ROHDE&SCHWARZ

Test and Measurement
Division

Service Manual Instrument

Radio Unit R&S CRTU-RU

1138.4000

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Republic of Germany

Throughout this manual CRTU-RU is generally used as an abbreviation for the Radio Unit R&S CRTU-RU.

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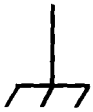
Safety Instructions

This unit has been designed and tested in accordance with the 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, the user must observe all instructions and warnings given in this operating manual.

Safety-related symbols used on equipment and documentation from R&S:

							
Observe operating instructions	Weight indication for units >18 kg	PE terminal	Ground terminal	Danger! Shock hazard	Warning! Hot surfaces	Ground	Attention! Electrostatic sensitive devices require special care

1. The unit may be used only in the operating conditions and positions specified by the manufacturer. Unless otherwise agreed, the following applies to R&S products:

   IP degree of protection 2X, pollution severity 2 overvoltage category 2, only for indoor use, altitude max. 2000 m.

   The unit may be operated only from supply networks fused with max. 16 A.

   Unless specified otherwise in the data sheet, a tolerance of ±10% shall apply to the nominal voltage and of ±5% to the nominal frequency.

2. For measurements in circuits with voltages V_{rms} > 30 V, suitable measures should be taken to avoid any hazards.

   (using, for example, appropriate measuring equipment, fusing, current limiting, electrical separation, insulation).

3. If the unit is to be permanently wired, the PE terminal of the unit must first be connected to the PE conductor on site before any other connections are made. Installation and cabling of the unit to be performed only by qualified technical personnel.

4. For permanently installed units without built-in fuses, circuit breakers or similar protective devices, the supply circuit must be fused such as to provide suitable protection for the users and equipment.

5. Prior to switching on the unit, it must be ensured that the nominal voltage set on the unit matches the nominal voltage of the AC supply network.

   If a different voltage is to be set, the power fuse of the unit may have to be changed accordingly.

6. Units of protection class I with disconnectible AC supply cable and appliance connector may be operated only from a power socket with earthing contact and with the PE conductor connected.

7. It is not permissible to interrupt the PE conductor intentionally, neither in the incoming cable nor on the unit itself as this may cause the unit to become electrically hazardous.

   Any extension lines or multiple socket outlets used must be checked for compliance with relevant safety standards at regular intervals.

8. If the unit has no power switch for disconnection from the AC supply, the plug of the connecting cable is regarded as the disconnecting device. In such cases it must be ensured that the power 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 units without power switches are integrated in racks or systems, a disconnecting device must be provided at system level.

9. Applicable local or national safety regulations and rules for the prevention of accidents must be observed in all work performed.

   Prior to performing any work on the unit or opening the unit, the latter must be disconnected from the supply network.

   Any adjustments, replacements of parts, maintenance or repair may be carried out only by authorized R&S technical personnel.

   Only original parts may be used for replacing parts relevant to safety (eg power switches, power transformers, fuses). A safety test must be performed after each replacement of parts relevant to safety.

   (visual inspection, PE conductor test, insulation-resistance, leakage-current measurement, functional test).

continued overleaf

Safety Instructions

10. Ensure that the connections with information technology equipment comply with IEC950 / EN60950.
11. Lithium batteries must not be exposed to high temperatures or fire.

    Keep batteries away from children.

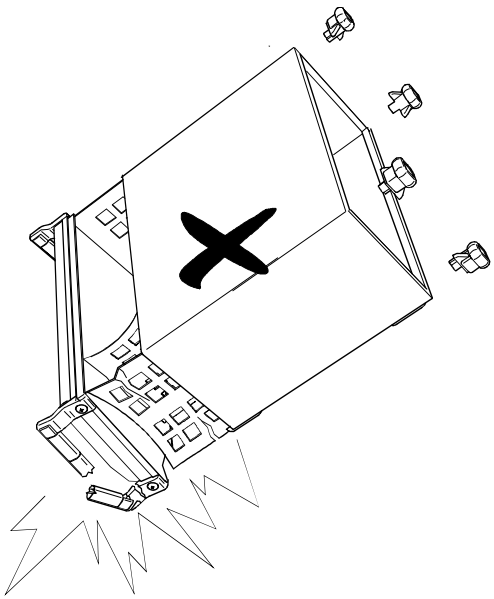
    If the battery is replaced improperly, there is danger of explosion. Only replace the battery by R&S type (see spare part list).

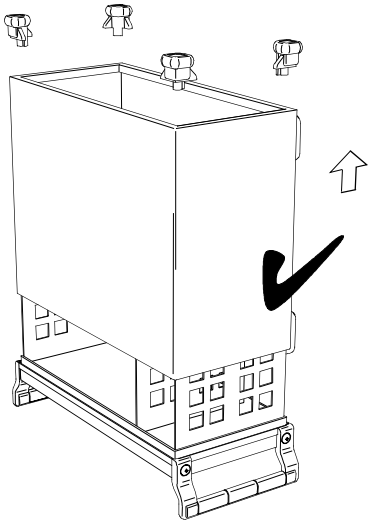
    Lithium batteries are suitable for environmentally-friendly disposal or specialized recycling. Dispose them into appropriate containers, only.

    Do not short-circuit the battery.
12. Equipment returned or sent in for repair must be packed in the original packing or in packing with electrostatic and mechanical protection.
13. Electrostatics via the connectors may damage the equipment. For the safe handling and operation of the equipment, appropriate measures against electrostatics should be implemented.
14. The outside of the instrument is suitably cleaned using a soft, lint-free dustcloth. Never use solvents such as thinners, acetone and similar things, as they may damage the front panel labeling or plastic parts.
15. Any additional safety instructions given in this manual are also to be observed.

Caution

Prior to removing the rear feet and taking off the enclosure, put unit onto front handles to avoid damages to the unit though slipping.

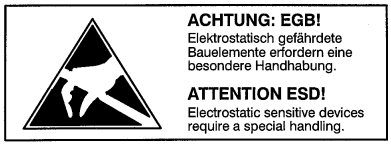




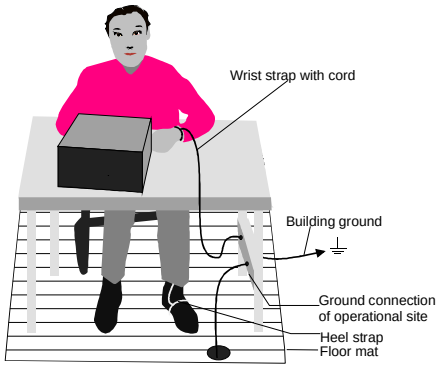
When mounting the tube take care not to damage or pull off cables.

Safety Instructions

The instrument contains components which are hazardous to electrostatic exposure and which are marked by the following symbol:



- To avoid damage of electronic components, the operational site must be protected against electrostatic discharge (ESD).



The following two methods of ESD protection may be used together or separately:

- Wrist strap with cord to ground connection
- Conductive floor mat and heel strap combination

The batteries used in the instrument are high-power lithium cells with a life utility of approx. 5 years. If you do not handle them properly, there is a danger of explosion. Therefore, observe the following safety instructions:

- Avoid short-circuit and loading of the battery
- Do not expose lithium batteries to high temperature or fire.
- Do not open used batteries
- Keep batteries away from children.
- Replace battery only by R&S type battery (R&S ordering number 0565.1687.00)
- Make sure to connect the battery to the appropriate terminals when replacing
- Lithium batteries are suitable for environmentally-friendly disposal or specialized recycling. Dispose them into appropriate containers, only.

Spare Parts Express Service

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In case of urgent spare parts requirements for this Rohde & Schwarz unit, please contact our spare parts express service.

Outside business hours, please leave us a message or send a fax or e-mail. We shall contact you promptly.

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Contents of User Documentation for Protocol Tester CRTU Radio Unit

Service Manual Instrument

This service manual for the CRTU Radio Unit provides information on checking the instrument for compliance with rated specifications, as well as on adjustment, repair and troubleshooting. It further contains all the information necessary for repairing the instrument by replacing modules.

The service manual comprises five chapters and an annex (chapter 5) containing the circuit documentation for the CRTU Radio Unit:

Chapter 1 Provides all the information necessary to check the CRTU Radio Unit for compliance with rated specifications. The required test equipment is included, too.

Chapter 2 Describes the adjustment of the +5 VDC reference source and of the 10-MHz reference frequency source as well as the software-controlled adjustment of module data after module replacement.

Chapter 3 Describes the design of the CRTU Radio Unit as well as simple measures for repair and fault diagnosis, in particular the replacement of modules and access to hardware settings by means of service commands.

Chapter 4 Contains information on the extension and modification of theCRTU Radio Unit by installing instrument software and retrofitting options.

Chapter 5 Contains spare parts lists and exploded views of the CRTU Radio Unit.

Data Sheet

The data sheet for the Universal Protocol Tester CRTU-G, PD 757.6056.2x, informs about the technical specifications of the CRTU Radio Unit.

Operating Manual

The operating manual for the CRTU Radio Unit contains information about the controls and connectors on the front and rear panel and their technical specifications, necessary steps for putting the instrument into operation, startup of the instrument until the GSM operation software is activated.

Service Manual Modules

The service manual modules is not delivered with the instrument but may be obtained from your R&S service department.

The service manual modules contains information about the individual modules of the CRTU Radio Unit. This comprises the test and adjustment of the modules, fault detection within the modules and the interface description.

Contents

1 Performance Test

This chapter provides the necessary information for checking the technical data of the CRTU Radio Unit. Please read the general notes on the test procedure on page 1.7 first. The measuring equipment required for the performance test is listed on p. 1.2; a form for the test report is to be found at the end of this chapter on p. 1.23.

The adjustment of the instrument for restoring data integrity and the measuring equipment required for this purpose is described in chapter 2 of this service manual.

Test Options

The technical data of a CRTU Radio Unit can be checked in the following ways:

A) Calibration by an R&S Representative with an ACS Calibration System

Advantages

- Automatic procedure
- Small measurement uncertainties
- Calibration and readjustment
- In most cases, the instrument does not have to leave the country

B) Sending the Instrument to the Factory (Memmingen, Germany)

Advantages

- Automatic procedure at the final test setup
- Minimum measurement uncertainties
- Calibration and readjustment

Necessary Documents

- Operating manual of the system the CRTU Radio Unit belongs to (e.g. CRTU-G, CRTU-W).
- Data sheet of the system the CRTU Radio Unit belongs to (e.g. CRTU-G, CRTU-W).

Note: *It is recommended to read the following journal on the subjects "measurement uncertainty" and "tolerance analysis": ETSI Technical Report ETR 028, June 1997. This document can be found on the GLORIS web site “https://gloris.rohde-schwarz.com” in the “Hints & Tricks” database / type CRTU.*

Measuring Instruments and Auxiliary Equipment

Table 1-1 Measuring instruments and auxiliary equipment for manual performance test

Item	Type of instrument	Required characteristics	Appropriate device	R&S order number	Use
1	Signal generator	100 kHz to 2.7 GHz, Generation of a GSM signal (dummy burst)	SME03 SMIQ	1038.6002.03	RX measurements
2	Spectrum analyzer	100 kHz to 7 GHz, Demodulation of GSM signals	FSE with FSE-B7 FSIQ FSP–3	1066.3010.20 1066.3010.30 1066.4317.02 1093.4495.03	TX measurements
3	Power meter		NRVD with sensors NRV-Z4 NRV-Z51	857.8008.02	RX measurements, TX measurements
4	Power amplifier	100 kHz to 2.7 GHz, Pout = 100 W			RX measurements
5	Harmonics filter	attenuate the harmonics of the power amplifiers to min 30 dBc			RX measurements
6	Directional coupler	50 MHz to 2.7 GHz, up to 100 W			RX measurements
7	Network analyzer or VSWR Bridge	100 kHz to 2.7 GHz	ZVR ZRC	1127.8551.41 1127.8600.50	Reflection coefficient/ VSWR RF connectors
8	Interface test board		Part of CRTU-Z3 (1139.0509.02)	1138.4530.02	Frequency and level settling time
9	USB Wheelmouse		PSL-Z10	1157.7060.02	For operation within GSM functionality (CRTU-G or CRTU-S system)
10	USB Keyboard US		PSL-Z2	1157.6870.03	

Test Setups

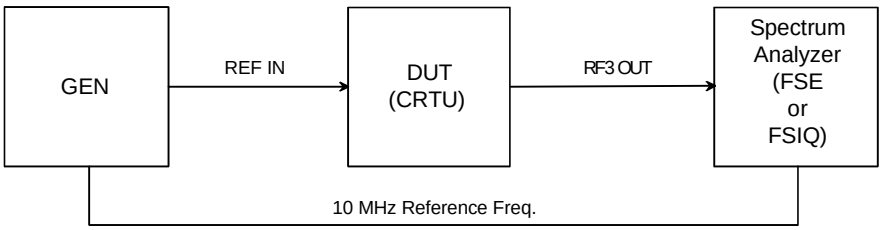
The quality of the test setup has an effect on the measurement procedures.

Note: *Make sure to use only high-quality coax cables and coax connectors as well as calibrated measuring equipment.*

Reference Frequencies

Test setup REF1:

REF1



Test setup REF2:

REF2

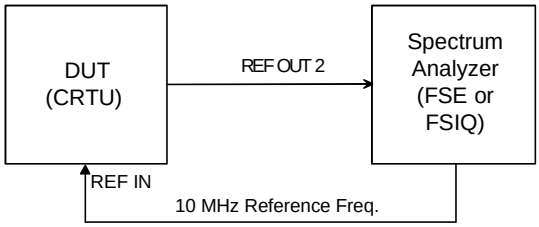


Fig. 1-1 Test setups for reference frequencies

TX Level Measurements

Test setup TX1, TX2, TX3, TX4 (depending on level range):

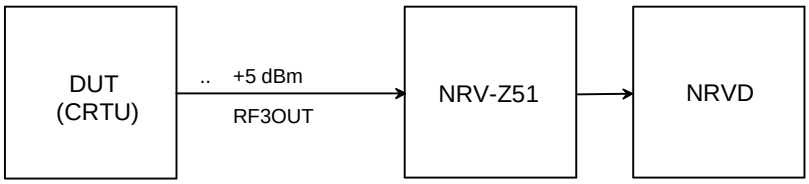
- Normalize spectrum analyzer (FSIQ) to wideband power meter (NRVD) at *Max. Level* setting of the CRTU Radio Unit (test setups TX1, TX2, TX3).

The attenuator of the spectrum analyzer must be held at this position over 60 dB.

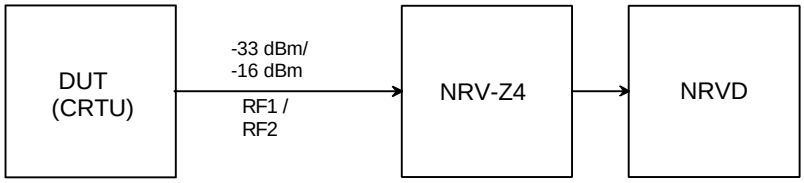
- Normalize spectrum analyzer with preamplifier to spectrum analyzer at last level (test setups TX3, TX4).

The attenuator of the spectrum analyzer must be held at this position over 60 dB.

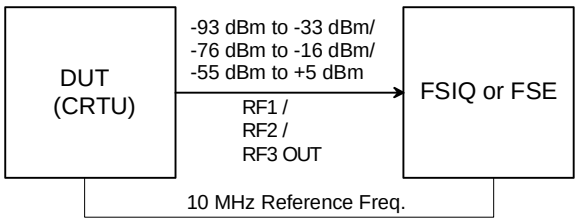
TX1



TX2



TX3



TX4

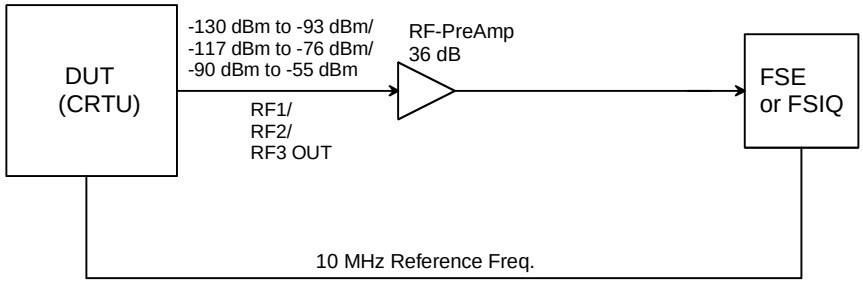


Fig. 1-2 Test setups for TX level measurements

General TX Measurements

Test setup TX5:

TX5

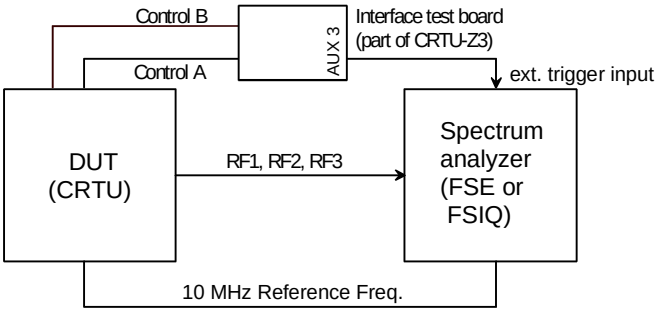


Fig. 1-3 Test setups for general TX measurements

RX Level Measurements

Test setup RX1, RX2 (depending on level range):

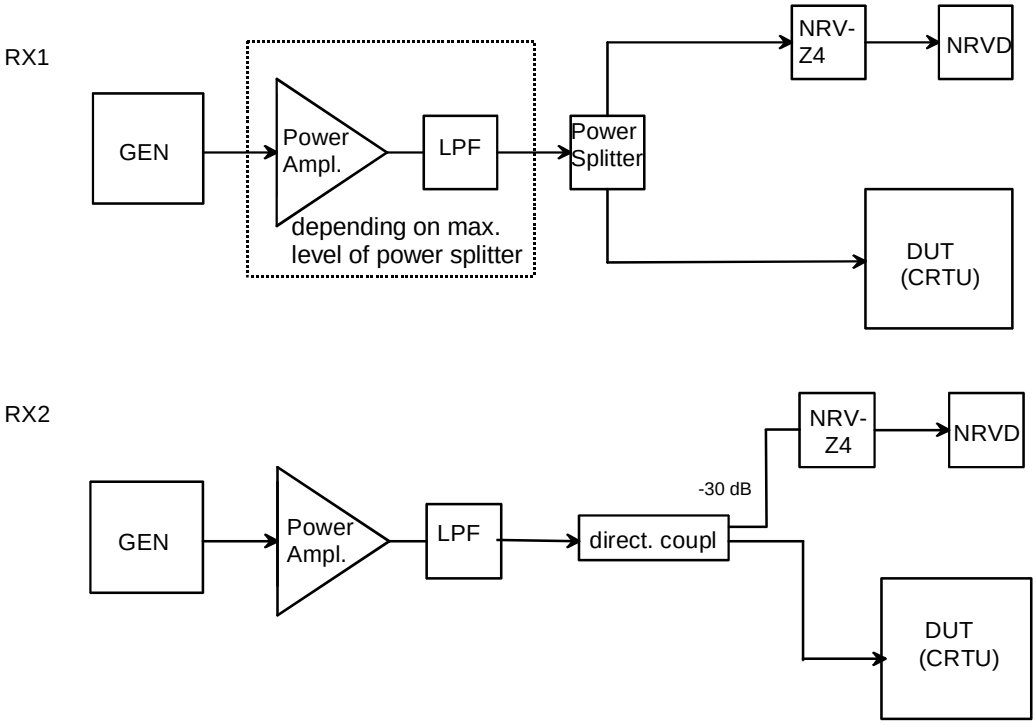


Fig. 1-4 Test setups for RX level measurements

General RX Measurements

Test setup RX3:

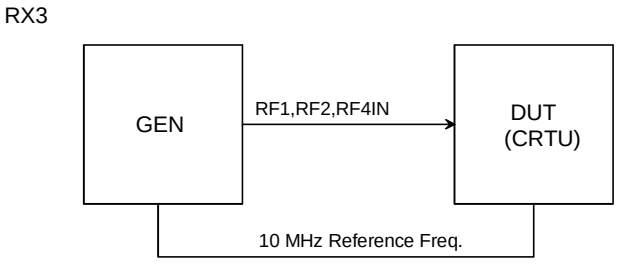


Fig. 1-5 Test setups for general RX measurements

RX Demodulation Measurements

Test setup RX4:

RX4

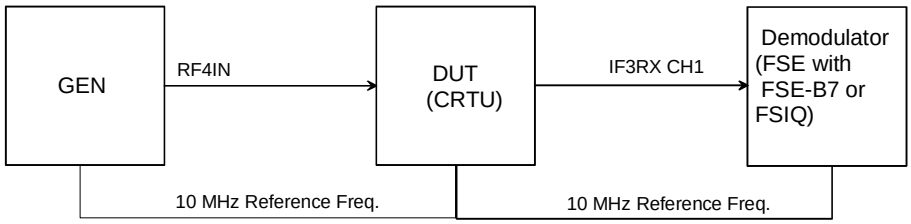


Fig. 1-6 Test setups for RX demodulation measurements

Tolerance Analysis

Due to the small measurement uncertainty of the CRTU Radio Unit, the measuring equipment must meet stringent requirements. Since the measurement uncertainty of the measuring equipment to be achieved depends on the test setup used, it is recommended to perform a tolerance analysis.

