the standby input once. The automatic system must be reset to "ready" manually by pressing the Reset Fault key. The preselected operating input then becomes active again.
Check Time Forward	For setting a delay time (0 to 60 s) which must elapse before the switchover to the standby input takes place in the event of a failure on the operating input <i>The function has no effect when seamless switching is active.</i>
Check Time Back	For setting a delay time (0 to 60 s) which must elapse before switching back to the preselected operating input after switching over from the standby input (which is no longer active) <i>The function has no effect when seamless switching is active and/or the priority mode is set to EQUAL.</i>
On Loss Of Input	For setting the behavior in the event of a defective input signal (synchronization error) – No Mute: The output signal is not suppressed (only effective with MFN) – Mute: The output signal is suppressed if the data rate is incorrect (this feature always applies to SFN)
Type Of Loss Of Input	Selection: – Warning: If the input signal fails, only a warning will be generated. – Fault: If the input signal fails, an additional sum fault will be generated after the time set under Fail Delay Time has elapsed. In the case of transmitter standby, switchover to the second transmitter takes place.
Fail Delay Time	For setting a delay time which must elapse after an input signal dropout before a sum fault is generated.

5.3.1 Automatic Input Switchover

The transmitter has an automatic switchover function which, in the event of a signal failure, switches the transmitter from one input to the other input (provided that a valid input signal is available at the standby input). Before a failure occurs, the preselected input is active.

The way in which this automatic switchover function operates is determined by the following factors:

- Automatic switchover: ON or OFF (**Autoswitch**)
- Delay times which must elapse before the switchover is performed (**Check Time Forward** and **Check Time Back**)
- Priority mode: Inputs have the same priority or the preselected inputs have priority (**Priority**)
- Operating and standby inputs synchronized or not synchronized (in conjunction with **Seamless Switching**)

Note *Automatic input switchover is not available with hierarchical coding.*

Automatic input switchover ON/OFF

If automatic switchover is OFF, the preselected input remains active even if the input signal fails.

If automatic switchover is ON and there is a failure at the preselected input, switchover to the associated standby input takes place.

Priority mode PRIO (input priority)

Following a switchover of the preselected input, the automatic system switches back to this priority input as soon as a signal reappears. Switchover is delayed for the set delay times.

If the signal fails at both the operating input and the standby input, the priority input remains active.

Note *By setting the **Automatic Ready After Change Over** switch position to **OFF** you can prevent an "automatic" return to the dominant input when the signal comes back. The switchover to the dominant input then only takes place when you press the **Reset Fault** key.*

Priority mode EQUAL (equal input priority)

Following a switchover of the preselected input, the standby input with the same priority remains active until the input signal fails on this input also. The automatic system switches back to the preselected input, but only if a signal is present on it once again. Switchover is delayed for the set delay times.

Note *Selecting this operating mode keeps to a minimum the number of switchover operations and in certain cases the number of breaks in transmission (in the case of unsynchronized input streams).*

5.3.2 Behavior with Defective Input Signal

The behavior in the event of a defective input signal can be influenced using the **On Loss Of Input** switch:

- **Mute:** The output signal of the transmitter is suppressed as soon as synchronization with the input signal (from the operating input *and* standby input) is no longer possible.
- **No Mute:** The output signal of the transmitter is not suppressed even though the input signal is defective. However, when this happens only null packets are transmitted.

5.4 TV Settings > Input > VF (ATV Only)



Setting item	Explanation
Nominal Input Amplitude (Vpp)	Used to select the nominal <i>input amplitude</i> , either 0.7 V _{pp} or 1 V _{pp} for 75 Ω in each case

Display	Explanation
Clipping	Indicates the status of input signal clipping; the indications are as follows: – No status display: Input signal is within the valid range (NO CLIPPING) – Yellow: Input signal is just off a limit boundary (NO HEADROOM) – Red: Input signal is limited (CLIPPING)

5.4.1 Input Amplitude

Nominal input amplitude

At the nominal input amplitude, a nominal signal with 30% S and 70% noncomposite components is assumed. All of the percent indications which follow with reference to the amplitude relate to the selected input amplitude and a nominal signal.

Permissible input amplitude

The maximum permissible deviation of the input amplitude from the nominal amplitude is equal to $\pm 50\%$. A smaller input amplitude can result in no vision signal being detected or the quality data not being complied with.

For a larger input amplitude, the input signal can be clipped during analog/digital conversion. This will cause signal components to be lost. Clipping of the input signal is indicated using the **Clipping** status indicator.

In addition, the input signal may have superimposed on it an interference signal with frequencies up to 300 Hz and a peak voltage of a maximum of 30% of the input amplitude as well as white noise that is band-limited to 6 MHz with a maximum level of -26 dBm.

Current input amplitude

The current input amplitude is measured in a selected scanning line in which the white pulse is located. The measured values for the current sync pulse amplitude and the white pulse amplitude can be displayed.

- Selecting the scanning line: see "TV Settings > ATV > Vision > White Control"
- Displaying the measurement values: see "TV Settings > ATV > Vision > Sync Pulse"

5.5 TV Settings > Input > Sound Menu (ATV Only)

The menu windows in the **TV Settings > Input > Sound** menu are used to set the parameters for audio signal processing in the ADTV coder according to the respective standard.

Menu windows

The **TV Settings > Input > Sound** menu branches to the following menu windows:

- **Input B|G, D|K, I, M1:** Used to set the nominal input levels for the AF signals and to adjust the pre-emphasis and low-pass filter
- **Input M, N:** Used to set the nominal input levels for the AF signals and to adjust the pre-emphasis and low-pass filter
- **Input M, N BTSC:** Used to set the nominal input level for the BTSC signal
- **Input NICAM Mod:** Used to set the nominal input levels for the AF signals and to adjust the pre-emphasis and low-pass filter
- **Input NICAM Cod:** Used to set the nominal input levels for the AF signals and to adjust the pre-emphasis (FM and NICAM) and the low-pass filter (FM)

5.5.1 Input Level at Analog Audio Coder

Nominal input level

The nominal input level determines the level of a sinusoidal signal with a frequency of 500 Hz for which the set nominal deviation (see the "FM deviation" section) will occur with the preemphasis switched off.

Permissible input level

The AF inputs may be overdriven by a maximum of +4 dB starting over the nominal input level. In case of higher input levels, the input signal will be clipped by the A/D converter. This will cause certain signal components to be lost.

This clipping helps to avoid overdriving the following units. The threshold is set so that no clipping occurs during normal operation.

5.5.2 Input Level at NICAM Coder

Nominal input level

The nominal input level is determined for a 2 kHz sinewave signal with 0 dBm in accordance with the NICAM specification.

In the case of input levels deviating from the nominal input level, an appropriate gain or loss (negative values) can be set for signals AF1 and AF2 under **Gain Adjustment NICAM**.

Permissible input level

If the input levels are set as described under "Nominal input level", the drive reserves defined in the NICAM specification will be available.

If the drive reserves are exceeded, the input signal will be clipped by the A/D converter. This will cause certain signal components to be lost. This is indicated by the **Input Clipping NICAM** status displays for inputs AF1 and AF2.

5.5.3 TV Settings > Input > Sound > Input B|G, D|K, I, M1



Setting item	Explanation
Nominal Level [AF1 / AF2]	Used to set the <i>nominal input level</i> for the AF signal AF1 or AF2
Preemphasis	Used to switch the pre-emphasis required by the respective TV standard (50 μ s or 75 μ s) on or off for FM sound
Lowpass	Used to switch a low-pass filter on or off for FM sound

Display	Explanation
Current Input Level [AF1 / AF2]	Indicates the current <i>input level at the FM sound modulator</i> for the AF signal AF1 and AF2 as a percentage of the maximum drive level
Input Clipping [AF1 / AF2]	If the AF signal AF1 or AF2 exceeds the maximum permissible <i>input level</i> , the amplitude is limited. This is signaled by the Input Clipping status display.

5.5.4 TV Settings > Input > Sound > Input M, N



.../TV Settings/Input/Sound/ [Input M, N] ↓	
Nominal Level AF1	6.00 dBu
Current Input Level AF1	0.00 %
Input Clipping AF1	☐

Setting item	Explanation
Nominal Level [AF1]	Used to set the <i>nominal input level</i> for the AF signal AF1
Preemphasis	Used to switch the pre-emphasis required by the respective TV standard (50 μ s or 75 μ s) on or off for FM sound
Lowpass	Used to switch a low-pass filter on or off for FM sound

Display	Explanation
Current Input Level [AF1]	Indicates the current <i>input level at the FM sound modulator</i> for the AF signal AF1 as a percentage of the maximum drive level
Input Clipping [AF1]	If the AF signal AF1 exceeds the maximum permissible <i>input level</i> , the amplitude is limited. This is signaled by the Input Clipping status display.

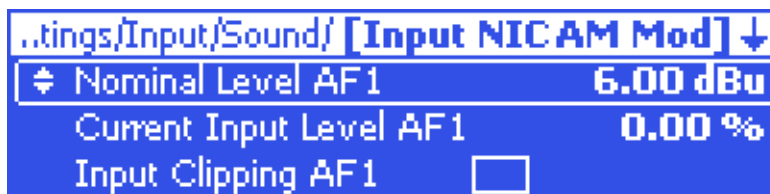
5.5.5 TV Settings > Input > Sound > Input M, N BTSC



Setting item	Explanation
Nominal Level [BTSC]	Used to set the <i>nominal input level</i> for the BTSC signal

Display	Explanation
Current Input Level [BTSC]	Indicates the current <i>input level at the FM sound modulator</i> for the BTSC signal as a percentage of the maximum drive level
Input Clipping [BTSC]	If the BTSC signal exceeds the maximum permissible <i>input level</i> , the amplitude is limited. This is signaled by the Input Clipping status display.

5.5.6 TV Settings > Input > Sound > Input NICAM Mod



Setting item	Explanation
Nominal Level [AF1 / AF2]	Used to set the <i>nominal input level</i> for the AF signal AF1 or AF2
Preemphasis	Used to switch the pre-emphasis required by the respective TV standard (50 µs or 75 µs) on or off for FM sound
Lowpass	Used to switch a low-pass filter on or off for FM sound

Display	Explanation
Current Input Level [AF1 / AF2]	Indicates the current <i>input level at the FM sound modulator</i> for the AF signal AF1 and AF2 as a percentage of the maximum drive level

Display	Explanation
Input Clipping [AF1 / AF2]	If the AF signal AF1 or AF2 exceeds the maximum permissible <i>input level</i> , the amplitude is limited. This is signaled by the Input Clipping status display.
NICAM 728 Datastream	Indicates that a NICAM 728 data stream is present

5.5.7 TV Settings > Input > Sound > Input NICAM Cod

Settings/Input/Sound/ [Input NICAM Cod] ↓	
◆ Nominal Level AF1	6.00 dBu
◆ Gain Adjustment Nicam..	0.00 dB
Current Input Level FM..	0.00 %

Setting item	Explanation
Nominal Level FM/ NICAM [AF1 / AF2]	Used to set the <i>nominal input level</i> for the AF signal AF1 or AF2
Gain Adjustment NICAM [AF1 / AF2]	Used to adapt the nominal input level for the AF signal AF1 or AF2 which is fed to the integrated NICAM coder
Preemphasis [FM]	Used to switch the pre-emphasis required by the respective TV standard (50 µs or 75 µs) on or off for FM sound
Preemphasis [NICAM]	Used to switch the pre-emphasis required by the TV standard on or off for NICAM sound
Lowpass [FM]	Used to switch a low-pass filter on or off for FM sound

Display	Explanation
Current Input Level FM [AF1 / AF2]	Indicates the current <i>input level at the FM sound modulator</i> for the AF signal AF1 and AF2 as a percentage of the maximum drive level
Current Input Level NICAM [AF1 / AF2]	Indicates the current <i>input level at the NICAM coder</i> for the AF signal AF1 and AF2 as a percentage of the maximum drive level
Input Clipping FM [AF1/AF2]	If the AF signal AF1 or AF2 exceeds the maximum permissible <i>input level</i> , the amplitude is limited. This is signaled by the Input Clipping status display.
Input Clipping NICAM [AF1 / AF2]	If the AF signal AF1 or AF2 is amplified beyond the permissible <i>input level at the NICAM coder</i> , the amplitude is limited. This is signaled by the Input Clipping NICAM status display.

6 RF Generation: TV Settings > RF Out Menu

The menu windows in the **TV Settings > RF Out** menu are used to enter settings for output power, frequency generation, modulation and RF monitoring.

Menu windows

The **TV Settings > RF Out** menu branches to the following menu windows:

- **Amplifier:** Used to set and display the output power and to display faults and warnings
- **Synthesizer:** Used to set the channel frequency
- **Output:** Used to enable the RF output, precorrect the amplitude-frequency response of downstream components; with ATV: used to set the sound carrier level and to adjust the residual carrier
- **IQ Adjust:** Used to adjust the modulator
- **Precorrection:** Used to switch the entire linear and nonlinear precorrection on or off

6.1 TV Settings > RF Out > Amplifier

The **Amplifier** menu window is used to adjust and display the power output and to signal a low output power.



Setting item	Description
Output Power ^{a)}	Used to set the required output power of the transmitter (the output power should not exceed the specified nominal power)
RF Fail Limit	Used to set a threshold value in dB for low RF output power. The threshold is referenced to the power output set under Output Power. If the power drops below the set threshold value, an RF Fail fault is generated. <i>Default setting: -3 dB</i>
RF Warning Limit	Used to set a threshold value in dB for low RF output power. The threshold is referenced to the power output set under Output Power. If the power drops below the set threshold value, an RF Warning is generated. <i>Default setting: -1 dB</i>

- a) When the time scheduler is enabled, the appropriate setting from the Time Scheduler Configuration menu has priority.

Display	Symbol	Description
Actual Power Status	OK	Power display is valid
	W	Power display is invalid The internal power meter of an amplifier is overloaded; the actual output power may be above the displayed power.
RF Fail	- OFF -	RF power at the output of the output stage OK or transmitter switched off
	F	RF power is below the threshold specified under RF Fail Limit
Amplifier	OK	No warning at the output stage
	W	Output stage signals a sum warning

Display	Description
Actual Power	Present forward power of the transmitter

6.2 TV Settings > RF Out > Synthesizer



Setting item	Description
Frequency ^{a)}	Used to set the transmission frequency
Frequency Offset	If a frequency offset exists, it is added directly to the transmission frequency (DVB only) The frequency offset transferred in the MIP is addressed to a specific transmitter in the network and is only evaluated if the Tx address set in the TV Settings > DVB > Common menu window identifies the correct receiver. Additionally, to allow display and activation, Tx Automatic must be activated under TV Settings > DVB > Common.

- a) When the time scheduler is enabled, the appropriate setting from the Time Scheduler Configuration menu has priority.

6.3 TV Settings > RF Out > Output



Setting item	Explanation
RF Output	Enables (On) or disables (Off) the RF output
RF Slope	Used to correct asymmetry of the amplitude-frequency response in the spectrum in order to precorrect the output stage and filter
Modulation Slope	Used to correct curvature of the amplitude-frequency response in the spectrum in order to precorrect the output stage and filter
Vision/Sound Carrier 1	Used to set sound carrier level 1 referenced to the peak envelope power of the vision carrier (Analog TV only)
Vision/Sound Carrier 2	Used to set sound carrier level 2 referenced to the peak envelope power of the vision carrier (Analog TV only)
Residual Carrier	Used to set the residual carrier in percent

6.4 TV Settings > RF Out > IQ Adjust

When the transmitter is delivered, the I/Q modulator is factory-adjusted so that no customer intervention is normally required. If further I/Q adjustment is needed at a later time, the **RF OUT > IQ Adjust** menu window provides the associated setting options.

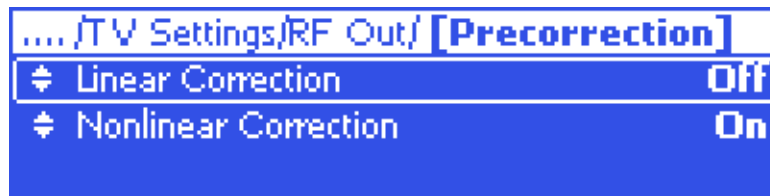
Note The chapter "Maintenance" describes how to perform I/Q adjustment.



Setting item/ Display	Description
I/Q Testsignal	For switching a test signal on or off so that I/Q adjustment can be carried out manually

Setting item/ Display	Description
Bias Coarse [I/Q]	Coarse adjustment and display of an actuator for suppressing the unwanted center carrier
Bias Fine [I/Q]	Fine adjustment and display of an actuator for suppressing the unwanted center carrier
Gain [I/Q]	For setting and displaying an actuator for suppressing the unwanted carrier in the sideband
Phase	For setting and displaying an actuator for suppressing the unwanted carrier in the sideband

6.5 TV Settings > RF Out > Precorrection



Setting item	Description
Linear Correction	For switching the entire linear precorrection on or off
Nonlinear Correction	For switching the entire nonlinear precorrection on or off
Restore Current Setting	Restores the factory set precorrection for the currently set power/frequency
Restore All Settings	Restores complete factory set precorrections for every power/frequency

Display	Description
User Precorrection State	Status of the user set precorrection – Inactive: No matching precorrection data stored in the instrument ^{a)} – Active: Normal status; database used – Warning ^{a)}: The present precorrection has been carried out using the same amplifier type, but the serial number stored in the database does not match. – Fault ^{a)}: The present precorrection has been carried out using a completely different instrument and therefore cannot be used.
Factory Precorrection State	Status of the factory set precorrection <i>Same displays as for User Precorrection State</i>

- a) The status should always be "Active". In every other case the CF card has been tampered with or the factory set pre-correction data has been deleted. In the latter case the instrument must be returned to Rohde & Schwarz Service so that the factory set pre-correction data can be reentered.

7 DVB Settings: TV Settings > DVB Menu

The menu windows in the **TV Settings > DVB** menu are used to (pre)set the DVB transmission parameters required for coding and modulation and to check the used (TPS) settings (TPS = Transmission Parameter Signaling) which are signaled during transmission.

Note *Providing there is a MIP (Megafame Initialization Packet) in the transport stream, TPS information can also be read out and used for configuring the DVB transmission parameters. In this case the signaled parameters may not be the same as the manually preset parameters.*

Menu windows

The **TV Settings > DVB** menu branches to the following menu windows and menu paths:

- **Common:** Used to select the digital TV standard, the network operating mode and the TPS source, to switch Tx Automatic on and off, to signal the cell ID in the TPS, and to set the Tx address
- **TPS:** Used to select the TPS source, to enter (pre)settings manually; displays the active TPS parameters
- **SFN Delay:** For displaying and setting signal delay times in the SFN
- **Test Signals:** Used to configure DVB transmission parameters for test mode

7.1 TV Settings > DVB > Common



Setting item	Explanation
Digital Standard	Used to select the digital TV standard: DVB-T or DVB-H
Network Mode	Used to select the network operating mode: SFN or MFN
TPS Source	Used to set the source for the TPS parameters: MIP or manual presets <i>The TPS source can also be set in the TV Settings > DVB > TPS menu window.</i>
Cell ID Enable	Used to switch cell ID signaling on or off in the TPS The cell ID itself is set in the TV Settings > DVB > TPS menu window. It can also be retrieved from the MIP. The Cell ID can only be retrieved from the MIP if Tx Automatic is activated and the Tx address is correctly set.

Setting item	Explanation
Tx Address	Used to set the transmitter address; address range: 0 to 65535 Setting the transmitter address is a precondition to reading Tx information (transmitter-specific settings) from the MIP. However, the information is only used if Tx Automatic is enabled.
Tx Automatic	Used to switch Tx Automatic on or off If Tx Automatic is activated (and the transmitter address is set), the following Tx parameters are retrieved from the MIP: Time Offset, Frequency Offset and Cell ID
Display	Explanation
Amplifier Control	Indicates the status of amplifier control

7.2 TV Settings > DVB > TPS



Selection of TPS source

The **TPS Source** switch is used to select the source for the TPS parameters:

- **MIP**: The TPS information is to be retrieved from the MIP
- **Manual Presets**: The TPS parameters are to be configured manually

Note *If the system is in MFN mode and the MIP drops out when MIP has been selected as the TPS source, the system continues transmission using the last known MIP values.*

Configuration of TPS parameters

TPS parameters classified as **Manual** can be configured. These manual settings become active if **Manual Presets** is selected as the TPS source.

If **MIP** is selected as the TPS source, the TPS information is retrieved from the MIP. If the MIP fails, the system attempts to continue transmission using the last known configuration. If the instrument is restarted, at least one MIP packet must be received for the configuration to be known.

Displaying active TPS parameters

Active identifies the active (and indicated) TPS parameters. There are also two displays for the required data rates at one or two active inputs (see the section "Checking Measured Data Rate").

If the TPS information from the MIP is used, the values displayed under **Active** may not be the same as the manual settings (**Manual**).

Overview of parameters

Setting item	Explanation
TPS Source	Used to set the source for the TPS parameters: MIP or manual presets

Display/ setting item	Explanation of active or manually set TPS parameters
Bandwidth	Signal bandwidth Display/setting: 5, 6, 7 or 8 MHz
FFT Length	IFFT length Display/setting: 2k or 8k; also 4k for DVB-H
Guard Interval	Guard interval Display/setting: 1/4, 1/8, 1/16 or 1/32
Constellation	Modulation mode Display/setting: QPSK, 16QAM or 64QAM <i>With hierarchical coding</i> , the value refers to the sum of constellation points from HP and LP Stream; possible values are therefore: 16QAM or 64QAM
Alpha	<i>Hierarchical parameter α</i> Display/setting: – No Hier: no hierarchical coding – 1 H: hierarchical coding with $\alpha = 1$ – 2 H: hierarchical coding with $\alpha = 2$ – 3 H: hierarchical coding with $\alpha = 3$ 1 H, 2 H or 3 H activates the hierarchical coding mode. However, this is only possible if Constellation is set to 16QAM or 64QAM.
Cell ID	Cell ID Display/setting: 0x0000 to 0xFFFF The cell ID can only be retrieved from the MIP if Tx Automatic is activated and the Tx address is correctly set in the TV Settings > DVB > Common menu. For the purpose of signaling in the output signal (TPS), the Cell ID Enable parameter must also be activated in the TV Settings > DVB > Common menu.

Display/ setting item	Explanation of active or manually set TPS parameters
Interleaver	Interleaver Display/setting: – nat: Default setting ("native") with standard function for DVB-T – in depth: 8k interleaving for DVB-H with IFFT lengths of 2k and 4k to improve transmission reliability (<i>DVB-H parameter</i>)
Code Rate [HP/LP]	Internal code rate (separate for HP and LP stream) Display/setting: 1/2, 2/3, 3/4, 5/6 or 6/7
Time Slicing [HP/LP]	Time slicing flag (<i>DVB-H parameter</i>) Display/setting separate for HP and LP stream: – OFF: Default setting; no signaling via flag – ON: A flag is set in the broadcast DVB signal. This flag informs the receiver that at least one service in the DVB-H data stream uses time slicing.
MPE FEC [HP/LP]	MPE FEC flag (<i>DVB-H parameter</i>) Display/setting separate for HP and LP stream: – OFF: Default setting; no signaling via flag – ON: This flag informs the receiver that at least one service in the DVB-H data stream uses the forward error correction for MPE (Multi Protocol Encapsulation).
Req. Data Rate [HP/LP]	Displays the data rate required at the input for the currently active TPS settings (see the TV Settings > Input > TS1(HP) menu and the TV Settings > Input > TS2(LP) menu)

7.3 TV Settings > DVB > SFN Delay

All transmitters in a single-frequency network (SFN) must transmit the same information at the same time and at the same frequency (single-frequency condition). A number of delay times occur prior to transmission at the antenna, defining the individual time of transmission at the transmitter station.

The **SFN Delay** menu window can be used to check the individual delay times. This makes it possible to check whether the single-frequency condition is met.



... /TV Settings/DVB/ [SFN Delay] ↓	
Processing Delay	3 100.8 us
⚡ Static Delay	0.0 us
Dynamic Delay	0.0 us

Display	Explanation
Maximum Delay	Time taken for the signal to travel from the playout center (MIP inserter) to the transmitter antenna for regular transmission. This delay is set in the MIP inserter and is the default for all transmitters of the SFN.

Display	Explanation
Network Delay	Time taken for the signal to travel from the playout center (MIP inserter) to the input of the exciter. This delay depends on the used transmission path.
Processing Delay	Minimum turnaround time of the signal by the exciter. This delay depends on the DVB transmission parameters.
Dynamic Delay	Time by which signal processing is delayed artificially in order to achieve the required time of transmission.
Total Delay	Actual turnaround time of the signal by the exciter. This time is the sum of Processing Delay plus Dynamic Delay.
Tx Offset Delay	Positive or negative offset (transferred in the MIP for the individual transmitter location) of the time of transmission relative to the regular time of transmission preset under Maximum Delay. This delay is only displayed and activated if Tx Automatic has been activated and the Tx address of the transmitter is correct. <i>If Tx Offset Delay and Static Delay are present at the same time, their effects are added together.</i>

Setting item	Explanation
Static Delay	Positive or negative offset (set manually for the individual transmitter location) of the time of transmission relative to the regular time of transmission preset under Maximum Delay. The Static Delay is used to compensate differences between transmission systems from different manufacturers. <i>If Static Delay and Tx Offset Delay are present at the same time, their effect is added together.</i>
Max Deviation Time	Maximum deviation in the calculated time of transmission which can be corrected without interrupting transmission. Default setting: 10 µs

7.3.1 Distribution of Delays on Timeline

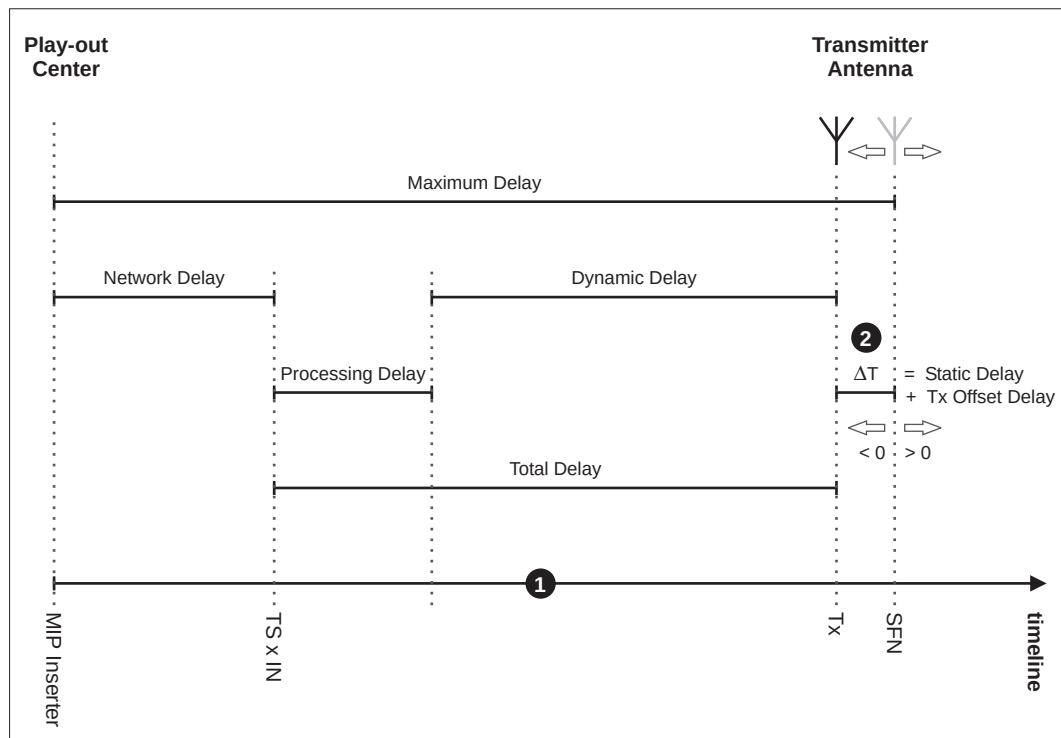


Fig. 15 Delays in SFN

- 1) Timeline showing the defined times for signal insertion (MIP Inserter), signal feed to the exciter (TS x IN), time of transmission at the station (Tx) and regular time of transmission (SFN)
- 2) ΔT = Difference between the individual time of transmission of the station and the regular time of transmission in the SFN; with negative sign in the example

Using the information in the MIP and the measured signal processing time, the microcontroller calculates the dynamic delay for the planned time of transmission.

Note In order to comply with the single-frequency condition, the value of the dynamic delay must be between 0 and 1 second.

7.4 TV Settings > DVB > Monitor / Monitor AUX Submenu (Only DVB-T/-H with Installed DVB-T/-H Monitor Option)

The menu windows in the menu **TV Settings > DVB > Monitor** and **TV Settings > DVB > Monitor AUX** are used to parameterize an optional monitor module and to query its status (DVB-T/-H monitor option). Separate submenus are available in the case of operation with two monitor modules.

Menu windows

The **Monitor** and **Monitor AUX** menus branch to the following menu windows:

- **Setup:** Used to parameterize the monitor module
- **TPS:** Displays the coding parameters detected by the DVB-T/-H monitor (code rate, guard interval, FFT length, ...)
- **Status:** Displays the measurement values determined by the DVB-T/-H monitor (BER, PER, SNR, ...)

7.4.1 TV Settings > DVB > Monitor / Monitor AUX > Setup



Setting item	Explanation
Input	Used to select the signal to be monitored The options are as follows: – Antenna: Signal at the input socket of the monitor module is monitored – Amplifier: Internally tapped signal at the output of the amplifier is monitored
Frequency	Used to set the frequency; displays the frequency according to the position of the Input switch: – Antenna: <i>Entry</i> of the center frequency of the DVB-T/-H signal fed to the monitor module from an external source – Amplifier: Automatic <i>display</i> of the current transmit frequency of the amplifier
Bandwidth	Channel bandwidth (6, 7 or 8 MHz)
RF Attenuation Antenna	Manual input attenuation (0 dB to 31 dB) This value should be adapted to the input level to be expected.
BER Threshold	Fault threshold for the bit error rate (measured downstream of the Viterbi decoder)
PER Threshold	Fault threshold for the packet error rate

Display	Explanation
Rx OK	Indicates the status of the DVB-T/-H monitor: – W: Warning; the monitor module is not receiving a valid input signal – OK: Monitor module is receiving a valid input signal

7.4.2 TV Settings > DVB > Monitor / Monitor AUX > TPS

If the monitor module displays **OK** in the **Rx OK** field in the menu **TV Settings > DVB > Monitor** (or **Monitor AUX**) > **Setup**, the DVB-T/-H parameters that the monitor module has determined are listed here and are valid.

.... /TV Settings/DVB/Monitor/ [TPS] ↓	
Hierarchy	off
DVB-Mode	DVB-T
Cell ID	0

7.4.3 TV Settings > DVB > Monitor / Monitor AUX > Status

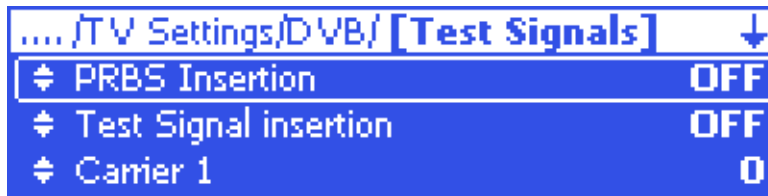
This menu displays the measured values of the associated receiver module.

.... /TV Settings/DVB/Monitor/ [Status] ↓	
Synchronized	No
Estimated S/N	0 dB
BER before Viterbi	0.000e+00

Display	Explanation
Synchronized	Indicates whether the DVB-T/-H monitor was able to synchronize to the received DVB-T/-H signal
Estimated S/N	Estimated (!) signal/noise ratio at the input of the monitor module The maximum displayed value is approx. 24 dB, even if the actual value is better.
BER before Viterbi	Bit error rate upstream of the Viterbi decoder
BER after Viterbi	Bit error rate downstream of the Viterbi decoder
PER	Packet error rate
IF AGC Input	Information about the status of the automatic gain control of the monitor module
RF Input Level	RF input level in dBμV
Gain Input	Information about the status of the automatic gain control of the monitor module

7.5 TV Settings > DVB > Test Signals

The **Test Signals** menu window is used to generate test signals.



Setting item	Description
PRBS Insertion	Insertion of a PRBS sequence instead of the transport stream present at the input Selection: – OFF: Normal operating status, test sequence not active – 2²³-1, 2¹⁵-1 or 2⁹-1: Displayed PRBS sequence selected
Test Signal Insertion	Insertion of unmodulated test carriers or suppression of modulated carrier ranges in the output frequency spectrum Selection: – OFF: Normal operating status, test signal not active – CARRIER 1: Insertion of an unmodulated test carrier at carrier position 1 – CARRIER 2: Insertion of an unmodulated test carrier at carrier position 2 – C1 and C2: Insertion of two unmodulated test carriers at carrier position 1 and carrier position 2 – BANDPASS: Suppression of the modulated carriers from position 0 to carrier position 1 and from carrier position 2 to the end of the frequency spectrum – BANDSTOP: Suppression of the modulated carriers in the range between carrier position 1 and carrier position 2 In the BANDPASS and BANDSTOP functions, the value for carrier 1 must be smaller than the value for carrier 2.
Carrier 1	Sets the position for test carrier 1
Carrier 2	Sets the position for test carrier 2

7.5.1 Arrangement of Test Signals in Output Frequency Spectrum

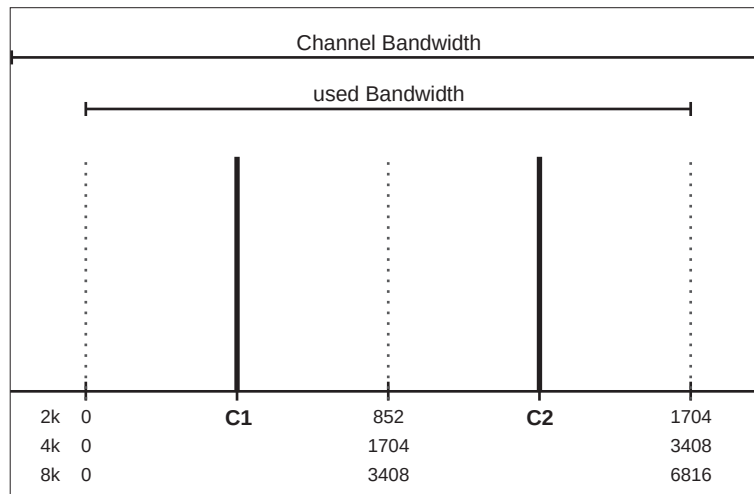


Fig. 16 Test Signal Insertion function | C1 and C2

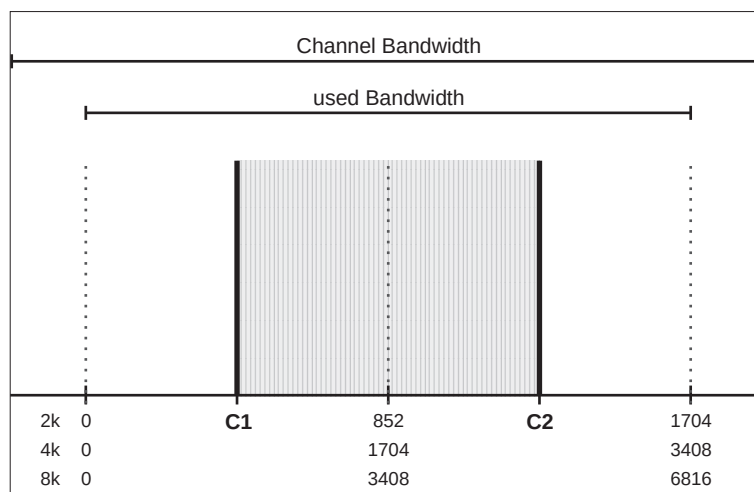


Fig. 17 Test Signal Insertion function | Bandpass

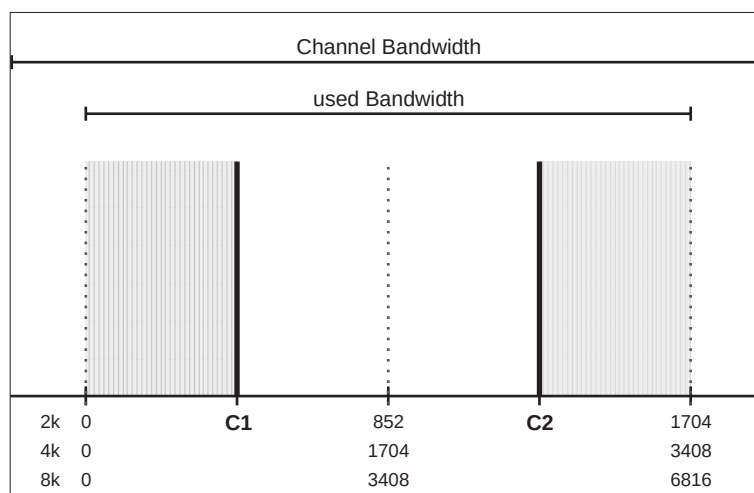


Fig. 18 Test Signal Insertion function | Bandstop

8 ATSC Settings: TV Settings > ATSC Menu

The menu windows in the **TV Settings > ATSC** menu can be used to configure up to two input channels.

Menu windows

The **TV Settings > ATSC** menu branches to the following menu windows:

- **Common:** Status display for amplifier control
- **Input Config:** Used to configure the input data streams; displays the data format, packet length and data rate

8.1 TV Settings > ATSC > Common



Display	Explanation
Amplifier Control	Status display for amplifier control

9 ATV Settings: TV Settings > ATV Menu

The menu windows in the **TV Settings > ATV** menu are used to enter settings for the ADTV coder with analog TV.

Menu windows/menu paths

The **TV Settings > ATV** menu branches to the following menu windows and menu paths:

- **Common**: Used to enter basic settings for signal processing
- **Vision** menu path: Used to set parameters for video signal processing in the ADTV coder
- **Sound** menu path: Used to set parameters for audio signal processing in the ADTV coder

9.1 TV Settings > ATV > Common



Setting item	Explanation
TV Standard	Used to select the ATV standard
IRT-NICAM	Setting: IRT or NICAM (for standards B G, D K, I, I1) – IRT: Second sound subcarrier is frequency-modulated – NICAM: Second sound subcarrier is modulated according to the NICAM specification
NICAM Mode	Used to select the NICAM mode (for standards B G, D K, I, I1): – Coder: AF signal feed of AF1 and AF2 via the inputs AUDIO 1 and AUDIO 2 as well as coding and modulation in the transmitter – Modulator: Signal feed as NICAM 728 data stream via the digital input NICAM DATA
NICAM Rolloff	Used to set the NICAM rolloff (for standards B G, D K, I, I1): – Auto: NICAM rolloff is automatically set according to the selected TV standard and in compliance with the NICAM specifications (<i>recommended setting !</i>) – 40% / 100%: Manual setting of the NICAM rolloff
Sound Select	Used to select the number of sound subcarriers (for standards B G, D K, I, I1, M1): – Single Carrier: One sound subcarrier – Dual Carrier: Two sound subcarriers

Setting item	Explanation
FM Input	Setting: AF 1 or BTSC (for standards M, N) – AF 1: MONO audio mode, signal feed via input AUDIO 1 – BTSC: BTSC audio mode, signal feed via input BTSC

9.2 TV Settings > ATV > Vision Menu

The menu windows in the **TV Settings > ATV > Vision** menu are used to set the parameters for video signal processing.

Menu windows

The **TV Settings > ATV > Vision** menu branches to the following menu windows:

- **White Control:** Used to switch on and adjust white control
- **White Limiter:** Used to switch on and adjust the white limiter
- **Sync Pulse:** Used to switch on and adjust sync-pulse regeneration
- **Equalizer:** Used to switch individual equalizer paths on or off

9.2.1 TV Settings > ATV > Vision > White Control



Setting item	Description
Automatic	Switches <i>white control</i> on or off.
Testline	Selects the test line for the white pulse. The test line can be in the first or second field.
Gain Source	Selection of the source for fixed video gain in case <i>offailure of the white pulse</i> with white control simultaneously switched on. The options are as follows: – MANUAL: For the gain, the manual settings under Manual Gain apply. – MEMORY: The gain uses the most recently saved value for white control.
Manual Gain	Manual setting of the video gain The value which is set is the gain of the actuator as a percentage referred to gain 1.

Display	Description
Memory Gain	Display of the last value saved by the <i>white control</i> which can be used for fixed video gain. The value which is displayed is the gain of the actuator as a percentage referred to gain 1.
Current Gain Source	Display of the active source for the video gain: – Manual: Manual setting (see Gain Source) – Memory: Memory for the white control (see Gain Source) – Automatic: White control
White Amplitude Input	Measured value for the white amplitude input
White Amplitude Output	Measured value for the white amplitude output
White Pulse Monitoring	Status display for the white pulse monitoring: – NONE: The test line with the white pulse was not found – OK: White pulse found and level OK – < -40% / < -30% / > +30% / > +40%: The level of the white pulse deviates from the nominal value by the displayed value.

9.2.2 TV Settings > ATV > Vision > White Limiter



Setting item	Description
Limiter	Switches the <i>white limiter</i> on or off.
Threshold	Sets the threshold for the <i>white limiter</i> .

Display	Description
Limiter Active	Status display for indicating if the white limiter responds.

9.2.3 TV Settings > ATV > Vision > Sync Pulse

.../TV Settings/ATV/Vision/ [Sync Pulse] ↓	
⚙ Regeneration	On
⚙ Sync Amplitude	300 mV
⚙ Sync Monitoring	no H+V

Setting item	Explanation
Regeneration	Used to switch <i>sync-pulse regeneration</i> on or off
Sync Amplitude	Used to set the amplitude of the regenerated sync pulse (with regeneration switched on)

Display	Explanation
Sync Monitoring	Indicates the status of sync-pulse monitoring of the input signal. The following may be displayed: – OK: A standard input signal is being applied – no V: No V-pulse frame detected – no H+V: No V and H-pulse frame detected – too low: Sync-pulse amplitude is less than 50% of the nominal sync-pulse amplitude; the processed signal is, however, available at the encoder output
Sync Amplitude Input	Displays the measured input amplitude [mV] of the sync pulse. If the selected scanning line is not found in the input signal, the measurement value 0 mV is displayed.
Sync Amplitude Output	Displays the measured output amplitude in [mV] of the sync pulse

9.2.4 TV Settings > ATV > Vision > Equalizer

.../TV Settings/ATV/Vision/ [Equalizer]	
⚙ Diplexer	OFF
⚙ Diplexer Peaking	0.1 dB
⚙ Receiver Pre-Equalization	ON

Setting item	Explanation
Diplexer	Used to switch the <i>diplexer pre-equalization</i> (diplexer peaking) on or off

Setting item	Explanation
Diplexer Peaking	Used to set the peaking in the range 0.1 dB to 2.5 dB at the band limit of the upper sideband
Receiver Pre-Equalization	Used to switch the <i>receiver pre-equalization</i> on or off

9.3 TV Settings > ATV > Sound Menu

The menu windows of the **Sound** menu are used to set the parameters for audio signal processing.

Menu windows

The **Sound** menu branches to the following menu windows:

- **FM Audio Mode:** Used to select the audio mode and adjust the pilot tone
- **FM Carrier:** Used to select the operating mode for the FM sound subcarrier, and to set the deviation and deviation limiter for the FM sound subcarrier
- **FM Precorrection:** Used to switch on and adjust the sound phase shifter
- **NICAM Audio Mode:** Used to select the NICAM audio mode
- **NICAM Carrier:** Used to select the operating mode for the NICAM sound subcarrier and to switch the precorrection for the NICAM sound subcarrier on or off

9.3.1 TV Settings > ATV > Sound > FM Audio Mode



..Settings/ATV/Sound/ [FM Audio Mode] ↓	
⚙ Coder Mode	Dual
⚙ Dataline	Line 16
Dataline Info	N/A

Setting item	Description
Coder Mode	Setting of the <i>audio mode</i>. The following settings are possible: Off, Mono, Stereo, Dual and Auto (Dataline). The selected TV standard determines the assignment of the audio inputs to the FM sound subcarriers. The following settings have a special meaning: – Off: Dual sound is set as the audio mode – Auto (Dataline): The audio mode is read from the <i>audio data line</i> in the picture signal.

Setting item	Description
Dataline	Selects the <i>audio data line</i> present in the picture signal; this is necessary for the Coder Mode > Auto setting.
Pilot	Switches the <i>pilot signal</i> on or off; not active in conjunction with NICAM.
Pilot Gain	Sets the level for the <i>pilot signal</i> ; not active in conjunction with NICAM.

Display	Description
Dataline Info	Display of the indication of the <i>audio mode</i> present in the audio data line (N/A means there is no indication in the selected audio data line).
Current Audio Mode	Display of the <i>audio mode</i> that is currently set.
Current Pilot Deviation	Display of the FM deviation for the <i>pilot signal</i> .

9.3.1.1 Audio Mode

The audio inputs are assigned to the sound subcarriers according to the selected TV standard. This assignment is then displayed under **Carrier 1** and **Carrier 2** in the **Status > TV** menu window.

9.3.1.2 Audio Data Line

If "audio data line" is preselected as the source for determining the audio mode and it cannot be found in the picture signal, the manual settings will apply.

9.3.1.3 Pilot Signal

In order to indicate the audio mode, a pilot signal is added to the AF2 signal which modulates sound subcarrier 2.

9.3.2 TV Settings > ATV > Sound > FM Carrier

../TV Settings/ATV/Sound/ [FM Carrier] ↓	
⚙ Carrier1	ON
⚙ AF1 Deviation	30 000 Hz
⚙ Limiter	ON

Setting item	Explanation
Carrier 1/Carrier 2	Used to set the mode for FM sound subcarrier 1 or 2; the following settings are possible: – Carrier OFF: Switches off the sound subcarrier – Modulation OFF: Switches on the sound subcarrier without modulation – ON: Switches on the sound subcarrier with modulation
Nom. Deviation [Carrier 1/Carrier 2]	Used to set the nominal <i>FM deviation</i> for sound subcarrier 1 and 2
Deviation Limiter	Used to switch the deviation limiter for the FM sound subcarrier on or off
Limiter Threshold	Used to set a threshold at which the deviation limiter is triggered
Warning Above	Used to set a threshold at which the deviation limiter warning is activated <i>In most cases, it is recommendable for Limiter Threshold and Warning Above to have the same value.</i>

Display	Explanation
Current Deviation [Carrier 1/Carrier 2]	Indicates the current FM deviation for sound subcarrier 1 and 2
Limitation [Carrier 1/Carrier 2]	Status display which indicates whether the deviation limiter has triggered

9.3.2.1 FM Deviation

Nominal deviation

The nominal deviation determines the FM deviation which arises with the preemphasis switched off if a sinusoidal signal with the frequency of 500 Hz and a level corresponding to the nominal input level (see the "Input level" section) is fed into the AF input.

Suggestions for setting the FM deviation

You can modify the FM deviation by varying the input level (with an unchanged setting for the nominal input level) or by varying the setting for the nominal deviation.

The deviation should never be increased by increasing the input level since this will decrease the drive reserve (see "Permissible input level"), producing a risk of clipping the signal.

Instead, the nominal input level should be set equal to the current input level and the deviation should be increased by increasing the setting for the nominal deviation.

9.3.3 TV Settings > ATV > Sound > FM Precorrection

This window is used to precorrect the phase of the sound subcarrier for combined operation. Precorrection is performed separately for each of the two FM sound subcarriers (Carrier 1 and Carrier 2). Two setting items are defined for each of the two FM sound subcarriers.



Setting item	Description
Precorrection	Switches the <i>sound phase shifter</i> on or off.
Inset Point 1	Determines the position of the 1st inset point referred to the drive of the picture signal.
Slope 1	Determines the sharpness at the 1st inset point.
Inset Point 2	Determines the position of the 2nd inset point referred to the drive of the picture signal.
Slope 2	Determines the sharpness at the 2nd inset point.

9.3.3.1 Sound Phase Shifter

This sound phase shifter modifies the phase of the sound subcarrier as a function of the low-frequency drive of the picture signal in order to precorrect the phase of the sound subcarrier during combined operation.

When the sound phase shifter is switched on, its characteristic curve is determined using two inset points.

The reference for setting the position is initially a value of 37.5% for the rear black shoulder. Smaller values are in the range of the sync pulse. A value of 0% corresponds to a sync pulse amplitude of 500 mV. Larger values are in the picture range. A value of 90% corresponds to picture amplitude of 700 mV.

There is an additional condition that the setting for inset point 1 must always be greater than that of inset point 2. The sharpness of the two inset points is determined by the slope of the characteristic curve at these points. The magnitude of the setting determines the magnitude of the phase shift. A setting of 50% specifies the maximum value. The sign of the setting value determines whether the phase is shifted in the positive or negative direction.

9.3.3.2 Computation of Characteristic Curve

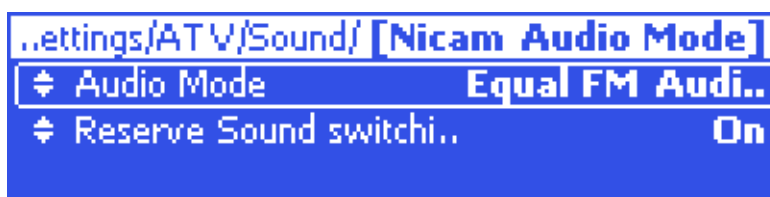
In computing the characteristic curve, it is divided using the two inset points into three linear ranges.

If the picture signal is driven in the range between the two inset points, no phase shift occurs, i.e. a correction phase of 0° is set.

If the picture signal is driven greater than the position of inset point 1, a correction phase not equal to 0° is set. The characteristic curve in this range begins with a correction phase of 0°, for a drive level corresponding to the position of inset point 1, and increases linearly up to the maximum phase set with inset sharpness 1 for drive of the picture signal of 100%.

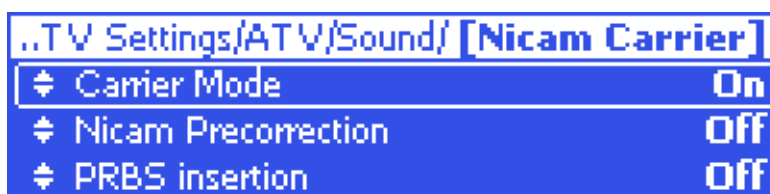
Analogously, for drive of the picture signal which is less than the position of inset point 2, a correction phase not equal to 0° is also set. The characteristic curve in this range begins with a correction phase of 0°, for a drive level corresponding to the position of inset point 2, and increases linearly up to the maximum phase set with inset sharpness 2 for drive of the picture signal of 0%.

9.3.4 TV Settings > ATV > Sound > NICAM Audio Mode



Setting item	Description
Audio Mode	Determines the NICAM audio mode (<i>possible only in the NICAM coder mode</i>): – Equal FM Audio Mode: The NICAM audio mode is oriented towards the FM audio mode. – Mono/Data, Stereo and Dual Sound: These settings determine the NICAM audio mode regardless of the FM channel; the encoding takes place in accordance with the NICAM specifications.
Reserve Sound Switching Flag	This flag can be set (On) or not set (Off); <i>possible only in the NICAM coder mode</i> .

9.3.5 TV Settings > ATV > Sound > NICAM Carrier



Setting item	Explanation
Carrier Mode	Used to set the mode for the NICAM sound subcarrier; the following settings are possible: – Carrier OFF: Switches off the sound subcarrier – Modulation OFF: Switches on the sound subcarrier without modulation – ON: Switches on the sound subcarrier with modulation
NICAM Precorrection	Used to switch the precorrection for the NICAM sound subcarrier on or off; the actual precorrection takes place using the precorrector GUI.
PRBS insertion	Used to activate/deactivate PRBS for the NICAM carrier

10 Reference Sources: TV Settings > Reference Menu

The menu windows in the **TV Settings > Reference** menu are used to select reference sources for stabilizing frequency processing (reference frequency source) and 1 pps sources (e.g. optional internal GPS receiver).

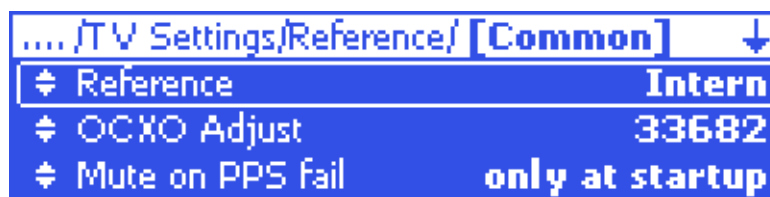
In addition, the behavior of the transmitter if the reference sources for frequency processing and the 1 pps fail can also be set.

Menu windows

The **TV Settings > Reference** menu branches to the following menu windows and menu paths:

- **Common**: Used to select the reference source and adjust the behavior on failure
- **GPS** menu path: Used to set the antenna type; GPS status displays

10.1 TV Settings > Reference > Common



Setting item	Description
Reference	Selects the reference frequency source. The following settings are possible: – Internal: Operation without external reference frequency source – External 5 MHz: Operation with external 5 MHz reference applied – External 10 MHz: Operation with external 10 MHz reference applied – External 1pps: Operation with external time reference (1 pps) – Internal GPS: Operation with optional internal GPS receiver
Monitoring Output	For selecting the signal which will be delivered via the REF OUT monitor socket on the rear panel of the instrument. The following settings are possible: – Off: Monitoring output disabled – 10 MHz: OCXO stabilized 10-MHz frequency – 1 PPS Generated: Internally generated PPS – 1 kHz: 1-kHz signal – 1 PPS Input: – If reference = Internal/external xx: External PPS – If reference = Internal GPS: PPS from GPS receiver
OCXO Adjust	Setting for adjusting the internal OCXO frequency (for "Internal" mode)

Setting item	Description
Mute on PPS Fail	Used to determine the behavior in SFN mode in the event of failure of the external time reference. The following settings are possible: – off: The output signal is not suppressed – only at startup: The output signal is suppressed at startup until a valid 1 pps signal is detected; if the 1 pps signal fails after successful synchronization, the output signal is no longer suppressed – after fail delay time: The output signal is suppressed if the 1 pps signal fails for longer than the period specified under Fail Delay Time. This is the recommended setting for operation in SFN mode.
Mute on Ref. Fail	Used to determine the behavior in SFN and MFN mode in the event of failure of the external reference frequency source. The following settings are possible: – off: The output signal is not suppressed – only at startup: The output signal is suppressed at startup until a valid reference source is detected; if the reference source fails after successful synchronization, the output signal is no longer suppressed – after fail delay time: The output signal is suppressed if the reference source fails for longer than the period specified under Fail Delay Time. This is the recommended setting for operation in SFN mode.
Fail Delay Time	If a reference source fails, the time specified here must elapse before the output signal is suppressed. The setting is effective if "after fail delay time" is set under Mute on PPS Fail or Mute on Ref. Fail. Selection: 0 to 24 hours; 0 hours = no delay time

10.1.1 Reference Frequency Source

The basis for frequency generation is a 10 MHz oven-controlled crystal oscillator (OCXO). This OCXO can be operated in different modes:

"Internal" mode

The OCXO runs in uncontrolled mode.

It obtains its control voltage via a D/A converter which can be set using the **OCXO adjust** setting item. This allows the OCXO frequency applied at the test output **REF OUT (X29, rear panel of the transmitter)** to be adjusted to 10 MHz where necessary.

"External 5 MHz" and "External 10 MHz" modes

The OCXO runs in controlled mode.

Due to the control, the control voltage generated by the D/A converter is adapted on an on-going basis so that the 10 MHz frequency of the OCXO is synchronized with the externally supplied 5 MHz or 10 MHz reference frequency.

"External 1pps" mode

The OCXO runs in controlled mode.

The 10 MHz frequency of the OCXO is synchronized with the external seconds pulse. In this mode, for example, SFN operation is possible without separate feed of a 10 MHz reference.

"Internal GPS" mode

The OCXO runs in controlled mode.

The 10 MHz frequency of the OCXO is synchronized with an optional internal GPS receiver.

10.1.2 Operation in Single-Frequency Network (SFN)

The following settings are permissible for operation in SFN mode:

- External 10 MHz: Requires an external 10-MHz clock and an external PPS
- External 1pps: Requires a feed from an external seconds pulse (PPS pulse)
- Internal GPS: (Possible only if GPS option installed) requires an external GPS antenna to be connected

10.1.3 Holdover Mode (If Reference Frequency Fails)

As soon as a failure of the external reference frequency is detected, the control voltage for the OCXO is no longer modified. The result of this is that the RF generation is now based on the stability of the OCXO.

As soon as the external reference frequency is restored, the control voltage on the OCXO will be controlled again with the externally supplied reference frequency.

10.2 TV Settings > Reference > GPS Submenu

The menu windows in the **TV Settings > Reference > GPS** menu contain information for operation of the internal optional GPS receiver as a frequency and time reference. There is also a setting to allow an active GPS antenna to be supplied with power from the transmitter.

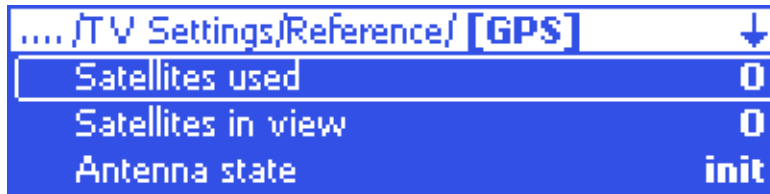
The information on the accuracy of the position and time determination and the number and quality of the received satellites allows the suitability of the antenna location to be assessed. It is therefore used for planning and control purposes.