To be able to trace back errors in the measurement, the measurement uncertainty should also be indicated in the test report.

The tolerances given in the test report refer to the values specified in the data sheet, i.e. the measurement uncertainties of the test setup used are to be taken into account as well.

Unless otherwise specified, the specified tolerances are always to be observed.

Note: *Please take into account the ETSI Technical Report ETR 028. This document can be found on the GLORIS web site "https://gloris.rohde-schwarz.com" in the "Hints & Tricks" database / type CRTU.*
The given tolerances refer to CRTU-G data sheet; PD 757.6056.2x.

Manual Test Procedure

The tests in this section are done with the *Service/WCDMA or DOS OPSW/Service* software which is accessible from the *BootMagic Menu.* This menu has to be selected after startup of the CRTU Radio Unit; see related sections in the operating manual.

The suggested frequencies and levels at which the measurements should be performed have been selected according to the instrument concept. The user can of course also select other frequencies and levels within the scope of values guaranteed in the data sheet.

Note: *Before testing the rated specifications, allow the instrument to warm up for at least 15 min. The ambient temperature should be 23°C to 26°C.*

Selftest

The CRTU Radio Unit offers various selftest options for checking the functioning and for troubleshooting. Before carrying out the performance test, the *Service/WCDMA or DOS OPSW/Service* software in the *BootMagic Menu* should be called up and the following selftests should be performed:

- *Continuous Selftest*
- *1→4/3→2 RF Loop Test*

Preparation:
- Switch on instrument and wait until the *BootMagic* startup screen is displayed.
- In the *BootMagic Menu* (selection window), select *Service/WCDMA or DOS OPSW/Service* software.

Test:
- Select the individual tests and check the results *(Continuous Selftest, 1→4/3→2 RF Loop Test)*.

Note: *The* Continuous Selftest combines the System Selftest *and* Internal RF Loop Selftest. *In this test, only a passed/failed message with error output is indicated. In case of errors, an error file 'cst.err' is created in addition.*

1→4/3→2 RF Loop Test: Selftest RF Path RF1→RF4 IN and RF3 OUT→RF2 via external N-coax cable by power measurements via internal generator and analyzer. In this test, all measured values are indicated.

To obtain more detailed information start the following tests:

System selftest:	*Selftest of the instrument for diagnostic voltages; only a passed/failed message with error output is indicated.*
Internal RF Loop Selftest:	*Selftest of the RF path by means of power measurements via internal generator and analyzer. All measured values are indicated.*
FE Selftest:	*Selftest of the RF FRONTEND module via diagnostic voltages. All measured values are indicated.*
REF Selftest:	*Selftest of the REFERENCE BOARD module via diagnostic voltages. All measured values are indicated.*
DIG Selftest:	*Selftest of the DIGITAL BOARD module via diagnostic voltages. All measured values are indicated*
RXTX1 Selftest:	*Selftest of the RXTX1 BOARD module via diagnostic voltages. All measured values are indicated.*
RXTX2 Selftest:	*Not available at present; will be supported in the near future.*

Interface Test

IEC-bus Interface

Preparation:
- Connect the IEC-bus interfaces of the CRTU Radio Unit and the controller via IEC-bus cables.

Test:
- Send the string '*IDN?<CR><NL>' from the controller to the CRTU Radio Unit and read the reply *STRING* of the CRTU Radio Unit.

  The reply *STRING* must contain the following message:

  'ROHDE & SCHWARZ, CMU <Var>,<Ser_Nr>,<Firmware_Vers._Nr>'

RS–232 Interface

Preparation:
- Connect the RS–232 interfaces of the CRTU Radio Unit and the controller via null-modem cables (see section *Measuring Instruments and Auxiliary Equipment* on p. 1.2).

Set the RS–232 interface of the controller to 8 data bits, 1 start bit, 1 stop bit, no parity bit, XON/XOFF handshake and 19200 baud.

Test:
- Send the string '*IDN?<CR><NL>' from the controller to the CRTU Radio Unit and read the reply string of the CRTU Radio Unit.

The reply string must contain the following message:

'ROHDE & SCHWARZ,CMU <Var>,<Ser_Nr>,<Firmware_Vers._No>'

Control and Sync Bus (CSB) and Trigger Test of CRTU-RU

Overview

The purpose of this test is to verify the function of the Control and Sync Bus of the CRTU-RU and external trigger connectors. This test differs depending on whether the CRTU-RU has the additional signalling Link Handler (LH) Boards CRTU-B5 fitted or not. This is important because the CRTU-B5 can generate trigger signals, whereas the CRTU-RU alone is not able to do this. So only a subset of tests apply to the CRTU-RU without CRTU-B5. To be able to achieve a test coverage of 100% an CRTU-RU with two CRTU-B5 and the additional Test Box is needed. This Test Box and the necessary cables are part of the Service Kit R&S CRTU-Z3. Depending on the available options three levels of tests can be performed:

1. Test sequence for CRTU-RU without CRTU-B5 Tests 1 - 3
2. Test sequence for CRTU-RU with two CRTU-B5 Tests 1 - 8
3. Test sequence for CRTU-RU with two CRTU-B5 and CRTU-Z3 Tests 1 -10

To start the tests a command line application is started. This program asks to apply and switch connectors, check clock frequencies as necessary and requests the Test Box. The required test setup is also described in the section "Control and Sync Bus: Detailed Test Analysis". An oscilloscope or a frequency counter is needed to check the clock signals.

The tests will be able to verify the function of the following external connectors:

- Control and Sync Bus (CONTROL A, CONTROL B)

- BNC-Trigger signals (TRIG IN A, TRIG OUT A, TRIG IN B, TRIG OUT B)
- Data Source RS232 connectors (DATA CH1, DATA CH2)
- Signalling clocks (BIT CLOCK, SLOT CLOCK)

The test result is either *PASSED* or *FAILED*.

Control and Sync Bus: Test for CRTU-RU without CRTU-B5

These tests are supported starting with CRTU-RU software version 3.00!

- Boot from the "*Service/WCDMA*" or "DOS OPSW/Service" partition in order to program all devices, then hit "**ALT-F4**" to get to the command prompt. If the CRTU-RU is not able to start up correctly and gets to the command prompt at once, then call the "**initdig**" program to ensure that the Digital Board is programmed correctly.
- Start the test by calling "CSBTSTRU.EXE".

The tests *Test 1* to *Test 3* (see section *Test Overview* above) are performed.

Note: *A log file with a detailed test report is always written to the current directory.*

In case of an error:
See section "Control and Sync Bus: Detailed Test Analysis" beginning on p. 1.10.

Control and Sync Bus: Test for CRTU-RU with two CRTU-B5

These tests are supported starting with CR02P2P operational software version 1.55 !

- Boot from the "*GSM Operation Software*" or "*Windows OPSW*" partition. Start the HW-Info tool on the desktop to check the hardware. HW-Info is described in the CR02P2P help.
- Start the Windows Explorer.
- Browse to "C:\SYS\TEST".
- Start the test by calling "DIO_TEST.EXE" (message if Test Box RU is available).

The tests *Test 1* to *Test 8* (see section *Test Overview* above) are performed.

Note: *A log file with a detailed test report is always written to the current directory.*

In case of an error:
See section "Control and Sync Bus: Detailed Test Analysis" beginning on p. 1.10.

Control and Sync Bus: Test for CRTU-RU with two CRTU-B5 and CRTU-Z3

These tests are supported starting with CR02P2P operational software version 1.55 !

- Boot from the "*GSM Operation Software*" or "*Windows OPSW*" partition. Start the HW-Info tool on the desktop to check the hardware. HW-Info is described in the CR02P2P help.
- Start Windows Explorer.
- Browse to "C:\SYS\TEST".
- Start the test by calling "DIO_TEST.EXE".

The tests *Test 1* to *Test 10* (see section *Test Overview* above) are performed.

Note: *A log file with a detailed test report is always written to the current directory. To be able to perform this test the **Service Kit R&S CRTU-Z3** is required. It contains:*
- R&S Test Box RU
- Two RS232 null modem cables
- Two BNC cables
- One CTRL cable

In case of an error:
See section "Control and Sync Bus: Detailed Test Analysis" beginning on p. 1.10.

Control and Sync Bus: Detailed Test Analysis

Note: *The CONTROL A, CONTROL B, TRIG IN A, TRIG OUT A, TRIG IN B, TRIG OUT B, DATA CH1, DATA CH2, SLOT CLOCK, BIT CLOCK COM1 and COM2 connectors are all on the rear panel of the CRTU-RU.*

Control and Sync Bus Test 1 – I2C Interface

Test Setup: No external connections needed.

Purpose: Test communication to the I2C IO Expander.

Error case: For test sequence 1:
First ensure that the Digital Board is initialized correctly, by typing "initdig" on the command prompt. If nothing helps replace the motherboard.

For test sequence 2 and 3:
Restart the Windows service "CRTU-X startup service".

Control and Sync Bus Test 2 – External Trigger Bus

Test Setup: CTRL-Cable connected to CONTROL A and CONTROL B of the CRTU-RU (loopback). Two BNC Cables connect TRIG OUT A with TRIG IN A and TRIG OUT B with TRIG IN B.

Purpose: Test BNC Triggers and basic communication via the Control and Sync Bus.

Error case: This test differentiates between errors on the Control and Sync Bus and errors on the BNC trigger lines. First check the external cable connections, if only the BNC tests fail then it is a good idea to check the cable from the motherboard to BNC socket. If nothing helps replace the motherboard.

Control and Sync Bus Test 3 – Correction Processor Interface

Purpose: Verify communication path of the correction processor interface from the Control and Sync Bus to the Digital Board.

Test Setup: CTRL-Cable connected to CONTROL A and CONTROL B.

Error case: First check the external cable connections, if this does not help replace the motherboard.

Control and Sync Bus Test 4 – Linkhandler Communication

Purpose: Verify communication to the signalling linkhandlers.

Test Setup: No external connectors needed.

Error case: – Verify if CRTU-B5 boards are present.
– Verify that the FPGAs on the DIGITAL BOARD and the CRTU-B5 are loaded

(blinking LEDs).

– If one of the CRTU-B5 seems to be defective, use HW-Info to check this. If one of these boards or the DIGITAL BOARD is defective, we are not able to do the motherboard tests. For further hints about testing the CRTU-B5, and the DIGITAL BOARD refer to the remaining *Troubleshooting* sections in the present chapter.

Control and Sync Bus Test 5 – Fading Simulator Interface

Purpose: Verify that the RS232 drivers and switches work correctly.

Test setup: Connect RS232 null modem cable from DATA CH1 to COM1 and from DATA CH2 to COM2

Error case: Check the RS232 cables, if the problem remains, the motherboard has to be replaced.

Note: *Because of the RS232 protocol the DTR pin of the RS232 connectors which are connected to the pin 4 of DATA CH1/2 connectors have to be measured by hand with a scope or a frequency counter. The test software offers break points for these tests.*

Control and Sync Bus Test 6 – Synchronization Clocks

Purpose: Test drivers for BNC clocks.

Test setup: Connect a oscilloscope to the SLOT CLOCK and BIT CLOCK connectors.

Analysis: The pulse width of both clocks should be 500 ns. The clock period of the SLOT CLOCK is 576.92 µs, and the period of the BIT CLOCK is 3.69 µs. If one or more clocks cannot be detected the motherboard must be replaced.

Control and Sync Bus Test 7 – Frame and Slot Triggers

Purpose: Test drivers and lines of the trigger signals at maximum speed.

Test setup: Connect CTRL-Cable to CONTROL A and CONTROL B (loopback).

Error case: Check the cable carefully, replace the motherboard if this does not help.

Control and Sync Bus Test 8 – Single Test

Purpose: Test remaining signals on the Control and Sync bus.

Test setup: Connect CTRL-Cable to CONTROL A and CONTROL B (loopback)

Error case: Check the cable carefully, replace the motherboard if this does not help.

Control and Sync Bus Test 9 – Special Path Test

Purpose: Test remaining connections.

Test Setup: Connect one CTRL-Cable from CONTROL A of the CRTU-RU to CONTROL A of the Test Box and one cable from CONTROL B of the CRTU-RU to CONTROL B of the Test Box. Connect a RS232 null modem cable from DATA CH1 to COM1. Connect a RS232 null modem cable from DATA CH2 to COM2

Error case: Check the cable carefully, replace the motherboard if this does not help.

Note: *Because of the RS232 protocol the DTR pin of the RS232 connectors which are connected to the pin 4 of DATA CH1/2 connectors have to be measured by hand with a scope or a frequency counter. The test software offers break points for these tests.*

Control and Sync Bus Test 10 – Special Path Test

Purpose: Test remaining connections.

Test Setup: Connect one CTRL-Cable from CONTROL A of the RU to CONTROL A of the Test Box and one cable from CONTROL B of the CRTU-RU to CONTROL B of the Test Box.

Error case: Check the cable carefully, replace the motherboard if this does not help.

Reference Frequencies

For different range of adjustment of the internal reference oscillator, the synchronization with an external reference frequency is checked.

Note: *The resolution of the frequency counter/analyzer should be max. 1/10 of the maximum permissible deviation.*

REF IN

The frequency and level ranges and the pull-in range are checked. The signal generator and the frequency counter must be synchronized (test setup REF1).

Preparation:
- Feed in at REF IN: 52 MHz sinewave, 0.5 V(rms)
- Connect frequency counter to RF3 OUT.

Control: Set CRTU Radio Unit to external reference 52 MHz, RF 1 GHz (menu *RF ANALYZER/ GENERATOR*.)

Test: Use frequency counter to measure frequency deviation from 1 GHz.

Preparation:
- Feed in at REF IN: 1 MHz sinewave, 0.5 V(rms).
- Connect frequency counter to RF3 OUT.

Control:
- Set CRTU Radio Unit to external reference 1 MHz, RF 1 GHz.

Test:
- Use frequency counter to measure frequency deviation from 1 GHz.

Preparation:
- Feed in at REF IN: 10.000 050 MHz sinewave, 1.4 V(rms).
- Connect frequency counter to RF3 OUT.

Control:
- Set CRTU Radio Unit to external reference 10 MHz, RF 1 GHz.

Test:
- Use frequency counter to measure frequency deviation from 1.000 005 000 GHz.

Preparation:
- Feed in at REF IN: 9.999 950 MHz sinewave, 1.4 V(rms).
- Connect frequency counter to RF3 OUT.

Control:
- Set CRTU Radio Unit to external reference 10 MHz, RF 1 GHz.

Test:
- Use frequency counter to measure frequency deviation from 0.999 995 GHz.

REF OUT 1

The level and frequency are checked.

Int. 10 MHz:
- Set CRTU Radio Unit to internal reference.
- Measure at REF OUT 1: 10 MHz, level > 1.4 V(pp).

REF IN signal:
- Set CRTU Radio Unit to external reference.
- Feed in at REF IN: 52 MHz TTL, (as an alternative +16 dBm from signal)
- Measure at REF OUT 1: 52 MHz, level > 1.4 V(pp).
- Measure at REF OUT 1: frequency 52 MHz ± 1 Hz
- Feed in at REF IN: 1 MHz TTL, (as an alternative +16 dBm from signal generator).
- Measure at REF OUT 1: 1 MHz, level > 0.5 V(rms) (1.4 V(pp)).
- Measure at REF OUT 1: frequency 1 MHz ± 1 Hz.

REF OUT 2

The level and frequency are checked. The CRTU Radio Unit and the frequency counter must be synchronized (test setup REF2).

REF OUT 2 signal 13 MHz or 10 MHz:
- Set CRTU Radio Unit to external reference.
- Feed in at REF IN: 10 MHz sinewave, 0.5 V(rms).
- Set CRTU Radio Unit to REF OUT 2 13 MHz or 10 MHz (depending on SW; menu *Connection Control/Sync.)*.
- Measure at REF OUT 2: 13 MHz or 10 MHz, level > 1.0 V(pp).
- Measure at REF OUT 2: frequency 13 MHz or 10 MHz ± 1 Hz.

TX Frequency Accuracy

Preparation: Test setup TX5, but CRTU Radio Unit not synchronized with frequency counter/analyzer and no external trigger.

CRTU Radio Unit connector RF3 OUT.

Control:
- Set CRTU Radio Unit to desired frequency, level 0 dBm.

Test:
- Determine frequency deviation from nominal frequency.

TX Frequency Settling Time

Preparation: Test setup TX5.

CRTU Radio Unit connector RF3 OUT.

CRTU Radio Unit: Ramping off, hopping on, F1 = start freq., F2 = stop freq.

Analyzer: Sweep time 1 ms, Center = stop frequency, FM demodulation, real time off, BW 50 kHz, 1 kHz/Div, external trigger, Slope negative

Control: ➢ Set CRTU Radio Unit to desired frequencies and hopping, level 0 dBm.

Test: Time from trigger point when the specified offset (< 1 kHz) from the stop frequency is reached.

TX Level Error

Preparation: Test setup TX1 to TX4 (depending on level range).

Control: ➢ Set CRTU Radio Unit to desired connector, frequency and level *(RF Analyzer* must be *OFF).*

Test: ➢ Measure the TX level of the CRTU Radio Unit.

Note: *The given frequencies and levels are suggested values. Of course, it is also possible to use other values for the measurement.*

VSWR

Preparation: ➢ Connect (scalar) network analyzer to RF1, RF2, RF3 OUT, RF4 IN one after the other.

Cable losses must be corrected.

Control: CRTU Radio Unit: Switch generator on and set level to minimum (–130 dBm or –90 dBm), switch RF wideband analyzer on (RF1/RF2/RF4 IN).

Test: ➢ Measure VSWR at 10 MHz, 900 MHz, 1800 MHz, 2700 MHz.

TX Level Settling Time

Preparation: Test setup TX5.

CRTU Radio Unit: Connector RF3 OUT 1GHz, Ramping On, Hopping Off.

Analyzer: Sweep time = 40 µs, Center = 1 GHz , Span = 0, RBW = 10 MHz, external trigger.

Control: ➢ Set CRTU Radio Unit to frequency = 1 GHz, specified level and ramping mode.

Test: ➢ The time period from the trigger point to the point in time when the nominal level < 0.5 dB has been reached is measured.

TX Harmonics

Preparation: Test setup TX5, no external trigger

Analyzer: Center = 2 x f_{nom} or Center = 3 x f_{nom}, Span = 1 MHz.

Control: ➢ Set CRTU Radio Unit to connector RF1, specified frequency, level = –27 dBm.

Test: The suppression of the signal at twice or three times the nominal frequency is measured relative to the nominal signal.

Control: ➢ Set CRTU Radio Unit to connector RF2, specified frequency, level = –10 dBm.

Test: The suppression of the signal at twice or three times the nominal frequency is measured relative to the nominal signal.

Control: ➢ Set CRTU Radio Unit to connector RF3 OUT, specified frequency, level = +10 dBm.

Test: The suppression of the signal at twice and three times the nominal frequency is measured relative to the nominal signal.

TX Non Harmonics

TX In-Band Spurious Signals

Spurious signals within the specified frequency bands are checked.