Menu windows

The **GPS** menu branches to the following menu windows:

- **Status:** Used to set the GPS antenna type; status displays for antenna and satellite reception as well as position and time information together with accuracy
- **Satellites:** Displays the quality and signal/noise ratio of the received satellites

10.2.1 TV Settings > Reference > GPS > Status



Setting item	Description
Active antenna	Used to set the GPS antenna type The following settings are possible: – active: The antenna is supplied with DC voltage (5 V) from the GPS module – passive: The antenna is not supplied with DC voltage from the GPS module <i>Longer cables can be used with active antennas ("active" setting).</i>
Show Position	The switch can be used to suppress the location coordinates display. You need configuration rights in order to change the setting. – yes: Once the GPS receiver can determine its position, precise coordinates are displayed under Latitude and Longitude. – no: Once the position is known, xx° xx.xxxx' is displayed. <i>In the absence of lock (position unknown) this is always displayed as ??° ??.'????' regardless of the switch setting.</i>

Display	Description
Satellites used	Number of satellites currently being used for position and time determination
Satellites in view	Number of satellites currently being received
Antenna state	Status of GPS ANTENNA antenna input (X2) With active antennas, the following may be displayed: – OK: The active antenna is correctly connected – OPEN: No active antenna is connected – SHORT: A short-circuit has been detected at the antenna input – UNKNOWN: The antenna status cannot be determined (standard display when "Antenna type" is set to "passive") <i>The status display is not available for passive antennas.</i>

Display	Description
Latitude	Latitude in WGS84 <i>The computed coordinate is only displayed if Show Position = yes has been set.</i>
Longitude	Longitude in WGS84 The computed coordinate is only displayed if Show Position = yes has been set.
Time Mode	Status display for the current <i>time mode</i> The following displays are possible: – <i>Survey In</i>: The receiver computes its own exact position and accumulates position data for optimum precision. After a power failure, it takes a relatively long time before the receiver has synchronized with the satellites and can deliver a stable reference. – <i>Fixed Mode</i>: The receiver has stored a precise position. After a power failure, the receiver can deliver a stable reference again after a relatively short time.
UTC	Received coordinated universal time (UTC) Display e.g. 12:34:56
Time DOP	Time Dilution of Precision A value < 2 indicates a high degree of precision

10.2.2 TV Settings > Reference > GPS > Satellites

The **Satellites** menu window contains a list of received satellites (Sat ID) showing reception quality and signal/noise ratio. The list is sorted by C/N value (best value at top). The number of lines displayed varies according to the number of visible satellites.

Display	Description
Sat ID	ID for a received satellite
Quality Indicator [ID]	Reception quality for the satellite concerned together with the following classification: – 0: Satellite not visible – 1,2 : Receiver searching for satellite signal – 3: Receiver has detected a satellite signal, but signal is unusable – 4: Receiver has switched to the C/A code (coarse acquisition code) – 5, 6: Receiver has switched to the C/A code and carrier L1 – 7: Receiver can read out satellite data with 50 bps
C/N [ID]	Signal/noise ratio referenced to carrier <i>The value should be at least 35 dB.</i>

11 Basic Settings: System Setup Menu

The menu windows in the **System Setup** menu are used to enter the default settings for transmission mode, signal processing and operating the instrument.

Optional software options can also be activated and the electronic type plates for the instrument can be read out for service purposes.

Menu windows/menu paths

The **System Setup** menu branches to the following menu windows and menu paths:

- **Ethernet**: Used to configure the Ethernet interfaces
- **SNMP** menu path: Used to configure the SNMP connection
- **Date | Time**: Used to enter the current date and time
- **Option Keys** menu path: For activating/deactivating software options; displaying the status of software options; displaying built-in hardware options
- **Tx Type** menu path: For setting TV standards ATV, DVB or ATSC; setting and enabling the time scheduler for multi-standard operating mode; defining special behavior patterns for the parallel remote control interface
- **Device Info** menu path: Displays electronic type plates

11.1 System Setup > Ethernet

The **System Setup > Ethernet** menu window is used to configure the two Ethernet interfaces for operation by PC or network client.



Setting item/display	Explanation
Local Ethernet	The interface X30 (ETHERNET LOCAL) is used to connect the PC or laptop for local operation via a web browser.
IP Address	IP address of the Ethernet interface X30. To allow communication with a connected PC, the address must be in the subnet of the network interface of the PC.
Subnet Mask	Displays the subnet mask of the Ethernet interface X30. To allow communication with a connected PC, the subnet mask must correspond to that of the PC.
MAC	Displays the unique hardware address of the Ethernet interface X30

Setting item/display	Explanation
Remote Ethernet	The interface X31 (ETHERNET REMOTE) is used for connection to a customer-specific remote monitoring system (remote operation).
IP Address	IP address of the Ethernet interface X31. To allow communication with a remote network client, the address must be in the subnet of the remote monitoring system.
Subnet Mask	Subnet mask of the Ethernet interface X31. To allow communication with a remote network client, the subnet mask must correspond to that of the remote monitoring network.
MAC	Displays the unique hardware address of the Ethernet interface X31
Gateway	Used to enter the gateway address (specified by the network administrator)

11.1.1 Preset IP Addresses

The Ethernet interfaces of the instrument are factory-configured as follows:

	IP address	Subnet mask
ETHERNET LOCAL (X30)	192.168.057.253	255.255.255.0
ETHERNET REMOTE (X31)	192.168.058.253	255.255.255.0

11.2 System Setup > Com-Port

The **System Setup > Com-Port** menu window is used to activate and configure external communication via Ethernet or RS-232-C/RS-485 by means of the BitBus or I20x protocol.

Note The instrument described here only supports the BitBus protocol type via Ethernet. The range of functions available in the menu window is therefore limited.

.../System Setup/ [Com-Port]			
Protocol Type		OFF	
Port		8 300	
Checksum		OFF	

Setting item	Explanation
Protocol Type	Used to select the protocol type for external communication – OFF: Communication is deactivated – Bitbus: BitBus protocol is activated – I20x: I20x protocol is activated (via serial interface only)
Port Type	Used to select the port type – TCP: Ethernet remote interface – RS-232-C: D-Sub interface – RS-485: D-Sub interface
Port	Used to select the logical port number for the BitBus communication via Ethernet
Baudrate	Used to set the transmission rate for port type RS-232-C or RS-485
I20x Address	Used to configure the protocol address to Exciter A or Exciter B for port type RS-232-C or RS-485
Checksum	Used to switch CRC-secured transmission on/off <i>The same setting must be made for the recipient of the messages.</i>

Display	Explanation
Connected	ON: Indicates that a connection to the called station exists

Context menu	Explanation
Reconnect	This function is used to set up the connection again after changes have been made to the settings

11.3 System Setup > SNMP Submenu

The operating software of the transmitter has an agent. This agent can communicate with a remote management station that is used for monitoring and remote control via SNMP protocol. The agent is configured in the menu windows of the **System Setup > SNMP** menu.

Menu windows

The **SNMP** menu branches to the following menu windows:

- **General:** Used to set the UDP port for SET/GET and to activate message suppression for local operation mode
- **Manager:** Used to set access protection for communities
- **Alarmsinks:** Used to configure alarm sinks

Note *To be able to use the SNMP functionality of the transmitter, the appropriate software option must be activated.*

11.3.1 SNMP > General Menu Window

... /System Setup/SNMP/ [General]	
Port SET/GET	161
Inhibit Status	Off
Max. not transmitted	255

Function	Explanation
Port SET/GET	UDP port for SNMP SET/GET Default setting: 161
Inhibit Status	Switch for message suppression in Local mode – Off: Traps (alarm messages) are sent in both operating modes (Remote and Local) – On: No traps are sent in Local mode but the alarms are stored; exception: trap for Local Mode Default setting: Off If OIDs are polled with message suppression active, the return value is 0 (undefined). In this operating state, SNMP commands (SET) are not executed but simply confirmed. When the Remote mode is reactivated, all stored alarms are sent once. The polling of OIDs again returns current values.
Max. not transmitted	Number of alarms to be stored if message suppression is active Default setting: 255

11.3.2 SNMP > Manager Menu Window



Function	Explanation
Access Level [1 ... 5]	Used to select access authorization for one of five user groups – Read Only: For GET (only read access to the agent) – Read / Write: For SET (read and write access to the agent)
Community [1 ... 5]	Used to set the SNMP community string (a type of password) for a user group Default setting: "public" for read only (GET) and "broadcast" for read / write (SET) <i>Case-sensitive!</i>
Enable	Used to activate (On) or deactivate (Off) a community <i>The Off setting is used for configuration purposes and for testing.</i>

11.3.3 SNMP > Alarmsinks Menu Window



Function	Description
Alarmsink	Used to select one of 5 alarm sinks for configuration
Enable	Used to activate (On) or deactivate (Off) a selected alarm sink <i>The Off setting is used for configuration purposes and for testing.</i>
IP Address	IP address of the alarm sink to which alarms are to be sent
Port	UDP port for the SNMP alarms Default setting: 162

Function	Description
Alarm Version	SNMP version in which the alarm is to be sent (v1 Trap, v2c Trap)
Community	Used to select the community (access protection) The community set here must also be used on the manager side. A distinction is made between upper-case and lower-case characters. <i>Communities are configured in the SNMP > Manager menu.</i>

11.4 System Setup > Date | Time

The date and precise time are required to make correct logbook entries. This information is supplied by the realtime clock of the instrument. If necessary, the time and date can be corrected in the **System Setup > Date | Time** menu window.



Setting item	Explanation
Date	Used to set the current date
Local Time	Used to set the local time The local time is the time of day or zone time applicable at the station. <i>Unlike universal time (UTC = universal time coordinated), there is a positive offset for time zones east of Greenwich or a negative offset for time zones west of Greenwich. This offset is determined by the time zone and is always a multiple of a full hour or sometimes of a half hour.</i> <i>In some countries, the clock is set forward by 1 hour in summer (daylight saving time). The time offset relative to UTC then changes correspondingly.</i>
UTC Time Offset	Used to enter the time offset between local time and UTC

11.5 System Setup > Option Keys Menu

Certain features of the device are activated using the Option Keys mechanism.

Each available software option can be enabled by installing a valid *activation key*. If a software option is later no longer required, activation can be canceled again by installing a *de-activation key*.

Note *The deactivation mechanism allows software options which are no longer required to be "returned" to Rohde & Schwarz.*

Option keys are available from your local Rohde & Schwarz sales partners.

Installing option keys

Option keys can be installed in two ways:

- Automatic installation of one or more activation keys using the Software Distributor
The procedure is the same as for performing software updates (see the chapter "Maintenance").
- Installation of an option key by means of a web browser
With this method, the option key can be transferred from, for example, a received mail using the copy/paste function.

The second method uses the installation menu **TV Settings > System Setup > Option > Install** described below.

11.5.1 System Setup > Option Keys > Status

The **System Setup > Option Keys > Status** menu window lists the available software options with their respective activation status.

... > System Setup > Option Keys > Status			
K	Name		Validity
K04	DVB-H	OK	
K12	DVB-T	OK	
K13	ATSC-MFN	OK	
K14	ATV	OK	
K15	ATV NICAM	OK	
K02	SNMP	OK	
K16	10 W	OK	
K17	50 W	OK	
K00	Demo	OK	Days left: 159

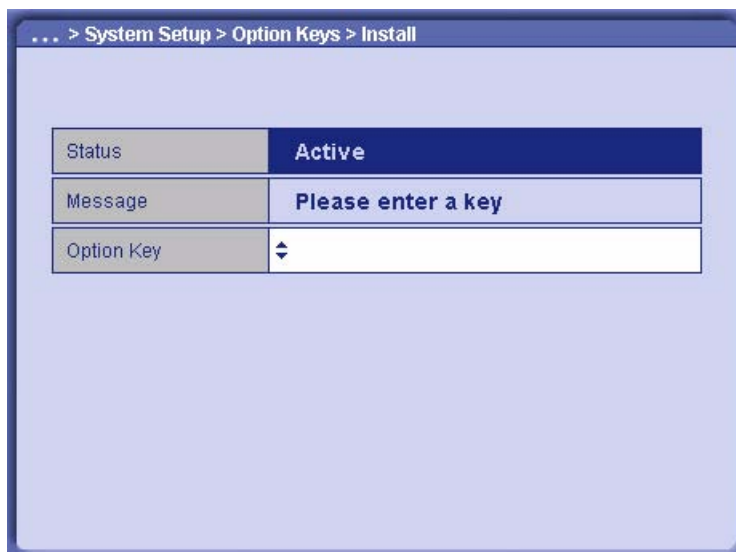
List column	Description
K	The K material number and stock number of the device are used to order an option key to activate a software option from Rohde & Schwarz sales partners.

List column	Description
Name	Name of the software option
—	Status of a software option: – Green (OK): Option has been activated – Gray: Option has not been activated
Validity	Validity period of an installed option key: – Permanent: Option activated for an unlimited period (standard license) – "Expiration date": Option remains activated until the displayed expiration date (e.g. as a test license)

Note *There must be (at least) one software option activated for the TV standard in order for the transmitter to generate an RF signal at the output.*

11.5.2 System Setup > Option Keys > Install

The **System Setup > Option Keys > Install** menu window is used to install option keys manually.



Setting item	Explanation
Option Key	Used to enter a 30-digit code to activate (or deactivate) a software option. Entry of the code is completed with Enter or OK .

Display	Explanation
Status	– Status = OK: The mechanism used to activate/deactivate software options is supported by the hardware. To be able to use a software option, the associated option key must be installed. – No key needed: The mechanism used to activate/deactivate software options is not supported by the hardware. All available software options can be used without installing option keys.
Message	Dialog box with the following messages: – Please enter a key: Prompt to enter a key – Key OK: Key entered successfully (the display changes back to "Please enter a key" after a few moments) – Key deactivated: Deactivation key entered successfully (the display changes back to "Please enter a key" after a few moments) – Invalid format: Invalid key entered

11.5.3 System Setup > Option Keys > Deactivations

The **System Setup > Option Keys > Deactivations** menu window lists software options which were once active, but have been deactivated again using a deactivation key.



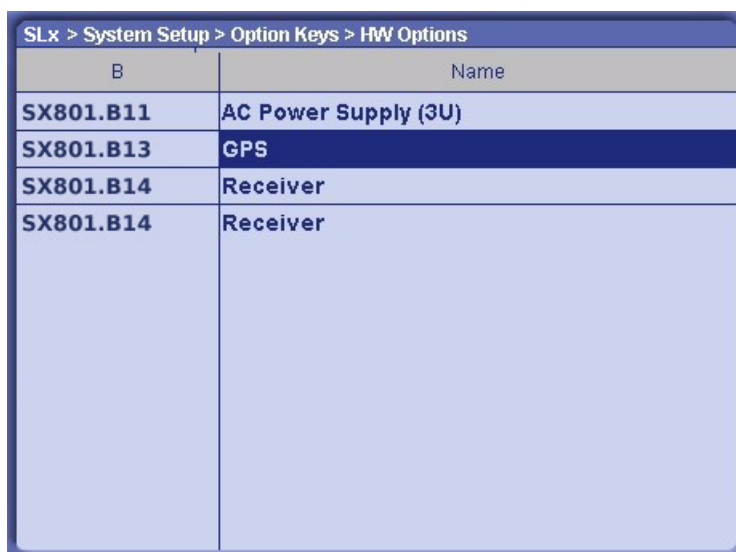
... > System Setup > Option Keys > Deactivations		
K	Name	Response
K04	DVB-H	0A91555059257504F

Column	Explanation
K	The K material number and stock number of the device are used for ordering an option key to activate a software option from Rohde & Schwarz sales partners.
Name	Name of the software option

Column	Explanation
Response	Acknowledgment code as a system response to a deactivation To prove that a software option has been deactivated, the acknowledgment code must be sent to the Rohde & Schwarz sales partner (e.g. by e-mail).

11.5.4 System Setup > Option Keys > HW Options

The **System Setup > Option Keys > HW Options** menu window contains a list of the installed hardware options.



SLx > System Setup > Option Keys > HW Options	
B	Name
SX801.B11	AC Power Supply (3U)
SX801.B13	GPS
SX801.B14	Receiver
SX801.B14	Receiver

List column	Description
B	Abbreviated option number
Name	Name of the hardware option

11.6 System Setup > Tx Type Submenu

Use the **System Setup > Tx Type** submenu to set the TV standard. It also includes a time scheduler for time-controlled transmission using different TV standards (multi-standard operating mode) and further settings that affect the behavior of the parallel remote control interface and the whole system.

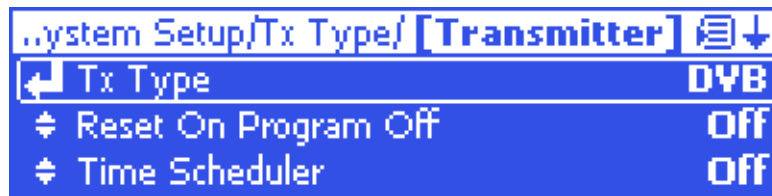
Menu windows

The **Tx Type** menu branches to the following menu windows:

- **Transmitter:** Used to select the TV standard, to activate message suppression for the parallel remote interface, to determine the behavior of the parallel remote interface when switching between analog TV and digital TV, to activate the time scheduler for multistandard operation and to enter the transmitter name
- **Configuration:** Used to select and configure the TV standards for time-controlled switchover
- **Time Scheduler:** Used to define switching times for time-controlled switchover of the standards

11.6.1 System Setup > Tx Type > Transmitter

The **System Setup > Tx Type > Transmitter** menu window is used among other things to set the input interfaces and signal processing the appropriate TV standard. You can also activate a time scheduler for multi-standard operating mode and enter special settings for the parallel remote control interface.



Setting item	Explanation
Tx Type	Used to select the TV standard: ATV, DVB or ATSC The instrument is rebooted automatically when the TV standard is changed. Signal processing is also switched over.
Reset On Program Off	In the ON switch position, a Reset Fault is automatically triggered when the RF output is locked.
Time Scheduler	Used to switch time-controlled tasks planned using the time scheduler on and off
Par I/O DTV setting	The parallel remote interface can be used to switch from ATV to DTV. The switch determines which standard is used for DTV.
Par I/O Inhibit Status	Used to switch message suppression for the parallel remote interface on and off – OFF: Message suppression is not activated; messages carried by the parallel remote interface are also output in local mode – ON: Message suppression is activated; in local mode, no messages are output via the parallel remote interface
Tx Name	Used to enter a transmitter name to make identification easier

11.6.2 System Setup > Tx Type > Configuration

You can use the **System Setup > Tx Type > Configuration** and **System Setup > Tx Type > Time Scheduler** menu windows to define the rules for a time-controlled switchover between individual TV standards.

Using **Configuration**, when you have selected and specified the TV standards you can then send them to the time schedule that you intend to configure.

System Setup/Tx Type/ [Configuration] ↓		
ATV	→ 802 000 000 Hz	250.0 W
DVB	→ 803 000 000 Hz	250.0 W
ATSC	→ 802 000 000 Hz	250.0 W

Column	Description
Tx Std	For selecting the TV standards that have to be taken into account during time-controlled switchover
Frequency	For setting the transmission frequency for the standard concerned
Power	For setting the output power for the standard concerned

Note The values for Frequency and Power, unlike corresponding Synthesizer and Output Stage settings, have priority as soon as the scheduled event is started.

11.6.3 System Setup > Tx Type > Time Scheduler

Time Scheduler is used to define switching times for the required switch between TV standards. Every switchover can be scheduled as an event that takes place once only or daily.

... > System Setup > Tx Type > Time Scheduler			
Event	Start Date	Time	TV Std
↕ Daily	↕ 2008-06-01	↕ 06:00:00	↕ ATV
↕ Daily	↕ 2008-06-01	↕ 23:00:00	↕ DVB
↕ Once	↕ 2011-01-01	↕ 03:00:00	↕ DVB
↕	↕ 2008-11-11	↕ 16:14:23	↕

Column	Description
Event	For defining the event type (selected via the context menu) – Once: The switchover to the defined standard (TV Std column) takes place once only at the chosen point in time (Start Date and Time columns) – Daily: The switchover to the defined standard (TV Std column) takes place each day at the chosen time of day (Time column) and takes place for the first time on the scheduled start date (Start Date column) <i>As soon as the event type has been determined, the system creates another empty event line.</i>
Start Date	For scheduling a date for the switchover to the chosen standard <i>If the event type is Daily, the switchover takes place every day from the start date onward.</i>
Time	For scheduling a time for the switchover to the chosen standard
TV Std	For selecting the TV standard that the system has to switch over to (selected via the context menu) <i>Only standards that have been specified in the Configuration menu window are available for selection.</i>

Example

The example in the above screenshot defines a day-night operating mode. Starting June 1st 2008, analog television is broadcast during the day from 06:00 hours onward, and in the evening the system switches over to digital television at 23:00 hours. From January 1st 2009 at 03:00 in the morning there will be continuous digital transmission only.

11.7 System Setup > Device Info Menu

The menu windows under **System Setup > Device Info** contain the electronic type plates for the instrument as a whole as well as for individual modules or elements:

- Device (complete device)
- Components (modules)
 - Coder
 - RF Board
 - Amplifier
 - GPS Board
 - Receiver/Monitor
 - Receiver AUX / Monitor AUX
 - ParIO board (optional)

The structure of the different type plates is more or less identical. The type plates for the complete device and the coder are shown in the examples.

11.7.1 System Setup > Device Info > Device

... /System Setup/Device Info/ [Device] ↓	
Part Number	2100.1000
Variant	31
Product Index	01.00

Display	Explanation
Part Number	Stock number
Variant	Device variant
Product Index	Product change index
Serial Number	Serial number
Product Date	Date of production
SW/FW/BIOS Number	Stock number of the software, firmware or BIOS
SW/FW/BIOS Version	Version number of the software, firmware or BIOS
Operating hours	Number of operating hours
Power up cycles	Number of times the device has been switched on/off

The information saved here is used for troubleshooting purposes. If servicing is required, this information allows you to precisely identify the device variant.

11.7.2 System Setup > Device Info > Boards > Coder/RF Board/ Amplifier/GPS Board/Receiver/ParIO

..stem Setup/Device Info/Boards/ [Coder] ↓	
Part Number	2095.2709
Variant	10
Product Index	02.04

Display	Explanation
Part Number	Stock number
Variant	Module variant
Product Index	Product change index

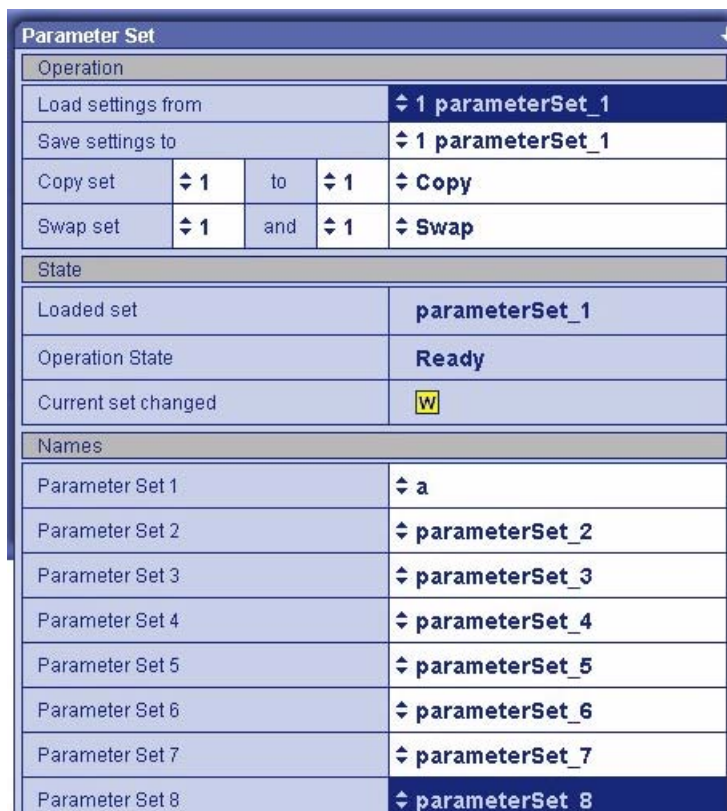
Display	Explanation
Serial Number	Serial number
Product Date	Date of production
BIOS Version	Version number of the BIOS (coder only)
Operating hours	Number of operating hours
Power up cycles	Number of times the device has been switched on/off

The information saved here is used for troubleshooting purposes. If servicing is required, this information allows you to precisely identify the defective component and order a replacement.

12 Other Menus

12.1 Multiple Parameter Sets: Parameter Set Menu

You can use the **Parameter Set** menu window to create, load and save parameter sets for a number of different overall configurations. If the operating environment changes (e.g. change of frequency) you can access complete parameter sets instead of having to set each individual value. You have eight memory locations available in addition to the active memory location (for the parameter set loaded).



Parameter Set				
Operation				
Load settings from		1 parameterSet_1		
Save settings to		1 parameterSet_1		
Copy set	1	to	1	Copy
Swap set	1	and	1	Swap
State				
Loaded set		parameterSet_1		
Operation State		Ready		
Current set changed		W		
Names				
Parameter Set 1		a		
Parameter Set 2		parameterSet_2		
Parameter Set 3		parameterSet_3		
Parameter Set 4		parameterSet_4		
Parameter Set 5		parameterSet_5		
Parameter Set 6		parameterSet_6		
Parameter Set 7		parameterSet_7		
Parameter Set 8		parameterSet_8		

Function	Description
Parameter Set	
Load settings from	For selecting a parameter set as the current parameter set; the currently loaded parameter set acts as an independent copy of the stored parameter set.
Save settings to	For saving the currently active settings to the chosen memory location.
Copy set x to y	For selecting a parameter set x, the content of which you wish to save to another memory location y. To start the copying procedure, select Copy and confirm with OK.
Swap set x and y	For selecting two parameter sets x and y, the content of which you wish to swap. To start the swap procedure, select Swap and confirm with OK.

Function	Description
State	
Loaded Set	Displays the active (i.e. loaded) parameter set
Operation State	Display showing the status of the action that is being carried out (Ready, Loading, Saving, Copying)
Current Set Changed	Yellow: The device settings have been changed and no longer match the settings of the loaded parameter set.
Names	
Parameter Set 1	Name to describe the parameter set (e.g. intended use)
Parameter Set 2	See above
Parameter Set 3	See above
Parameter Set 4	See above
Parameter Set 5	See above
Parameter Set 6	See above
Parameter Set 7	See above
Parameter Set 8	See above

Settings that are not saved in parameter sets

Certain parameter settings that are valid only for the individual device, and a few other settings, are not saved. This includes:

- Instrument-specific parameters, such as **OCXO Adjust**
- Test mode settings, such as **I/Q-Testsignal** or **Test Mode**
- Limiter settings
- Port settings, such as in the **Ethernet** menu window

These settings remain valid regardless of which parameter set is currently loaded.

12.2 Saving Transmitter Information: Menu Item "TxTool" (Web Browser Only)

In order to improve clarity and for archiving purposes, you can save transmitter data selected via the web browser (such as logbook or device information, measurement values or parameters) to an ASCII or HTML file. You can also delete and restore logbook entries of the transmitter components.

1. Select **TxTool** in the browser window.

A security query appears first of all.

Note

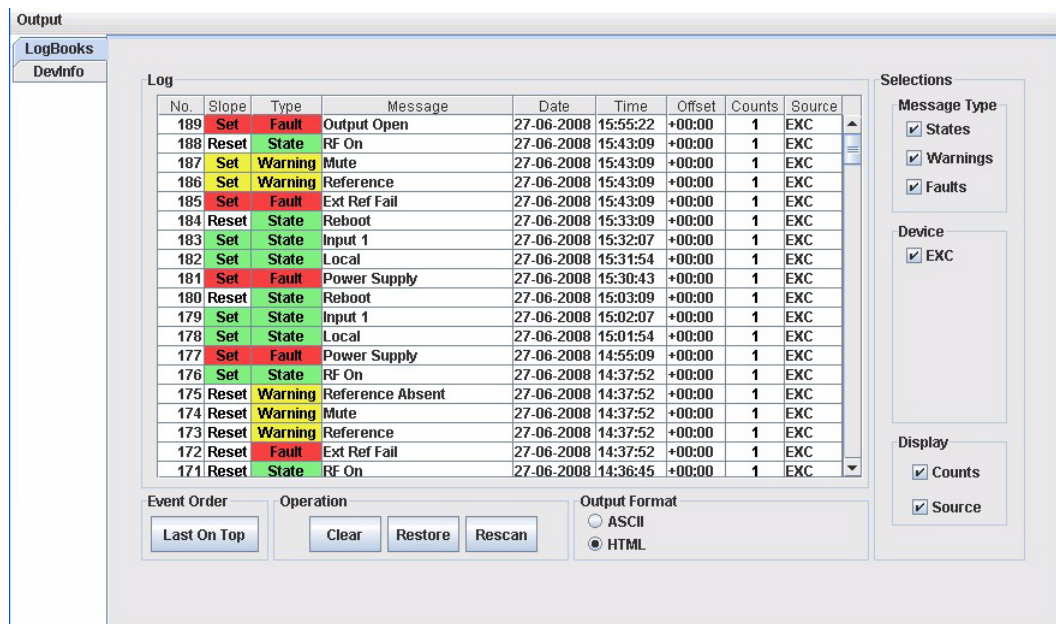
Execution of the TxTool requires write rights to the file system of the computer. To grant these rights you must confirm the security query.

*If you select **Always trust content from this author**, the security query will not be displayed the next time the TxTool is called.*



2. Confirm the security query with **Run**.

The **TxTool** window used to display and save transmitter data appears.



The window is initially empty when opened. The required settings must be selected before the data is read out.

Reading out data

1. Select (top left) the data that is to be displayed.
Different windows containing additional functions are displayed depending on the type of data you select. Depending on the selected tab, the window will still be empty (e.g. **LogBooks**) or the appropriate data will be displayed (e.g. **DeviceInfo**).
2. Select (depending on the window) which data is to be displayed (see the table under "Functions in Logbooks Window").
3. Start readout of the data with **Rescan** (if this function is available in the window).

Saving data

Different options and formats are available for saving the data.

1. Under **Output Format**, select the file format in which the data is to be saved.
2. In the **Output** menu, select whether the data is to be saved as a file (**Write to File**) or copied to the clipboard (**Copy to Clipboard**).