Preparation Test setup TX5, no external trigger

Analyzer Start/Stop = specified frequency range, RBW = 100 kHz

Control: ➢ Set CRTU Radio Unit to connector RF3 OUT, specified setting frequency, level = 0 dBm.

Test: The suppression of the signal is measured at the test frequency relative to the set signal.

TX Fixed Spurious Signals

Fixed spurious signals are checked.

Preparation: Test setup TX5, no external trigger.

Analyzer: Center = specified test frequency, RBW = 100 kHz, Span = 1 MHz.

Control: ➢ Set CRTU Radio Unit to connector RF3 OUT, specified setting frequency, specified level.

Test: The suppression of the signal is measured at the test frequency relative to the set signal.

TX SSB Phase Noise

Preparation Test setup TX5, no external trigger

➢ Connect spectrum analyzer or modulation analyzer to RF3 OUT.

Control: ➢ Set CRTU Radio Unit generator to specified RF frequency.

Output level at RF3 OUT 0 dBm,

Analyzer to specified center frequency,

Span = 50 kHz to 5 MHz, RBW = Span/500,

Noise measurement function.

Test
- Measure the phase noise at the specified spacing from the carrier.

TX Residual FM

Preparation: Test setup TX5, no external trigger.
- Connect spectrum analyzer or modulation analyzer to RF1.

Control:
- Set CRTU Radio Unit generator to the specified RF frequency.

Output level at RF1 –27 dBm, analyzer to specified center frequency, FM demodulator.

Test:
- The residual FM with the specified weighting is measured.

TX Residual AM

Preparation: Test setup TX5, no external trigger.
- Connect spectrum analyzer or modulation analyzer to RF1.

Control:
- Set CRTU Radio Unit generator to specified RF frequency.

Output level at RF1 –27 dBm, analyzer to specified center frequency, AM demodulator.

Test:
- The residual AM with the specified weighting is measured.

TX Carrier/Sideband Suppression, Max. Distortion

The modulation quality of the analog IQ modulator of the CRTU Radio Unit is measured.

Preparation Test setup TX5, no external trigger.
- Connect spectrum analyzer to RF3 OUT.

Control:
- Set CRTU Radio Unit generator to specified RF frequency.

  Output level at RF3 OUT, 0 dBm,
- Switch on RF generator with offset modulation, 300- kHz baseband filter,
- Set analyzer to center frequency f_c = 1000 MHz, Span = 300 kHz / 3 MHz

Test: The suppression of the carrier at f_c is measured relative to the useful sideband signal at $f_c + f_{mod}$.

RX Power Meter (Frequency-Selective)

Preparation: Test setup RX1, RX2 (depending on level range).

Control:
- Set CRTU Radio Unit to desired RX frequency and level and Input in menu *RF ANALYZER/ GENERATOR*.

Measuring Bandwidth = 1 kHz.

Test: ➢ Measure RX level measurement accuracy of CRTU Radio Unit.

Note: *The given frequencies and levels are suggested values; of course, it is also possible to use other values for the measurement.*

RX Power Meter (Wideband)

Preparation Test setup RX1, RX2 (depending on level range).

Control: ➢ Set CRTU Radio Unit to desired RX connector, frequency and level and Input in menu *RF Analyzer/ Generator*.

Measuring *Bandwidth* = *Wide*

Test: ➢ Measure RX level measurement accuracy of CRTU Radio Unit.

Note: *The given frequencies and levels are suggested values; of course, it is also possible to use other values for the measurement.*

RX Harmonics

Preparation: Test setup RX3,

Generator = f_{in} ; level = 0 dBm.

Control: ➢ Set CRTU Radio Unit to connector RF2, *Max Level* = 2 dBm.

Test: ➢ The suppression of the signal at twice and three times the input frequency is measured relative to the input signal.

Preparation: Test setup RX3

Generator = f_{in} ; level = –2 dBm

Control: ➢ Set CRTU Radio Unit to connector RF4 IN, *Max Level* = 0 dBm.

Test: ➢ The suppression of the signal at twice and three times of input frequency is measured relative to the input signal.

RX Spurious Response / Image Rejection

Preparation: Test setup RX3,

Generator = f_{in} ; level = 0 dBm.

Control: ➢ Set CRTU Radio Unit to connector RF2, *Max Level* = 2 dBm, *Mode* = *Low Distortion*

Test: ➢ The suppression of the spurious or image signal is measured relative to the input signal.

Preparation: Test setup RX3,

Generator = f_{in} ; level = –2 dBm.

Control:
- Set CRTU Radio Unit to connector RF4 IN, *Max level = 0 dBm, Mode = Low Distortion*

Test: The suppression of the spurious or image signal is measured relative to the input signal.

RX SSB Phase Noise

Preparation: Test setup RX3,

Generator = $f_{iCRTU\ Radio\ Unit}$ + df ; level = 10 dBm.

Control:
- Set CRTU Radio Unit to connector RF2, *Max Level* = 10 dBm and to desired frequency.
- Switch on frequency-selective power meter.

Test: The measurement is taken with a small test bandwidth at different carrier offsets.

Note: *The input level is +10 dBm, RBW = 100 Hz*
--> Phase noise = measured value –10 dB –21 dB.

RX Residual FM/AM

Preparation: Test setup RX4,

Generator = $f_{iCRTU\ Radio\ Unit}$; level = –20 dBm.

Control:
- Set CRTU Radio Unit to connector RF4 IN, *Max Level* = –20 dBm and to desired frequency.
- Switch on frequency-selective power meter.

Test: The measurement is taken with an external FM/AM demodulation instrument (FSE with FSE-B7) via the *IF3RXCH1* BNC connector at the rear panel of the CRTU Radio Unit.
- Set the FSE to desired frequency, ref. level, AF filters.

RX Dynamic/ Average Noise Level

Preparation: No signal is fed in, CRTU Radio Unit generator is OFF.

Control: Set CRTU Radio Unit to given receive frequency, *Max. Level, Bandwidth*, *Mode = Low Noise.*

Test: Use frequency-selective power meter, measurement bandwidth = 1 kHz / 500 kHz, measured value in dB below reference level *(Max. Level)*.

Options for CRTU Radio Unit

The following tests can be carried out only if the GSM-MS software option is installed and enabled by entering a key code (option CRTU-K2[1]).

TX GSM Modulation

Only with option CRTU-K2:

The GSM phase/frequency error of a TX path is measured.

Preparation: Test setup TX5:

- Connect spectrum analyzer FSIQ to RF3 OUT.

Control:

- Set CRTU Radio Unit generator to specified RF frequency.

Output level at RF3 OUT 10 dBm
Training Sequence -> GSM0;
Bit Mod. *-> PRBS*
Transmission *-> BURST*

Settings at spectrum analyzer FSIQ:
Mode -> Digital Standards -> GSM
Mode -> Meas Result -> Result_Length -> 146 (the useful part normally comprises 147 bits, however, the FSIQ can be set to an integer number of bits only and therefore cuts off 0.5 bits at the beginning and at the end of the measurement range)
Trigger -> Find Sync -> ON
Trigger -> Sync Pattern -> gsm_bts0 (training sequence GSM0)
Trigger -> Sync Offset -> 60 symbols

Test: Phase (rms and peak) and frequency errors are measured according to GSM recommendation.

RX GSM Demodulation

Only with option CRTU-K2:

The GSM phase/frequency error of a RX path is measured.

Preparation:

- Connect GSM signal generator to RF2 (test setup RX3).

The signal generator must be synchronized with the CRTU Radio Unit via the 10 MHz reference frequency.

Control: Signal generator SMIQ: GSM signal at given frequency, level according to table, burst signal with the following settings:

Digital Std -> GSM/EDGE -> State -> ON;
Digital Std -> GSM/EDGE -> Select Slot -> Burst type -> NORM
Digital Std -> GSM/EDGE -> Select Slot -> Slot Level -> FULL
Digital Std -> GSM/EDGE -> Select Slot -> Data -> PN9
Digital Std -> GSM/EDGE -> Select Slot -> TSC -> TSC0

CRTU Radio Unit:GSM Non Signalling, *training sequence = GSM 0, trigger source = IF Power, Trigger Level = Medium*

Test:

- Measure GSM phase error (rms and peak) as well as frequency error.

[1] The purpose of option CRTU-K2 is to enable the GSM bands in the CRTU-RU. Operation by Rohde & Schwarz service representatives only.

Verification of GSM Functionality

The following tests are available for a CRTU-RU which belongs to a CRTU-G or CRTU-S test system. The tests, which need to be executed at the service to verify proper GSM protocol test functionality, are split in two groups:

- The first group of tests checks the analog part of the device. This includes checking the technical data. The tests are described in the previous sections of this chapter (see section Manual Test Procedure on p. 1.7 ff.). These tests should be done first to provide a reliable basis for the second test group. The test results can be reported in Table 1-2 on p. 1.23 ff.
- The second group of tests only checks the GSM functionality itself. There are no further tests of the technical data. The group includes the hardware test of the CRTU-B5 LINKHANDLER option and of the CRTU-B6 MAC SPEECH board option. All tests of the second test group are described in the remainder of this section. The test results can be reported in Table 1-3 on p. 1.43.

All the following tests are to be executed in the "GSM Operation Software" or "Windows OPSW" module which can be selected in the BootMagic® menu after booting.

Note: *For details on how to do GSM protocol testing including the mentioned test programs see the "Software Manual for Operational Software CR02P2P".*

Auxiliary equipment for verifying the GSM protocol test functionality:

Item	Required Equipment	R&S Article Name	R&S Order Number
1	GSM Test Mobile (at least dual band)	–	–
2	SIM card Phase 2+	CRT-Z2	1039.9005.02
3	Service Kit CRTU (the hard lock is required for GSM protocol testing)	CRTU-Z3	1139.0509.02
4	USB Wheelmouse	PSL-Z10	1157.7060.02
5	USB Keyboard US	PSL-Z2	1157.6870.03

Hardware Test of CRTU-B5 and CRTU-B6

➢ Use the HW-Info tool or call DSPTEST from the CRTx command shell.

This is an internal selftest which downloads test software into the DSPs of the two options CRTU-B5, *Linkhandler*, and CRTU-B6, *MAC SPEECH Board*. The test performs a memory test on all DSPs. All the important interfaces between the DSPs and the FPGAs on the CRTU-B5 options are tested as well as some interfaces to the Digital Board.

Note: *Use the tool DSPPOLL for a quick hardware overview.*

RF Loopback Overall Test

➢ Select the *LOOP* mode in CRTx command shell (call: loop), start Sequencer tool (call: seq) and select the *SATLOOP* test environment.

➢ Run the *SLFTST* application to verify the proper functioning of the complete signal path of both RF channels.

This is an internal selftest which uses the standard protocol test software. It sets up a traffic channel in loopback mode so that the CRTU-RU can also receive the transmitted signal. The loopback is an RF loopback in the Frontend. The test performs a Bit Error Rate (BER) test on both RF channels. In case

an error is detected, the two channels are cross-linked and the test is automatically repeated to locate the error.

Note: *Two additional tests BERTST and XTST are intended to provide a more detailed picture of the RF signal path. These tests show the current Bit Error Test results as long as the test is not terminated. The test BERTST tests an individual RF channel, which is selected as a test parameter. The test XTST is a cross-link test. It combines the transmitter of channel 1 with the receiver of channel 2 or vice versa, depending on the test settings.*

Real Mobile Overall Test

- Please connect the Test Mobile to RF2 connector at the front panel.
- Start Configuration Manager tool and make sure that the two items “Select Connectors Manually” and “Select Power Levels Manually” are not activated. The operation mode must be set to “Stand Alone”.
- Select the *GSM* mode in CRTx command shell (call: gsm), start Sequencer tool (call: seq) and select the CRTUSENV test environment.
- Make sure that the Test SIM configuration within SetCfg tool is set so that it matches the Test SIM you are using (by default CRT-Z2 Phase 2+ SIM card).

MTC Audio Path Test

- Run AUD_CALL with parameter FR (Full Rate Traffic Channel).

This is a Mobile Terminated Call (MTC), where the CRTU-RU sets up a traffic channel. Also the audio path is activated.

Short-circuit the BNC connectors AUX1 and AUX2 with a BNC cable. When the traffic channel is established, the Mobile’s microphone picks up, the audio signal is looped back and will be output to the Mobile’s speaker with a delay of about a second. If this can be heard, the complete audio path works properly.

BER Test Channel 1

- Run BER_TEST with parameter *CngChn.*

For this test the CRTU-RU sets up a traffic channel on RF channel 1 and performs a Bit Error Rate test. There shall be no incorrect frames but it is ok if there are some bit errors. This is because of the low RF level provided to the mobile.

BER Test Channel 2

- Run BER_TEST with parameter none.

For this test the CRTU-RU sets up a traffic channel on RF channel 2 and performs a Bit Error Rate test. There shall be no incorrect frames but it is ok if there are some bit errors. This is because of the low RF level provided to the mobile.

MAC Test

- Run MAC_TEST with parameter none.

For this test the CRTU-RU sets up an EGPRS channel and sends RLC Data Blocks until the test is terminated with the ESC key. Within this test the proper work of the MAC Speech board is tested. It should be run for at least the time needed to send 5000 blocks.

Note: *Due to an intermittent initialization problem of the DSPs the test has to be run twice in case an error occurs during the first run !*

EDGE Layer 1 Performance Tool Test

- If the CRTx command shell is open, close it.
- Start the EDGE command shell.

If the EDGE Layer 1 Performance Tool is started correctly, all involved DSPs are downloaded and work properly. This test only verifies that the tool can be started.

Detection Test of CRTU-G or CRTU-S

Complete each test of a CRTU-RU belonging to a CRTU-G or CRTU-S system by checking the tray icon in the bottom right corner of the desktop. For each system the correct tray icon must be displayed.

or


If a CRTU-G is detected as a CRTU-S, the CRTU-K5 software option (1139.9106.02) must be installed. For the installation procedure you have to distinguish which version of CRTU-RU software is present:

1.CRTU-RU SW >= 3.20: see Service-Circular No. 1555.

2.CRTU-RU SW < 3.20:

- Boot up the CRTU-G within the BootMagic® menu into “Service/WCDMA” or „DOS OPSW / Service“.
- Press <Alt> + <F4> keys at once to enter the DOS-prompt.
- Move to C:\CMU\DATA.
- Open file “SWOPT.DAT” using the <edit> command.
- Enter the 16-digit CRTU-K5 code (with comment) into a single line (all letters have to be written in upper case, e.g. XXXXXXXXXXXXXXXX ; K5).
- Save the file and close it.
- Reboot the CRTU-G by pressing <Ctrl> + <Alt> + <Del> keys at once.
- Within the BootMagic® menu, move into the default partition “GSM Operation SW” or „Windows OPSW“ and check the correct tray icon again.

Usually the K5 code is affixed at the lateral panel of the instrument casing (tube). If the serial number of the CRTU-G begins with “8xx xxx” the following K5 codes apply:

Serial number	K5 Code
83 69 17	2B80768F4DB4C662
83 91 55	11419B13E092AD39
83 58 55	7D7FF1541D22C4D4

If none of the cases above applies, please contact the central R&S Service in Munich in order to obtain the correct K5 code.

Test Reports

ROHDE & SCHWARZ	CRTU Radio Unit	1138.4000.82
Serial number:		
Tested by:		
Date:		
Signature:		

Table 1-2 Test report

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	Ambient temperature during calibration		23		26		°C
General Tests							
	CONTINUOUS SELFTEST		Passed		passed		
	1→4/3→2 RF LOOP TEST		Passed		passed		
	Adjusting +5 V DC REFERENCE VOLTAGE	Chapter 2	4.999		5.001		mV
	Adjusting TCXO 10 MHz at RF3 OUT 1 GHz (if none option CRTU-B2 is not installed)	Chapter 2	–50		+50		Hz
	Adjusting CRTU-B2 OCXO 10 MHz at RF3 OUT 1GHz (if option CRTU-B2 is installed)	Chapter 2	–10		+5		Hz
	REF IN 52 MHz	REF IN	–1		+1		Hz
	REF IN 1 MHz		–1		+1		Hz
	REF IN 10 MHz +50 Hz		–1		+1		Hz
	REF IN 10 MHz –50 Hz		–1		+1		Hz
	REF OUT 1 Int 10 MHz	REF OUT 1	1.4		5		V(pp)
	REF OUT 1 52 MHz		1.4		5		V(pp)
	REF OUT 1 52 MHz		–1		+1		Hz
	REF OUT 1 1 MHz		1.4		5		V(pp)
	REF OUT 1 1 MHz		–1		+1		Hz
	REF OUT 2 13 MHz or 10 MHz	REF OUT 2	1		5		V(pp)
	REF OUT 2 13 MHz or 10 MHz		–1		+1		Hz

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
TX Frequency Accuracy							
	TX Frequency accuracy 2200 MHz	TX Frequency accuracy	–2200 –220 –11		+2200 (TCXO), +220 (B11), +11 (B12)		Hz
TX Frequency Settling							
	TX frequency settling time F1 = 100 MHz ->F2 = 200 MHz to <1 kHz	TX Frequency settling			400		µs
	TX frequency settling time F1 = 1800 MHz ->F2 = 1900 MHz to <1 kHz				400		µs
	TX frequency settling time F1 = 2200 MHz ->F2 = 2100 MHz to <1 kHz				400		µs
	TX frequency settling time F1 = 100 MHz ->F2 = 2200 MHz to <1 kHz				400		µs
	TX frequency settling time F1 = 2000 MHz ->F2 = 100 MHz to <1 kHz				400		µs
VSWR							
	VSWR RF1 10 MHz	VSWR			1.2		
	VSWR RF1 900 MHz				1.2		
	VSWR RF1 1800 MHz				1.2		
	VSWR RF1 2700 MHz				1.6		
	VSWR RF2 10 MHz				1.2		
	VSWR RF2 900 MHz				1.2		
	VSWR RF2 1800 MHz				1.2		
	VSWR RF2 2700 MHz				1.6		
	VSWR RF3 OUT 10 MHz				1.5		
	VSWR RF3 OUT 900 MHz				1.5		
	VSWR RF3 OUT 1800 MHz				1.5		
	VSWR RF3 OUT 2700 MHz				1.7		
	VSWR RF4 IN 10 MHz				1.5		
	VSWR RF4 IN 900 MHz				1.5		
	VSWR RF4 IN 1800 MHz				1.5		
	VSWR RF4 IN 2700 MHz				1.6		
TX Level Settling Time							
	TX Level settling time at P = +10 dBm to ΔP = 0.5 dB	TX level settling time			4		µs

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	TX Level settling time at P = –20 dBm to ΔP = 0.5 dB				4		µs
	TX Level settling time at P = –50 dBm to ΔP = 0.5 dB				4		µs
TX Harmonics							
	TX 2nd harmonic at RF2 at carrier frequency = 10 MHz	TX harmonics			–30		dBc
	TX 2nd harmonic at RF2 at carrier frequency = 900 MHz				–30		dBc
	TX 2nd harmonic at RF2 at carrier frequency = 1800 MHz				–30		dBc
	TX 2nd harmonic at RF2 at carrier frequency = 2200 MHz				–30		dBc
	TX 3rd harmonic at RF2 at carrier frequency = 10 MHz				–30		dBc
	TX 3rd harmonic at RF2 at carrier frequency = 900 MHz				–30		dBc
	TX 3rd harmonic at RF2 at carrier frequency = 1800 MHz				–30		dBc
	TX 3rd harmonic at RF2 at carrier frequency = 2200 MHz				–30		dBc
	TX 2nd harmonic at RF3 OUT at carrier frequency = 10 MHz				–20		dBc
	TX 2nd harmonic at RF3 OUT at carrier frequency = 900 MHz				–20		dBc
	TX 2nd harmonic at RF3 OUT at carrier frequency = 1800 MHz				–20		dBc
	TX 2nd harmonic at RF3 OUT at carrier frequency = 2200 MHz				–20		dBc
	TX 3rd harmonic at RF3 OUT at carrier frequency = 10 MHz				–20		dBc
	TX 3rd harmonic at RF3 OUT at carrier frequency = 900 MHz				–20		dBc
	TX 3rd harmonic at RF3 OUT at carrier frequency = 1800 MHz				–20		dBc
	TX 3rd harmonic at RF3 OUT at carrier frequency = 2200 MHz				–20		dBc
TX In-band Spurious Responses							
	TX In-band spurious CRTU setting = 460.9 MHz search freq. ± 5.500 kHz from carrier	TX in-band spurious responses			–40		dBc
	TX In-band spurious CRTU setting = 468.1 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 489.3 MHz search freq. ± 5.500 kHz from carrier				–40		dBc