Depending on your selection, you can save the data in a file using the Windows **Save** command or copy it to the clipboard and then use it in other applications.

Note

If the data is to be evaluated in a spreadsheet application (e.g. Microsoft Excel) it is advisable to copy the data to the clipboard in HTML format. If the clipboard is then copied to an (empty) worksheet, the values are separated in tabular form.

12.2.1 Functions in LogBooks Window

The following additional functions are available in the **Logbooks** window:

Function	Explanation
Message Type	Used to select the type of messages which are to be listed (more than one option can be selected)
Device	Used to select the transmitter components for which message data is to be displayed (more than one option can be selected)
Display	Used to show and hide the columns Counts (shows the number of messages of this message type) and Source (shows the transmitter component to which the message is assigned)
Last/First On Top	Sorts the displayed messages according to the time at which they occurred
Clear	(Real) deletion of the logbook entries (identical to deleting the logbook entries using the context menu of the Logbook menu window)
Restore	(Real) restoration of the logbook entries (identical to restoring the logbook entries using the context menu of the Logbook menu window)
Rescan	Updates the displayed messages

12.3 Saving Transmitter Data: Storage Menu (Web Browser Only)

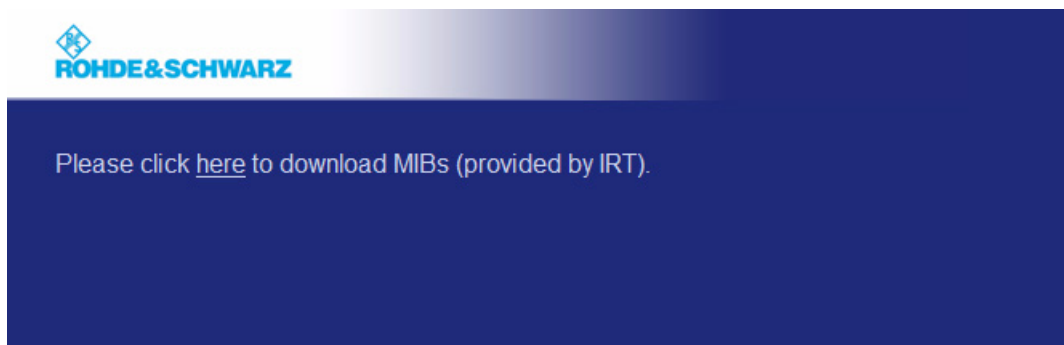
You can save the parameter data of the transmitter on an external medium and then recall this data when required.

Note This function is described in the chapter "Maintenance".

12.4 Menu Item "SNMP Administration" (Web Browser Only)

With the menu item **SNMP Administration**, you can download the Management Information Base (MIB) of the SNMP agent to configure the management station by means of this information.

After calling up the menu item, a further browser window will be opened inviting you to download data:



13 Introduction to Manual Precorrection

Factory set precorrection curves v. manual precorrection

The transmitter equipment includes factory preset precorrection curves covering every frequency range and all dynamic ranges. The appropriate precorrection curve is automatically loaded in each case, so as a rule manual precorrection is not needed.

In certain cases the precorrection can be further optimized by manual precorrection. Precorrection can then be carried out for different frequencies and output powers. Since manual precorrection does not overwrite any factory set precorrection curves, the factory defaults can be restored at any time (see section "Characteristic Curves" in "Loading an existing characteristic curve").

User interface for manual precorrection

The corrector is operated with the aid of a web browser. The transmitter makes a Java applet (precorrector GUI) available for this purpose. This applet is launched in the web browser and contains all the elements for operating the corrector.

The following section is a brief introduction to the configuration and use of this software. This is followed by a description of the individual menus for setting the corrector.

13.1 Launching Precorrector GUI

The precorrector GUI is integrated in the transmitter web browser interface. Before the precorrector GUI is launched, therefore, the conditions must be created for remote operation from a locally connected PC or remote control via a distant network client.

Note *For further information on installing and configuring remote operation from a local PC or remote control via a distant network client, refer to the section "Remote Operation and Remote Control" earlier in this chapter.*

1. From your browser, call the web GUI and log on with *Configuration* rights.
2. Launch the precorrector GUI by going to the **Navigator** window in the web GUI, below the **Precorrection** entry, and double-clicking on **Start Precorrector-GUI**.

While the program is starting up, the message Starting ADE GUI will be displayed. After a brief time, the initial operating window for the precorrector should appear.

Note *An additional empty browser window will appear. If this window is closed, the Precorrector GUI will also be terminated.*

Note *If the browser supports tabs (e.g. Internet Explorer 7), a new window is not created. The precorrector GUI opens in a new tab instead.*

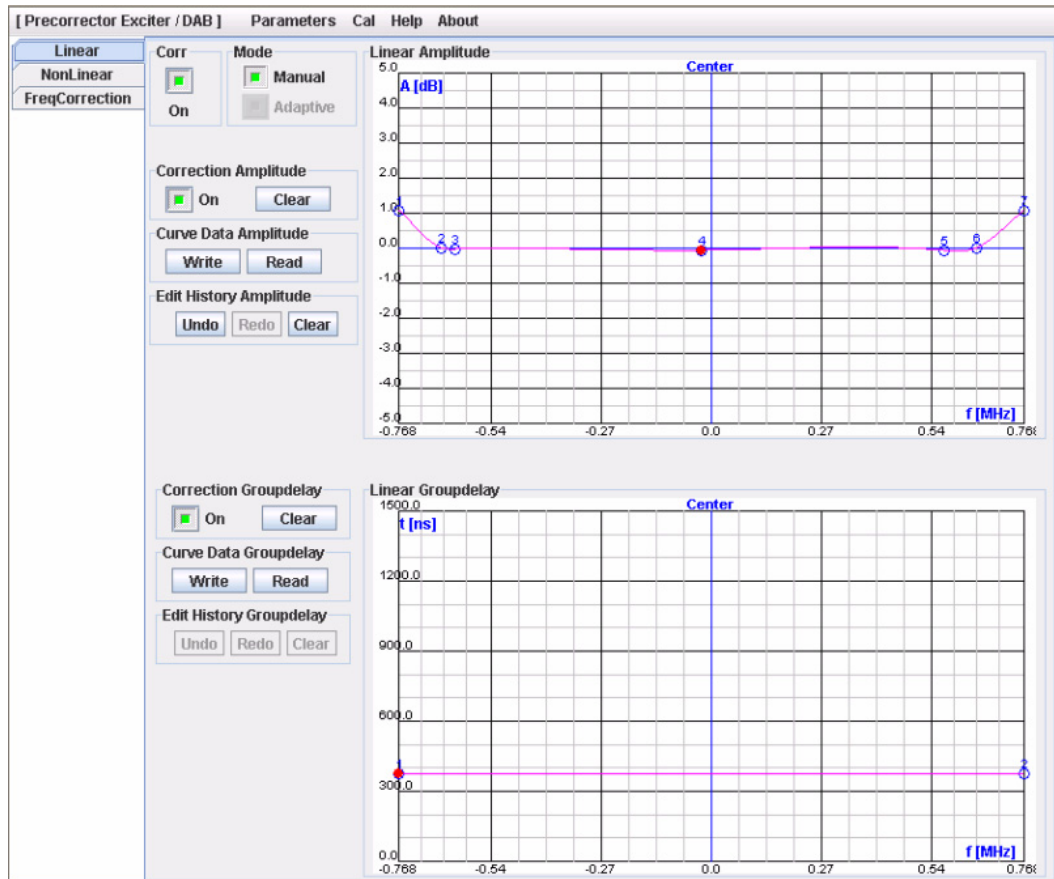


Fig. 19 Initial operating window in the precorrection GUI

The operating windows of the precorrection GUI are divided into the following areas:

- Title bar (for separately opened window only)
- Menu bar
- Selection column with tabs
- Work area

The menu bar and selection column are the same for all of the windows in the precorrection GUI.

Title bar

The title bar contains the following information:

- Name of the exciter that is currently being operated
- Transmitter type

Menu bar

The menu bar comprises the following program commands:

- **Parameters > Rescan**
Refresh to show all parameters that can be displayed in the GUI
- **Cal > Calibration**
Access to the alignment parameters – for production staff only
- **Help > Help**
Access to help information
- **About > About this**
Information about the software version

Selection column

The selection column contains the following tabs:

- **Linear**
Opens the operating window for the linear corrector.
- **Nonlinear**
Opens the operating window for the nonlinear corrector.
- **FreqCorrection**
Opens the operating window for nonlinear frequency response correction.

Work area

The work area contains the fields required by the different operating windows. Use the fields to perform precorrection.

13.2 Operating Functions

13.2.1 Operating Fields

The precorrection settings can be entered using three operating fields. Besides the characteristic field, the operating fields contain different operating elements such as buttons, input fields and checkboxes.

Depending on your system configuration, the following operating fields will be present:

- Linear Precorrection
- Nonlinear Precorrection
- Nonlinear frequency response precorrection

The following figure provides a basic view of how an operating field is structured:

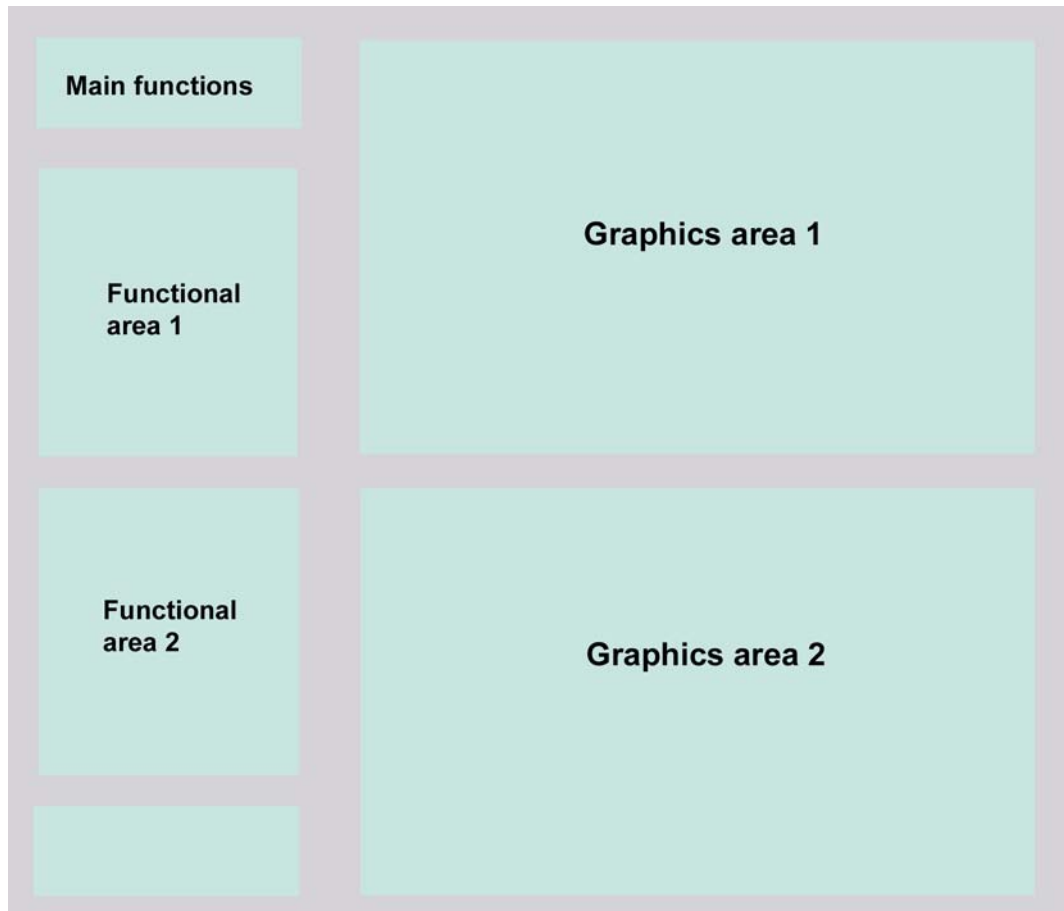


Fig. 20 Basic structure of an operating field

Each operating field consists of graphics areas and functional areas.

The graphics areas are used to display the set characteristics. Here, you can interactively modify, reset or redraw the characteristics. You can also set a default characteristic. Using a contextual menu, you can access additional functions as well as a navigator for fine adjustment.

There are two graphics areas per operating field. The upper *graphics area 1* is used to display amplitude precorrections. The lower *graphics area 2* is used to display phase or group delay precorrections.

The functional area contains buttons, input field, checkboxes and message windows that are used to manage the precorrection process. It is divided into the following areas:

- *Main functions*
This area contains functions that apply to all of the displayed precorrection (ON/OFF, choice of manual or automatic mode).
- *Function area 1*
This area contains functions referring to the curve in graphics area 1.
- *Function area 2*
This area contains functions referring to the curve in graphics area 2.

Note *In certain operating windows, some of these areas will not be present.*

13.2.2 Graphics Areas

The graphics area basically consists of display and drawing levels. In many operating fields, the drawing level is not necessary.

Display level (blue characteristic)

In the *display level*, the characteristic that is currently set in the precorrector is displayed. If the precorrector function is switched off, a note to this effect will appear in the diagram.

To display the characteristic, the database is read from the precorrector and the curve is computed with the same function as forms the basis of computation for the setting parameters and the FPGA. This ensures that the display and the effect are exactly matched.

In addition, the display level also contains additional functions such as the position of the carrier frequency or center frequency, notable drive level of the signal or the position of thresholds relative to the display range.

Drawing level (red characteristic)

In the *drawing level*, you can create a new characteristic or edit an existing one.

You can access the database data for the characteristic for further processing from the display level. The curve is edited directly on the data from the database. The remainder of the curve is computed with the same function as in the display level.

A *contextual menu* provides support in the process of editing curves. A *navigator window* can be used to make a fine setting.

Note *The drawing levels are supported only in the operating fields for linear precorrection and nonlinear precorrection. Only the display level supports nonlinear frequency response precorrection. At this level it is not possible to edit characteristic curves.*

13.2.3 Characteristic Curves

The following settings are necessary in the functional area to create characteristic curves manually or edit them:

- **Corr > On** (precorrection active)
- **Correction Amplitude > On** (upper characteristic active) or
- **Correction Groupdelay / Phase > On** (lower characteristic active)

There are two ways of modeling a characteristic:

- Draw a new characteristic and edit the points.
- Load an existing characteristic (predefined characteristic or a characteristic saved on the hard drive) and edit the points.

Modeling a characteristic involves use of the mouse, contextual menu and navigator window.

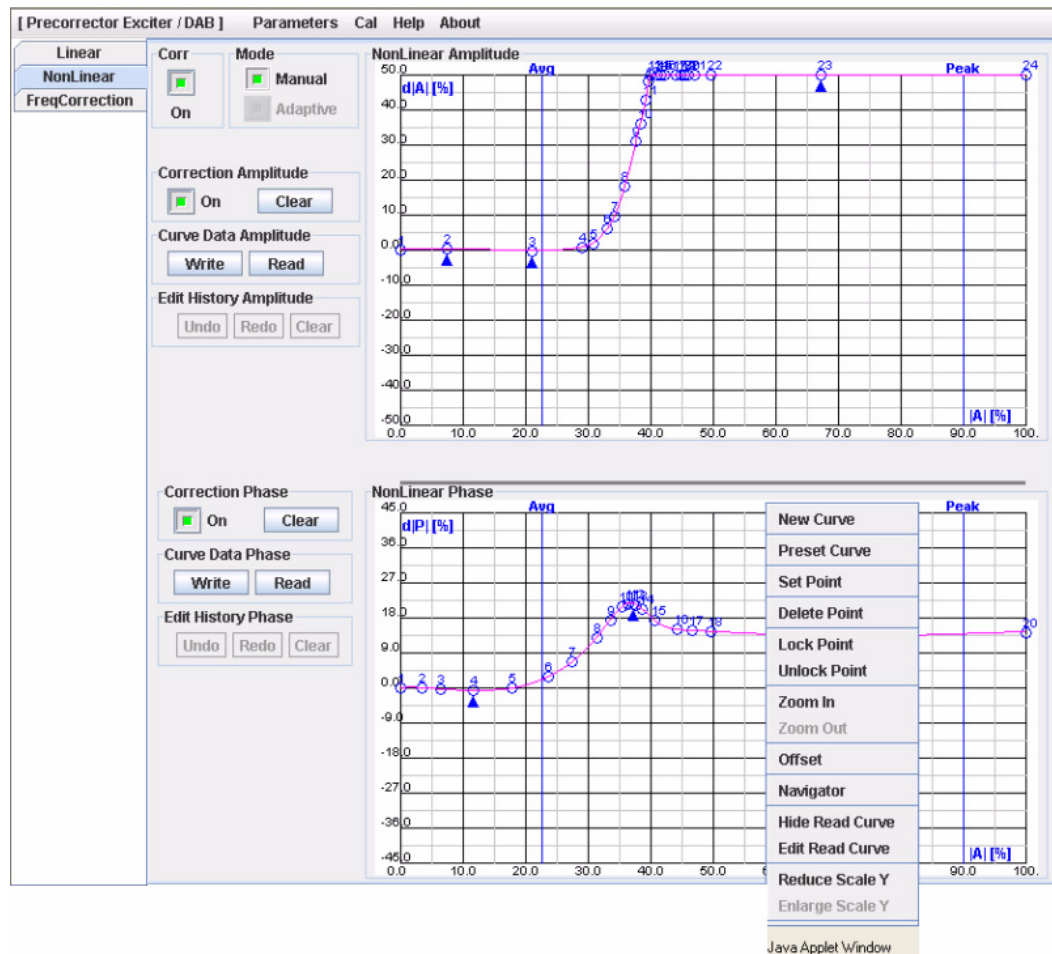


Fig. 21 Contextual menu for the precorrector GUI

The contextual menu appears if you click on a vacant point of the drawing plane with the right mouse button. You can use the contextual menu to call up the navigator window for making fine settings.

Note A pre-correction curve is always modeled locally in the drawing plane (red curve) and then written to the pre-correction memory by the menu function **Curve Data xxx Write**.

Creating a new characteristic

To create a new characteristic, you must place the relevant points with the mouse into the chart in order from left to right. First, a point is set at the minimum unit on the x axis. The end is formed by a final point at the maximum unit on the x axis.

1. Click on the right mouse button to show the context menu and select the **New Curve** menu item. When you are asked if you want to delete the curve already displayed, answer with **OK**.
2. Follow the prompting "Click to set curve points ..." and set the points one after the other with the left mouse button.

The points are automatically joined to a curve.

3. Point to the right margin of the diagram with the mouse and set the last point.

Input mode will be terminated and you can now edit the curve as required (see the section "Editing the characteristic").

Loading an existing characteristic curve

Instead of creating a characteristic curve from scratch, you can load existing curves into the drawing level and edit them as required. There are three possibilities:

- Select **Preset Curve** in the contextual menu. A preset curve highlighted in the program is loaded into the display level (*blue curve*). Now, using the **Edit Read Curve** contextual entry, transfer the characteristic curve into the drawing level (*red curve*).
- Use the **Curve Data xxx Read** function to load the current characteristic curve from the precorrection memory straight into the drawing level (*red curve*).
- Load an existing precorrection from a file using the **Storage** function from the Navigator window for transmitter operation.
- In the **RF Out > Precorrection** menu window use the **Restore Current Setting** or **Restore All Settings** parameter to reactivate the original precorrection curve (factory set precorrection) in the instrument. Then in the precorrector GUI use **Parameters > Recan** to update the display. The original precorrection curve is displayed.

Note

*You may have to fetch the read precorrection curve with the **Show Read Curve** contextual function into the foreground so it can be viewed.*

Editing a characteristic

Characteristics are edited based on the points they contain. Each point in the database contains the following information: x value, y value, slope and locking of the slope. The number of points is variable.

The characteristic is computed using one or more sectionally defined spline functions with a specified start-point and end-point slope on the edges. The edges are considered to be the right or left edge of the graphics as well as fixed points. A fixed point (recognizable by a triangular symbol) "freezes" the slope of the curve. Like normal points, fixed points can also be moved later on, but the slope due to the fixed point stays unchanged.

Existing points are *edited directly*. You can shift them with the mouse in the x and y directions (click and drag). Double-click to lock them (or to unlock them).

You can use the *contextual menu* to add and delete points and to lock and unlock their slope. The procedure is as follows:

- *Set Point:*
 1. Select the **Set Point** function.
 2. Using the mouse, set a new point on the curve.
- *Delete Point, Lock Point and Unlock Point:*
 1. Select the desired function.
 2. Click on an existing point.

For fine setting of the characteristic, there is a *navigator window* available which can be called up from the contextual menu. The navigator window can be used to set the point coordinates and the slope (fixed points only) as numerical values. The procedure is as follows:

1. Call up the navigator window.

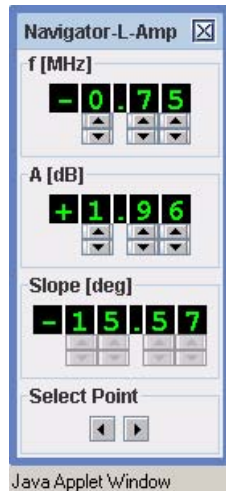


Fig. 22 The navigator window

2. Click on the desired point with the mouse, or select it in the navigator window with the arrow keys at **Select Point**.

The selected point is highlighted in red.

3. Set the coordinates and/or the slope with the input register in the navigator window.

By locking characteristic points, it is also possible to *define ranges* which can be edited without modifying the curve sections outside of the given range.

Note When unlocking a locked point, more or less significant changes can arise in the characteristic between the two locked points that are closest to the point that was unlocked.

Setting characteristics in the precorrector

Basically, the edited curves are written using the **Curve Data xxx > Write** buttons individually for each characteristic type into the precorrector and set there.

In the case of nonlinear precorrection, writing of the edited curve is carried out immediately during setting using the navigator window. Hysteresis becomes active which suppresses immediate setting of the curve for a permanent change. Only the last value is set when exiting.

Clearing a characteristic in the precorrector

Using the **Correction xxx Clear** button, you can clear the characteristic set in the precorrector (and displayed in the display level).

Using the editing history

While editing a characteristic, the editing steps are recorded. You can undo the steps using the **Edit History xxx Undo** button or redo them using the **Edit History xxx Redo** button. Use the **Edit History xxx Clear** button to clear the editing history.

13.3 Setting Linear Precorrection

The **Linear** operating field is for setting linear precorrection defaults which can be used to compensate amplitude frequency response and group delay errors at the channel filter below the transmitter.

In the default setting this corrector is switched off.

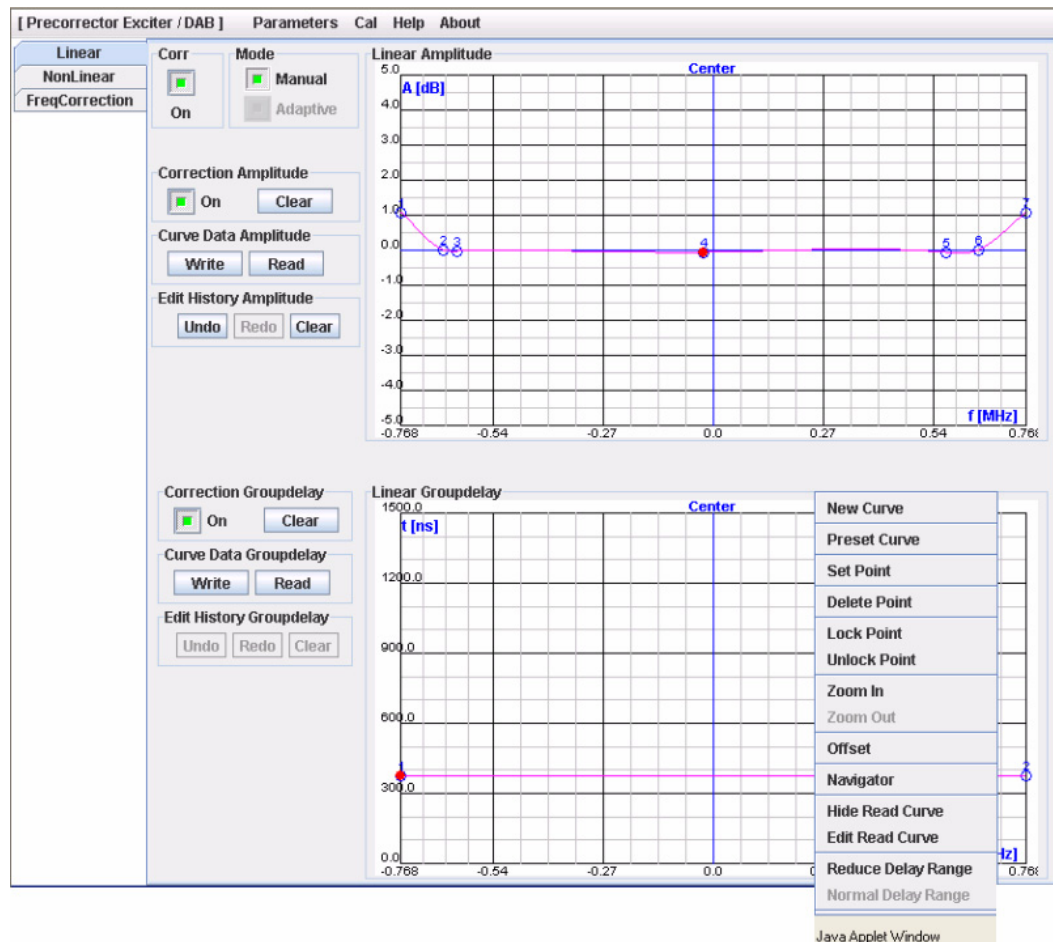


Fig. 23 The Linear operating window

13.3.1 Main Function

The **Corr > On/Off** switch can be used to turn the entire linear precorrection on or off.

13.3.2 Linear Precorrection

During precorrection the characteristics for the amplitude-frequency response and group delay are modeled in the drawing level and then written to the precorrection memory.

Functions, area 1

The following settings are possible:

- **Correction Amplitude > On/Off:** Switches amplitude frequency response pre-correction on or off.
- **Correction Amplitude Clear:** Clears the data in the precorrector for the amplitude frequency response pre-correction; you will be asked if you are sure you want to do this.
- **Curve Data Amplitude Write:** Writes the linear precorrector with the amplitude frequency response modeled in the drawing level.
- **Curve Data Amplitude Read:** Reads out the amplitude frequency response set in the linear precorrector and shows it in the display level.
- **Edit History Amplitude Undo / Redo / Clear:** History memory; settings in the drawing level can be undone step by step and redone. The history memory can also be cleared.

Functions, area 2

The following settings are possible:

- **Correction Groupdelay > On/Off:** Switches group delay pre-correction on or off.
- **Correction Groupdelay Clear:** Clears the data in the precorrector for the group delay pre-correction; you will be asked if you are sure you want to do this.
- **Curve Data Group Delay Write:** Writes the linear precorrector with the group delay modeled in the drawing level.
- **Curve Data Groupdelay Read:** Reads out the group delay set in the linear precorrector and shows it in the display level.
- **Edit History Groupdelay Undo / Redo / Clear:** History memory; settings in the drawing level can be undone step by step and redone. The history memory can also be cleared.

Graphics area 1: Modeling of the amplitude frequency response

The **Linear Amplitude** diagram (in graphics area 1) has a coordinate system for displaying and editing the characteristic for the amplitude frequency response. The x axis is used to show the frequency f in MHz relative to the carrier or to the center frequency. The y axis shows the amplitude A in dB. The scaling on both axes is system-dependent.

The diagram has a drawing level and a display level.

In the *drawing level*, you can model the amplitude frequency response (red curve) locally. With the mouse, the contextual menu and the navigator window, you can draw a new curve or load and edit an existing curve. The characteristic data are then written into the precorrector using **Curve Data Amplitude Write**.

A curve read from the precorrector (**Curve Data Amplitude Read**) is shown in the *display level* (blue curve). The Edit Read Curve contextual function allows you to transfer this curve to the drawing level for editing. The contextual menu also lets you hide the display level.

The diagram indicates if amplitude frequency response pre-correction is switched off. The display and drawing levels still remain active, however.

For further details, please see the "Characteristic Curves" section.

Graphics area 2: Modeling of the group delay

The **Linear Groupdelay** diagram (in graphics area 2) has a coordinate system for displaying and editing the characteristic for the amplitude frequency response. The x axis is used to display the frequency f in MHz relative to the carrier or to the center frequency. The y axis shows the group delay time t in ns. The scaling on both axes is system-dependent.

Otherwise, this works analogously to graphics area 1 except that the corresponding functions (e.g. for Read/Write) are found in area 2.

The diagram indicates if group delay precorrection is switched off. The display and drawing levels still remain active, however.

In the contextual menu for the group delay precorrection, you can use the **Reduce Delay Range** and **Enlarge Delay Range** commands to select between the two scalings for the y axis. It is possible to display the following ranges of values:

	Linear Precorrection
Reduced	0 ns to 750 ns
Enlarged	0 ns to 1500 ns

For further details, please see the "Characteristic Curves" section.

13.4 Setting Nonlinear Precorrection

The **Nonlinear** operating field is for setting nonlinear precorrection defaults to equalize nonlinearities in the output stage.

Nonlinear precorrection is a significant factor in the shoulder distance that is achieved.