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	TX In-band spurious CRTU setting = 496.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 925.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 960.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 1805.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 1880.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 869.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 894.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 1930.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 1990.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 1920.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 1980.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 2110.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
	TX In-band spurious CRTU setting = 2170.5 MHz search freq. ± 5.500 kHz from carrier				–40		dBc
TX Fixed Spurious Responses							
	TX fixed spurious, CRTU setting = 14.35 MHz search freq. 13.85 MHz Level = –20 dBm	TX fixed spurious			–40		dBc
	TX fixed spurious, CRTU setting = 37.4333 MHz search freq. 36.9333 MHz Level = –20 dBm				–40		dBc

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	TX fixed spurious, CRTU setting = 42.05 MHz search freq. 41.55 MHz Level = –20 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 111.3 MHz search freq. 110.8 MHz Level = –20 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 222.1 MHz search freq. 221.6 MHz Level = –20 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 332.9 MHz search freq. 332.4 MHz Level = –20 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 501.87 MHz search freq. 501.37 MHz Level = –20 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1330.1 MHz search freq. 1329.6 MHz Level = 0 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 100 MHz search freq. 1917.12 MHz Level = 0 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1300 MHz search freq. 2142.08 MHz Level = 0 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 2200 MHz search freq. 3042.08 MHz Level = 0 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 100 MHz search freq. 86.15 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 100 MHz search freq. 113.85 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 100 MHz search freq. 1817.12 MHz Level = +10 dBm				–40		dBc

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	TX fixed spurious, CRTU setting = 100 MHz search freq. 1917.12 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 900 MHz search freq. 917.12 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 900 MHz search freq. 1817.12 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1199 MHz search freq. 618.12 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1199 MHz search freq. 1817.12 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1201 MHz search freq. 842.08 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1201 MHz search freq. 1684.16 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1201 MHz search freq. 2043.08 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1201 MHz search freq. 2885.16 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1700 MHz search freq. 842.08 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1700 MHz search freq. 2542.08 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1800 MHz search freq. 842.08 MHz Level = +10 dBm				–40		dBc

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	TX fixed spurious, CRTU setting = 1800 MHz search freq. 1684.16 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1800 MHz search freq. 2642.08 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1900 MHz search freq. 842.08 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1900 MHz search freq. 1057.92 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1900 MHz search freq. 1684.16 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 1900 MHz search freq. 2742.08 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 2199 MHz search freq. 842.08 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 2199 MHz search freq. 1356.92 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 2199 MHz search freq. 1684.16 MHz Level = +10 dBm				–40		dBc
	TX fixed spurious, CRTU setting = 2199 MHz search freq. 3041.08 MHz Level = +10 dBm				–40		dBc
TX SSB Phase Noise							
	TX SSB phase noise f = 100 MHz, Δf = 20 kHz	TX SSB phase noise			–100		dBc
	TX SSB phase noise f = 100 MHz, Δf = 250 kHz				–110		dBc
	TX SSB phase noise f = 100 MHz, Δf = 400 kHz				–110		dBc
	TX SSB phase noise f = 100 MHz, Δf = 1990 kHz				–110		dBc

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	TX SSB phase noise f = 945 MHz, Δf = 20 kHz				–100		dBc
	TX SSB phase noise f = 945 MHz, Δf = 250 kHz				–110		dBc
	TX SSB phase noise f = 945 MHz, Δf = 400 kHz				–110		dBc
	TX SSB phase noise f = 945 MHz, Δf = 1990 kHz				–110		dBc
	TX SSB phase noise f = 1850 MHz, Δf = 20 kHz				–100		dBc
	TX SSB phase noise f = 1850 MHz, Δf = 250 kHz				–110		dBc
	TX SSB phase noise f = 1850 MHz, Δf = 400 kHz				–110		dBc
	TX SSB phase noise f = 1850 MHz, Δf = 1990 kHz				–110		dBc
	TX SSB phase noise f = 2200 MHz, Δf = 20 kHz				–100		dBc
	TX SSB phase noise f = 2200 MHz, Δf = 250 kHz				–110		dBc
	TX SSB phase noise f = 2200 MHz, Δf = 400 kHz				–110		dBc
	TX SSB phase noise f = 2200 MHz, Δf = 1990 kHz				–110		dBc
TX Residual FM							
	TX Residual FM at 1000 MHz 30 Hz to 15 kHz, rms				50		Hz
	TX Residual FM at 1000 MHz 30 Hz to 15 kHz, peak				200		Hz
	TX Residual FM at 1000 MHz CCITT, rms				5		Hz
	TX Residual FM at 2000 MHz 30 Hz to 15 kHz, rms				50		Hz
	TX Residual FM at 2000 MHz 30 Hz to 15 kHz, peak				200		Hz
	TX Residual FM at 2000 MHz CCITT, rms				5		Hz
TX Residual AM							
	TX Residual AM at 500 MHz CCITT, rms				0.02		%
	TX Residual AM at 1000 MHz CCITT, rms				0.02		%
	TX Residual AM at 1500 MHz CCITT, rms				0.02		%
	TX Residual AM at 2200 MHz CCITT, rms				0.02		%

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
TX Modulation characteristics							
	TX Modulation characteristics carrier suppression, f_{mod} = 10 kHz, f_{RF} = 1000 MHz				–40		dBc
	TX Modulation characteristics carrier suppression, f_{mod} = –20 kHz, f_{RF} = 1000 MHz				–40		dBc
	TX Modulation characteristics carrier suppression, f_{mod} = 20 kHz, f_{RF} = 1000 MHz				–40		dBc
	TX Modulation characteristics carrier suppression, f_{mod} = 30 kHz, f_{RF} = 1000 MHz				–40		dBc
	TX Modulation characteristics carrier suppression, f_{mod} = 60 kHz, f_{RF} = 1000 MHz				–40		dBc
	TX Modulation characteristics carrier suppression, f_{mod} = 100 kHz, f_{RF} = 1000 MHz				–40		dBc
	TX Modulation characteristics carrier suppression, f_{mod} = 135 kHz, f_{RF} = 1000 MHz				–40		dBc
	TX Modulation characteristics carrier suppression, f_{mod} = –135 kHz, f_{RF} = 1000 MHz				–40		dBc
RX Harmonics							
	RX 2nd harmonic at RF2 , f_{IN} = 50 MHz, CRTU frequency = 100 MHz	RX harmonics			–30		dBc
	RX 2nd harmonic at RF2 fIN = 600 MHz, CRTU frequency = 1200 MHz				–30		dBc
	RX 2nd harmonic at RF2 , f_{IN} = 625 MHz, CRTU frequency = 1250 MHz				–30		dBc
	RX 2nd harmonic at RF2 , f_{IN} = 1100 MHz, CRTU frequency = 2200 MHz				–30		dBc
	RX 3rd harmonic at RF2 , f_{IN} = 50 MHz, CRTU frequency = 150 MHz				–30		dBc
	RX 3rd harmonic at RF2 , f_{IN} = 400 MHz, CRTU frequency = 1200 MHz				–30		dBc
	RX 3rd harmonic at RF2 , f_{IN} = 420 MHz, CRTU frequency = 1260 MHz				–30		dBc
	RX 3rd harmonic at RF2 , f_{IN} = 730 MHz, CRTU frequency = 2190 MHz				–30		dBc
	RX 2nd harmonic at RF4 IN , f_{IN} = 50 MHz, CRTU frequency = 100 MHz				–20		dBc
	RX 2nd harmonic at RF4 IN , f_{IN} = 600 MHz, CRTU frequency = 1200 MHz				–20		dBc
	RX 2nd harmonic at RF4 IN , f_{IN} = 625 MHz, CRTU frequency = 1250 MHz				–20		dBc
	RX 2nd harmonic at RF4 IN , f_{IN} = 1100 MHz, CRTU frequency = 2200 MHz				–20		dBc

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	RX 3rd harmonic at RF4 IN , f_{IN} = 50 MHz, CRTU frequency = 150 MHz				–20		dBc
	RX 3rd harmonic at RF4 IN , f_{IN} = 400 MHz, CRTU frequency = 1200 MHz				–20		dBc
	RX 3rd harmonic at RF4 IN , f_{IN} = 420 MHz, CRTU frequency = 1260 MHz				–20		dBc
	RX 3rd harmonic at RF4 IN , f_{IN} = 730 MHz, CRTU frequency = 2190 MHz				–20		dBc
RX Spurious Response							
	RX inherent spurious response at RF2, f_{IN} = 1876.03 MHz, CRTU frequency = 903 MHz	RX Spurious response			–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 881.6 MHz, CRTU frequency = 903 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 843.085 MHz, CRTU frequency = 200 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 421.5425 MHz, CRTU frequency = 200 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 908.0575 MHz, CRTU frequency = 300 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 605.3716667 MHz, CRTU frequency = 300 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 454.02875 MHz, CRTU frequency = 300 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 500 MHz, CRTU frequency = 505.35 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 968.0575 MHz, CRTU frequency = 60 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1200 MHz, CRTU frequency = 291.9425 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 645.3716667 MHz, CRTU frequency = 60 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1200 MHz, CRTU frequency = 891.9425 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1936.115 MHz, CRTU frequency = 60 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 2200 MHz, CRTU frequency = 191.9425 MHz				–50		dBc

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	RX inherent spurious response at RF2, f_{IN} = 1226.97 MHz, CRTU frequency = 2200 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1821.4 MHz, CRTU frequency = 1800 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 2936.17 MHz, CRTU frequency = 1250 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 843.085 MHz, CRTU frequency = 2200 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 421.5425 MHz, CRTU frequency = 2200 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 281.0283333 MHz, CRTU frequency = 2200 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1816.115 MHz, CRTU frequency = 2200 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 908.0575 MHz, CRTU frequency = 2200 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 605.3716667 MHz, CRTU frequency = 2200 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1671.5425 MHz, CRTU frequency = 1250 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 2200 MHz, CRTU frequency = 1778.4575 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1812.056667 MHz, CRTU frequency = 1250 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1681.5425 MHz, CRTU frequency = 1680 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1468.085 MHz, CRTU frequency = 1250 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1683.085 MHz, CRTU frequency = 1680 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1943.085 MHz, CRTU frequency = 2200 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 978.7233333 MHz, CRTU frequency = 1250 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1295.39 MHz, CRTU frequency = 2200 MHz				–50		dBc

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	RX inherent spurious response at RF2, f_{IN} = 1210.843333 MHz, CRTU frequency = 1210.743333 MHz				–50		dBc
	RX inherent spurious response at RF2, f_{IN} = 1262.31375 MHz, CRTU frequency = 1260 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 968.0575 MHz, CRTU frequency = 60 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 1200 MHz, CRTU frequency = 291.9425 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 645.3716667 MHz, CRTU frequency = 60 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 1200 MHz, CRTU frequency = 891.9425 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 1936.115 MHz, CRTU frequency = 60 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 2200 MHz, CRTU frequency = 191.9425 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 1671.5425 MHz, CRTU frequency = 1250 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 2200 MHz, CRTU frequency = 1778.4575 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 1812.056667 MHz, CRTU frequency = 1250 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 1681.5425 MHz, CRTU frequency = 1680 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 1468.085 MHz, CRTU frequency = 1250 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 1683.085 MHz, CRTU frequency = 1680 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 1943.085 MHz, CRTU frequency = 2200 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 978.7233333 MHz, CRTU frequency = 1250 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 1295.39 MHz, CRTU frequency = 2200 MHz				–50		dBc
	RX inherent spurious response at RF4 IN, f_{IN} = 1210.843333 MHz, CRTU frequency = 1210.743333 MHz				–50		dBc

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	RX inherent spurious response at RF4 IN, f_{IN} = 1262.31375 MHz, CRTU frequency = 1260 MHz				–50		dBc
RX SSB Phase Noise							
	RX SSB phase noise at RF2 f = 100 MHz, Δf = +20 kHz	RX SSB phase noise			–100		
	RX SSB phase noise at RF2 f = 100 MHz, Δf = +250 kHz				–110		
	RX SSB phase noise at RF2 f = 100 MHz, Δf = +400 kHz				–118		
	RX SSB phase noise at RF2 f = 100 MHz, Δf = +1990 kHz				–118		
	RX SSB phase noise at RF2 f = 945 MHz, Δf = +20 kHz				–100		dBc/Hz
	RX SSB phase noise at RF2 f = 945 MHz, Δf = +250 kHz				–110		dBc/Hz
	RX SSB phase noise at RF2 f = 945 MHz, Δf = +400 kHz				–118		dBc/Hz
	RX SSB phase noise at RF2 f = 945 MHz, Δf = +1990 kHz				–118		dBc/Hz
	RX SSB phase noise at RF2 f = 1850 MHz, Δf = –20 kHz				–100		dBc/Hz
	RX SSB phase noise at RF2 f = 1850 MHz, Δf = -–250 kHz				–110		dBc/Hz
	RX SSB phase noise at RF2 f = 1850 MHz, Δf = -–400 kHz				–118		dBc/Hz
	RX SSB phase noise at RF2 f = 1850 MHz, Δf = -–1990 kHz				–118		dBc/Hz
	RX SSB phase noise at RF2 f = 2200 MHz, Δf = –20 kHz				–100		dBc/Hz
	RX SSB phase noise at RF2 f = 2200 MHz, Δf = –250 kHz				–110		dBc/Hz
	RX SSB phase noise at RF2 f = 2200 MHz, Δf = –400 kHz				–118		dBc/Hz
	RX SSB phase noise at RF2 f = 2200 MHz, Δf = –1990 kHz				–118		dBc/Hz
RX Residual FM/AM							
	RX Residual FM at 500 MHz at RF4 IN, –20 dBm 30Hz to 15 kHz, rms	RX residual FM/AM			50		Hz
	RX Residual FM at 500 MHz at RF4 IN, –20 dBm 30Hz to 15 kHz, peak				200		Hz
	RX Residual FM at 500 MHz at RF4 IN, –20 dBm CCITT, rms				5		Hz

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	RX Residual AM at 500 MHz at RF4 IN, –20 dBm CCITT, rms				0.02		%
	RX Residual FM at 900 MHz at RF4 IN, –20 dBm 30Hz to 15 kHz, rms				50		Hz
	RX Residual FM at 900 MHz at RF4 IN, –20 dBm 30Hz to 15 kHz, peak				200		Hz
	RX Residual FM at 900 MHz at RF4 IN, –20 dBm CCITT, rms				5		Hz
	RX Residual AM at 900 MHz at RF4 IN, –20 dBm CCITT, rms				0.02		%
	RX Residual FM at 1900 MHz at RF4 IN, –20 dBm 30Hz to 15 kHz, rms				50		Hz
	RX Residual FM at 1900 MHz at RF4 IN, –20 dBm 30Hz to 15 kHz, peak				200		Hz
	RX Residual FM at 1900 MHz at RF4 IN, –20 dBm CCITT, rms				5		Hz
	RX Residual AM at 1900 MHz at RF4 IN, –20 dBm CCITT, rms				0.02		%
	RX Residual FM at 2100 MHz at RF4 IN, –20 dBm 30Hz to 15 kHz, rms				50		Hz
	RX Residual FM at 2100 MHz at RF4 IN, –20 dBm 30Hz to 15 kHz, peak				200		Hz
	RX Residual FM at 2100 MHz at RF4 IN, –20 dBm CCITT, rms				5		Hz
	RX Residual AM at 2100 MHz at RF4 IN, –20 dBm CCITT, rms				0.02		%
	RX Residual FM at 2500 MHz at RF4 IN, –20 dBm 30Hz to 15 kHz, rms				50		Hz
	RX Residual FM at 2500 MHz at RF4 IN, –20 dBm 30Hz to 15 kHz, peak				200		Hz
	RX Residual FM at 2500 MHz at RF4 IN, –20 dBm CCITT, rms				5		Hz
	RX Residual AM at 2500 MHz at RF4 IN, –20 dBm CCITT, rms				0.02		%

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
RX Average Noise Level							
	RX average noise level RF1, RBW = 1 kHz, expPow = 47 dBm, f = 10 MHz	RX average noise level			–100		dBc
	RX average noise level RF1, RBW = 1 kHz, expPow = 47 dBm, f = 500 MHz				–100		dBc
	RX average noise level RF1, RBW = 1 kHz, expPow = 47 dBm, f = 1000 MHz				–100		dBc
	RX average noise level RF1, RBW = 1 kHz, expPow = 47 dBm, f = 1500 MHz				–100		dBc
	RX average noise level RF1, RBW = 1 kHz, expPow = 47 dBm, f = 2200 MHz				–100		dBc
	RX average noise level RF1, RBW = 1 kHz, expPow = 47 dBm, f = 2700 MHz				–95		dBc
	RX average noise level RF1, RBW = 1 kHz, expPow = 10 dBm, f = 10 MHz				–100		dBc
	RX average noise level RF1, RBW = 1 kHz, expPow = 10 dBm, f = 500 MHz				–100		dBc
	RX average noise level RF1, RBW = 1 kHz, expPow = 10 dBm, f = 1000 MHz				–100		dBc
	RX average noise level RF1, RBW = 1 kHz, expPow = 10 dBm, f = 1500 MHz				–100		dBc
	RX average noise level RF1, RBW = 1 kHz, expPow = 10 dBm, f = 2200 MHz				–100		dBc
	RX average noise level RF1, RBW = 1 kHz, expPow = 10 dBm, f = 2700 MHz				–95		dBc
	RX average noise level RF2, RBW = 500 kHz, expPow = 33 dBm, f = 10 MHz				–73		dBc
	RX average noise level RF2, RBW = 500 kHz, expPow = 33 dBm, f = 500 MHz				–73		dBc
	RX average noise level RF2, RBW = 500 kHz, expPow = 33 dBm, f = 1000 MHz				–73		dBc
	RX average noise level RF2, RBW = 500 kHz, expPow = 33 dBm, f = 1500 MHz				–73		dBc
	RX average noise level RF2, RBW = 500 kHz, expPow = 33 dBm, f = 2200 MHz				–73		dBc

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	RX average noise level RF2, RBW = 500 kHz, expPow = 33 dBm, f = 2700 MHz				–68		dBc
	RX average noise level RF2, RBW = 500 kHz, expPow = –4 dBm, f = 10 MHz				–73		dBc
	RX average noise level RF2, RBW = 500 kHz, expPow = –4 dBm, f = 500 MHz				–73		dBc
	RX average noise level RF2, RBW = 500 kHz, expPow = –4 dBm, f = 1000 MHz				–73		dBc
	RX average noise level RF2, RBW = 500 kHz, expPow = –4 dBm, f = 1500 MHz				–73		dBc
	RX average noise level RF2, RBW = 500 kHz, expPow = –4 dBm, f = 2200 MHz				–73		dBc
	RX average noise level RF2, RBW = 500 kHz, expPow = –4 dBm, f = 2700 MHz				–68		dBc
	RX average noise level RF4 IN, RBW = 1 kHz, expPow = –22 dBm, f = 10 MHz				–100		dBc
	RX average noise level RF4 IN, RBW = 1 kHz, expPow = 0 dBm, f = 500 MHz				–100		dBc
	RX average noise level RF4 IN, RBW = 1 kHz, expPow = 0 dBm, f = 1000 MHz				–100		dBc
	RX average noise level RF4 IN, RBW = 1 kHz, expPow = 0 dBm, f = 1500 MHz				–100		dBc
	RX average noise level RF4 IN, RBW = 1 kHz, expPow = 0 dBm, f = 2200 MHz				–100		dBc
	RX average noise level RF4 IN, RBW = 1 kHz, expPow = 0 dBm, f = 2700 MHz				–95		dBc
	RX average noise level RF4 IN, RBW = 1 kHz, expPow = –22 dBm, f = 10 MHz				–100		dBc
	RX average noise level RF4 IN, RBW = 1 kHz, expPow = –22 dBm, f = 500 MHz				–100		dBc
	RX average noise level RF4 IN, RBW = 1 kHz, expPow = –22 dBm, f = 1000 MHz				–100		dBc
	RX average noise level RF4 IN, RBW = 1 kHz, expPow = –22 dBm, f = 1500 MHz				–100		dBc
	RX average noise level RF4 IN, RBW = 1 kHz, expPow = –22 dBm, f = 2200 MHz				–100		dBc