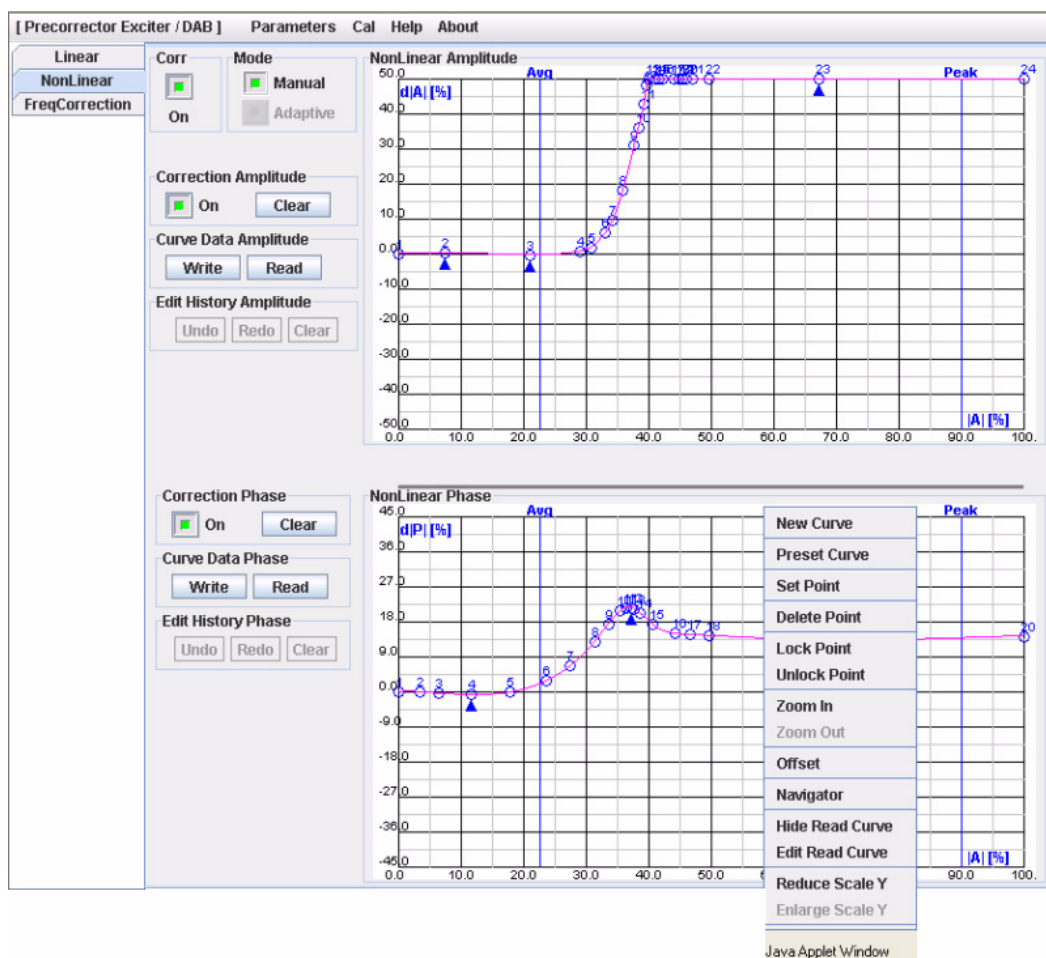


Fig. 24 The Nonlinear operating window

13.4.1 Main Function

The **Corr > On/Off** switch can be used to turn the entire nonlinear precorrection on or off.

13.4.2 Nonlinear Precorrection

For manual precorrection, you model the amplitude and phase characteristics in the drawing level and then write them to the precorrection memory.

Functions, area 1

The following settings are possible:

- **Correction Amplitude > On/Off:** Switches the amplitude precorrection on or off.
- **Correction Amplitude Clear:** Clears the data in the precorrection memory for the nonlinear amplitude precorrection; you will be asked if you are sure you want to do this.
- **Curve Data Amplitude Write:** Writes the nonlinear precorrection with the amplitude characteristic modeled in the drawing level.

- **Curve Data Amplitude Read:** Reads out the amplitude characteristic set in the nonlinear precorrector and shows it in the display level.
- **Edit History Amplitude Undo / Redo / Clear:** History memory; settings in the drawing level can be undone step by step and redone. The history memory can also be cleared.

Functions, area 2

The following settings are possible:

- **Correction Phase > On/Off:** Switches the phase precorrection on or off.
- **Correction Phase Clear:** Clears the data in the precorrector for the nonlinear phase precorrection; you will be asked if you are sure you want to do this.
- **Curve Data Phase Write:** Writes the nonlinear precorrector with the phase characteristic modeled in the drawing level.
- **Curve Data Phase Read:** Reads out the phase characteristic set in the nonlinear precorrector and shows it in the display level.
- **Edit History Phase Undo / Redo / Clear:** History memory; settings in the drawing level can be undone step by step and redone. The history memory can also be cleared.

Graphics area 1: Modeling of the amplitude characteristic

The **NonLinear Amplitude** diagram (in graphics area 1) has a coordinate system for displaying and editing the amplitude characteristic.

The x axis is used to display the drive level A in %. Note that 100% corresponds to the maximum system drive level. The y axis is used to display the delta drive level dA in % relative to the maximum drive level. The scale ranges from -50% to +50%.

The diagram has a drawing level and a display level.

In the *drawing level*, you can model the amplitude characteristic (red curve) locally. With the mouse, the contextual menu and the navigator window, you can draw a new curve or load and edit an existing curve. The characteristic data are then written into the precorrector using **Curve Data Amplitude Write**.

A curve read from the precorrector (**Curve Data Amplitude Read**) is shown in the *display level* (blue curve). The **Edit Read Curve** contextual function you to transfer this curve to the drawing level for editing. The contextual menu also lets you hide the display level.

The diagram indicates if nonlinear amplitude precorrection is switched off. The display and drawing levels still remain active, however.

For further details, please see the "Characteristic Curves" section.

Graphics area 2: Modeling of the phase characteristic

The **NonLinear Phase** diagram (in graphics area 2) has a coordinate system for displaying and editing the phase characteristic.

The x axis is used to display the drive level A in %. Note that 100% corresponds to the maximum system drive level. The y axis is used to display the delta phase dP in angular degrees [°]. The scale ranges from -45° to +45°.

Otherwise, this works analogously to graphics area 1 except that the corresponding functions (e.g. for Read/Write) are found in functional area 2.

The diagram indicates if nonlinear phase precorrection is switched off. The display and drawing levels still remain active, however.

For further details, please see the "Characteristic Curves" section.

13.5 Setting Nonlinear Frequency Response Precorrection

The **FreqCorrection** field is for setting extended nonlinear precorrection. You can specifically influence the effects of the amplitude and phase characteristics for low-frequency and high-frequency signal components (frequency response correction).

All entries are numeric. The **Amplitude** and **Phase** diagrams show the characteristics of nonlinear precorrection and the location of the thresholds (inset points) plus percentages for the effect of the frequency response correction.

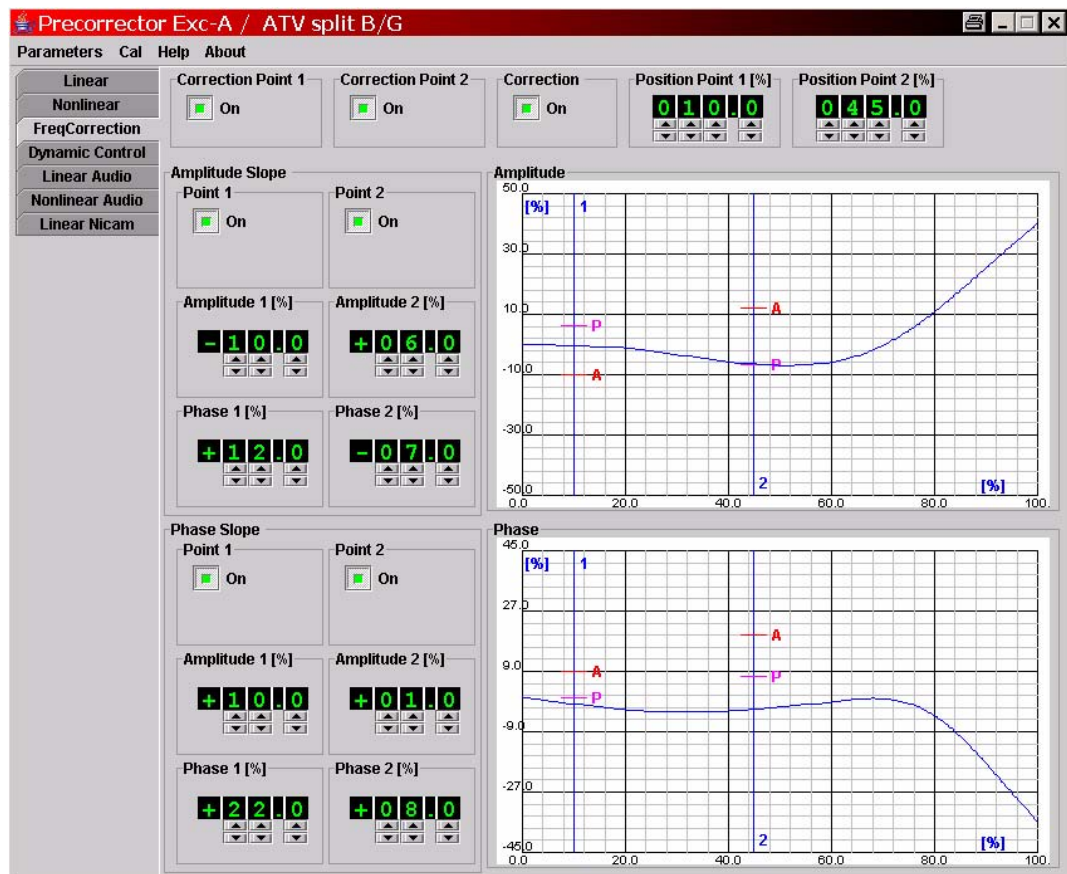


Fig. 25 The FreqCorrection operating window

Main functions

- **Correction > On/Off:** Switches the entire frequency response correction on or off.
- **Correction Point 1 (2) > On/Off:** Switches frequency response correction on branch 1 (or 2) on or off.
- **Position Point 1 (2):** Entry of the threshold for the point of frequency response correction 1 (or 2). Frequency response correction is effective only if the instantaneous drive level exceeds this threshold; setting range: 0 ... 100%

Functions, area 1

- **Amplitude Slope Point 1 (2) > On/Off:** Switches frequency response correction on branch 1 (or 2) for the amplitude characteristic on or off.
- **Amplitude Slope Amplitude 1 (2):** Sets amplitude frequency response correction for the amplitude pre-corrections on branch 1 (or 2); setting range: -50 ... +50%. A positive number increases the frequency response.
- **Amplitude Slope Phase 1 (2):** Sets phase frequency response correction for the amplitude pre-corrections on branch 1 (or 2); setting range: -50 ... +50%. A positive number increases the frequency response.

Functions, area 2

- **Phase Slope Point 1 (2) > On/Off:** Switches frequency response correction on branch 1 (or 2) for the phase characteristic on or off.
- **Phase Slope Amplitude 1 (2):** Sets amplitude frequency response correction for the phase pre-correction on branch 1 (or 2); setting range: -45 ... +45%. A positive number increases the frequency response.
- **Phase Slope Phase 1 (2):** Sets phase frequency response correction for the phase pre-correction on branch 1 (or 2); setting range: -45 ... +45%. A positive number increases the frequency response.

CHAPTER 6

MAINTENANCE

CONTENTS

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1 Maintenance Information

1.1 Overview of Maintenance Work

The device has been designed to provide years of operation with little maintenance. Maintenance of the hardware is limited to:

- Software updates (as required)
(for improved performance and for retrofitting options)
- Replacement of fan after approx. 40000 operating hours
- Replacement of fan mat (option)

Further actions:

- Backup of parameter data to an external medium (recommended)
- Adjustment of I/Q modulator (if required)

1.2 Required Tools

Software update	– PC – Update data (on CD-ROM) – RJ-45 cable (crossover or patch cable)
Backup of parameter data	– PC as backup medium
Replacement of fans	– Torx screwdriver TX10
Adjusting the I/Q Modulator	– Spectrum analyzer

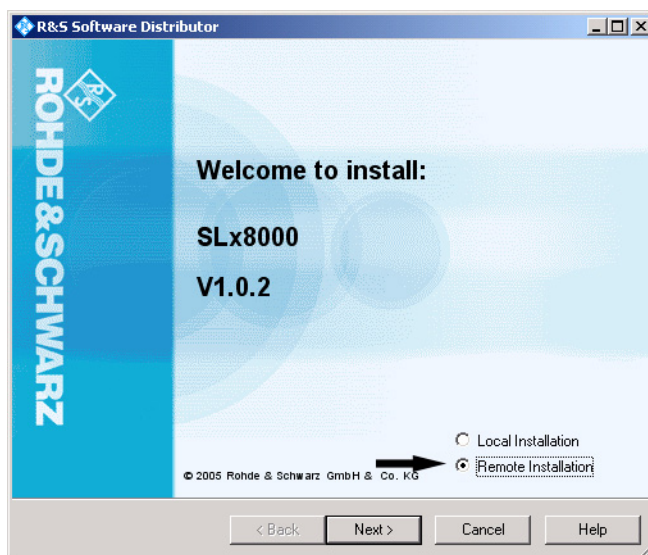
2 Software Update

To perform a software update, you must connect the transmitter to a PC or network client via the Ethernet and make sure that the interface (**X30, ETHERNET LOCAL** or **X31, ETHERNET REMOTE**) is correctly configured.

The procedure for performing a software update is as follows:

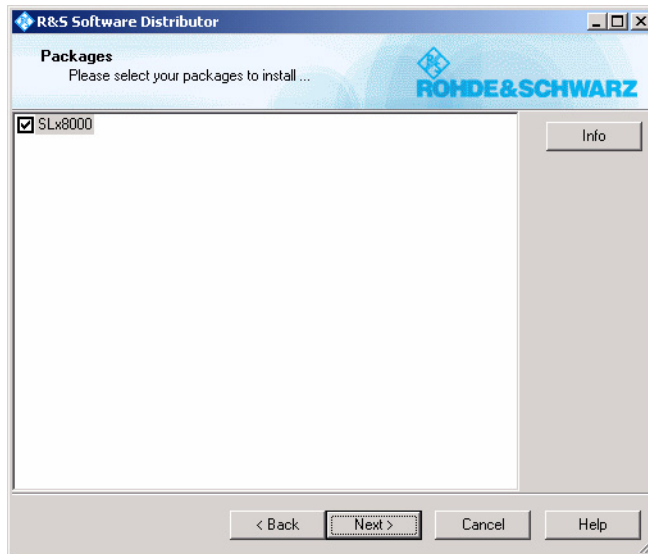
1. Deactivate the energy saving option of the network card in the PC. Proceed as follows:
 - a) Under Windows, open the Device Manager by selecting **Start > Control Panel > System > Hardware > Device Manager**.
 - b) In the Device Manager, select the correct network adapter and then double-click to open the associated Properties window.
 - c) In the Properties window, click the **Power Management** tab and (if required) deactivate the option **Allow the computer to turn off this device to save power**.
2. Start the installation software on the PC/client.

The start window of the R&S Software Distributor appears.



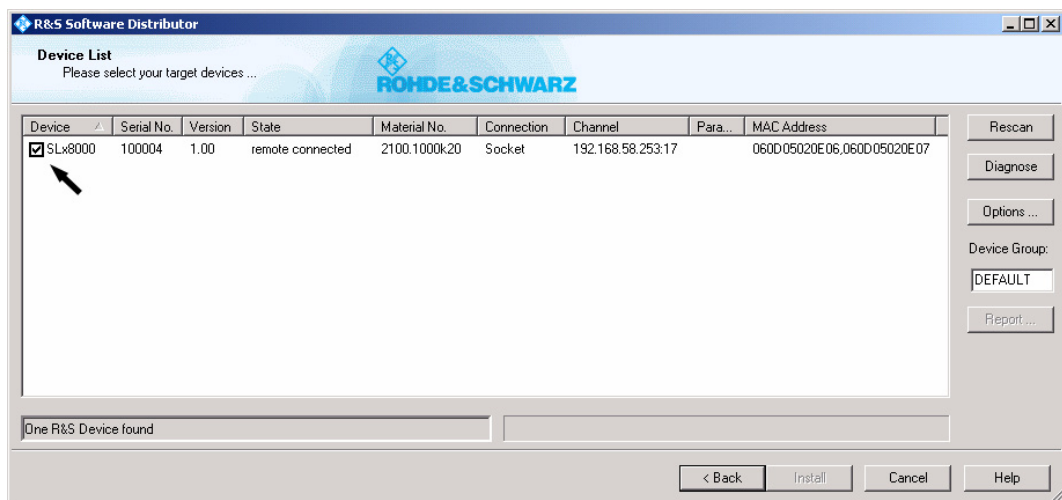
3. Select **Remote Installation** and confirm with **Next**.

The software updates that can be installed are displayed. You can obtain additional information about the update you select by highlighting it with the cursor and then clicking the **Info** button.

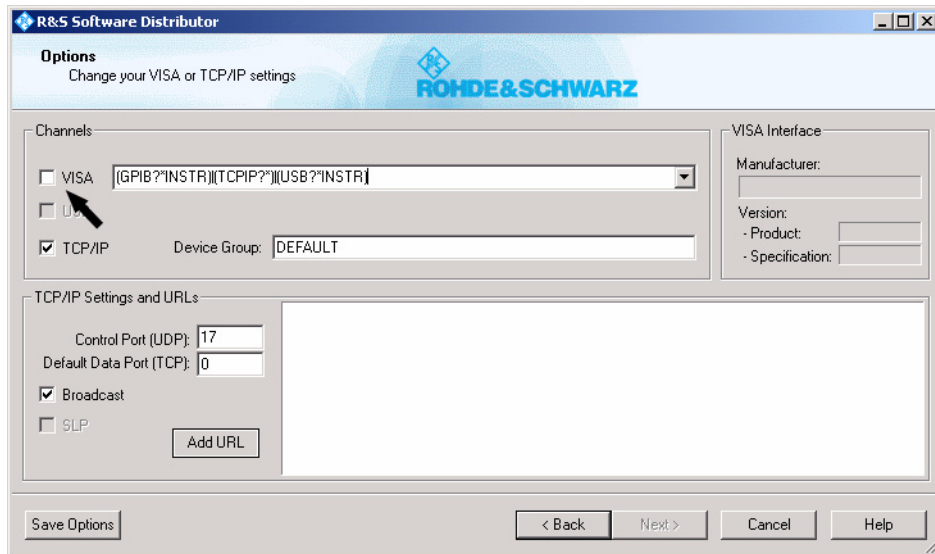


4. In the network, search for updatable devices by clicking **Next**.

The devices found will be listed after few seconds.



5. If despite correct network settings no devices are found, the VISA interface is probably active. If this is the case:
- Check the settings by clicking **Options** and, if necessary, deactivate **VISA** using the check box.
 - Save the changed settings by clicking **Save Options** and then search for devices again by clicking **Rescan**.



6. In the **Device List**, select the device to be updated by enabling the check box.
7. Click **Install** to start the update.

After the update has been completed, an appropriate message will appear in the field bottom left in the window. The transmitter is automatically rebooted.

Note

*If the update is aborted before it has been completed (the message "Copying/Installing ... %" stops before 100% is reached), abort the update by clicking **Cancel** and then restart the R&S Software Distributor.*

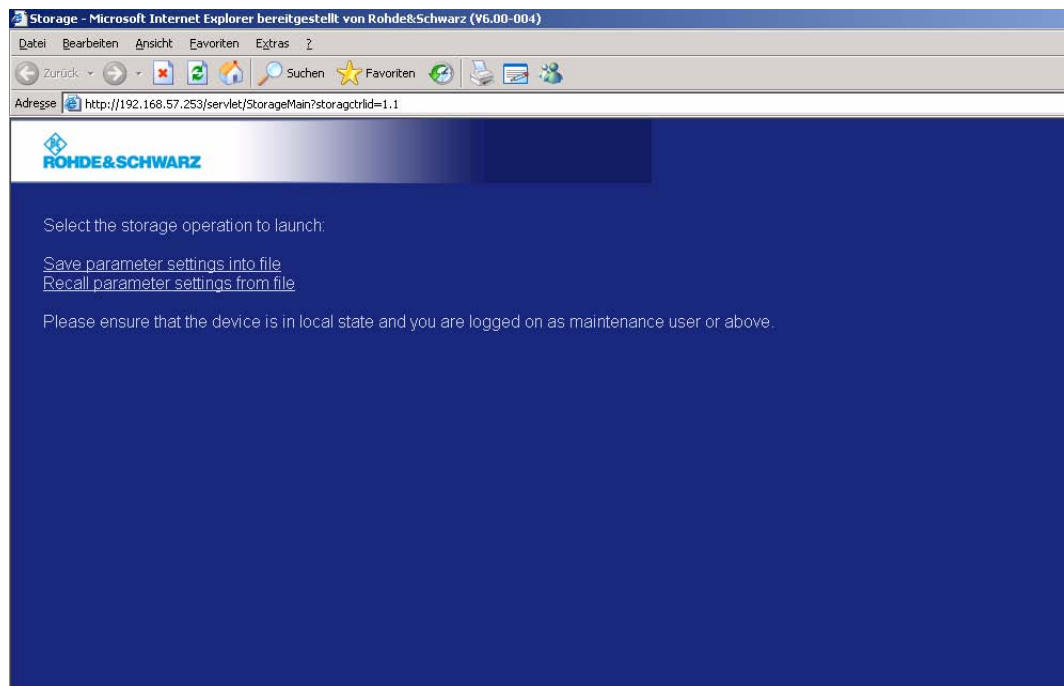
3 Backing Up Parameter Data

You can back up the parameter data for the instrument to an external medium and reimport it whenever necessary.

Local mode using a PC and web browser must be set up for this function.

☞ Select **Storage** from the browser window.

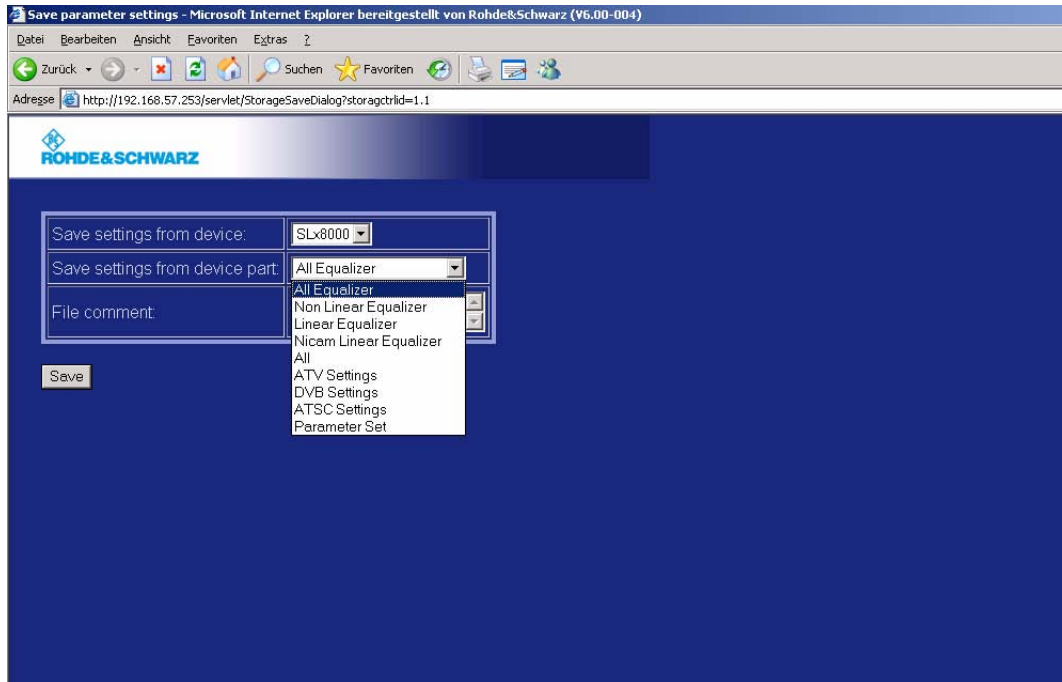
The start window to save and recall parameter data is displayed.



3.1 Saving Parameter Data on PC

1. In the start window, select **Save parameter settings into file**.

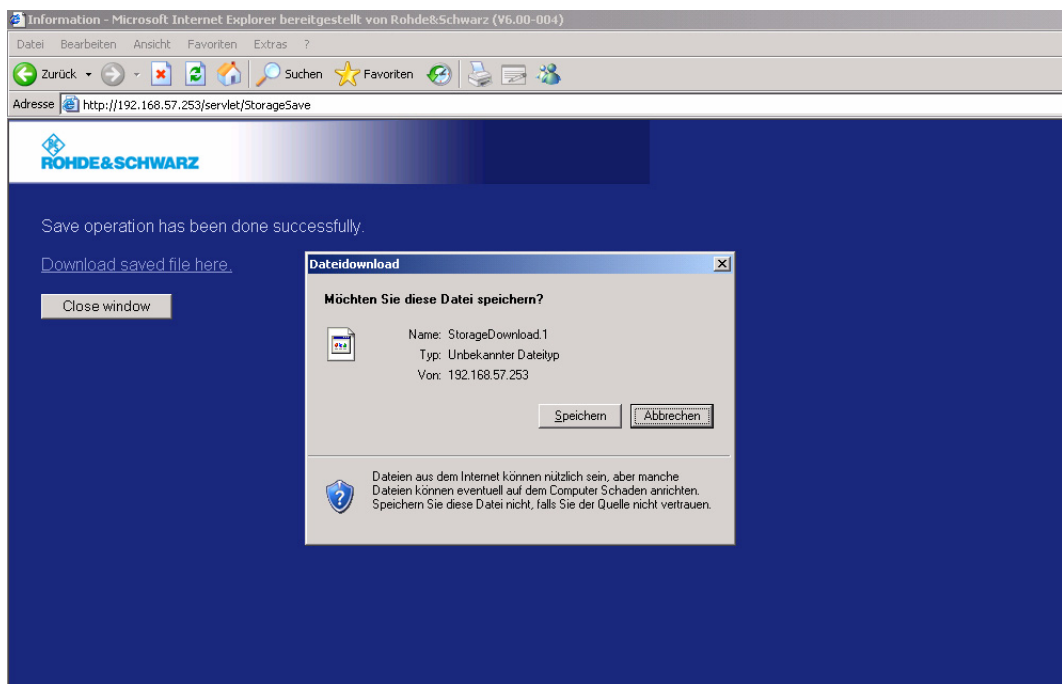
A window opens from which you can select the parameter data you want to save.



2. Select the parameter data set you want to save.
3. Enter a unique comment for the selected parameter data set to help you recognize the content of the parameter data set or its intended use.
4. Click **Save**.

The parameter data set is transferred to the PC.

5. Click **Download saved file here** and confirm the subsequent Windows dialog box to save the parameter data set to a file.



3.2 Loading Parameter Data from PC

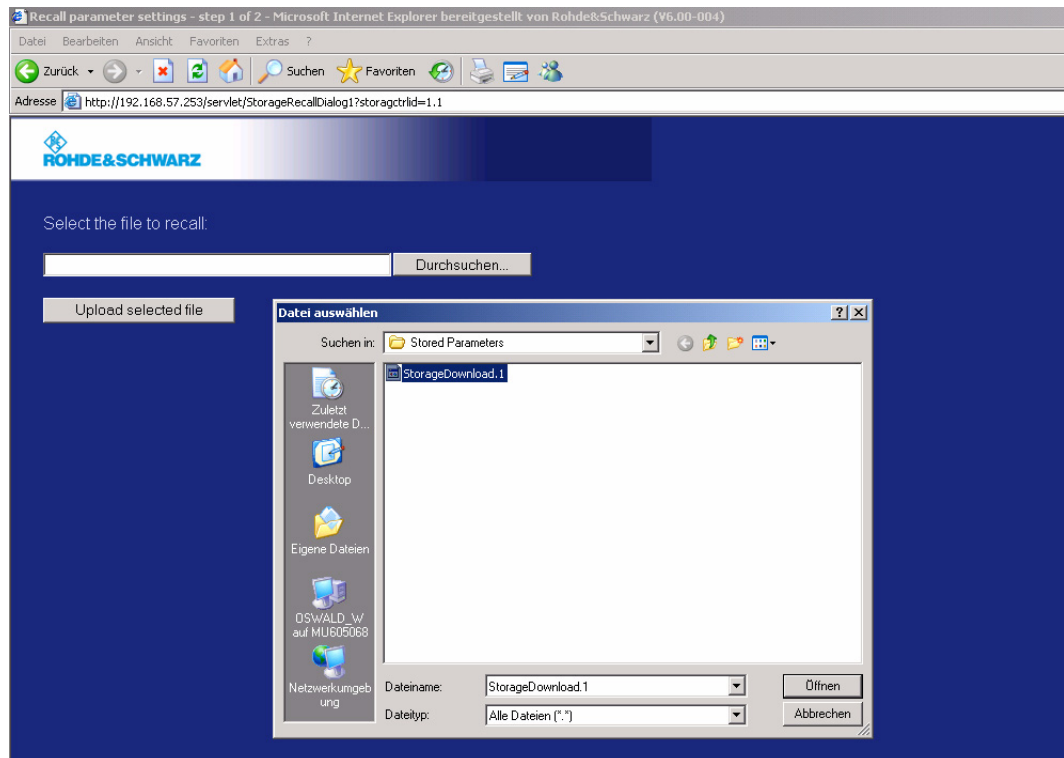


ATTENTION!