Item No.	Description	Measure-ment to section	Min.	Actual	Max.	Measurement uncertainty	Unit
	RX average noise level RF4 IN, RBW = 1 kHz, expPow = –22 dBm, f = 2700 MHz				–95		dBc

TX Generator level error at RF1 (measurement on frequency cal. points)

Frequency MHz	10, 100, 200, 300, 400, 500, 600, 700, 800, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, , 2100, 2200, 2300, 2400, 2500, 2600, 2700	820, 840, 860, 880, 900, 920, 940, 960, 1710, 1730, 1750, 1770, 1790, 1810, 1830, 1850, 1870, 1890, 1910, 1930, 1950, 1970, 1990
Level in dBm	–33, –55, –73, –87, –106, –117, –130	–33, –55, –73, –87, –106, –117, –130
Tolerance	See data sheet: Base Unit RF Generator	See data sheet: GSM Specification RF Generator

TX Generator level error at RF2 (measurement on frequency cal. points)

Frequency MHz	10, 100, 200, 300, 400, 500, 600, 700, 800, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, , 2100, 2200, 2300, 2400, 2500, 2600, 2700	820, 840, 860, 880, 900, 920, 940, 960, 1710, 1730, 1750, 1770, 1790, 1810, 1830, 1850, 1870, 1890, 1910, 1930, 1950, 1970, 1990
Level in dBm	–16, –41, –59, –73, –95, –106, –117	–16, –41, –59, –73, –95, –106, –117
Tolerance	See data sheet: Base Unit RF Generator	See data sheet: GSM Specification RF Generator

TX Generator level error at RF3 OUT (measurement on frequency cal. points)

Frequency MHz	10, 100, 200, 300, 400, 500, 600, 700, 800, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, , 2100, 2200, 2300, 2400, 2500, 2600, 2700	820, 840, 860, 880, 900, 920, 940, 960, 1710, 1730, 1750, 1770, 1790, 1810, 1830, 1850, 1870, 1890, 1910, 1930, 1950, 1970, 1990
Level in dBm	+5, –18, –36, –50, –72, –80, –90	+5, –18, –36, –50, –72, –80, –90
Tolerance	See data sheet: Base Unit RF Generator	See data sheet: GSM Specification RF Generator

RX Power meter (frequency selective) level error at RF1 (measurement on frequency cal. points)

Frequency in MHz	50, 100, 200, 300, 400, 500, 600, 700, 800, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, , 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700	450, 470, 490, 820, 840, 860, 880, 900, 920, 940, 960, 1720, 1740, 1760, 1780, 1800, 1820, 1840, 1860, 1880, 1900, 1920, 1940, 1960, 1980
Level in dBm	+47, +40, +33, +30, +25, +20, +15, +10, +6, 0, –5, –10, –15, –20, - 25, –30, –35, –40 Note: P = –40 dBm is valid for f = 50 MHz to 2200 MHz only	+47, +40, +33, +30, +25, +20, +15, +10, +6, 0, –5, –10, –15, –20, - 25, –30, –35, –40 Note: P = –40 dBm is valid for f = 50 MHz to 2200 MHz only
Tolerance	See data sheet: Base Unit RF Analyzer	See data sheet: GSM Specification RF Analyzer

RX Power meter (frequency selective) level error at RF2 (measurement on frequency cal. points)

Frequency in MHz	50, 100, 200, 300, 400, 500, 600, 700, 800, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, , 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700	450, 470, 490, 820, 840, 860, 880, 900, 920, 940, 960, 1720, 1740, 1760, 1780, 1800, 1820, 1840, 1860, 1880, 1900, 1920, 1940, 1960, 1980
Level in dBm	+33, +26, +19, +16, +11, +6, +1, –4, –8, –14, –19, –24, - 29, –34, –39, –44, –49, –54 Note: P = –54 dBm is valid for f = 50 MHz to 2200 MHz only	+33, +26, +19, +16, +11, +6, +1, –4, –8, –14, –19, –24, –29, –34, –39, –44, –49, –54 Note: P = –54 dBm is valid for f = 50 MHz to 2200 MHz only
Tolerance	See data sheet: Base Unit RF Analyzer	See data sheet: GSM Specification RF Analyzer

RX Power meter (frequency selective) level error at RF4 IN (measurement on frequency cal. points)

Frequency in MHz	50, 100, 200, 300, 400, 500, 600, 700, 800, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, , 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700	450, 470, 490, 820, 840, 860, 880, 900, 920, 940, 960, 1720, 1740, 1760, 1780, 1800, 1820, 1840, 1860, 1880, 1900, 1920, 1940, 1960, 1980
Level in dBm	0, –6, –9, –14, –19, –24, –29, –33, –39, –44, –49, –54, –59, –64, –69, –74, –80 Note: P = –80 dBm is valid for f = 50 MHz to 2200 MHz only	0, –6, –9, –14, –19, –24, –29, –33, –39, –44, –49, –54, –59, –4, –69, –74, –80 Note: P = –80 dBm is valid for f = 50 MHz to 2200 MHz only
Tolerance	See data sheet: Base Unit RF Analyzer	See data sheet: GSM Specification RF Analyzer

RX Power meter (wideband) level error at RF1 (measurement on frequency cal. points)

Frequency in MHz	50, 100, 200, 300, 400, 500, 600, 700, 800, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, , 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700	450, 470, 490, 820, 840, 860, 880, 900, 920, 940, 960, 1720, 1740, 1760, 1780, 1800, 1820, 1840, 1860, 1880, 1900, 1920, 1940, 1960, 1980
Level in dBm	+47, +40, +33, +30, +25, +20, +15, +10 Note: P> +33 dBm is calibrated from 800 MHz to 2000 MHz only;	+47, +40, +33, +30, +25, +20, +15, +10 Note: P> +33 dBm is calibrated from 800 MHz to 2000 MHz only;
Tolerance	See data sheet: Base Unit RF Analyzer	See data sheet: Base Unit RF Analyzer

RX Power meter (wideband) level error at RF2 (measurement on frequency cal. points)

Frequency in MHz	50, 100, 200, 300, 400, 500, 600, 700, 800, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, , 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700	450, 470, 490, 820, 840, 860, 880, 900, 920, 940, 960, 1720, 1740, 1760, 1780, 1800, 1820, 1840, 1860, 1880, 1900, 1920, 1940, 1960, 1980
Level in dBm	+33, +26, +19, +16, +11, +6, +1, –4	+33, +26, +19, +16, +11, +6, +1, –4
Tolerance	See data sheet: Base Unit RF Analyzer	See data sheet: Base Unit RF Analyzer

RX Power meter (wideband) level error at RF4 IN (measurement on frequency cal. points)

Frequency in MHz	50, 100, 200, 300, 400, 500, 600, 700, 800, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, , 2000, 2100, 2200, 2300, 2400, 2500, 2600, 2700	450, 470, 490, 820, 840, 860, 880, 900, 920, 940, 960, 1720, 1740, 1760, 1780, 1800, 1820, 1840, 1860, 1880, 1900, 1920, 1940, 1960, 1980
Level in dBm	0, –6, –9, –14, –19, –24, –29	0, –6, –9, –14, –19, –24, –29
Tolerance	See data sheet: Base Unit RF Analyzer	See data sheet: Base Unit RF Analyzer

Options for CRTU: CMU-K2, TX Generator GSM Modulation

Output RF3 OUT, level 10 dBm, GSM Non Signaling
Training Sequence GSM0, Bit Modulation PRBS, Transmission Burst

K20	TX GSM phase error at 460 MHz, peak	GSM Modulation	–4		+4		°		X
K20	TX GSM phase error at 460 MHz, rms		–1		+1		°		X
K20	TX GSM frequency error at 460 MHz		–15		+15		Hz		X
K20	TX GSM phase error at 496 MHz, peak		–4		+4		°		X
K20	TX GSM phase error at 496 MHz, rms		–1		+1		°		X
K20	TX GSM frequency error at 496 MHz		–15		+15		Hz		X
K21	TX GSM phase error at 921 MHz, peak		–4		+4		°		X
K21	TX GSM phase error at 921 MHz, rms		–1		+1		°		X
K21	TX GSM frequncy error at 921 MHz		–15		+15		Hz		X
K21	TX GSM phase error at 960 MHz, peak		–4		+4		°		X
K21	TX GSM phase error at 960 MHz, rms		–1		+1		°		X
K21	TX GSM frequency error at 960 MHz		–15		+15		Hz		X
K22	TX GSM phase error at 1805 MHz, peak		–4		+4		°		X
K22	TX GSM phase error at 1805 MHz, rms		–1		14		°		X
K22	TX GSM frequency error at 1805 MHz		–15		+15		Hz		X
K22	TX GSM phase error at 1880 MHz, peak		–4		+4		°		X
K22	TX GSM phase error at 1880 MHz, rms		–1		+1		°		X
K22	TX GSM frequency error at 1880 MHz		–15		+15		Hz		X
K23	TX GSM phase error at 1930 MHz, peak		–4		+4		°		X
K23	TX GSM phase error at 1930 MHz, rms		–1		+1		°		X
K23	TX GSM frequency error at 1930 MHz		–15		+15		Hz		X
K23	TX GSM phase error at 1990 MHz, peak		–4		+4		°		X
K23	TX GSM phase error at 1990 MHz, rms		–1		+1		°		X
K23	TX GSM frequency error at 1990 MHz		–15		+15		Hz		X

K24	TX GSM phase error at 869 MHz, peak		–4		+4		°		X
K24	TX GSM phase error at 869 MHz, rms		–1		+1		°		X
K24	TX GSM frequency error at 869 MHz		–15		+15		Hz		X
K24	TX GSM phase error at 894 MHz, peak		–4		+4		°		X
K24	TX GSM phase error at 894 MHz, rms		–1		+1		°		X
K24	TX GSM frequency error at 894 MHz		–15		+15		Hz		X

Options for CRTU: CMU-K2, RX Analyzer GSM Demodulation

Input RF2, GSM Non Signaling
Training Sequence GSM0, Trigger Source IF Power, Trigger Level Medium

K20	GSM phase error RX at 450 MHz, peak, level +5 dBm	RX Demodulation	–2		+2		°		X
K20	RX GSM phase error at 450 MHz, rms, level +5 dBm		–0.6		+0.6		°		X
K20	RX GSM frequency error at 450 MHz, level +5 dBm		–10		+10		Hz		X
K20	RX GSM phase error at 486 MHz, peak, level –14 dBm		–2		+2		°		X
K20	RX GSM phase error at 486 MHz, rms, level –14 dBm		–0.6		+0.6		°		X
K20	RX GSM frequency error at 486 MHz, level –14 dBm		–10		+10		Hz		X
K21	RX GSM phase error at 876 MHz, peak, level +5 dBm	RX Demodulation	–2		+2		°		X
K21	RX GSM phase error at 876 MHz, rms, level +5 dBm		–0.6		+0.6		°		X
K21	RX GSM frequency error at 876 MHz, level +5 dBm		–10		+10		Hz		X
K21	RX GSM phase error at 915 MHz, peak, level –14 dBm		–2		+2		°		X
K21	RX GSM phase error at 915 MHz, rms, level –14 dBm		–0.6		+0.6		°		X
K21	RX GSM frequency error at 915 MHz, level –14 dBm		–10		+10		Hz		X
K22	RX GSM phase error at 1710 MHz, peak, level +5 dBm	RX Demodulation	–2		+2		°		X
K22	RX GSM phase error at 1710 MHz, rms, level +5 dBm		–0.6		+0.6		°		X
K22	RX GSM frequency error at 1710 MHz, level +5 dBm		–10		+10		Hz		X
K22	RX GSM phase error at 1785 MHz, peak, level –14 dBm		–2		+2		°		X
K22	RX GSM phase error at 1785 MHz, rms, level –14 dBm		–0.6		+0.6		°		X

K22	RX GSM frequency error at 1785 MHz, level –14 dBm		–10		+10		Hz		X
K23	RX GSM phase error at 1850 MHz, peak, level +5 dBm	RX Demodulation	–2		+2		°		X
K23	RX GSM phase error at 1850 MHz, rms, level +5 dBm		–0.6		+0.6		°		X
K23	RX GSM frequency error at 1850 MHz, level +5 dBm		–10		+10		Hz		X
K23	RX GSM phase error at 1910 MHz, peak, level –14 dBm		–2		+2		°		X
K23	RX GSM phase error at 1910 MHz, rms, level –14 dBm		–0.6		+0.6		°		X
K23	RX GSM frequency error at 1910 MHz, level –14 dBm		–10		+10		Hz		X
K24	RX GSM phase error at 824 MHz, peak, level +5 dBm	RX Demodulation	–2		+2		°		X
K24	RX GSM phase error at 824 MHz, rms, level +5 dBm		–0.6		+0.6		°		X
K24	RX GSM frequency error at 824 MHz, level +5 dBm		–10		+10		Hz		X
K24	RX GSM phase error at 849 MHz, peak, level –14 dBm		–2		+2				X
K24	RX GSM phase error at 849 MHz, rms, level –14 dBm		–0.6		+0.6				X
K24	RX GSM frequency error at 849 MHz, level –14 dBm		–10		+10		Hz		X

Table 1-3 Test report GSM Functionality

Test	Comment	Test Result
Hardware Test CRTU-B5 LINKHANDLER option and the CRTU-B6 MAC SPEECH board option		
RF Loopback Over All Test		
MTC Audio Path Test		
BER Test Channel 1		
BER Test Channel 2		
MAC Test		
EDGE Layer 1 Performance Tool Test		
Detection Test of CRTU-G or CRTU-S		

Contents

2 Adjustment

The following chapter describes the manual adjustment of the reference sources as well as the software-controlled adjustment of individual module data after module replacement (automatic adjustment of module data). The tests in this chapter are done with the *Service/WCDMA or DOS OPSW/Service* software which is accessible from the *BootMagic Menu.* This menu has to be selected after startup of the CRTU Radio Unit; see related sections in the operating manual.

The manual adjustment of the +5 VDC reference source which provides the highly stable DC reference voltage for the individual CRTU Radio Unit modules as well as that of the 10 MHz reference frequency source which determines the frequency accuracy of the CRTU Radio Unit are described. The adjustment permits to maintain and restore the data integrity of the instrument.

Manual adjustments must be performed at an ambient temperature between +23°C and +26°C after the instrument has warmed up.

After the software-controlled adjustment has been performed, the CRTU Radio Unit is ready for use and offers full data integrity except for the level accuracy. In order to attain the level accuracy specified in the data sheet, it is necessary to record the path error data. To this end, the CRTU Radio Unit must be tested using the test system ACS 100 (see chapter 1, *Performance Test)*.

Manual Adjustment

In the following, the measuring instruments and auxiliary means required for the manual adjustment of the CRTU Radio Unit, the appropriate preparations of the instrument as well as the individual adjustments will be explained.

Measuring Instruments and Auxiliary Equipment

Table 2-1 Measuring instruments and auxiliary equipment for manual adjustment of the CRTU Radio Unit

Item	Type of instrument	Required characteristics	Appropriate device	R & S order number	Use page
1	Voltmeter	DC measurement	URE3	350.5315.03	
2	Spectrum analyzer with frequency counter	Frequency measure-ment up to 1 GHz	FSE	1066.3010.20 (30)	

Preparing the Instrument

Opening the casing:

- Remove the power plug on the CRTU Radio Unit and place the instrument onto the front handles.
- Loosen the four size 20 Torx screws at the four rear-panel feet and take off the feet.
- Pull off the instrument tube towards the top.
- Locate the adjustment devices (see chapter 5, drawing 1100.0008.01 D, page 3. The location of the adjustment points is analogous to the CMU).
- After performing the manual adjustment, close the casing again in the reverse order.

Note: *If only the Option OCXO REFERENCE OSC. CRTU-B2 is to be adjusted, it is not necessary to open the complete tube of the CRTU Radio Unit. The adjustment can be made from outside through the ventilation holes using a small screwdriver.*

Adjusting the + 5 VDC Reference Voltage

Preparation:

- Connect the DC voltmeter test cable to the SMB plug X221 on the motherboard.
- Switch on the *CRTU Radio Unit* and allow it to warm up for approx. 5 minutes.

Adjustment:

- Use potentiometer R120 on the REFERENCE BOARD to adjust the measured value at the DC voltmeter to + 5.000 V ± 1 mV.

Adjusting the 10 MHz Reference Frequency

Preparation: The measurement can be performed either at connector REF OUT1 (rear of *CRTU Radio Unit*) at 10 MHz or at connector RF3 OUT (front) at 1 GHz using a frequency counter.

- For the measurement at connector RF3 OUT set the generator to 1 GHz and 13 dBm without modulation in the RF menu.

  For the adjustment, the *CRTU Radio Unit* must be set to internal reference source.
- This setting is to be selected in the *Connection Control – Sync.* menu.

Note: *The measurement at 1 GHz can be performed with a lower frequency counter resolution (1 Hz) in order to achieve a faster adjustment.*

TCXO

Adjustment:

- Use potentiometer R121 on the REFERENCE BOARD to adjust the measured value at the frequency counter to

  10.000 000 0 MHz ± 0.5 Hz (at REF OUT1) or
  1.000 000 000 GHz ± 50 Hz (at RF3 OUT).

Note: *This adjustment is only required if option CRTU-B2 is not installed.*

OCXO REFERENCE OSC. CRTU-B2

(if option is installed)

Adjustment:

- Use potentiometer R5 on the OCXO REFERENCE OSC. BOARD to adjust the measured value at the frequency counter to

  10.000 000 00 MHz –0.1/ +0.05 Hz (at REF OUT1) or
  1.000 000 000 GHz –10 Hz/ +5 Hz (at RF3 OUT)

  (a lead of at least –2 to –5 Hz at 1 GHz is desired because of aging).

Note: *The CRTU Radio Unit must have been switched on for at least 5 minutes so that the OCXO has warmed up. During the adjustment, operate the CRTU-RU in the horizontal position.*

Automatic Adjustment of Module Data

In order to match the data stored in EEPROMs on the respective modules to the complete instrument, an automatic adjustment of module data is always necessary after replacing a module.

In addition to some standard information such as module name, serial number, hardware status and date of manufacture, these stored data items contain important pieces of information within value tables from module pre-testing, e.g. frequency responses for module error data.

This information permits to make the complete instrument ready for operation again (see also chapter 1, *Performance Test*).

In the following, the preparations and the procedure of the automatic module data adjustment will be explained.

Preparing the adjustment

Replacement of module(s):

- Replace the faulty module(s) (see chapter 3, *module replacement)*.
- Close the CRTU Radio Unit casing (see chapter 3, *module replacement*).
- Connect the CRTU Radio Unit to the mains and switch on.

Performing the adjustment

Starting the version manager:

- Note the startup in the display when switching on the CRTU Radio Unit for the first time.
- When a beep can be heard three times, press the *MENU SELECT* key.

  The version manager is started (see also chapter 4, *Firmware Update*). The display includes the menu item *Firmware update after board change*.

Procedure:

- Press the softkey to the left of the above mentioned menu item.

The automatic adjustment of module data is started under software control.

It may take a few minutes to additionally perform firmware updates for microprocessors and programmable devices.

After the adjustment has been terminated, press the softkey to the left of the EXIT menu item, the operating software starts and the CRTU Radio Unit is ready for use and can be operated in the usual way.

Contents

3 Repair

This chapter describes the design of the CRTU Radio Unit, simple measures for repair and troubleshooting and, in particular, the replacement of modules. For troubleshooting and diagnosis, a maintenance menu is available, which permits to poll diagnostic voltages of the modules and indicate limit violations.

The installation of options and software update are explained in chapter 4 of this service manual.

Instrument Design and Function Description

Instrument design

For a detailed overview of the CRTU Radio Unit design refer to the block diagram below and the exploded views in Chapter 5.

The function description of the instrument in the present chapter refers to the block diagram.

Cabinet design

The casing of the CRTU Radio Unit is a robust, gray-blue Rohde & Schwarz standard casing according to BW 2000.

It consists of a frame with integrated rear panel and a labeling panel at the front. The frame is covered by a one-piece tube and screwed with four rear-panel feet. Two front handles are screwed to the frame as standard, an additional handle on the left side is deliverable as an accessory.

The dimensions are as follows:

Overall:	W*H*L 465 mm * 193 mm * 517 mm
Rackmount: W*H	1/1 of 19 inch * 4 units

Note: *The terms "left" and "right" in the manual always refer to the front view of the instrument.*

Block diagram

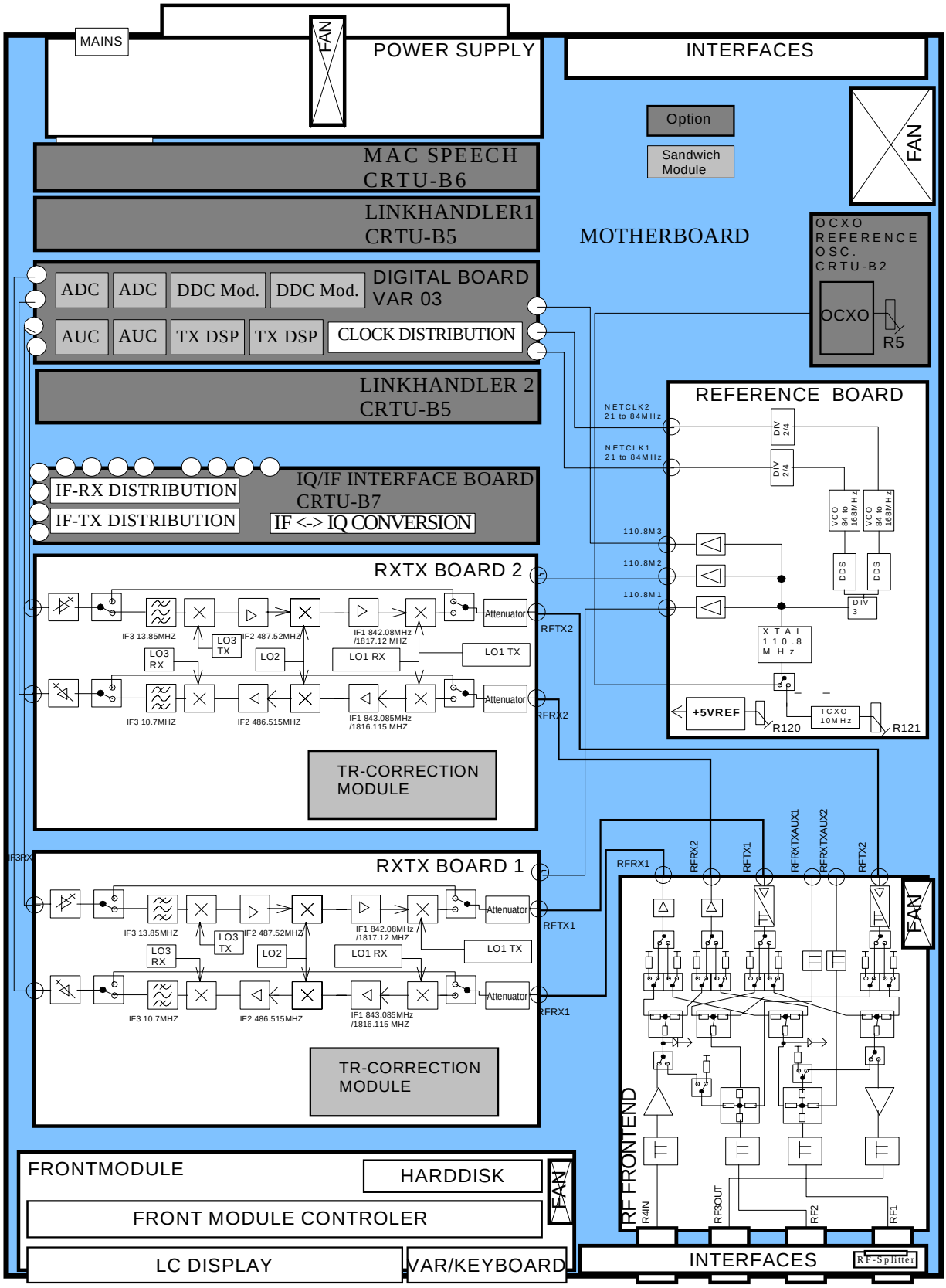


Fig. 3-1 Block diagram of CRTU Radio Unit

Instrument Frame

The instrument frame consists of front frame, module support, partition, cage and air duct. The module support is screwed to the front frame. It incorporates the partition, the cage and the air duct and provides all mechanical connectors and slots for modules. The MOTHERBOARD for electrical connection of the modules as well as the big fan for cooling the modules are screwed to the instrument frame.

Rear of Instrument Frame

At the rear of the CRTU Radio Unit instrument frame, the power supply with integrated power plug and switch as well as other important electrical interfaces are fitted (see the operating manual for the system the CRTU Radio Unit belongs to). The power supply unit can be easily replaced.
A further rear panel that is screwed to the frame serves as support for further electrical interfaces and optional extensions.

Front of Instrument Frame

The front of the instrument frame incorporates the FRONT MODULE, the most important electrical interfaces as well as the PCMCIA INTERFACE drive including the power splitter.

FRONT MODULE

The components of the FRONT MODULE that are directly arranged at the front of the CRTU Radio Unit are the LCD and the operating keys with the spinwheel.
The operating keys consist of a membrane and a mat inserted into the keyboard frame of the FRONT MODULE. The operating keys are colored differently to highlight their function and partly labeled.
This module can be conveniently replaced as a unit.

The beeper with sound outlet on the FRONT MODULE is used for acoustic prompts and error warnings.

Electrical interfaces

The electrical interfaces are mounted on an extra mounting plate. The RF interfaces are components of the RF FRONTEND.

Cooling the Instrument

Axial fan in the casing

The right side panel contains a temperature-controlled axial fan (120 mm x 120 mm x 38 mm), which sucks in cold ambient air at the right tube of the casing and blows it through the modules via a ventilation duct and further ventilation slots. The amount of air is controlled via the width of the slots depending on the power dissipation of the module.
The modules are cooled by the air flow, and the heated air is then blown out at the left side panel.

Axial fan of power supply

In addition, the power supply of the CRTU Radio Unit is equipped with its own temperature-controlled axial fan (80 mm x 80 mm x 25 mm) with a separate air circulation. The fan sucks in cold air on the left rear side of the power supply casing and blows out the heat produced in the power supply on the right rear side of the power supply casing.

Axial fan of FRONT MODULE

For cooling the controller board, the FRONT MODULE is provided with its own axial fan (40 mm x 40 mm x 10 mm), which sucks in cold ambient air on the left side of the instrument and blows it out at the right side panel.

Axial fan of RF FRONTEND

The RF FRONTEND which can process powers up to 50 W is equipped with an aluminum casing with its own air duct, cooling fins and a temperature-controlled axial fan (40 mm x 40 mm x 20 mm), which dissipates the heat by sucking in cold air directly on the right rear side of the instrument and blowing in out again on the right front side of the instrument.

The cooling concept makes sure that all components are optimally cooled so that the complete instrument achieves a high MTBF.

FRONT MODULE

The FRONT MODULE consists of an aluminum case panel and a mounting plate which accommodates the LCD, the keyboard mat with the membrane and the spinwheel. The case panel incorporates the FRONT MODULE CONTROLLER, the fan and the hard disk.

LCD

The color LCD provides a visible output of any information, measurements etc. to the user.
The resolution of the LCD is 640 * 480 pixels (VGA).
The display incorporates two cold cathode tubes for the illumination. The high voltage required for this purpose is generated in an extra DC/AC converter mounted next to the display on the mounting plate and connected both to the display and the Display Adapter Board (DAB) via a cable.
The liquid crystal display is controlled by the DAB that is plugged in on the controller board via a ribbon cable.

Operating keys

The operating keys consisting of a keyboard mat and a membrane release a contact when the rubber key is pressed. Two LEDs for the STANDBY/ON key (orange for STANDBY/green for ON) are also accommodated on this membrane. The rubber keys enable the user to call up all CRTU Radio Unit functions.

The key evaluation and LED control are effected via a film cable connector on the controller board. Like the control of the two LEDs, it is controlled in a special microprocessor on the controller board by means of a matrix technique. The STANDBY/ON key is handled by the computer's ATX functionality.

Spinwheel

The spinwheel consists of a flexible magnetic ring with individual magnets for the lock-in positions. With each turn of the spinwheel, electrical pulses are released from the LEDs and the optical position detectors and sent via a ribbon cable to the microprocessor on the FRONT MODULE CONTROLLER for evaluation.
The spinwheel serves the user as a further means of data entry and operation.

FRONT MODULE CONTROLLER

The FRONT MODULE CONTROLLER contains all the necessary components on a board such as processor, memory chips, I/O devices (ISA bus), lithium battery, IEC-bus controller (IEEE), two serial interfaces (COM1/2), a parallel interface (LPT), four Universal Serial Bus (USB) interfaces, two Ethernet interfaces, an LCD graphics controller, an external VGA monitor graphics interface (monitor) and an external keyboard connection (keyboard PS/2).
In addition, an IDE hard disk controller are integrated on the controller board.

Hard disk

The hard disk is screwed to the rear of the aluminum case panel and connected to the printed circuit board via a ribbon cable.

Fan

A small axial fan in the case panel produces an air flow through the FRONT MODULE CONTROLLER, cooling it with cold ambient air.

Connection

The FRONT MODULE is directly plugged to the MOTHERBOARD via two 96-pin FUTURE BUS connectors and one additional 110-pin PCI Bus connector.

POWER SUPPLY

The POWER SUPPLY of the CRTU Radio Unit consists of a two-part aluminum casing with three boards arranged in a so-called sandwich technique (U-shape). In addition to cooling, the axial fan already mentioned above (see cooling of instrument) is also used to support the three boards.

STANDBY/ON signal

The control signal STANDBY/ON controlled by the FRONT MODULE CONTROLLER (depending on the operating key STANDBY/ON on the front of the instrument frame) activates the power supply.

Power Factor Correction (PFC) and Standby circuit

The POWER SUPPLY is a primary clocked switching power supply with Power Factor Correction (PFC) and Standby circuit (+12 V Standby).
On the secondary side, it generates all DC voltages (+3.3 V; +5.2 V; +6 V; +8 V; +12 V; +12 VFAN; +12 V Standby; +28 V; -12 V) for the CRTU Radio Unit.
The secondary voltages are open-circuit-proof and short-circuit-proof with respect to ground and each other.

POWERGOOD - Signal

When switching on and off (defined reset), the POWER SUPPLY generates a POWERGOOD signal for control of the FRONT MODULE CONTROLLER.

Overtemperature protection

An overtemperature protective circuit is additionally installed to prevent overheating. This status is taken to the FRONT MODULE CONTROLLER via a status signal (OT).

AC voltage supply

A 3-pin connector with integrated 2-pin mains switch for connection with the AC-Supply is installed on the rear panel of the POWER SUPPLY. From there, the AC supply voltage is internally taken to the first board via two cables.
Two fuses are also fitted there as a means of fire protection.

Note: *These fuses are not accessible to the user from outside and are only blown in the case of a serious fault of the power supply (servicing required!).*

Primary side

The following circuit parts follow on the first board: EMI filter and power rectifier. The rectified AC supply voltage is taken via a cable to the second board of the Power Factor Correction (PFC). This circuit converts the rectified AC supply voltage up to a constant voltage of 380 VDC. Then this voltage is taken to a step down converter which provides a constant voltage of 280 VDC for the subsequent resonance step down converter, which chops it with approx. 35 kHz.
An additional connecting cable is used to feed the big transformer located on the first board. It is provided with taps for the various secondary voltages, and the following rectifiers constitute the transition to the DC secondary side.

Secondary side

The +12 V-, -12 V- and +6 V- secondary voltages are provided with analog regulators in order to ensure a high spurious suppression.
The +3.3 V- and +5.2 V- secondary voltages have their own stepdown converters to achieve small power dissipations.
The +28 V- voltage requires a stepup converter in order to generate the high voltage with a high accuracy.
At the +12 VFAN, a constant current source is used for efficient suppression of fan interference.
The secondary voltages are then filtered and subsequently taken to the output connector.

Standby converter and control unit

The third printed circuit board which serves as a connection between the first and second board accommodates the control and monitoring circuit parts. Besides, it includes the standby converter, which generates a +12-V standby voltage from the 380 VDC voltage of the PFC circuit.

Connection

The POWER SUPPLY is directly connected to the MOTHERBOARD via a 96-pin FUTURE-bus connector on the MOTHERBOARD and via a 4-pin high power connector to a future option. It is screwed to the integrated rear panel of the CRTU Radio Unit with its casing.

MOTHERBOARD

The MOTHERBOARD consists of five individual printed circuit boards: MOTHERBOARD1, MOTHERBOARD2, FRONTPANEL BOARD1, FRONTPANEL BOARD2, REARPANEL BOARD.

MOTHERBOARD1

MOTHERBOARD1 is the central motherboard and serves as connection between most of the modules. It supplies the modules both with voltages and control, status and bus signals in various layers (14-layer multilayer).
MOTHERBOARD1 accommodates various ISA bus driver devices for the PCMCIA INTERFACE control as well as protective circuits. These protective circuits consist of diodes and polyswitches (current-dependent, self-opening and closing fuses) and protect against external overvoltages of the interface signals.
Nine LEDs indicate the status of the supply voltages and help with troubleshooting.
On MOTHERBOARD1, a circuit for temperature-dependent instrument fan control is also implemented:
The individual module temperatures are polled by the FRONT MODULE CONTROLLER of the CRTU Radio Unit. This information is passed on via the DIGITAL BOARD to the fan control with the aid of a control signal. The instrument fan is controlled such that an optimum module temperature is achieved on the one hand and as little noise as possible is emitted by the fan on the other hand.

MOTHERBOARD2

MOTHERBOARD2 serves for supply and connection of the modules located higher at the side, the REFERENCE BOARD and a further option.
For connection with MOTHERBOARD1 two 50-pin ribbon cables are used.

FRONTPANEL BOARD1

FRONTPANEL BOARD1 is located at the front of the instrument frame and accommodates the six LEDs for the display of the active RF inputs/outputs are located there.
For connection with MOTHERBOARD1 a 34-pin ribbon cable is used.

FRONTPANEL BOARD2

FRONTPANEL BOARD2 accommodates the USB connectors at the front of the instrument. It is connected to the FRONT MODULE.

REARPANEL BOARD

The REARPANEL BOARD is mounted to the right of the integrated and unscrewable rear panel plate and accommodates the interfaces AUX 5, DATA CH1, DATA CH2, IQ IN/OUT CH1 and IQ IN/OUT CH2. For connection with MOTHERBOARD1 two 34-pin ribbon cables are used.

REFERENCE BOARD

The REFERENCE BOARD provides all required clock signals (NETCLK1/2) and reference frequencies (110.8 MHz) as well as the +5 VDC reference voltage for the CRTU Radio Unit. The REFERENCE BOARD is a plug-in module in HVC design.

Design

At the top of the module, nine MMCX connectors are attached, which serve as inputs or outputs for various clock signals and are routed to the respective modules or the integrated rear panel with appropriate coax cables. Two holes in the HVC panel at the top are used for adjusting the +5 VDC reference voltage and the 10 MHz TCXO reference frequency.

Connection

The plug-in module REFERENCE BOARD is inserted in the CRTU Radio Unit on the right side on MOTHERBOARD2 using a 48-pin FUTURE-bus connector.

REFERENCE frequency generation

All frequencies provided by the CRTU Radio Unit are derived from internal high-precision 10-MHz reference elements (TCXO or optional OCXO) or from externally applied frequencies.
A 110.8-MHz crystal oscillator is coupled in locked phase relation in a PLL loop with the selected reference.
The reference element TCXO is used as standard on the reference board. If the option OCXO (CRTU-B2) is installed in the CRTU Radio Unit, it is automatically used as reference element and the standard TCXO is switched off.
It is additionally possible to switch over to external synchronization and use the signal fed in at the BNC connector REF IN at the rear of the CRTU Radio Unit as reference signal.
At the BNC connector REF OUT1 at the rear of the CRTU Radio Unit, either the internal 10-MHz reference frequency or the signal applied at REF IN can be buffered and tapped depending on the selected reference element.
The 110.8-MHz sinewave signal of the crystal oscillator passes a harmonics filter, is buffered and provided at three MMXC connectors, serving as reference frequency for the RXTX BOARD1/2 and the DIGITAL BOARD.
At a further MMCX connector, the TTL signal RESFREQ is available with 27.7 MHz (110.8 MHz / 4) for the option CMU-B41, AUDIO-GEN. + ANA. as clock signal.

Netclock generation

The REFERENCE BOARD is also used for netclock generation, providing adjustable TTL clock frequencies from 21 MHz to 84 MHz with a very high frequency resolution of 0.1 Hz. This function is provided twice so that two independent netclock frequencies are available at the same time.

The signal generated by the 110.8-MHz crystal oscillator is divided by three and applied to a DDS (Direct Digital Synthesis) circuit. The DDS circuit is used as a fine-adjustable frequency divider and generates a divided signal between 9 MHz and 12 MHz.
This signal is then used in a further PLL as nominal value for the phase detector in order to tune a VCO (Voltage Controlled Oscillator) with a tuning range of 84 MHz to 168 MHz in locked phase relation.
A fractional divider used in the feedback of the PLL provides the actual value for the phase detector.

The output signal of the VCO is divided by two or four, buffered and provided at the MMCX connector NETCLK 1 or NETCLK 2 and serves as network-specific TTL clock for the DIGITAL BOARD.

Option OCXO REFERENCE OSC. CRTU-B2

This option consists of a printed circuit board with the reference element OCXO (oven-controlled crystal oscillator), the control circuit and a potentiometer for adjusting the OCXO.

Installation

The option OCXO REFERENCE OSC. is installed on the right side below the instrument fan such that the potentiometer is easily accessible from outside without the need for opening the CRTU Radio Unit tube.

Connection

The option OCXO is directly inserted via a 10-pin connector on the MOTHERBOARD and screwed to the module support by means of three screws.

RF FRONTEND

Design

The printed circuit board of the RF FRONTEND is installed in a silver-coated aluminum casing which is screwed to the instrument frame. The RF FRONTEND is fitted at the right front of the CRTU Radio Unit such that the four RF N-type connectors which are directly connected to the FRONTEND board are accessible on the front of the instrument frame of the CRTU Radio Unit. This is absolutely necessary to ensure a good VSWR (Voltage Standing Wave Ratio).

Cooling system

The aluminum casing in which the RF FRONTEND is installed is equipped with cooling fins in a special cooling duct and an extra temperature-controlled fan for heat dissipation if high RX power is fed in.

Control and supply

Control and supply of the RF FRONTEND are effected from MOTHERBOARD1 via a 34-pin ribbon cable.

RF connectors

For the internal RF connection to the RXTX BOARD1 (RFRX1, RFTX1) two SMA screw connections and coaxial solid-jacket cables are used. Thus a high-quality RF connection is ensured.
Besides, two further internal RF connections (RFRX2, RFTX2) to the optional RXTX BOARD2 are available.

Two bidirectional monitor inputs/outputs (RFRXTXAUX1/2) at the RF FRONTEND permit to connect further RF devices via optional cables leading to the integrated rear panel of the CRTU Radio Unit.
As external RF interface, the RF FRONTEND is equipped with the four N-type connectors RF1, RF2, RF3OUT, RF4IN, which permit to perform all the RF measurements of the CRTU Radio Unit.
RF1 and RF2 are bidirectional inputs/outputs depending on the setting and measurement application.
RF3OUT is a unidirectional output.
RF4IN is a unidirectional input.

Optical indication

For optical indication of the selected N-connectors and input and/or output functions, yellow LEDs located above the N-connectors are switched on.

Functions

On the transmitter side (TX), the RF FRONTEND serves the purpose of distributing internal RF signals to the outside to the various N-

connectors (RF1, RF2, RF3OUT) and attenuate or amplify them according to the selected output and level.
On the receiver side (RX), its purpose is to internally distribute external RF signals from the different N-connectors (RF1, RF2, RF3OUT) and attenuate or amplify them according to the selected input and the applied level.
Since high levels and powers up to 50 W can be fed in on the receiver side (RX), the RF FRONTEND is equipped with power attenuators and the cooling system with the fan described above, which is controlled by the temperature at the power attenuators.
The RF FRONTEND additionally features two broadband power measuring diodes, which permit to measure the power applied at the N-connectors RF1, RF2, RF4IN even in pulsed operation.