When you read in parameter data, the current parameters are overwritten without prior warning.

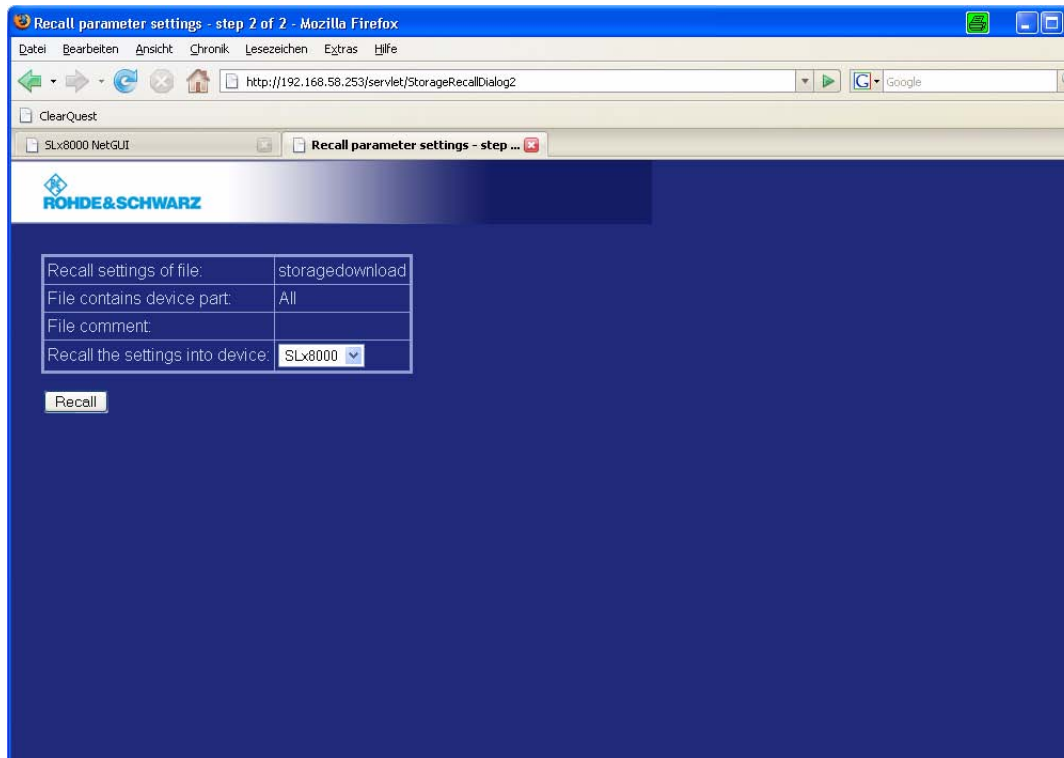
1. In the start window, select **Recall parameter settings into file**.

A window appears in which you can select the saved parameter data you want to load.



2. Click **Browse** and select the required file.
3. Click **Upload selected file** to load the file.

A confirmation window appears.



4. Confirm the selected file with **Recall**.

The parameter data is copied to the transmitter.

4 Adjustment of I/Q Modulator

Note *The transmitter must have been in operation for at least 30 minutes before adjustment is performed (operating temperature).*

Objective

If quadrature modulation were optimal (theoretically possible), the residual carrier would be completely suppressed. In actual practice, however, residual carriers arise (e.g. due to crosstalk). They must be suppressed using suitable correction carriers.

The objective of I/Q adjustment is to suppress the undesired center carrier and undesired carrier in the sideband with respect to a test carrier by better than 60 dB.

4.1 Manual Adjustment

Preparation and test carrier measurement

1. Call the **TV Settings > RF Out > IQ Adjust** menu.



2. Switch on the test signal using the **I/Q Testsignal** switch.
3. Connect a spectrum analyzer to the **RF MONITOR** output on the front panel of the transmitter and select the following settings:

Center Frequency	Frequency of the vision carrier
Span	6 MHz
Resolution BW	30 kHz
Video BW	300 Hz
Sweep	coupled

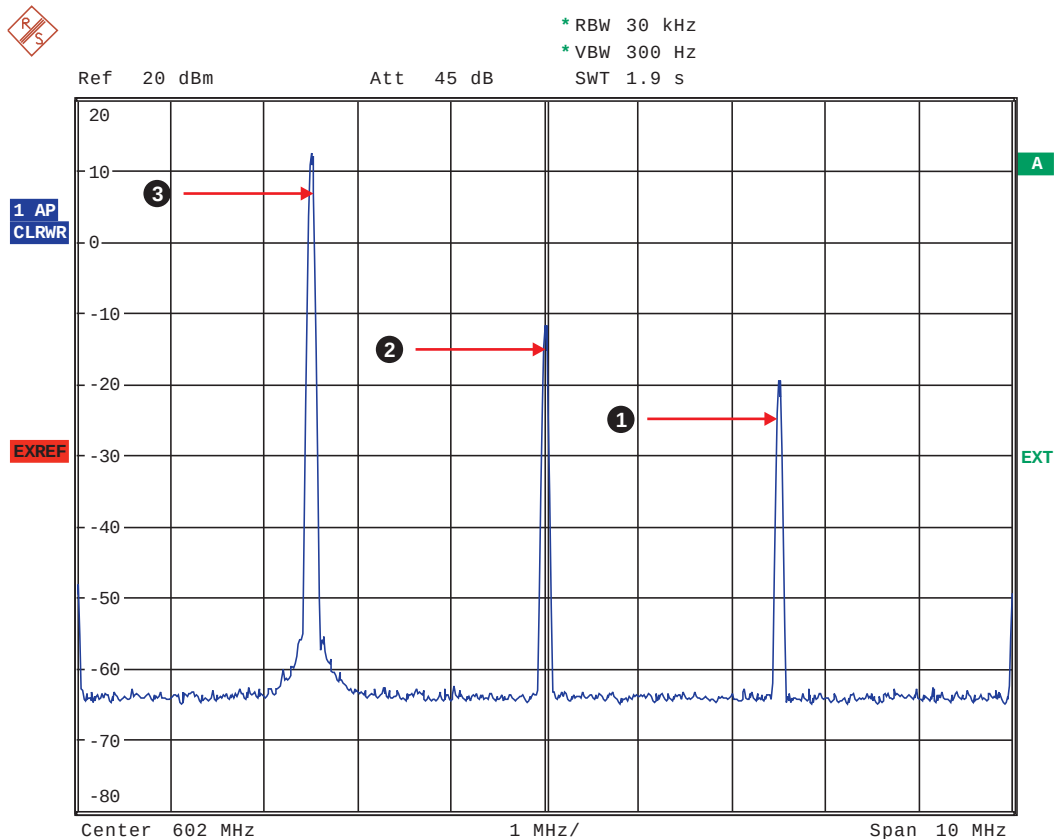


Fig. 1 Spectrum analyzer display prior to adjustment

- 1) Unwanted carrier in sideband at vision carrier frequency +2.5 MHz
- 2) Unwanted center carrier at vision carrier frequency
- 3) Desired test carrier at vision carrier frequency -2.5 MHz

Implementation

1. Set the **Bias Fine [I/Q]** actuators to zero.
2. *Course adjustment, center carrier:* Using the **Bias Coarse [I/Q]** actuators, suppress the undesired center carrier as much as possible with respect to the test carrier. You should individually adjust each actuator going back and forth several times until you achieve an optimum value.
3. *Sideband adjustment:* Use the **Gain [I/Q]** and **Phase** actuators to suppress the undesired carrier in the sideband by more than 70 dB with respect to the test carrier. You should individually adjust each actuator going back and forth several times until you achieve an optimum value.
4. *Course adjustment, center carrier optimization:* Using the **Bias Coarse [I/Q]** actuators, suppress the undesired center carrier as much as possible with respect to the test carrier. You should individually adjust each actuator going back and forth several times until you achieve an optimum value.
5. *Fine adjustment, center carrier:* If the center carrier is suppressed by less than 70 dB, carry out a fine adjustment using the **Bias Fine [I/Q]** actuators.

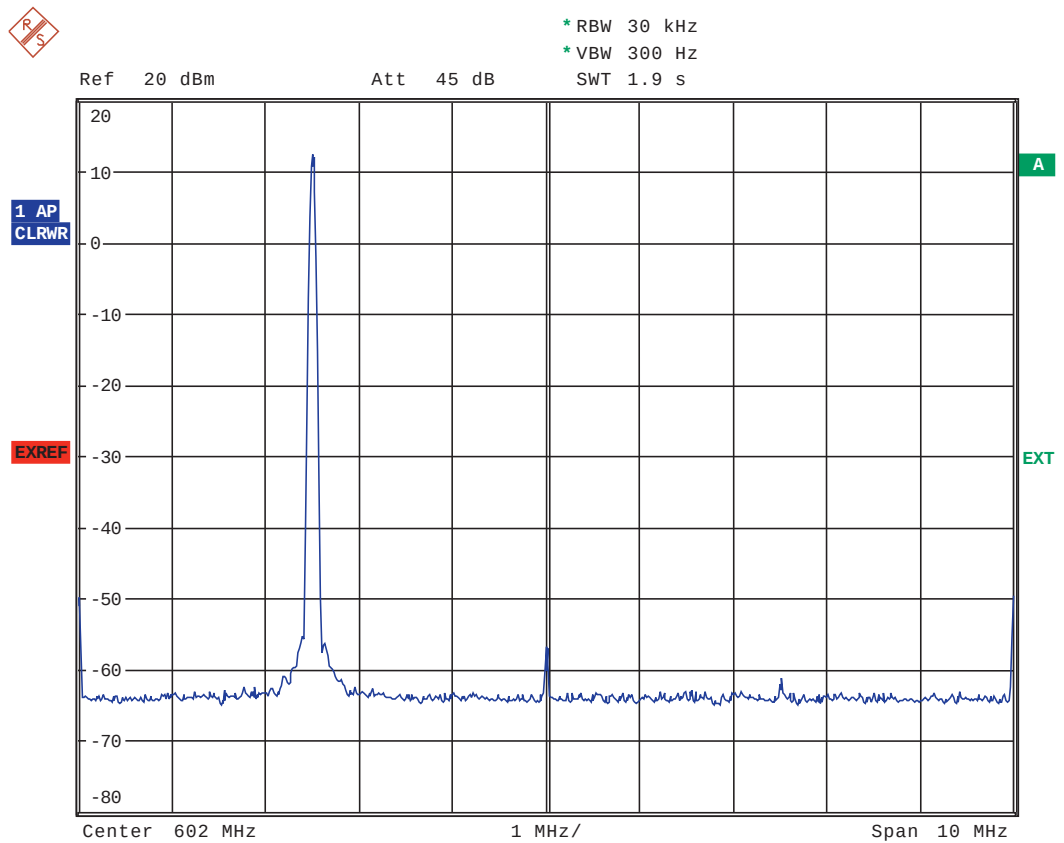


Fig. 2 Spectrum analyzer display after the adjustment

6. Use the **I/Q Test Signal** switch to turn the test signal back off.

5 Replacing Fan


WARNING!

For safety reasons the instrument must be powered down when the fan is being replaced .

5.1 Removing Fan

1. Switch off instrument.
2. Loosen and remove the screw from the fan cover.

The fan cover is then only held in place by two tabs on the right-hand side.



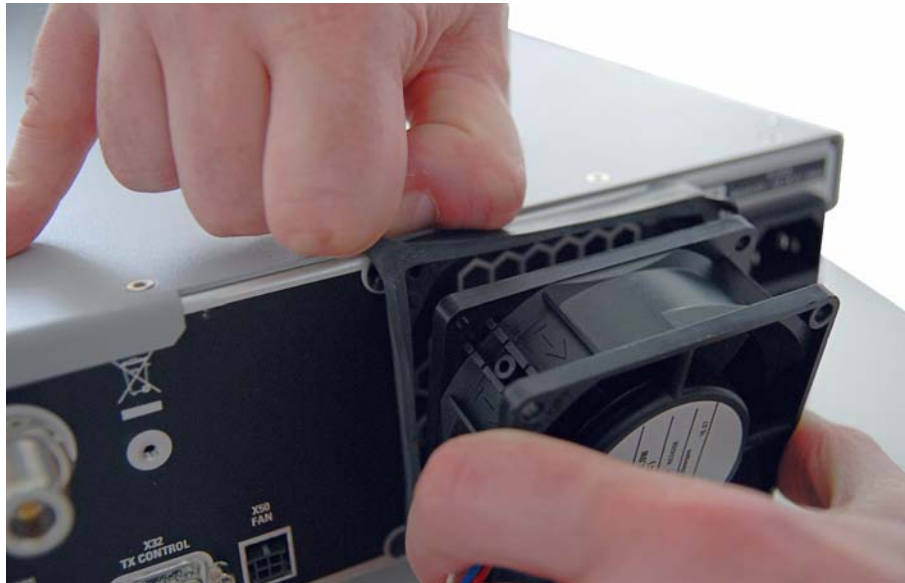
3. Swing the fan cover out to the right and remove.



4. Press the connector locking lever (female X50, FAN) and withdraw the supply cable to the instrument.



5. Grip the fan shroud at one corner and stretch until the fan can be removed.



6. Remove the fan.

5.2 Installing Fan



1. Grip the fan shroud at one corner and stretch until the replacement fan can be inserted.
2. Insert the fan so that the type plate faces outward and the power supply cable is at the bottom left.

In this installation position, the fan extracts air from the inside of the device (the black arrow on the side of the fan must point toward the outside).

3. Connect the fan to the power supply socket **X50 (FAN)**.

4. Insert the two tabs on the fan cover (right-hand side) into the recesses on the rear panel of the device and swing the fan cover closed so that it is flush with the rear panel.

When doing so, make sure that the power supply cable does not protrude from the side of the cover. Do not allow the cable to be pinched.

5. If there are error messages, reset them using the **Reset Fault** context command.

CHAPTER 7

TROUBLESHOOTING

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1 Information

Troubleshooting information will be provided at a later date.

CHAPTER 8

SERVICE

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1 Information

The inside of the instrument does not contain any parts that can be repaired by the customer. Service work must be carried out by your local Rohde & Schwarz representative.

To be able to continue transmission if service work should become necessary, it is advisable to keep one or more replacement instruments to hand. The following section "Replacing Instrument" describes how to quickly make such a replacement instrument ready for operation.

2 Replacing Instrument

Scenario

The operational instrument is faulty and can be replaced by an available replacement instrument of the same type.

Objective

The settings of the operational instrument are to be transferred to the replacement instrument as quickly and simply as possible.

Necessary measures

Operating software, settings and precorrection curves (factory precorrection and possibly also manual precorrection) are stored on the memory card (CompactFlash) of the faulty instrument. Since this data is loaded automatically when the instrument is booted, the parameterization can be transferred to the replacement instrument by simply changing the memory card.

However, if additional measures are not taken, the precorrection curves created individually for the replacement instrument will be lost when the card is changed. To prevent this, it is recommended to follow the procedure below:

- Save factory precorrection curves and any manual precorrection curves of the replacement instrument to a PC
- Insert the memory card of the faulty operational instrument into the replacement instrument
- Copy the precorrection curves from the PC back to the replacement instrument

Note *The content of the memory card cannot be read on a PC because the transmitter and PC use different file systems. If you try to write data to the memory card using a PC, the transmitter will then no longer be able to read the content of the memory card.*

2.1 Saving Precorrection Curves of Replacement Instrument to PC

To allow backups and later recovery (see the section "Loading Precorrection Curves of Replacement Instrument from PC"), you must set up remote operation via a PC and web browser (see the chapter "Operating").

To do so, connect an Ethernet cable from the replacement instrument to the PC and also the power cable to the replacement instrument. The cables in the transmitter system must not be connected until just before the system is put into operation.

Requirements

- The replacement instrument and PC must be connected via Ethernet.
- The IP addresses of the used Ethernet interfaces must be in the same subnet.
- The browser of the PC must be correctly configured.
- The replacement instrument and PC must be switched on.

Note *The necessary measures are described in the section "Remote Operation and Remote Control" in the chapter "Operation".*

Backing up precorrection curves

The **Storage** function is used to save a parameter data set (download) that contains only the precorrection curves (see also the section "Saving Parameter Data on PC" in the chapter "Maintenance"):

1. In the browser, log on at the transmitter with Configuration rights.
2. In the Navigator window of the web browser, click the link **Storage**.
A new browser window opens in which you can select the storage operations.
3. Click the link **Save parameter settings into file**.
4. Under **Save settings from device part**, select the list entry **All Equalizer**.
5. Confirm the selection by clicking the **Save** button.
6. Call the Download dialog box using the link **Download saved file here** and save the parameter data set containing the precorrection curves to the PC.

2.2 Changing Memory Card

To simplify matters, it is assumed below that the memory cards of the faulty operational instrument and the replacement instrument are to be *swapped over*. The procedure is basically the same for both instruments.

Note *Inserting a memory card back into the faulty instrument is, of course, not necessary at this time (except for the purpose of providing a complete description of the procedure).*

2.2.1 Removing Original Memory Card

Faulty operational instrument and replacement instrument:



ATTENTION!

If the memory card is removed or inserted while the instrument is still in operation, the card or the stored data can be damaged. Only change the memory card with the instrument switched off.

1. Make sure that the instrument is switched off. Disconnect the power plug.

2. On the right-hand side of the instrument, remove the cover of the card slot by unscrewing the two Torx screws.



Fig. 1 Removing cover of card slot

3. Pull the memory card out of the slot.



Fig. 2 Removing memory card

2.2.2 Inserting Replacement Memory Card

Faulty operational instrument and replacement instrument:

1. Carefully push the memory card all the way into the card slot.
2. Screw on the cover of the card slot.

2.3 Loading Precorrection Curves of Replacement Instrument from PC

The **Storage** function is used to copy the previously saved precorrection curves back to the transmitter (upload):

1. In the browser, log on at the transmitter with Configuration rights.
2. In the Navigator window of the web browser, click the link **Storage**.
A new browser window opens in which you can select the storage operations.
3. Click the link **Recall parameter settings from file**.
4. Under **Save settings from device part**, select the list entry **All Equalizer**.
5. Click the **Browse** button to call the **Select File** window in the Explorer.
6. Select the previously saved parameter data set containing the precorrection curves and confirm the selection by clicking the **Open** button.
7. Click the **Upload selected File** button.

The browser page that then appears provides information about the contents of the selected file.

8. Check that you have selected the correct file and then click the **Recall** button to copy the previously saved precorrection curves back to the transmitter.

CHAPTER 9

ANNEX

Interface Description

TRANSMITTER

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1 Interface Description

1.1 Rear-Panel Interfaces

1.1.1 Power Feed/Cooling

1.1.1.1 X8: AC Power Feed (Option SLX8000B9/SLX8000B11)

Low-temperature connector

Variants 20/21 (2 W DTV / 5 W DTV / 10 W DTV)

Signal name	Direction	Value range	Contact	Remarks ¹⁾
L1	Input	90 V to 265 V AC $I \leq 2.3 \text{ A}$ 50 Hz to 60 Hz $\pm 10 \%$	X8.L	Power supply connection
N	Input		X8.N	Power supply connection
PE	Input		X8.PE	Power supply connection

1) Max. 180 VA

Variant 30 (25 W DTV / 50 W DTV / 100 W DTV)

Signal name	Direction	Value range	Contact	Remarks ¹⁾
L1	Input	90 V to 265 V AC $I \leq 9.0 \text{ A}$ 50 Hz to 60 Hz $\pm 10 \%$	X8.L	Power supply connection
N	Input		X8.N	Power supply connection
PE	Input		X8.PE	Power supply connection

1) Max. 735 VA (100 W DTV)

Variant 31 (125 W ATV / 250 W ATV)

Signal name	Direction	Value range	Contact	Remarks ¹⁾
L1	Input	<i>for 125 W ATV:</i> 90 V to 265 V AC $\pm$ 10% <i>for 250 W ATV:</i> 100 V to 240 V AC + 10% $I \leq 9.3$ A 50 Hz to 60 Hz	X8.L	Power supply connection
N	Input		X8.N	Power supply connection
PE	Input		X8.PE	Power supply connection

1) Max. 840 VA

1.1.1.2 X8: DC Power Feed (Option SLX8000B10/SLX8000B12)
Variant 20 (2 HU instruments)


Fig. 1 Pin assignment (from top to bottom)

- 1) Negative, GND (-)
- 2) Protective conductor (PE)
- 3) Positive (+)

Signal name	Direction	Value range	Contact	Remarks
Positive	Input	+38 V to +72 V DC	X8.3	Power supply connection
Negative	Input	GND	X8.1	Power supply connection
PE	Input		X8.2	Power supply connection

Variant 30 (3 HU instruments)

Fig. 2 Pin assignment

- 1) Positive (+)
- 2) Negative, GND (-)
- 3) Protective conductor (PE)

Signal name	Direction	Value range	Contact	Remarks
Positive	Input	+38 V to +72 V DC	X8.1	Power supply connection, pin 1
Negative	Input	GND	X8.2	Power supply connection, pin 2
PE	Input		X8.PE	Power supply connection, PE conductor pin

1.1.1.3 X50: Fan Supply

Molex, male connector (4-contact)

Signal name	Direction	Value range	Contact	Remarks
VCC_FAN	Output	+20 V DC to 24 V DC	X50.1	
VCC_GND	Bidirect.	0 V	X50.2	
FAN_SPEED	Input	Open collector	X50.3	
NC			X50.4	

1.1.2 Control Interfaces
1.1.2.4 ETHERNET REMOTE (X31): Control Interface for Remote Control

RJ45, female connector (8-contact)

Signal name	Direction	Value range	Contact	Remarks
TD+	Output	Ethernet	X31.1	
TD-	Output	Ethernet	X31.2	
RD+	Input	Ethernet	X31.3	
NC			X31.4	
NC			X31.5	
RD-	Input	Ethernet	X31.6	
NC			X31.7	
NC			X31.8	

1.1.2.5 ETHERNET LOCAL (X30): Control Interface for Local Operation

RJ45, female connector (8-contact)

Signal name	Direction	Value range	Contact	Remarks
TX+	Output	Ethernet	X30.1	
TX-	Output	Ethernet	X30.2	
RX+	Input	Ethernet	X30.3	
NC			X30.4	
NC			X30.5	
RX-	Input	Ethernet	X30.6	
NC			X30.7	
NC			X30.8	

1.1.2.6 TX CONTROL (X32): RF Loop, CAN Bus

D-Sub, female connector (9-contact)

Signal name	Direction	Value range	Contact	Remarks
+12 V	Output	+12 V +0.5/-1.5 V	X32.1	Power supply for external modules (max. 0.5 A)
+12 V	Output	+12 V +0.5/-1.5 V	X32.9	

Signal name	Direction	Value range	Contact	Remarks
GND	Bidirect.	0 V	X32.3	
GND	Bidirect.	0 V	X32.6	
CAN_L	Bidirect.	–	X32.2	CAN bus
CAN_H	Bidirect.	–	X32.7	CAN bus
RF_LOOP_P	Output	–	X32.8	Optocoupler
RF_LOOP_N	Bidirect.	0 V floating	X32.4	Ground
+12V_PF	Output	+12 V floating	X32.5	R _i = 1 k Ω (for diagnosis)

1.1.3 POWER OUT (X7): RF Output

N female, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
Power out	Output	For power outputs of models, refer to power output table in chapter "Design and Characteristics"	X7.1	RF output R _i = 50 Ω
GND	Two way	0 V	X7.2	

1.1.4 Reference Interfaces

1.1.4.7 EXT 1 PPS (X23): Second Pulse from External GPS

BNC, female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
EXT 1 PPS	Input	LVT	X23.1	R _i = 50 Ω for AC
GND	Bidirect.	0 V	X23.2	

1.1.4.8 EXT REF (X24): Reference Input

BNC, female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
EXT REF	Input	-5 dBm to 20 dBm or LVT	X24.1	Reference input for 5 MHz or 10 MHz Ri = 50 Ω for AC
GND	Bidirect.	0 V	X24.2	

1.1.4.9 REF OUT (X29): Reference Monitoring

BNC, female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
REF OUT	Output	350 mV pp to 450 mV pp	X29.1	Reference frequency or 1 PPS ¹⁾ (for monitoring only) Ri = 50 Ω
GND	Bidirect.		X29.2	

1) Can be selected using software

1.1.5 DTV Input Interfaces

1.1.5.10 TS 1 (X21): Signal Input 1 (Also HP Stream)

BNC, female connector, 75 Ω

Signal name	Direction	Value range	Contact	Remarks
TS1	Input	ASI / SMPTE310M	X21.1	Ri = 75 Ω
GND	Bidirect.	0 V	X21.2	

1.1.5.11 TS 2 (X22): Signal Input 2 (Also LP Stream)

BNC, female connector, 75 Ω

Signal name	Direction	Value range	Contact	Remarks
TS2	Input	ASI / SMPTE310M	X22.1	Ri = 75 Ω
GND	Bidirect.	0 V	X22.2	

1.1.6 ATV Input Interfaces

1.1.6.12 AUDIO 1 (X27): Analog Audio Input AF1

XLR, female connector

Signal name	Direction	Value range	Contact	Remarks
AF1-	Input	-12 dBu to +12 dBu	X27.1	Ri = 600 Ω / > 10 k Ω
AF1+	Input		X27.2	
GND	Bidirect.	0 V	X27.3	
GND	Bidirect.	0 V	X27.4	

1.1.6.13 AUDIO 2 (X28): Analog Audio Input AF2

XLR, female connector

Signal name	Direction	Value range	Contact	Remarks
AF2-	Input	-12 dBu to +12 dBu	X28.1	Ri = 600 Ω / > 10 k Ω
AF2+	Input		X28.2	
GND	Bidirect.	0 V	X28.3	
GND	Bidirect.	0 V	X28.4	

1.1.6.14 BTSC (X25): Analog Audio Input to BTSC Standard (M, N)

BNC, female connector, 75 Ω

Signal name	Direction	Value range	Contact	Remarks
BTSC	Input	0.25 Vrms to 2 Vrms	X25.1	Ri = 75 Ω
GND	Bidirect.	0 V	X25.2	

1.1.6.15 VF (X20): Analog Video Input

BNC, female connector, 75 Ω

Signal name	Direction	Value range	Contact	Remarks
VF	Input	0.7/1 V pp $\pm$ 3 dB	X20.1	Ri = 75 Ω
GND	Bidirect.	0 V	X20.2	

1.1.6.16 NICAM DATA (X26): Digital Data Input for NICAM 728

BNC, female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
NICAM DATA	Input	1 V pp to 10 V pp	X26.1	Ri = 50 Ω for AC
GND	Bidirect.	0 V	X26.2	

1.1.7 Interfaces for Options

1.1.7.17 RECEIVER (X1): Antenna Input for DVB-T Receiver

N female, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
RECEIVER	Input	-80 dBm to 20 dBm	X1.1	For options: – Retransmitter – Monitoring Ri = 50 Ω
GND	Bidirect.	0 V	X1.2	

1.1.7.18 RECEIVER AUX (X3): Antenna Input for Second DVB-T Receiver

N female, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
RECEIVER AUX	Input	-80 dBm to 20 dBm	X3.1	For options: – Retransmitter AUX – Monitoring AUX Ri = 50 Ω
GND	Bidirect.	0 V	X3.2	

1.1.7.19 GPS ANTENNA (X2): Antenna Input for GPS Receiver

N female connector, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
GPS ANTENNA	Input	Minimum level: -128 dBm	X2.1	Ri = 50 Ω
GND	Bidirect.	0 V	X2.2	

1.2 Front-Panel Interface

1.2.1 RF MONITOR (X4): RF Test Output

SMA, female, 50 Ω

Signal name	Direction	Value range	Contact	Remarks
RF MONITOR	Output	Decoupling at amplifier output P_{rms} approx. 6 dBm	X4.1	Ri = 50 Ω frequency-dependent, not calibrated
GND	Bidirect.		X4.2	