RXTX BOARD1/2

The RXTX BOARD1/2 constitutes the central RF board which contains all circuit parts for conversion from RF to IF both for the transmitter (TX) and receiver (RX).

Design

The RXTX BOARD1/2 is designed as plug-in module with a silver-coated two-shell aluminum casing fixed with several screws.

Cooling system

This casing is equipped with cooling fins at the front and rear which are provided with a cover sheet each so that two special cooling ducts are produced. These cooling ducts are evenly cooled by the air flow of the instrument fan irrespective of neighboring modules.
This efficient cooling is required since a very high degree of integration and a large portion of fast RF components are implemented on this board.

Control and supply

Control and voltage supply of the RXTX BOARD1/2 are effected via a 96-pin FUTURE-bus connector from MOTHERBOARD1.

Complete function

For conversion from RF to IF, the transmitter side (TX) is implemented on one side of the multilayer PC board and the receiver side (RX) on the other side on the RXTX BOARD1/2. This strict separation of the functions permits to achieve high decouplings as they can usually only be achieved with two separate modules.

Transmitter functions

On the transmitter side (TX), an IF signal is applied at the MMCX connector IF3TX1 (top of module) of the RXTX BOARD1/2, which is provided by the DIGITAL BOARD.
On the RXTX BOARD1/2, this signal is taken via various amplifier stages, attenuator pads and filters and finally set to the desired RF frequency by means of triple signal conversion (IF3, IF2, IF1). This is necessary to obtain a high image-frequency rejection.

At the TX output, a switchable attenuator with fine stepping and large attenuation range is used to set the RF signal amplitude according to the level selected.

The RF signal is finally taken to the RF FRONTEND at the SMA connector RFTX1 (bottom of module).

The transmitter side is provided with an extra LO1TX (Local Oscillator) with large tuning range and very fine frequency resolution used for setting the desired transmitter frequency, an LO2 fixed-frequency oscillator shared with the receiver side and an extra LO3TX with small

tuning range. All LOs are synchronized by the MMCX connector 110.8MHz at the bottom of the module with the reference frequency from the REFERENCE BOARD.
Besides, an MMCX connector at the top of the RXTX BOARD1/2 is designed as input with the second transmitter IF (RESIF2TX) which is activated via software switches.

Receiver functions

On the receiver side (RX), the RF signal is fed in at the SMA connector RFRX1 (bottom of module) of the RXTX BOARD1/2 which is provided by the RF FRONTEND.
On the RXTX BOARD1/2, this signal is taken via a switchable attenuator with fine stepping and large attenuation range in order to match the level according to the level applied.
Subsequently, this signal is converted to an IF frequency of 10.7 MHz by means of triple signal conversion (IF1, IF2, IF3) and several filter and amplifier stages and provided at the MMCX connector IF3RX1 (top of module) for the DIGITAL BOARD.
This procedure is necessary to achieve a high image-frequency rejection and a high dynamic range with a simultaneously high intermodulation suppression.
For the receiver side, an extra LO1RX (local oscillator) is provided with a large tuning range and a very fine frequency resolution used for setting the receive frequency, an LO2 fixed-frequency oscillator shared with the transmitter and an extra LO3RX with a very small tuning range.
All LOs are synchronized by the MMCX connector 110.8 MHz at the bottom of the module with the reference frequency from the REFERENCE BOARD.
A further MMCX connector RESIF3RX (top of module) provides a buffered RX IF signal which is taken to the rear of the CRTU Radio Unit via a coax cable. This signal output can be activated via a software switch.
Besides, an MMCX connector at the top of the RXTX BOARD1/2 is designed as output with the second receiver IF (RESIF2RX) which can be activated via software switches.

Correction processor

The RXTX BOARD1/2 contains an extra correction processor with large flash PROM.
It controls all the static and dynamic settings on the RXTX BOARD1/2 and, as a special feature, also the attenuator pads and amplifiers of the RX and TX attenuator on the RF FRONTEND.
Besides, the correction processor permits to read out the individual module error data from the EEPROMS of the respective modules in a so-called correction procedure (automatic module data adjustment) and calculate the deviations for all possible signal paths. These deviations are stored as correction values in the flash PROM. The correction processor then sets the desired level settings, corrected by the correction values, in the flash PROM so that frequency, linearity and temperature responses of the modules are compensated for.
This ensures the excellent level accuracy of the CRTU Radio Unit which is essential for most measurements.

DIGITAL BOARD

The DIGITAL BOARD constitutes the central control and measurement board which contains all circuit parts for conversion and further processing of the analog IF (receiver side) into digital I/Q values.
On the transmitter side, analog as well as digital I/Q values are modulated upon the carrier and provided as analog IF.

Design

The DIGITAL BOARD is designed as HVC2000 plug-in module. The HVC2000 cabinet is equipped with a screwed-on cover both at the front and rear to ensure optimum electrical shielding of the module.

Cooling system

The casing is provided with ventilation holes on the right and left side. The instrument fan can generate a strong cooling flow through these holes and the module.

This efficient cooling is necessary, since a great number of highly integrated fast digital devices is used on the module and eight sandwich modules are fitted so that the board is densely packed.

Control and supply

The control, bus lines and voltage supply of the DIGITAL BOARD are effected via four 96-pin and one 48-pin FUTURE-bus connectors from MOTHERBOARD1.

Function

For each RF channel a set of sandwich boards ADC MODULE1/2, DDC MODULE1/2, TXDSP MODULE1/2 and AUC MODULE1/2 is fitted.
On the DIGITAL BOARD, all necessary clocks are generated and provided from the netclocks 1 and 2 in a clock conditioning and distribution circuit. These clocks are required for sampling, filtering and down converting the digital IF internally and for the LINKHANDLER1/2.
Besides, two programmable logic devices (FPGA) are used on the DIGITAL BOARD, which provide address decoding, interrupt control and host interfaces between ISA bus and internal circuit parts (DDC/TXDSP) as well as the control of the RF FRONTEND (via FE I^2C-Bus), the REFERENCE BOARD and AUDIO BOARD (via buffered ISA bus) and the RXTX BOARD1/2 (via serial bus). Further serial interfaces lead from the programmable logic devices to both linkhandlers LINKHANDLER1/2 and vice versa.
An AD converter on the DIGITAL BOARD is used for polling the diagnostic voltages of the CRTU Radio Unit modules, which can indicate module states and errors.

ADC MODULE1/2

The sandwich modules ADC MODULE1/2 are connected to the DIGITAL BOARD via a multipoint connector. In addition, they are screwed to a solid ground block to obtain a good ground connection.
The modules ADC MODULE1/2 receive the analog IF from the RXTX BOARD1/2 directly via a MMCX connector (IF3RX1 and IF3RX2 respectively) and convert it into a 12-bit data stream by means of a fast AD converter.

DDC MODULE1/2

The sandwich modules DDC MODULE1/2 are directly plugged onto the DIGITAL BOARD via three multipoint connectors and process the digital data stream of the receiver. In a special ASIC chip, the I/Q shaping, the matching of the data rate and the respective filtering (bandwidth shaping) of the digital data stream are produced. Then follows a DSP (RX DSP) with further evaluation of the digital I/Q data for measurement purposes. Besides, the digital I/Q data are passed on via the MOTHERBOARD1 to both linkhandlers LINKHANDLER1/2 for evaluation.

TXDSP MODULE1/2

The sandwich modules TXDSP MODULE1/2 are directly plugged onto the DIGITAL BOARD via two multipoint connectors. It contains the DSP on the transmitter side (TXDSP), which generates I/Q data according to the application and provides them to the AUC MODULE1/2 via two 12-bit D/A converters and several selection switches located on the DIGITAL BOARD.

AUC MODULE1/2

The sandwich modules AUC MODULE1/2 are directly plugged onto the DIGITAL BOARD via a multipoint connector and serve the purpose of filtering the analog I/Q data from the TXDSP MODULE1/2 or the LINKHANDLER1/2 depending on the position of the selection switches on the DIGITAL BOARD according to the application (bandwidth shaping) and converting it to the transmit IF by means of an I/Q modulator. Subsequently, the transmit IF is routed via the MMCX connector (IF3TX1 and IF3TX2, respectively) on the DIGITAL BOARD to the RXTX BOARD1/2.

Option LINKHANDLER1/2 CRTU-B5

The LINKHANDLER constitutes the Channel Coder and Decoder and the Modulator and Demodulator of the physical GSM protocol layer. The FPGA is the central clock source which generates all required clock and trigger signals by dividing the net clock from the Digital Board. Only the DSP clocks are not synchronous to the net clock.

On the transmit side analogue IQ signals are generated. On the receive side digital IQ signals or magnitude and phase are expected.

Design

The LINKHANDLER is designed as a HVC2000 plug-in module. The HVC2000 cabinet is equipped with a screwed-on cover both at the front and rear to ensure optimum electrical shielding of the module.

Cooling system

The casing is provided with ventilation holes on the right and left side. The instrument fan can generate a strong cooling flow through these holes and the module.

As the board does not consume very much power, some of the holes are covered with a tape to reduce the air flow through the LINKHANDLER and reserve the main cooling capacity for the other boards.

Control and supply

The control, bus lines and voltage supply of the LINKHANDLER are effected via two 96-pin and one 48-pin FUTURE-bus connectors from MOTHERBOARD1.

Complete function

The FPGA interconnects almost all DSP module interfaces. It also provides the ISA Bus interface for them. This enables a very flexible architecture which can be adapted to the different requirements of the applications. The FPGA is also the central clock source which generates all required clock and trigger signals by dividing the net clock from the Digital Board. So all clock and trigger signals are synchronous.

The LINKHANDLER of the second channel uses the clock generated by the first LINKHANDLER to ensure that his own signals are fully synchronous to the first LINKHANDLER. The first LINKHANDLER can also use an external clock source to enable synchronization to an external device.

The TX and RX DSP modules are connected to the MAC DSP module

of the MAC SPEECH board via direct serial interfaces to get a maximum data rate.

Two auxiliary DSP Modules are reserved for future extensions.

An additional reserved module slot with multipoint connectors is used for pre-production boundary scan testing.

Transmitter function The TX DSP module provides the channel coder functionality and configuration settings for power, frequency and timing of the output and trigger signals. The Modulator DSP module modulates the signal and controls the real-time settings of the power, the frequency and the timing. The digital IQ samples are fed into a FIFO (simulated in the FPGA) and converted to analogue.

Receiver function So far the Demodulator DSP module is only used for monitoring. The signals are directly fed into the RX DSP module which provides the channel decoding functionality.

DSP 56301 Modules The sandwich modules are directly plugged onto the LINKHANDLER via multipoint connectors. They contain the DSPs including the memory.

DSP 56311 Modules The sandwich modules are directly plugged onto the LINKHANDLER via multipoint connectors. They contain the DSPs including the memory.

Option MAC SPEECH CRTU-B6

The MAC SPEECH board constitutes the MAC/RLC layer for GPRS and EGPRS. It also provides the speech coder/decoder functionality including audio digital/analog conversion and amplifying. The DSP clocks are not synchronous to the netclock.

Design The MAC SPEECH board is designed as a HVC2000 plug-in module. The HVC2000 cabinet is equipped with a screwed-on cover both at the front and rear to ensure optimum electrical shielding of the module.

Two auxiliary DSP Modules are reserved for future extensions.

Cooling system The casing is provided with ventilation holes on the right and left side. The instrument fan can generate a strong cooling flow through these holes and the module.

As the board does not consume very much power, some of the holes are covered with a tape to reduce the air flow through the MAC SPEECH and reserve the main cooling capacity for the other boards.

Control and supply The control, bus lines and voltage supply of the MAC SPEECH board are effected via two 96-pin and one 48-pin FUTURE-bus connectors from MOTHERBOARD1.

MAC/RLC function The MAC DSP module provides the MAC/RLC functionality. Two direct serial interfaces to the TX and RX DSP modules of the LINKHANDLER ensure a maximum data rate.

Audio function The Speech DSP module provides the Speech Coder/Decoder functionality. The audio Codec does the digital/analog conversion. The audio amplifier enables direct connection of a handset.

DSP 56301 Module

The sandwich modules are directly plugged onto the LINKHANDLER via multipoint connectors. They contain the DSPs including the memory.

Option IQIF BOARD CRTU-B7

The IQIF BOARDs contains all circuit parts for generating IQ In and Out for 2 RX and TX channels.

Design

The IQIF BOARD is designed as a plug-in module with a silver-coated two-shell aluminum casing fixed with several screws.

Cooling system

This casing is equipped with cooling fins at the rear which are provided with a cover sheet so that a special cooling duct is produced. These cooling duct is evenly cooled by the air flow of the instrument fan irrespective of neighboring modules. This efficient cooling is required since a very high degree of integration is implemented on this board.

Control and supply

Control and voltage supply of the IQIF BOARD are effected via two 96-pin FUTURE-bus connectors from MOTHERBOARD1.

Complete function

The IQIF BOARD demodulates IQ-data from the IF for two RX and TX channels. It also modulates external IQ-data onto an IF frequency. So an external loop between IQ IN and IQ OUT is possible for each of the two RX and TX channels (connectors IQ IN/OUT CH1 and IQ IN/OUT CH2 on the rear panel).

The board is divided into 4 parts: RX1 IQ IN and OUT, RX2 IQ IN and OUT, TX1 IQ IN and OUT and TX2 IQ IN and OUT. This strict separation of the functions permits to achieve high decoupling between the separate modules.

The module can also generate a reference signal at the internal MMCX connector REF OUT3. The LO for this reference signal is synchronized by the 110.8 MHz reference frequency from the REFERENCE BOARD fed in via the MMCX connector IN110.8M3.

The buffered 110.8 MHz signal is fed out via a further MMCX connector.

Receiver functions
(x stands for first or second channel)

On the receiver side an IF signal provided by the RXTX board is applied to the internal MMCX connector IF3RXCHxIN of the IQIF BOARD. The signal can be directly fed through to IF3RXCHxOUT and IFWRXCHxOUT or fed through the inner path with additional monitoring of the IQ OUT signal at pins RXxIOUT and RXxQOUT of the IQ IN/OUT CHx connectors. Alternatively, it is possible to feed out the IQ data via IQ IN/OUT CHx and to modulate the IF with IQ IN fed in via IQ IN/OUT CHx.

The first RX (RX1) channel can be split to generate a second RX channel.

The signal received from the RXTX-Board is fed out via the connector EXTxIFRXOUT. An external IF signal can be fed in via EXTxIFRXIN.

The LO is synchronized to the 110.8 MHz reference frequency from the REFERENCE BOARD applied to the MMCX connector IN110.8M3.

Transmitter functions
(x stands for first or second channel)

On the transmitter side an IF signal provided by the DIGITAL BOARD is applied to the MMCX connector IF3TXCHxIN of the IQIF BOARD. This IF signal can also be applied to the MMCX connector IFWTXCHxIN which will be provided by a future option. The signal can be directly fed through to IF3TXCHxOUT or fed through the inner path with additional monitoring of the IQ OUT signal at pins TXxIOUT and TXxQOUT of the IQ IN/OUT CHx connectors. Alternatively it is possible to feed out the IQ data via IQ IN/OUT CHx and to modulate the IF with new IQ data at pins TXxIIN and TXxQIN of IQ IN/OUT CHx.

A further MMCX connector EXTxIFTXOUT provides a buffered TX IF signal. At EXTxIFTXIN an external IF signal can be fed in.

The two TX-channels can be summed to form the first TX channel TX1.

The LO is synchronized to the 110.8 MHz reference frequency from the REFERENCE BOARD applied to the MMCX connector IN110.8M3.

Correction

The board contains an EEPROM with correction data for the IF-paths and the IQ-paths.

Module Replacement

Caution!

Disconnect the instrument from the mains before opening the casing. Please note the safety instructions at the beginning of this manual.

When mounting the tube take care not to damage or pull off cables.

Replacing the FRONT MODULE

(see chapter 5, *spare part list, Current No. 120, and explosion drawing 1138.4000.01 D sheet 2*)

For replacement proceed as follows:

Opening the instrument and removing the FRONT MODULE

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Unscrew the four screws of the front handles at the instrument frame on both sides and take off the front handles.
- Unscrew a countersunk screw (if present) at the front on the labeling panel next to the spinwheel and pull off the labeling panel towards the front.
- Unscrew all three countersunk screws in the front frame at the top and all four countersunk screws at the bottom of the frame. Also unscrew the two countersunk screws at the front frame above the AUX1/2 BNC connectors.
- Unscrew a combi screw at the top of the FRONT MODULEfor support of the PCMCIA INTERFACE.
- Disconnect the three ribbon cables from the MOTHERBOARD1 connectors.
- Unscrew the two countersunk screws at the cover of the PCMCIA INTERFACE and carefully pull the option towards the front out of the FRONT MODULE.
- Slightly push the FRONT MODULE from the rear to the front using little pressure.
- After sliding out the FRONT disconnect the ribbon cable from the MOTHERBOARD1 connector.
- Disconnect the RJ45 connector from the FRONT MODULE.
- Take the FRONT MODULE completely out of the CRTU Radio Unit.
- Disconnect the cable for the USB interface from the FRONT MODULE connected to the RF SPLITTER.
- Unscrew a combi screw between the holder and the FRONT MODULE.

Installing the new FRONT MODULE and completing the instrument

- Install the old PCMCIA INTERFACE in a new FRONT MODULE in the reverse order.
- Install the new FRONT MODULE in the CRTU Radio Unit in the reverse order.
- Complete the instrument without causing damage to the cables.

Putting into operation

- Connect the instrument to the mains
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit: The built-in FRONT MODULE CONTROLLER registers on the LCD. The BIOS is factory-set to the CRTU Radio Unit.
- If necessary, load new software to the FRONT MODULE (see chapter 4, *Firmware update*).
- Boot up within BootMagic® menu into “DOS OPSW / Service” or “Service / WCDMA”.
- During startup observe the display.
- When three BEEPs can be heard, press the *MENU SELECT* key.
  The Version Manager is started (see also chapter 4, *Firmware update*).
  The display includes the menu item *FIRMWARE UPDATE AFTER BOARD CHANGE*.
- Press the softkey to the left of the above mentioned menu item.
  The automatic module data adjustment is performed under software control, firmware updates for microprocessors and programmable devices being also performed on the modules. This may take a few minutes.

After the adjustment has been terminated, the operating software starts automatically and the CRTU Radio Unit is ready for use and can be operated as usual.

Replacing the FRONT MODULE CONTROLLER in the FRONT MODULE

(see chapter 5, *spare part list, Current No. 270 and explosion drawing 1090.9244.01 D sheet 4*)

The FRONT MODULE CONTROLLER is incorporated in the FRONT MODULE. For replacement proceed as follows:

Opening the instrument and removing the FRONT MODULE

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Unscrew the four screws of the front handles at the instrument frame on both sides and take off the front handles.
- Unscrew a countersunk screw (if present) at the front on the labeling panel next to the spinwheel and pull off the labeling panel towards the front.
- Unscrew two countersunk screws in the front frame at the top and at the bottom as well as two countersunk screws at the front above the AUX1/2 BNC connectors.
- Unscrew a combi screw at the top of the module support for support of the PCMCIA INTERFACE.
- After unscrewing the two countersunk screws at the top left instrument frame slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Slightly push the FRONT MODULE from the rear to the front using little pressure.

  Note: *Note the three ribbon cables for the PCMCIA INTERFACE that are still connected to the MOTHERBOARD1.*
- After sliding out the FRONT MODULE disconnect the three ribbon cables from the MOTHERBOARD1 connector.
- Take the FRONT MODULE completely out of the CRTU Radio Unit.

Removing the FRONT MODULE CONTROLLER from the FRONT MODULE

- Unscrew the two countersunk screws on the cover of the PCMCIA INTERFACE and carefully pull out the option from the FRONT MODULE towards the front.
- Place the FRONT MODULE onto a clean surface with the aluminum panel pointing downwards.
- Unscrew the four screws on the mounting plate at the top, bottom and left and carefully swing away the mounting plate towards the rear.
- Pull off the connecting cables to the LCD, DC/AC illumination converter, keyboard membrane and spinwheel.