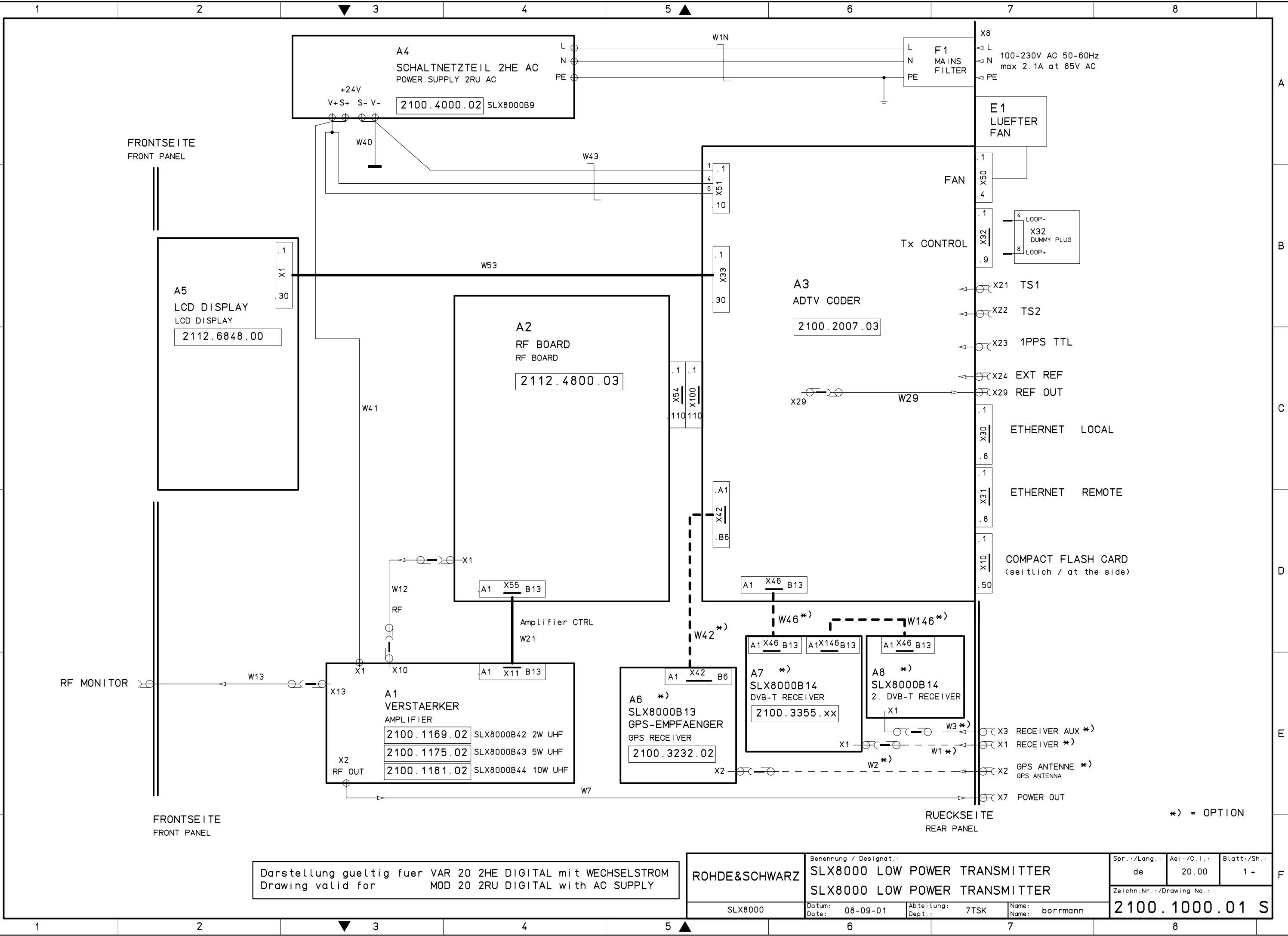
Drawings and Diagrams

TRANSMITTER

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F



Darstellung gueltig fuer VAR 20 2HE DIGITAL mit WECHSELSTROM
Drawing valid for MOD 20 2RU DIGITAL with AC SUPPLY

ROHDE&SCHWARZ

Benennung / Designat.:
SLX8000 LOW POWER TRANSMITTER
SLX8000 LOW POWER TRANSMITTER

Spr.:/Lang.: de Aei:/C.I.: 20.00 Blatt:/Sh.: 1 +

Zeichn.Nr.:/Drawing No.:

2100.1000.01 S

SLX8000

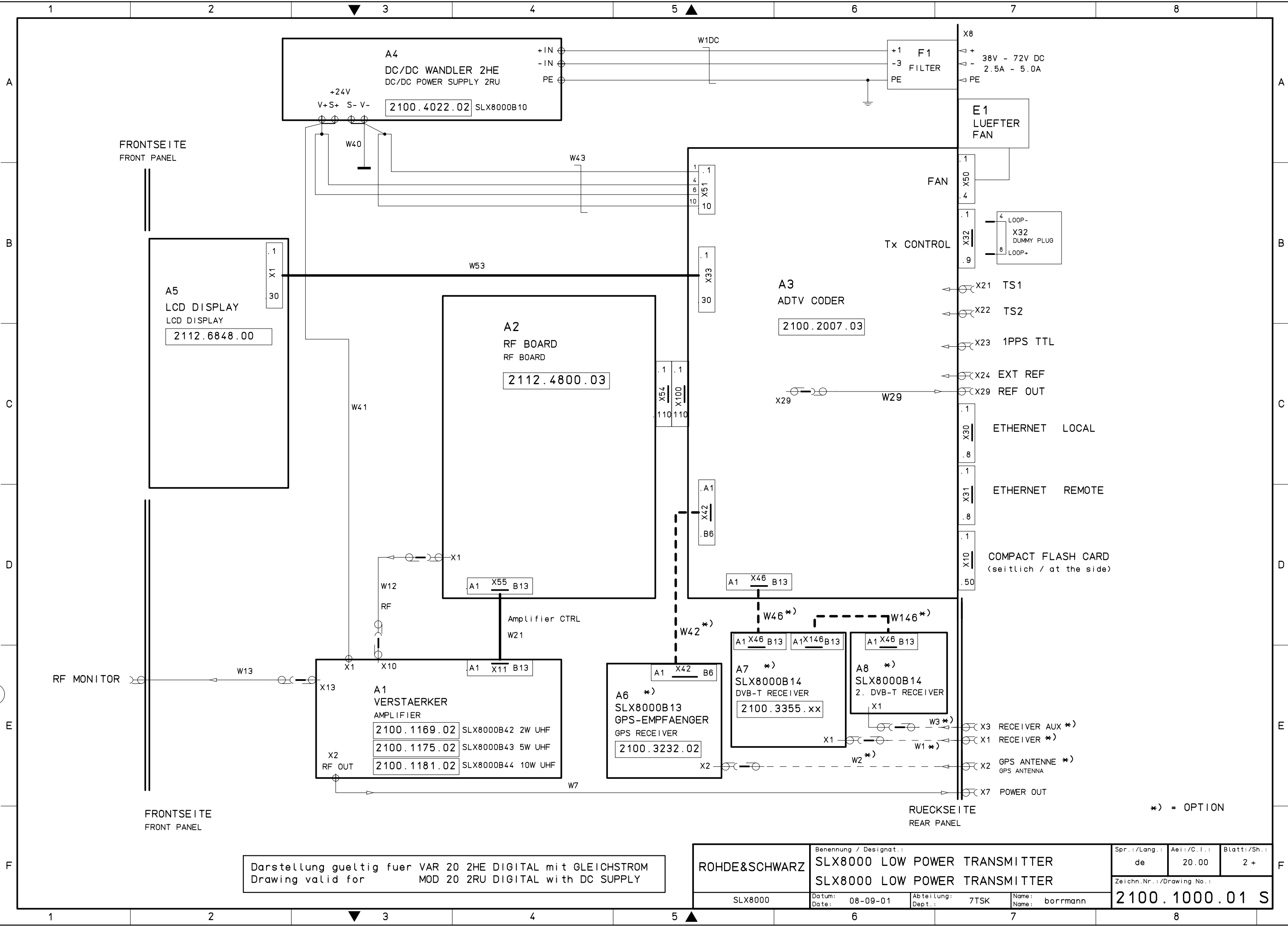
Datum:
Date: 08-09-01

Abteilung:
Dept.: 7TSK

Name:
Name: borrmann

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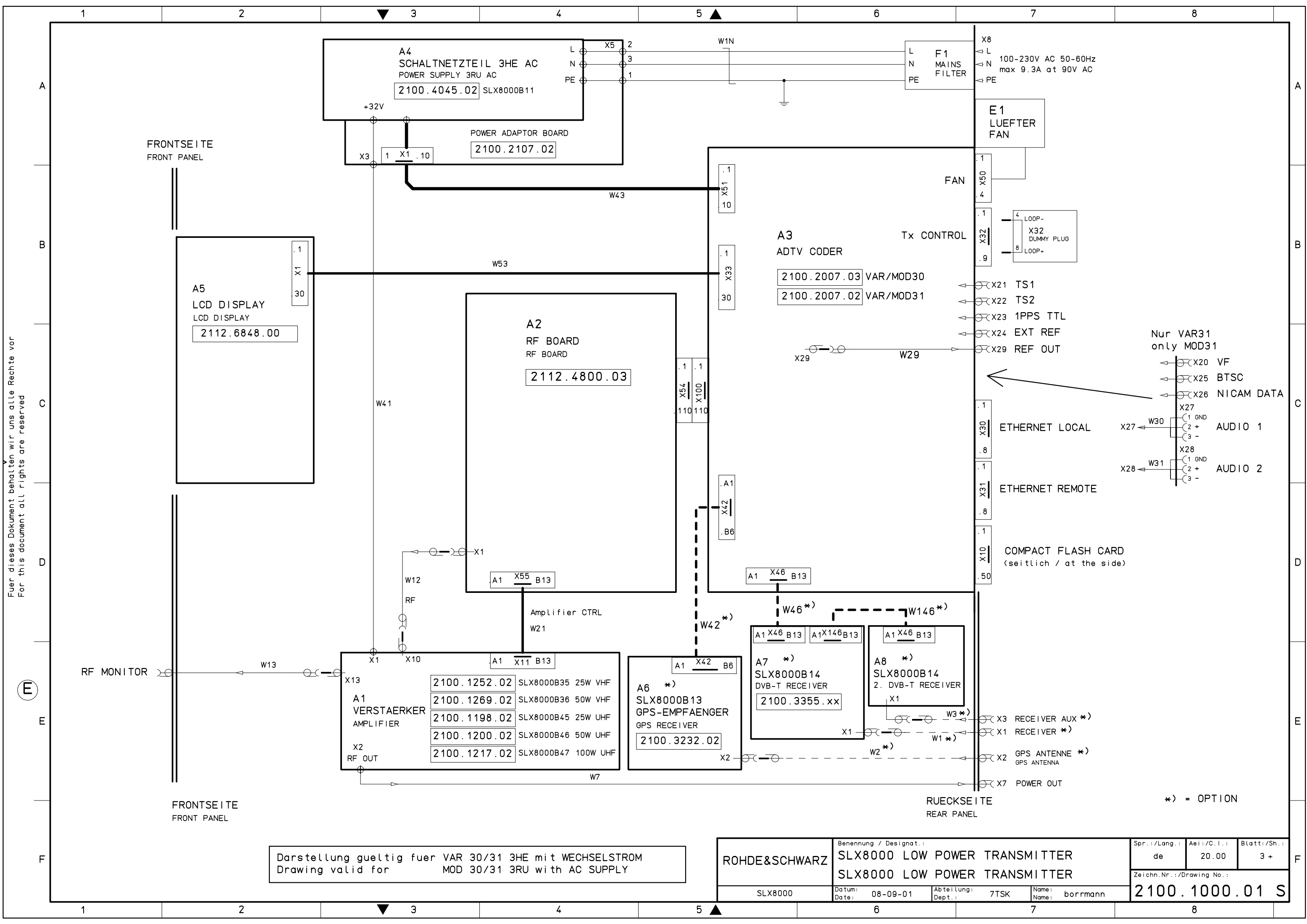


*) = OPTION

Darstellung gueltig fuer VAR 20 2HE DIGITAL mit GLEICHSTROM
Drawing valid for MOD 20 2RU DIGITAL with DC SUPPLY

ROHDE&SCHWARZ	Benennung / Designat.:			Spr.:/Lang.:	Aei:/C.I.:	Blatt:/Sh.:
	SLX8000 LOW POWER TRANSMITTER			de	20.00	2 +
SLX8000 LOW POWER TRANSMITTER			Zeichn.Nr.:/Drawing No.:			
SLX8000	Datum: Date:	08-09-01	Abteilung: Dept.:	7TSK	Name: Name:	bormann
2100.1000.01						S

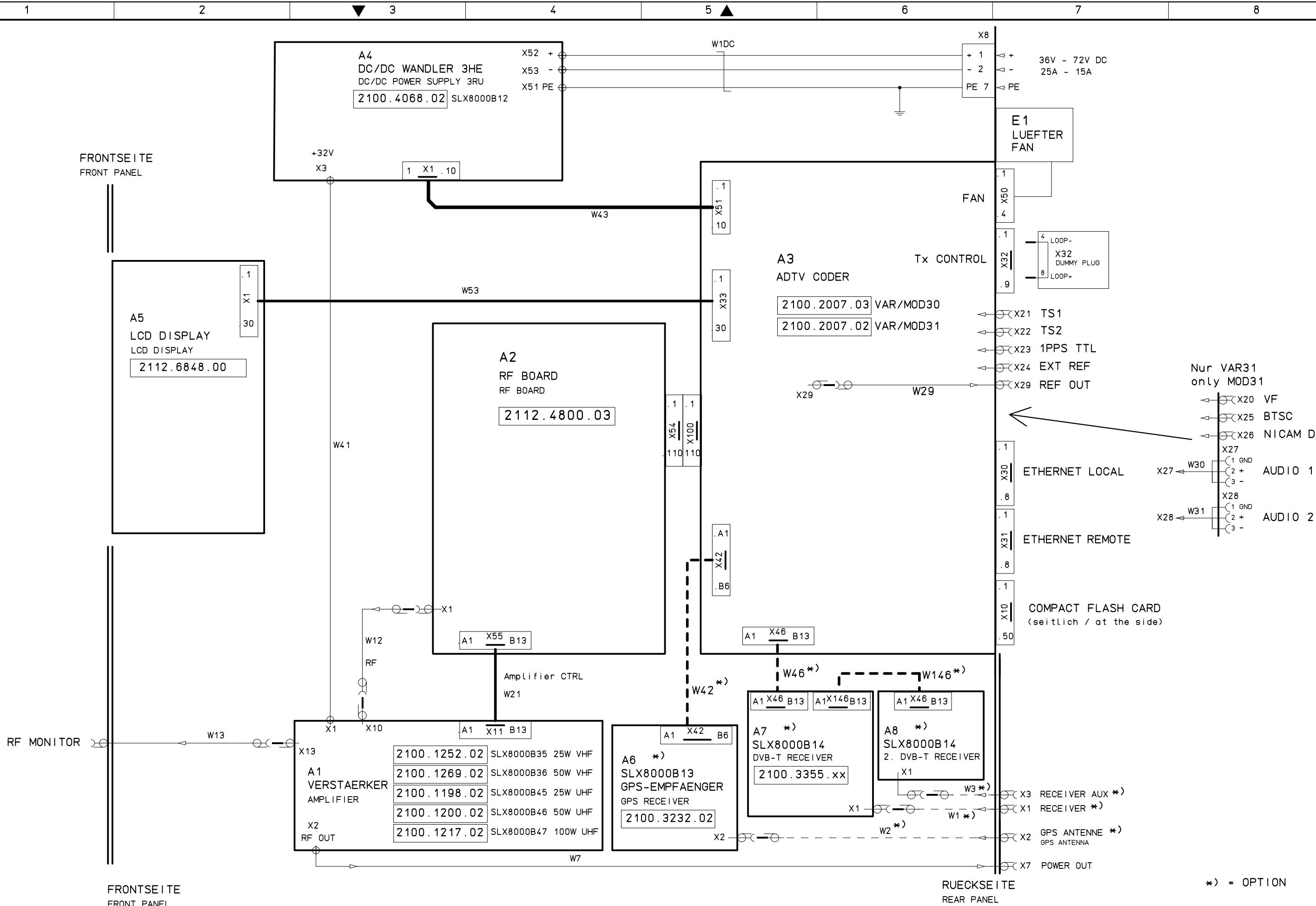
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Darstellung gueltig fuer VAR 30/31 3HE mit WECHSELSTROM
Drawing valid for MOD 30/31 3RU with AC SUPPLY

ROHDE&SCHWARZ	Benennung / Designat.: SLX8000 LOW POWER TRANSMITTER SLX8000 LOW POWER TRANSMITTER			Spr.:/Lang.: de	Aei:/C.I.: 20.00	Blatt:/Sh.: 3 +
	SLX8000	Datum: Date: 08-09-01	Abteilung: Dept.: 7TSK	Name: Name: borrmann	Zeichn.Nr.:/Drawing No.: 2100.1000.01 S	

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*) = OPTION

Darstellung gueltig fuer VAR 30/31 3HE mit GLEICHSTROM
Drawing valid for MOD 30/31 3RU with DC SUPPLY

ROHDE&SCHWARZ

Benennung / Designat.:
SLX8000 LOW POWER TRANSMITTER
SLX8000 LOW POWER TRANSMITTER

Spr.:/Lang.: Aei:/C.I.: Blatt:/Sh.:

de 20.00 4 +

Zeichn.Nr.:/Drawing No.:

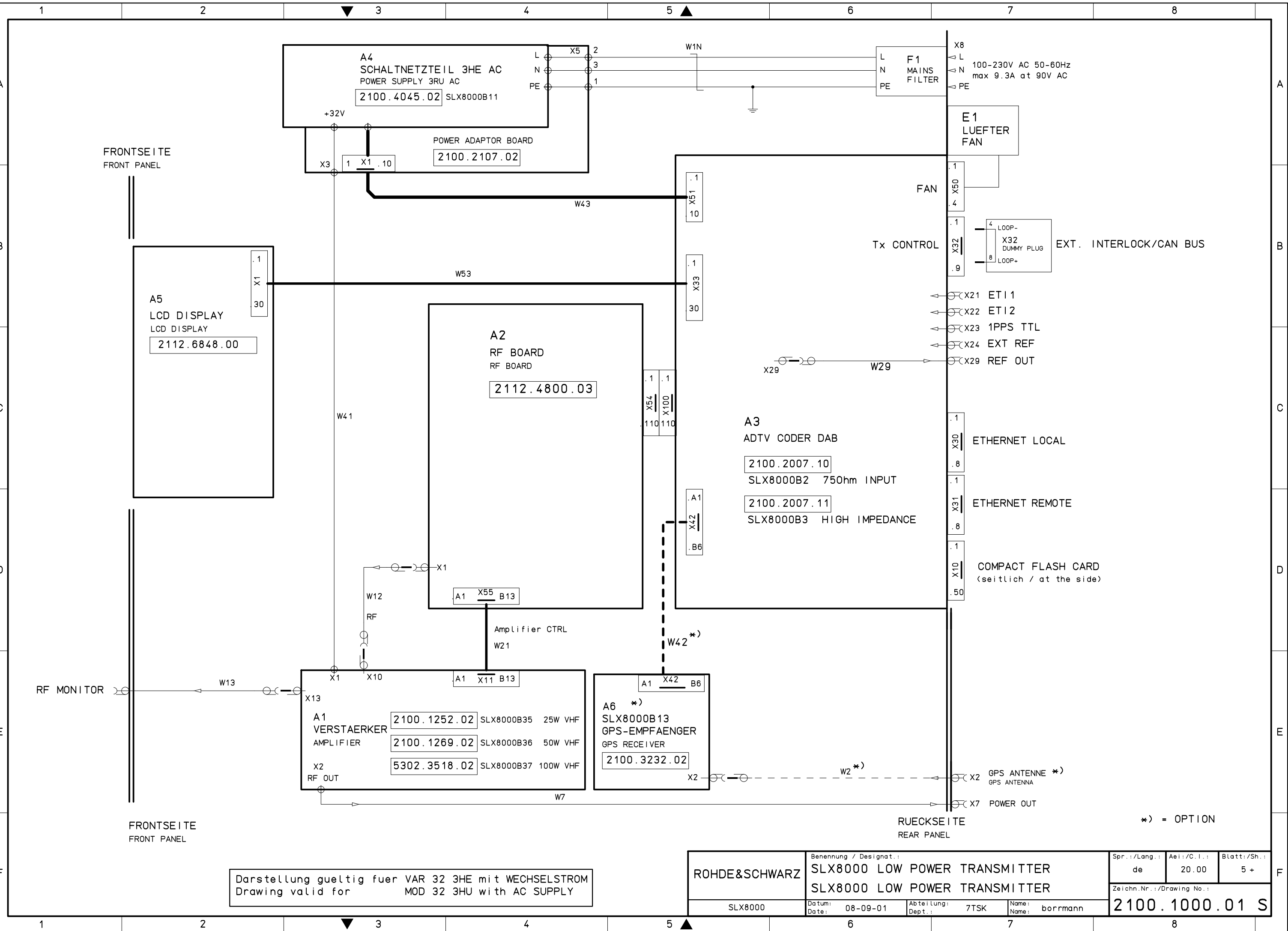
2100.1000.01 S

SLX8000

Datum:
Date: 08-09-01

Abteilung:
Dept.: 7TSK

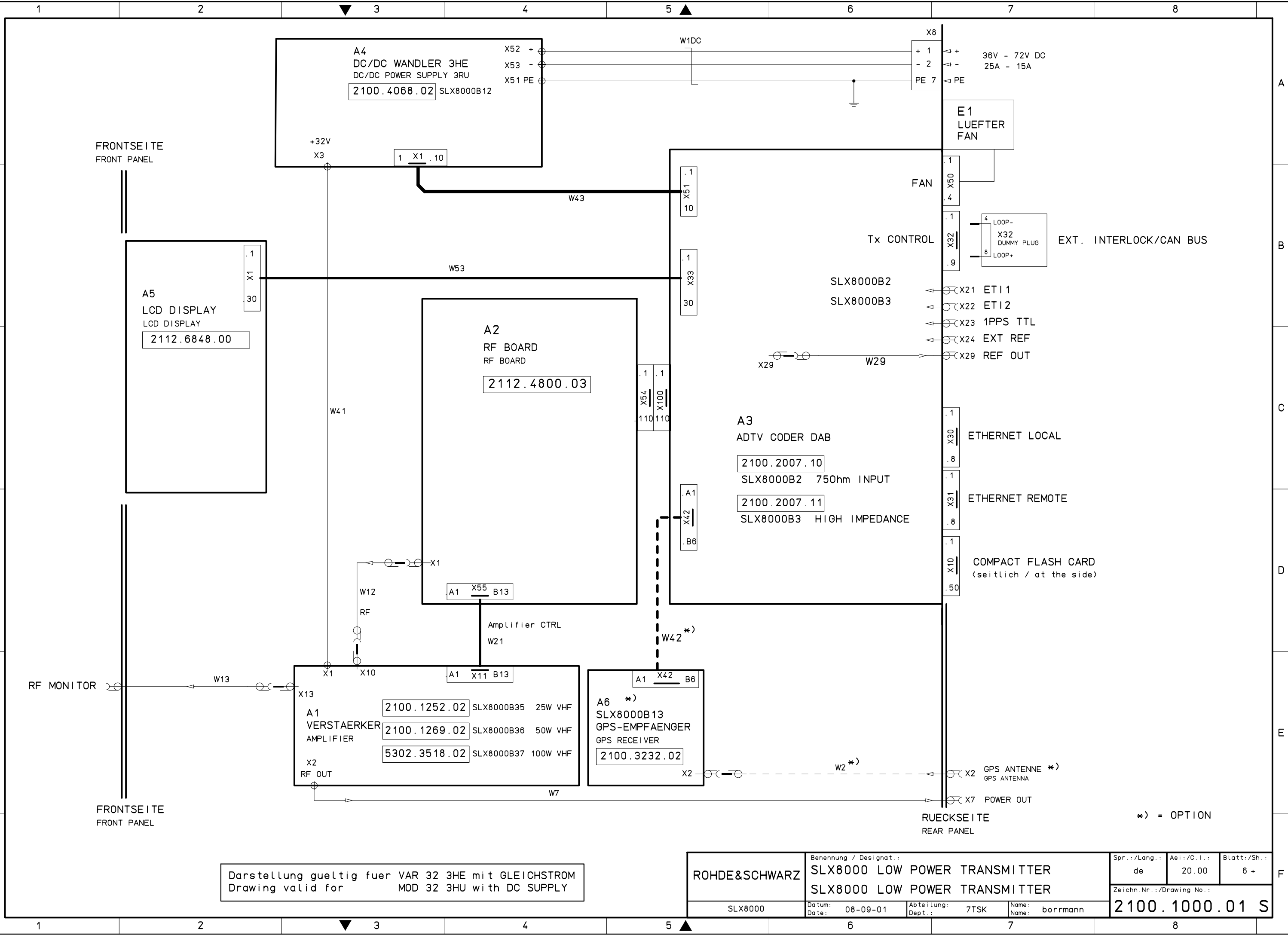
Name:
Name: borrmann



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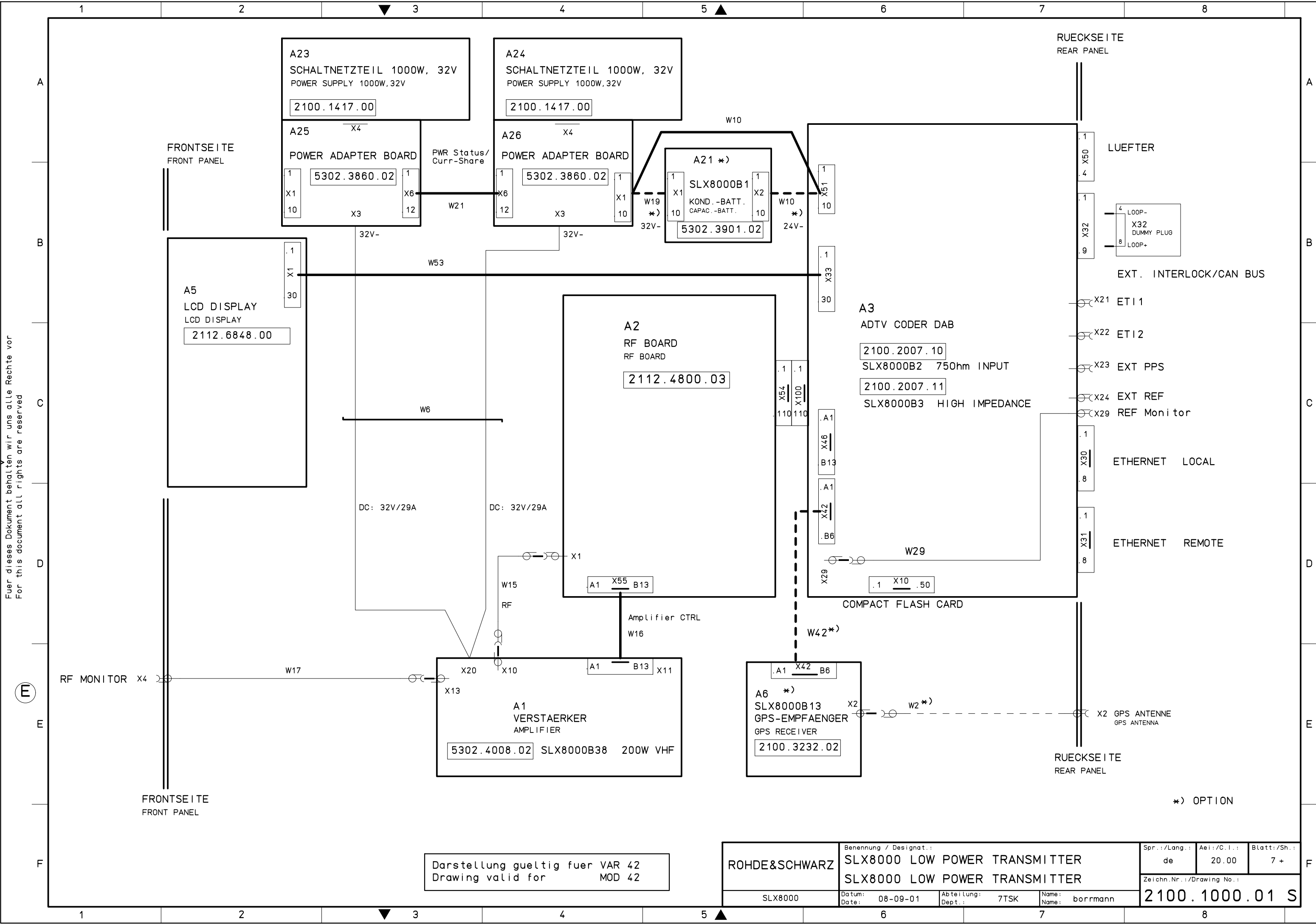
F



Darstellung gueltig fuer VAR 32 3HE mit GLEICHSTROM
Drawing valid for MOD 32 3HU with DC SUPPLY

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	SLX8000	Datum: Date: 08-09-01	Abteilung: Dept.: 7TSK	Name: Name: borrmann	Zeichn.Nr.:/Drawing No.: 2100.1000.01 S	

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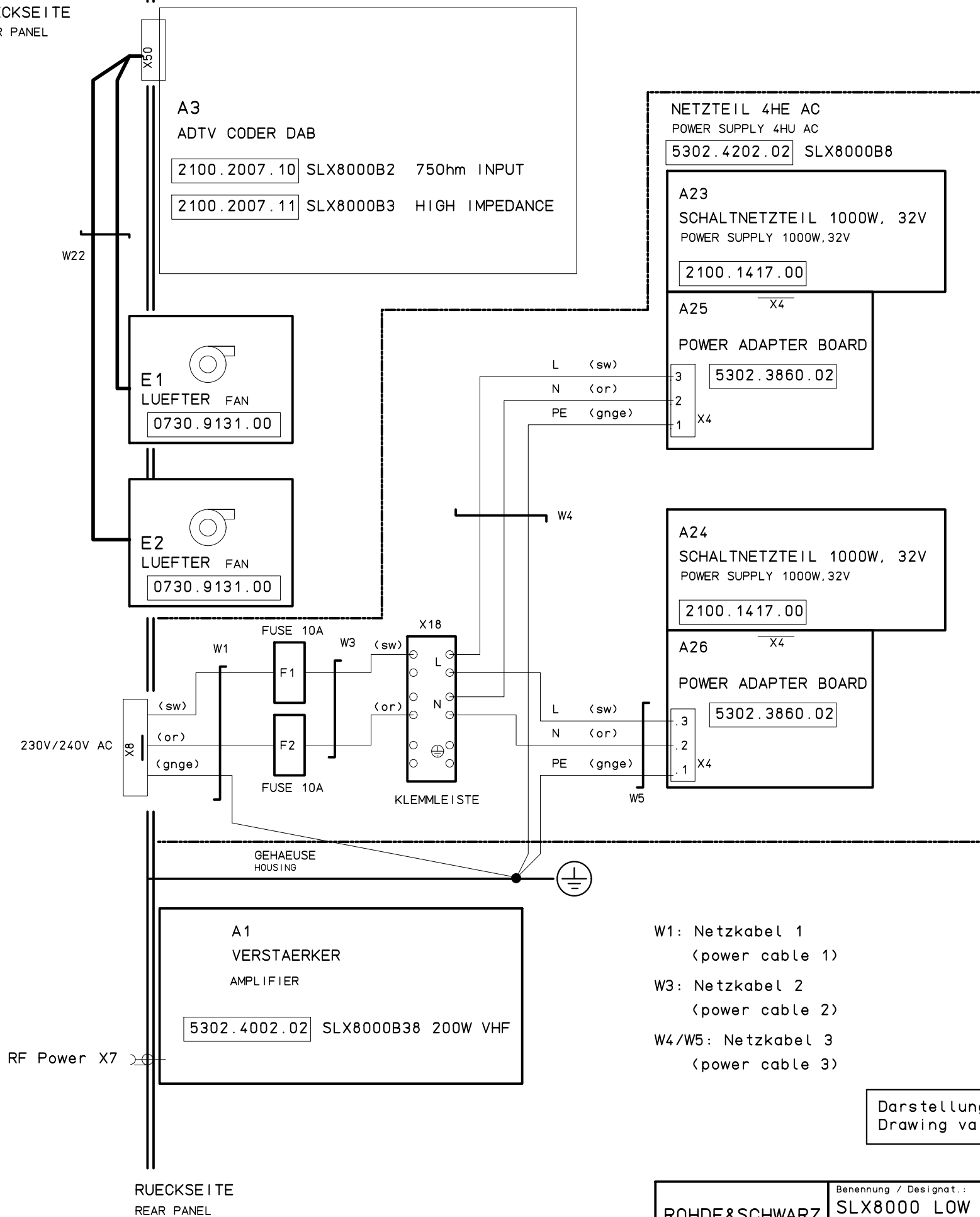


Darstellung gueltig fuer VAR 42
Drawing valid for MOD 42

ROHDE&SCHWARZ	Benennung / Designat.: SLX8000 LOW POWER TRANSMITTER SLX8000 LOW POWER TRANSMITTER			Spr.:/Lang.: de	Aei:/C.I.: 20.00	Blatt:/Sh.: 7 +
	SLX8000	Datum: Date: 08-09-01	Abteilung: Dept.: 7TSK	Name: Name: bormann	Zeichn.Nr.:/Drawing No.: 2100.1000.01 S	

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RUECKSEITE
REAR PANEL



RF Power X7

RUECKSEITE
REAR PANEL

W1: Netzkabel 1
<power cable 1>
W3: Netzkabel 2
<power cable 2>
W4/W5: Netzkabel 3
<power cable 3>

Darstellung gueltig fuer VAR 42 mit 230/240V AC NETZEINGANG
Drawing valid for MOD 42 with 230/240V AC POWER INPUT

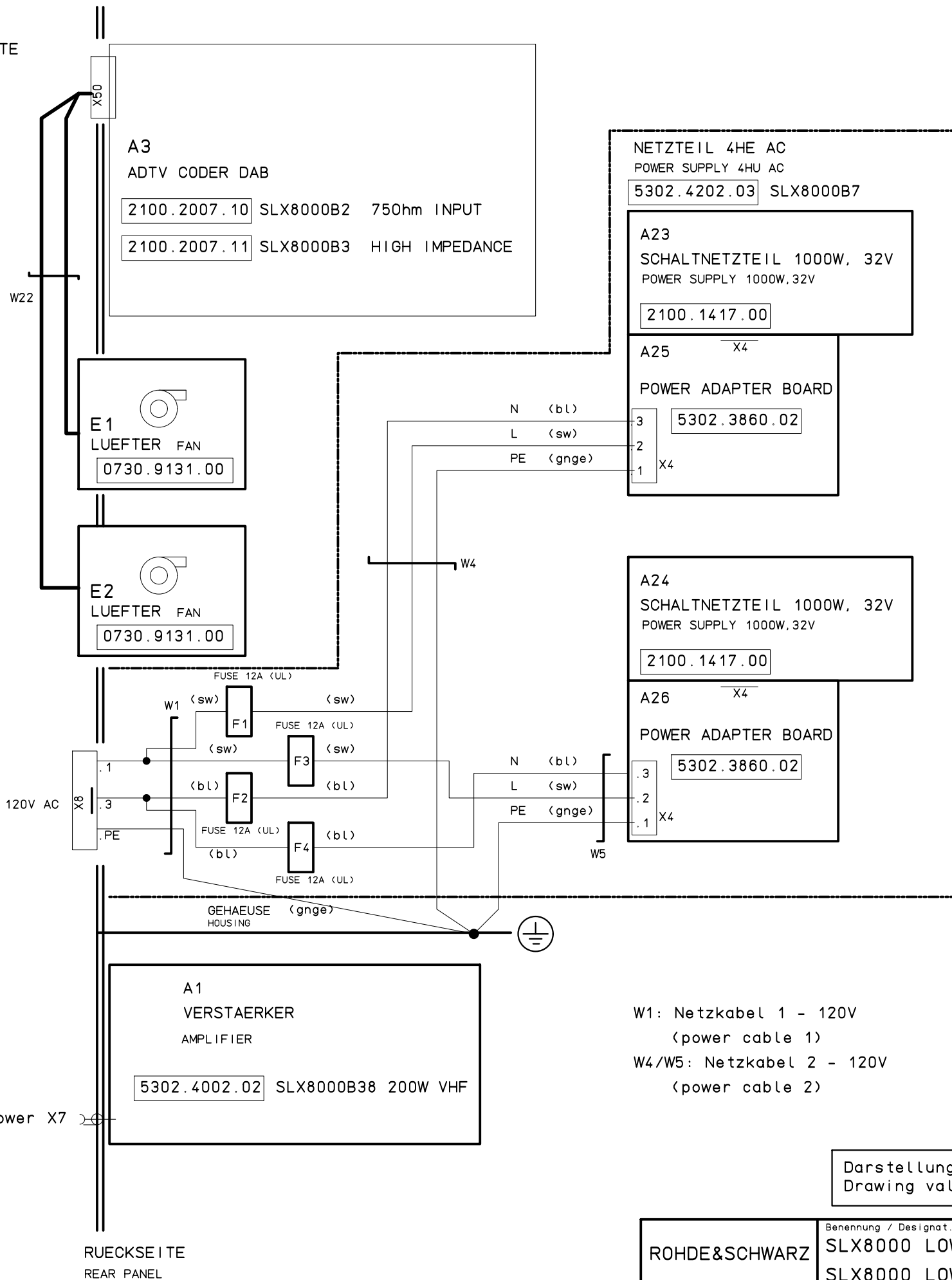
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	SLX8000	Datum: Date: 08-09-01	Abteilung: Dept.: 7TSK	Name: Name: borrmann	Zeichn.Nr.:/Drawing No.: 2100.1000.01 S	

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RUECKSEITE
REAR PANEL



Darstellung gueltig fuer VAR 42 mit 120V AC NETZEINGANG
Drawing valid for MOD 42 with 120V AC POWER INPUT

ROHDE&SCHWARZ	Benennung / Designat.: SLX8000 LOW POWER TRANSMITTER SLX8000 LOW POWER TRANSMITTER			Spr.:/Lang.: de	Aei:/C.I.: 20.00	Blatt:/Sh.: 9 -
	SLX8000	Datum: Date: 08-09-01	Abteilung: Dept.: 7TSK	Name: Name: bormann	Zeichn.Nr.:/Drawing No.: 2100.1000.01 S	

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el.Kennz Part	Benennung / Hinweise Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bestellbezeichnung Designation	enthalten in contained in
	ACHTUNG EGB /ATTENTION ESD *VARIANTENERKLAERUNG *EXPLANATION OF MODELS VAR20=SLX8000 GRUNDGERAET 2HE DIGITAL MOD20= VAR21=SLX8000 GRUNDGERAET 2HE ANALOG/DIGITAL MOD21=SLX8000 BASIC UNIT 2HU ANALOG/DIGITAL VAR30=SLX8000 GRUNDGERAET 3HE DIGITAL MOD30= VAR31=SLX8000 GRUNDGERAET 3HE ANALOG/DIGITAL MOD31=SLX8000 BASIC UNIT 3HU ANALOG/DIGITAL VAR32=SLX8000 GRUNDGERAET 3HE DAB MOD32= VAR40=SLX8000 GRUNDGERAET 4HE DIGITAL MOD40= VAR41=SLX8000 GRUNDGERAET 4HE ANALOG/DIGITAL MOD41= VAR42=SLX8000 GRUNDGERAET 4HE DAB MOD42=				
A2	ED RF BOARD RF BOARD	2112.4800.03			2100.1000.01
A3	ED ADTV CODER ADTV CODER VAR 20 30 40	2100.2007.03			2100.1000.01
A3	ED ADTV CODER ADTV CODER VAR 21 31 41	2100.2007.02			2100.1000.01
A3	ED ADTV CODER ADTV CODER VAR 32 42 enthalten in 5302.4408.02 SLX8000B2	2100.2007.10			2100.1000.01
A3	ED ADTV CODER ADTV CODER VAR 32 42 enthalten in 5302.4414.02 SLX8000B3	2100.2007.11			2100.1000.01
A5	ND DISPLAY LCD 200X48-8T/5LED DISPLAY LCD 200X48-8KEYS/5LED	2112.6848.00	DATA_MODUL	DISPLAY LCD 200X48-8T/5LED (LCM 164-02)	2100.1000.01
E1	EV 80X80X32 22.0L/S 24V BLOWER VAR 20 21	2100.1469.00	PAPST	8314H/2 R&S- ZCHNG.2100.1469.00 AEZ.01.00	2100.1000.01
E1	EV 119X119X38 76L/S 24V FAN 119X119X38 VAR 30 31 32	2100.1481.00	PAPST	DV4114N/2 R&S- ZCHNG.2100.1481.00 AEZ.02.	2100.1000.01
 ROHDE&SCHWARZ Benennung/Designation SLX8000 LOW POWER TRANSMITTER SLX8000 LOW POWER TRANSMITTER				Sprach./Lang de en Ä.I. / C./ 45.00	Blatt/Sheet 1 of 2 Dokument Nr. / Document No. 2100.1000.01 SA
SLX8000		Datum/ Date 2009-10-29	Abt. / Dept. 7TSK	Name / Name HG	

el.Kennz Part	Benennung / Hinweise Designation	Sachnummer Stock No.	Hersteller Manufacturer	Bestellbezeichnung Designation	enthalten in contained in		
E1 - E2	EV 119X119X38 50L/S 24V- BLOWER 24V 50L/S VAR 40 41 42	0730.9131.00	PAPST	4184NX 9294310103	2100.1000.01		
W12	DV RF KABEL EF316D SMP/W- SMA/W RF CABLE VAR 20 21 30 31 40 41	2100.1830.00			2100.1000.01		
W13	DV RF KABEL EF316D SMP/W- SMA/E RF CABLE VAR 20 21 30 31 40 41	2100.1846.00			2100.1000.01		
W22	DX DC-KABEL LUEFTER DC CABLE FAN VAR 40 41 42	5302.3899.00			2100.1000.01		
W29	DV RF KABEL EF316D SMP/W- BNC/E RF CABLE VAR 20 21 30 31 32 40 41 42	2100.1817.00			2100.1000.01		
W31	DX AF KABEL AF CABLE VAR 21 31	2100.1930.00			2100.1000.01		
W31	DX AF KABEL 4HE AF CABLE 4RU VAR 41	2104.1805.00			2100.1000.01		
W32	DX AF KABEL AF CABLE VAR 21 31	2100.1930.00			2100.1000.01		
W53	DF FLEX-STRIP 30P. R=0.5 L=400 FLEX-STRIP 30P. R=0.5 L=400 VAR 20 21 30 31 32	2112.6790.00	SUMITUMO	SML2CD-30X390- ADX8(BL)-90.5-S5-M- N(35)F	2100.1000.01		
W53	DF FLEX-STRIP 30P. R=0.5 L=550 FLEX-STRIP 30P. R=0.5 L=550 VAR 40 41 42	5302.4037.00	SUMITUMO	SML2CD30X550-ADX6(BL)- P0,5-S4-M(35)-F	2100.1000.01		
X32	DX BLINDSTECKER X6 DUMMY PLUG X6 dem Geraet beiliegend	2098.9810.00			2100.1000.01		
ROHDE&SCHWARZ		Benennung/Designation SLX8000 LOW POWER TRANSMITTER SLX8000 LOW POWER TRANSMITTER			Sprach./Lang de en	Ä.I. / C.I 45.00	Blatt/Sheet 2 of 2
SLX8000		Datum/ Date 2009-10-29	Abt. / Dept. 7TSK	Name / Name HG	Dokument Nr. / Document No. 2100.1000.01 SA		

Spare Parts Lists

TRANSMITTER

Printed in Germany

Pos.-Nr. ItemNo	Menge Quantity	ME Unit	El.Kennz Ref.Des.	Benennung / Bezeichnung Designation	Z	Sachnummer Stock No.	Ersatzteil Subst.part	BA	VH
				ACHTUNG EGB/ATTENTION ESD *VARIANTENERKLAERUNG *EXPLANATION OF MODELS VAR20=GRUNDGERAET 2HE DIGITAL MOD20=BASIC MODEL 2HU DIGITAL VAR21=GRUNDGERAET 2HE DIGITAL MOD21=BASIC MODEL 2HU DIGITAL VAR30=GRUNDGERAET 3HE DIGITAL MOD30=BASIC MODEL 3HU DIGITAL VAR31=GRUNDGERAET 3HE ANALOG MOD31=BASIC MODEL 3HU ANALOG VAR32=GRUNDGERAET 3HE DAB MOD32=BASIC MODEL 3HU DAB VAR40=GRUNDGERAET 4HE DIGITAL MOD40=BASIC MODEL 4HU DIGITAL VAR41=GRUNDGERAET 4HE ANALOG MOD41=BASIC MODEL 4HU ANALOG VAR42=GRUNDGERAET 4HE DAB MOD42=BASIC MODEL 4HU DAB					
40	1	S		KR BW2-FRONTGRIFF 2E FRONT HANDLE VAR 20 21 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		1096.1468.00	X	B	O
42	1	S		KR BW2-GESTELLWINK.2E RE. ANGLE VAR 20 21 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		1096.3425.00	X	M	O
43	1	S		KR BW2-GESTELLWINK.2E LI. ANGLE LEFT VAR 20 21 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		1096.3431.00	X	M	O
50	1	S		KR BW2-FRONTGRIFF 3E FRONT HANDLE VAR 30 31 32 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		1096.1474.00	X	B	O
55	1	S		KR BW2-GESTELLWINKEL 3E ANGLE VAR 30 31 32 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		1096.3448.00	X	M	O
60	1	S		KR BW2-FRONTGRIFF 4E FRONT HANDLE VAR 42 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		1096.1480.00	X	B	O
65	1	S		MZ BW2-GESTELLWINKEL 4E ANGLE VAR 42 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		1096.3454.00	X	M	O
80	1	S		KR BW2-GLEITSCHIENE RAIL ## Verwendet in: ## 2100.1000.01		1096.3677.00	X	B	T



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Benennung/Designation
ERSATZTEILLISTE SLX8000
SPARE PART LIST SLX8000

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SLX8000

Datum/
Date 2010-04-13

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273	1	S		MT ABSCHIRMUNG LED COVER ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		2100.3884.00	X	M	
274	1	S		MZ DRUCKPLATTE PLATE ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		2112.5329.00	X	M	
276	1	S		OP MESH-SCHEIBE 102.9X30X2 ACRYL A3 SCREENED FILTER GLASS ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		2112.2413.00	X	B	O
282	1	S	W53	DF FLEX-STRIP 30P. R=0.5 L=400 FLEX-STRIP 30P. R=0.5 L=400 VAR 20 21 30 31 32 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		2112.6790.00	X	B	O
284	1	S	W53	DF FLEX-STRIP 30P. R=0.5 L=550 FLEX-STRIP 30P. R=0.5 L=550 VAR 42 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		5302.4037.00	X	B	O
286	1	S		ZN FRONTPLATTE 2HE BEDRUCKT COVER VAR 20 21 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät	Z	2100.1675.00	X	M	
288	1	S		ZN FRONTHAUBE 3HE BEDRUCKT PRINTED VAR 30 31 32 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		2100.1523.00	X	M	
290	1	S		KB FRONTHAUBE 4HE BEDRUCKT FRONT COVER 4HU PRINTED VAR 42 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät	Z	5302.3760.00	X	M	
292	1	S	W22	DX DC-KABEL LUEFTER DC CABLE FAN VAR 42 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät	Z	5302.3899.00	X	M	
295	1	S		MZ ABDECKUNG COVER VAR 20 30 32 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		2100.1552.00	X	M	
298	1	S		MB MASSEBOLZEN GROUND BOLT VAR 20 21 30 31 32 ## Verwendet in: ## 2100.1000.01 ## SLx8000 Grundgerät		5301.0215.00	X	M	
300	1	S	X32	DX BLINDSTECKER X6	Z	2098.9810.00	X	M	
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2010	1	S	F1	NOTE NETZTEILKOMPONENTEN FN NETZFILTER M.SCH.U.SI.3A CONNECTOR ## Verwendet in: ## Option Netzteil SLx8000B9 ## 2100.4000.01 ## verwendet in K20 K21		2100.3610.00	X	B	O
2020	1	S	F1.1	SS SCHMELZ. T3.15H IEC60127/V TIME LAG FUSE ## Verwendet in: ## Option Netzteil SLx8000B9 ## 2100.4000.01 ## verwendet in K20 K21		0099.6729.00	X	B	B
2030	1	S	A4	NJ NETZTEIL 24V/6.5A POWER SUPPLY ## Verwendet in: ## Option Netzteil SLx8000B9 ## 2100.4000.01 ## verwendet in K20 K21		4065.8599.00	X	B	O
2040	1	S		MZ NETZFILTERABSCHIRMUNG CONDUCTIVE FOAM ## Verwendet in: ## Option Netzteil SLx8000B9 ## 2100.4000.01 ## verwendet in K20 K21		2100.1600.00	X	M	
2045	1	S		MZ NETZFILTERABDICHTUNG HOLDER ## Verwendet in: ## Option Netzteil SLx8000B9 ## 2100.4000.01 ## verwendet in K20 K21		2100.1723.00	X	M	
2050	1	S	W1N	DX NETZKABEL W1N MAIN CABLE ## Verwendet in: ## Option Netzteil SLx8000B9 ## 2100.4000.01 ## verwendet in K20 K21	Z	2100.1952.00	X	M	
2080	1	S	F1	FN DC-STECKER MIT FILTER DC-POWERPLUG WITH FILTER ## Verwendet in: ## Option Netzteil SLx8000B10 ## 2100.4022.01 ## verwendet in K20 K21		2100.3690.00	X	B	B
2090	1	S	A4	NJ DC/DC-WANDLER FUER LP3 DC/DC-POWER SUPPLY ## Verwendet in: ## Option Netzteil SLx8000B10 ## 2100.4022.01 ## verwendet in K20 K21		2100.3684.00	X	B	B
2100	1	S		MZ NETZFILTERABSCHIRMUNG CONDUCTIVE FOAM ## Verwendet in: ## Option Netzteil SLx8000B10 ## 2100.4022.01 ## verwendet in K20 K21		2104.1505.00	X	M	
2110	1	S		MZ STECKERHALTER DC SUPPORT ## Verwendet in: ## Option Netzteil SLx8000B10 ## 2100.4022.01 ## verwendet in K20 K21		2100.1798.00	X	M	
2120	1	S	W1DC	DX W1DC INPUT KAB. 2HE DC CABLE	Z	2100.1923.00	X	M	
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2130	1	S		## Verwendet in ## Option Netzteil SLx8000B10 ## 2100.4022.01 ## verwendet in K20 K21 OS SCHILD NETZFILTER 2HE LABEL ## Verwendet in ## Option Netzteil SLx8000B10 ## 2100.4022.01 ## verwendet in K20 K21		2100.1769.00	X	M	
2140	1	S	X-X8	FP GEHAEUSE 3POL. MATE-N-LOCK HOUSING 3CIRCUIT MATE-N-LOCK ## Verwendet in ## Option Netzteil SLx8000B10 ## 2100.4022.01 ## verwendet in K20 K21		2100.3726.00	X	B	B
2150	3	S	X-X8	FP BUCHSENKONT.0.5-2.1QMM SOCKET CONTACT ## Verwendet in ## Option Netzteil SLx8000B10 ## 2100.4022.01 ## verwendet in K20 K21		0343.4946.00	X	B	B
2200	1	S	F1	FN GERAETESTECKER 10A CONNECTOR ## Verwendet in: ## Option Netzteil SLx8000B11 ## 2100.4045.01 ## verwendet in K30 K31 K32		2100.3626.00	X	B	O
2210	1	S	F1.1	SS SCHMELZS.T10 IEC60127-2/V TIME LAG FUSE T10 ## Verwendet in: ## Option Netzteil SLx8000B11 ## 2100.4045.01 ## verwendet in K30 K31 K32		0606.3136.00	X	B	B
2220	1	S	A4	NJ AC/DC-NETZTTEIL 1000W 32V AC/DC POWER SUPPLY ## Verwendet in: ## Option Netzteil SLx8000B11 ## 2100.4045.01 ## Option Netzteil SLx8000B12 ## 2100.4068.01 ## Option Netzteil SLx8000B8 ## 5302.4208.01 ## verwendet in K30 K31 K32 ## verwendet in K42		2100.1417.00	X	B	B
2230	1	S	A23 A24 A4A	ED POWER ADAPTERBOARD 1KW POWER ADAPTERBOARD 1KW ## Verwendet in: ## Option Netzteil SLx8000B11 ## 2100.4045.01 ## verwendet in K30 K31 K32	Z	2100.2107.02	X	M	
2240	1	S	W1N	DX NETZKAB. 3HE W1N MAINS CABLE ## Verwendet in: ## Option Netzteil SLx8000B11 ## 2100.4045.01 ## verwendet in K30 K31 K32	Z	2100.1969.00	X	M	
2270	1	S		LK KLAPPKERN SW 7.5-8.5MM HINGED FERRITE CORE ## Verwendet in: ## Option Netzteil SLx8000B12 ## 2100.4068.01 ## verwendet in K30 K31		3584.1694.00	X	B	O
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2280	1	S		ED DC-DC WANDLER 48/32V DC-DC CONVERTER 48/32V ## Verwendet in: ## Option Netzteil SLx8000B12 ## 2100.4068.01 ## verwendet in K30 K31	Z	2100.2207.02	X	M	
2290	1	S		EV 40X40X25 5.00L/S 12V BLOWER ## Verwendet in: ## Option Netzteil SLx8000B12 ## 2100.4068.01 ## verwendet in K30 K31		2100.2236.00	X	B	O
2292	1	S		MZ ADAPTERBLECH DC AD SHROUT ## Verwendet in: ## Option Netzteil SLx8000B12 ## 2100.4068.01 ## verwendet in K30 K31		2100.1781.00	X	M	
2294	1	S	W1DC	DX DC-EINGANGSKABEL DC INPUT CABLE ## Verwendet in: ## Option Netzteil SLx8000B12 ## 2100.4068.01 ## verwendet in K30 K31	Z	2100.1917.00	X	M	
2296	1	S		OS BESCHRIFTUNG DC NETZEINGANG LABEL ## Verwendet in: ## Option Netzteil SLx8000B12 ## 2100.4068.01 ## verwendet in K30 K31		2100.3832.00	X	M	
2298	1	S	X-X8	FO BUCHSENTRAEGER 6POL+E CONTACT-HOLDER ## Verwendet in: ## Option Netzteil SLx8000B12 ## 2100.4068.01 ## verwendet in K30 K31		6058.8860.00	X	B	O
2300	1	S	X-X8	FO BUCHSENKONTAKT B F.35A CONTACT ## Verwendet in: ## Option Netzteil SLx8000B12 ## 2100.4068.01 ## verwendet in K30 K31		6058.8883.00	X	B	O
2302	1	S	X-X8	FO STIFTKONTAKT B CONNECTOR ## Verwendet in: ## Option Netzteil SLx8000B12 ## 2100.4068.01 ## verwendet in K30 K31		6058.8877.00	X	B	O
2304	1	S	X-X8	FO KAB.STECKER M.ZUGENTL. CONNECTOR ## Verwendet in: ## Option Netzteil SLx8000B12 ## 2100.4068.01 ## verwendet in K30 K31		6058.8848.00	X	B	O
2310	1	S	X8	FN GERAETEST. 2POL.+SCHU. RECEPTACLE ## Verwendet in: ## Netzeingang X8 ## 5302.4220.01 ## beinhaltet in Option SLx8000B8 ## 5302.4208.01 ## verwendet in K42		0092.3930.00	X	B	O
2320	1	S	A25	ED POWER ADAPTERBOARD 1KW POWER ADAPTERBOARD 1KW ## Verwendet in:	Z	5302.3860.02	X	M	



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2330	1	S	A26 F1	## Option SLx8000B8 ## 5302.4208.01 ## verwendet in K42 SS SCHMELZS.T8 IEC127-2/V FUSE ## Verwendet in: ## Netzeingang X8 ## 5302.4220.01 ## beinhaltet in Option SLx8000B8 ## 5302.4208.01 ## verwendet in K42		0359.3615.00	X	B	B
2500	0	S	F2	PB BEMERKUNG NOTE Option Luftfilter; Luftfiltermatten		0999.9610.00		B	O
2510	1	S		MZ FILTERMATTE 2HE LINKS FILTER MAT ## Verwendet in ## Option Luftfilter SLx8000B22 ## 2100.3803.02 ## verwendet in K20 K21		2100.3755.00	X	M	
2520	1	S		MZ FILTERMATTE 2HE RECHTS FILTER MAT ## Verwendet in ## Option Luftfilter SLx8000B22 ## 2100.3803.02 ## verwendet in K20 K21		2100.3761.00	X	M	
2530	1	S		MZ FILTERMATTE 3HE LINKS FILTER MAT ## Verwendet in ## Option Luftfilter SLx8000B23 ## 2100.3803.03 ## verwendet in K30 K31 K32		2100.3778.00	X	M	
2540	1	S		MZ FILTERMATTE 3HE RECHTS U FILTER MAT ## Verwendet in ## Option Luftfilter SLx8000B23 ## 2100.3803.03 ## verwendet in K30 K31 K32		2100.3784.00	X	M	
2550	1	S		MZ FILTERMATTE 3HE RECHTS O FILTER MAT ## Verwendet in ## Option Luftfilter SLx8000B23 ## 2100.3803.03 ## verwendet in K30 K31 K32		2100.3790.00	X	M	
2560	1	S		MZ FILTERMATTE 4HE LINKS FILTER MAT ## Verwendet in ## Option Luftfilter SLx8000B24 ## 2100.3803.04 ## verwendet in K42		5302.4108.00	X	M	
2570	1	S		MZ FILTERMATTE 4HE RECHTS FILTER MAT ## Verwendet in ## Option Luftfilter SLx8000B24 ## 2100.3803.04 ## verwendet in K42		5302.4114.00	X	M	
2580	0	S		PB BEMERKUNG NOTE Option GPS-Empfaenger		0999.9610.00		B	O
2590	1	S		ED GPS-EMPFAENGER GPS RECEIVER ## Verwendet in:	Z	2100.3255.02	X	M	
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2600	1	S	W2	## Option GPS SLx8000B13 ## 2100.3232.01 ## verwendet in K20 K21 K30 K31 K32 K42 DV RF KABEL EF316D SMP/W-N/E RF CABLE ## Verwendet in: ## Option GPS SLx8000B13 ## 2100.3232.01 ## verwendet in K20 K21 K30 K31 K32 K42	Z	2100.1823.00	X	M	
2690	0	S		PB BEMERKUNG NOTE Option DVB-T/H Receiver		0999.9610.00		B	O
2700	1	S		ED DVB-T/H RECEIVER DVB-T/H RECEIVER ## Verwendet in: ## Option DVB-T/H Retransmitter SLx8000B14 ## Option DVB-T/H Monitoring SLx8000B15 ## 2100.3355.01 ## verwendet in K20 K21 K30 K31	Z	2100.3403.02	X	M	
2710	1	S	W1	DV RF KABEL EF316D SMP/W-N/E RF CABLE ## Verwendet in: ## Option DVB-T/H Retransmitter SLx8000B14 ## Option DVB-T/H Monitoring SLx8000B15 ## 2100.3355.01 ## verwendet in K20 K21 K30 K31	Z	2100.1823.00	X	M	
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