  Note: *When pulling off the connecting cables be careful with the cable connecting to the keyboard. It is a film cable which can only be disconnected after sliding up the lock of the film cable plug. Besides, be careful with the ribbon cable connecting to the spinwheel. First loosen the locking brackets of the plug.*
- Pull off the ribbon cable from the hard disk to the FRONT MODULE CONTROLLER.
- Disconnect the fan cable from the printed circuit board of the FRONT MODULE CONTROLLER.
- Unscrew the eleven combi screws of the FRONT MODULE CONTROLLER board and take out the FRONT MODULE CONTROLLER.

Installing the new FRONT MODULE CONTROLLER

- Carefully insert the new FRONT MODULE CONTROLLER, fasten using the eleven combi screws and reconnect the cable to the fan.
- Carefully reconnect the ribbon cable to the FRONT MODULE CONTROLLER.
- Replace the memory modules from the old into the new FRONT MODULE CONTROLLER (see replacing the memory modules).
- Carefully insert the cable connectors to the controller board, taking care not to reverse the polarities, and replace the mounting plate in the reverse order.

Installing the option again and completing the instruments

- Replace the old PCMCIA INTERFACE in the FRONT MODULE in the reverse order.
- To install the FRONT MODULE in the CRTU Radio Unit again proceed in the reverse order.

  Note: *Make sure to route the cables of the PCMCIA INTERFACE properly, not to catch them and insert them on the MOTHERBOARD1 before sliding the FRONT MODULE completely into the CRTU Radio Unit.*
- Complete the instrument without causing damage to the cables.

Putting into operation, BIOS update

- Connect the instrument to the mains.
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit.
- Boot up within BootMagic® menu into “DOS OPSW / Service” or “Service / WCDMA”.
- During startup observe the display.
- When three BEEPS can be heard, press the softkey to the left upper side of the LCD: c:\ will appear.
- Insert a flash disk with the program FLASH FMR6 including the batch FLASHFM6.bat (all this is available on R&S Lotus Notes Service Board) in the PCMCIA slot 0 (right drive D:).
- Call the Batch with D:\FLASHFM6.BAT.
- During the programming of the flash EEPROM the CRTU Radio Unit must not be switched off.
- When the prompt C:\ appears switch off and on the CRTU Radio Unit.
- Press the DEL key (delete) on the external keyboard in order to access the Setup menu.
- Choose the item LOAD CRTU RU DEFAULTS and press ENTER; quit with y and ENTER.
- Exit Bios Setup with key ESC and quit with y (save changes and exit) and press ENTER.

The CRTU Radio Unit starts the operating software automatically, it is ready for use and can be operated as usual.

Replacing the Lithium Battery in the FRONT MODULE

(see chapter 5, *spare part list, Current No. 280* and *explosion drawing 1090.9244.01 D sheet 4*)

The lithium battery is accommodated on the FRONT MODULE CONTROLLER board inside the FRONT MODULE. For replacement proceed as follows:

Opening the instrument and removing the FRONT MODULE

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Unscrew the four screws of the front handles at the instrument frame on both sides and take off the front handles.
- Unscrew a countersunk screw (if present) at the front on the labeling panel next to the spinwheel and pull off the labeling panel towards the front.
- Unscrew two countersunk screws in the front frame at the top and at the bottom as well as two countersunk screws at the front above the AUX1/2 BNC connectors.
- Unscrew a combi screw at the top of the module support for support of the PCMCIA INTERFACE.
- After unscrewing the two countersunk screws at the top left instrument frame slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Slightly push the FRONT MODULE from the rear to the front using little pressure.

  Note: *Note the three ribbon cables for the PCMCIA INTERFACE that are still connected to the MOTHERBOARD1.*
- After sliding out the FRONT MODULE disconnect the three ribbon cables from the MOTHERBOARD1 connector.
- Take the FRONT MODULE completely out of the CRTU Radio Unit.

Removing the lithium battery

- Unscrew the two countersunk screws on the cover of the PCMCIA INTERFACE and carefully pull out the option from the FRONT MODULE towards the front.
- Place the FRONT MODULE onto a clean surface with the aluminum panel pointing downwards.
- Unscrew the four screws on the mounting plate at the top, bottom and right and carefully swing away the mounting plate towards the rear.
- Pull off the connecting cables to the LCD, DC/AC illumination converter, keyboard membrane and spinwheel.

  Note: *When pulling off the connecting cables be careful with the cable connecting to the keyboard. It is a film cable which can only be disconnected after sliding up the lock of the film cable plug. Besides, be careful with the ribbon cable connecting to the spinwheel. First loosen the locking brackets of the plug.*
- Locate the lithium battery on the controller board (see chapter 5, *explosion drawing 1090.9244.01 D sheet 4*) in the battery holder (BT1).
- Carefully take out the battery of the battery holder.

Note: *The lithium battery is of the type CR2032 (spare part list, Current No. 280).*

Caution!

Lithium batteries must not be exposed to high temperatures or fire.

Keep away from children.

If the battery is replaced improperly, there is danger of explosion. Only replace the battery by R&S type (spare part list, Current No. 280).

Lithium batteries are hazardous waste and must be disposed of in dedicated containers.

Do not short-circuit the battery!

Installing the new battery and completing the instrument

- Replace the battery with the correct polarity in the battery holder BT1.

  Note: *Do not short-circuit the battery!*

- Carefully plug the cable connectors to the controller board without reversing the polarities and replace the mounting plate in the reverse order.
- Install the old PCMCIA INTERFACE in the FRONT MODULE in the reverse order.
- Install the FRONT MODULE in the CRTU Radio Unit in the reverse order.

  Note: *Make sure to route the cables of the PCMCIA INTERFACE properly, not to catch them and insert them on the MOTHERBOARD1 before sliding the FRONT MODULE completely into the CRTU Radio Unit.*

- Complete the instrument without causing damage to the cables.

Putting into operation

- Connect the instrument to the mains.
- Connect the external keyboard to the keyboard connector on the rear panel of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit.
- Press the key DEL (Delete) on the external keyboard in order to get into the Setup menu
- Choose the item LOAD CRTU RU DEFAULTS and press *ENTER*; quit with y and *ENTER*.
- Choose the item Setup Standard and set date and time. Exit with *ESC* key.
- Exit BIOS Setup with the key *ESC* and quit with y (save changes and exit) and ENTER.

- The CRTU Radio Unit starts the operating software automatically, it is ready for use and can be operated as usual.

Replacing the Hard Disk in the FRONT MODULE

(See chapter 5, *spare part list, Current No. 310* and *explosion drawing 1138.4000.01 D sheet 4*)

Note: *The CRTU-RU must be equipped with a **programmed** hard disk (see spare part list, Current No. 310). Software installation will generally fail if an empty hard disk is installed.*

The hard disk is incorporated outside on the back of the aluminum panel of the FRONT MODULE. For replacement proceed as follows:

Saving Customer-Specific Data

In case the CRTU-RU belongs to a CRTU-G or CRTU-S system the following files, containing registration codes, have to be saved onto a PCMCIA card or to the network site.

C:\CONFIG\REG_INFO.DAT

Opening the instrument and removing the FRONT MODULE

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.

Removing the hard disk from the FRONT MODULE

- After unscrewing the two countersunk screws at the top left instrument frame, slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Remove the ribbon cable from the hard disk to the FRONT MODULE CONTROLLER, unscrew the two screws on the back of the aluminum panel of the FRONT MODULE and pull out the hard disk. Unscrew the hard disk from the disk holder.

Installing the new hard disk

- Carefully fit the new hard disk, fasten with the four screws to the disk holder. Insert the hard disk with the disk holder on the back of the aluminum case of the FRONT MODULE. Be careful with the lower cover plate locking in the concerning opening.
  Connect the ribbon cable to the FRONT MODULE CONTROLLER. Fit the disk holder with two screws to the aluminum panel of the FRONT MODULE.
- Complete the instrument without causing damage to the cables.

Putting into operation

Note: *See also chapter 4, Software Update/Installing Options. Please note in particular the relationship between software products, boot partitions and disk partitions described in Table 4-1.*

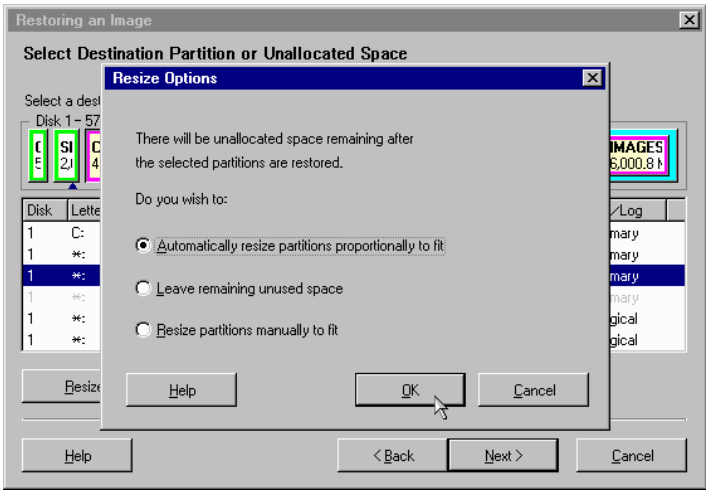
- Connect the instrument to the mains and switch on: The built-in *FRONT MODULE CONTROLLER* registers on the LCD. The BIOS is factory-set to the *CRTU Radio Unit*, the new hard disk is automatically detected.

- Observe the instructions in the following subsections.

Customizing the hard disk

Additional steps in case the CRTU-RU belongs to a CRTU-G system:

- Boot up within MS-DOS 6.22 Startup Menu into "*1. Drive Image Backup And Restore Software*" (set by default).
- Click on the "Restore Image" button.
- Click on the "Browse" button and select in the "Drives" pull-down window \\.\disk1.part5 IMAGES
- Select the file "StdImage\CRTUG4_1.PQI" and click on the OK button.
- Click on *Next*, select the partition "CRTU_SW", click *Next, OK, Next* and *Finish*.
- Select the option "Automatically resize partitions proportionally to fit" and click the OK button.



- After restoring the image click *No* and *Exit*.

General steps for all CRTU-RU instruments:

- Boot up within MS-DOS 6.22 startup menu into "2. DOS".
- Start the BootMagic® software by typing "BM".
- Check the "BootMagic Enabled" box and make sure that the menu name "*Windows OPSW*" is set as the default system.
- Click on the "Save/Exit" button and reboot by pressing <*Ctrl*> + <*Alt*> + <*Del*> keys at once.
- Boot up within BootMagic® menu into "*DOS OPSW / Service*".
- An automatic "Firmware update after board change" will be performed and the CRTU-RU will reboot.
- Boot up within BootMagic® menu into "*DOS OPSW / Service*".

Note: For the following actions use the (soft) keys or the roll key (rotary knob) on the front panel of the CRTU-RU.

- Press the "Setup" key within SYSTEM front panel field.
- Press the "Options" softkey on the lower side of the internal display.
- Select the "Software Options" menu with the roll key.
- Note the CRTU-K2 and CRTU-K5 (for CRTU-G only) code which is usually affixed at the lateral panel of the instrument casing (tube) or at the rear panel of the CRTU-RU.

  If the serial number of the CRTU-RU begins with "8xx xxx" the following K5 codes apply:

Serial number	K5 Code
83 69 17	2B80768F4DB4C662
83 91 55	11419B13E092AD39
83 58 55	7D7FF1541D22C4D4

If none of cases above applies, please contact the central R&S Service in Munich in order to obtain the correct K5 code.

- Enter the CRTU-K2 as well as the CRTU-K5 (for CRTU-G only) codes.
- Boot up within BootMagic® menu into "*Windows OPSW*".

Preparing WIN2000:

Note: *During the following setup procedure you will be asked to enter your own user and company name as well as the Windows 2000 product key. This key can be found in the upper left corner of the right side panel of the device, inside the gray metal case.*

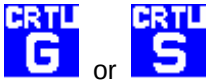
- Reboot into "Windows OPSW".
- Click *Next*, accept the agreement, click *Next, Next* and enter name and company.
- Click *Next*, insert the Windows 2000 product key, click *Next* and enter company name.
- Click Next, set the COMPUTERNAME and PASSWORD for administrator.
- Click *Next*, select *Time Settings, Next,* select *Typical Settings, Next, Next, Finish*.
- Reboot (automatically done), click *Next* and "User must enter user name".
- Click *Next, Finish* and login.
- In case the CRTU-RU belongs to a CRTU-G or CRTU-S system, copy the file "REG_INFO.DAT" which has been saved from the exchanged hard disk to the path "C:\CONFIG".
- Boot up within BootMagic® menu into "*DOS OPSW / Service*" and make sure that the currently valid version of CRTU-RU software is installed on the CRTU-RU. This depends on the system that the CRTU-RU belongs to (e.g. CRTU-G, CRTU-S, CRTU-W).

Installing the GSM Operational Software

Note: *The GSM operational software CR02P2P can be installed only if the CRTU-RU belongs to a CRTU-G or CRTU-S system. The CR02P2P software is located on the Service Harddisk (1139.0573.00) which is part of the Service Kit CRTU-Z3 (1139.0509.02). For the file-copy process it is necessary to connect both harddisks to the IDE controller of the CRTU-RU. To this end the unit must be opened.*

- Configure the Service Harddisk with a jumper-connector as Device 1 (if not yet done).
- Remove the casing (tube) and the cover plate of the CRTU-RU.
- Use the Y-cable (1139.0550.00) to connect the customer's harddisk (=destination harddisk) as IDE Master and the Service Harddisk (=source harddisk) as IDE Slave to the primary IDE controller of the CRTU-RU.
- Boot up within BootMagic® menu into "Windows OPSW".
- Login as "Administrator" with no password.
- Open the Windows Explorer and browse to drive volume "SERVICE_HARDDISK".
- Start the installation process of the Operational Software by calling "\CR02P2P\1Vxx\SETUP.EXE".

- Reboot the CRTU-RU (done automatically) and boot into “Windows OPSW” within BootMagic® menu.
- Login as “Administrator” with no password.
- Complete each modification of a CRTU-RU belonging to a CRTU-G or CRTU-S system by checking the tray icon in the bottom right corner of the desktop. For each system the correct tray icon must be displayed.



Cleaning up the system:

- Empty the recycle bin.
- Run a cleanup process on each visible drive (Windows Explorer → right mouse-click on each drive → properties → Disk cleanup).
- Switch off the unit. Remove the Y-cable and connect only the customer's harddisk with the ribbon cable to the primary IDE controller of the CRTU-RU.
- Re-mount the cover plate and fit on back the housing of the CRTU-RU.

Replacing the Memory Modules in the FRONT MODULE

(see chapter 5, *spare part list, Current No. 290* and *explosion drawing 1090.9244.01 D sheet 4*)

The memory modules are incorporated in the FRONT MODULE. The FRONT MODULE CONTROLLER features two SODIMM-144 slots, in each of which up to 256 MB memory can be fitted. The BIOS automatically detects the size of the memory modules. For replacement proceed as follows:

Opening the instrument and removing the FRONT MODULE

- Switch off the instrument, pull the power plug, unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Unscrew the four screws of the front handles from the instrument frame on both sides and take off the front handles.
- Unscrew a countersunk screw (if present) at the front on the labeling panel next to the spinwheel and pull off the labeling panel towards the front.
- Unscrew two countersunk screws in the front frame at the top and at the bottom as well as two countersunk screws at the front above the AUX1/2 BNC connectors.
- Unscrew a combi screw at the top of the module support for support of the PCMCIA INTERFACE.
- After unscrewing the two countersunk screws at the top left instrument frame slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Slightly push the FRONT MODULE from the rear to the front using little pressure.

  Note: *Note the three ribbon cables for the PCMCIA INTERFACE that are still connected to the MOTHERBOARD1.*
- After sliding out the FRONT MODULE disconnect the three ribbon cables from the MOTHERBOARD1 connector.
- Take the FRONT MODULE completely out of the *CRTU Radio Unit*.

Making the memory modules accessible

- Unscrew the two countersunk screws on the cover of the PCMCIA INTERFACE and carefully pull out the option from the FRONT MODULE towards the front.
- Place the FRONT MODULE onto a clean surface with the aluminum panel pointing downwards.
- Unscrew the four screws on the mounting plate at the top, bottom and right and carefully swing away the mounting plate towards the rear.
- Pull off the connecting cables to the LCD, DC/AC illumination converter, keyboard membrane and spinwheel.

Note: *When pulling off the connecting cables be careful with the cable connecting to the keyboard. It is a film cable which can only be disconnected after sliding up the lock of the film cable plug. Besides, be careful with the ribbon cable connecting to the spinwheel. First loosen the locking brackets of the plug.*

Removing the memory module

- Remove the old module: Carefully bend the lateral brackets towards the outside and pull out the memory module.

Installing the new memory module and completing the instrument

- Insert the new module: insert the memory module into the slot, slightly press towards the rear and engage the brackets on the sides.

Note: *The memory modules can be obtained with the size 256 MB (spare part list, Current No. 290). It is possible to insert two of these modules, even of different size. First fit slot 1 (U3) and then slot 2 (U2).*

- Carefully plug the cable connectors to the controller board without reversing the polarities and replace the mounting plate in the reverse order.
- Install the old PCMCIA INTERFACE in the FRONT MODULE in the reverse order.

Note: *Make sure to route the cables of the PCMCIA INTERFACE properly, not to catch them and insert them on the MOTHERBOARD before sliding the FRONT MODULE completely into the CRTU Radio Unit.*

- Complete the instrument without causing damage to the cables.

Putting into operation

- Connect the instrument to the mains and switch on. The built-in FRONT MODULE CONTROLLER registers on the LCD. The BIOS is factory-set to th*e CRTU Radio Unit.*

- If required, supplement the BIOS Setup as follows:
  - Connect external keyboard to keyboard connector on the rear panel of the CRTU Radio Unit.
  - If the message 'CMOS Memory Size wrong, RUN SETUP, Press F1 to resume‘ appears, press the F1 key.
  - Quit the BIOS setup using the ESC key and the RETURN key.

The CRTU Radio Unit starts the operating software automatically and is ready for use and can be operated as usual.

Replacing the LCD and/or DC/AC Converter in the FRONT MODULE

(see chapter 5, *spare part list, LCD: Current No. 200, DC/AC Converter: Current No. 240* and *explosion drawing 1090.9244.01 D sheet 4*)

The LCD is accommodated on the mounting plate of the FRONT MODULE together with the associated DC/AC converter. It is connected to the FRONT MODULE CONTROLLER via cables, which can also be replaced individually. For replacement proceed as follows:

Opening the instrument and removing the FRONT MODULE

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Unscrew the four screws of the front handles at the instrument frame on both sides and take off the front handles.
- Unscrew a countersunk screw (if present) at the front on the labeling panel next to the spinwheel and pull off the labeling panel towards the front.
- Unscrew two countersunk screws in the front frame at the top and at the bottom as well as two countersunk screws at the front above the AUX1/2 BNC connectors.
- Unscrew a combi screw at the top of the module support for support of the PCMCIA INTERFACE.
- After unscrewing the two countersunk screws at the top left instrument frame slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Slightly push the FRONT MODULE from the rear to the front using little pressure.

  Note: *Note the three ribbon cables for the PCMCIA INTERFACE that are still connected to the MOTHERBOARD1.*

- After sliding out the FRONT MODULE disconnect the three ribbon cables from the MOTHERBOARD1 connector.
- Take the FRONT MODULE completely out of the CRTU Radio Unit.

Making the LCD accessible

- Unscrew the two countersunk screws on the cover of the PCMCIA INTERFACE and carefully pull out the option from the FRONT MODULE towards the front.
- Place the FRONT MODULE onto a clean surface with the aluminum panel pointing downwards.
- Unscrew the four screws on the mounting plate at the top, bottom and right and carefully swing away the mounting plate towards the rear.
- Pull off the connecting cables to the LCD, DC/AC illumination converter, keyboard membrane and spinwheel.

  Note: *When pulling off the connecting cables be careful with the cable connecting to the keyboard. It is a film cable which can only be disconnected after sliding up the lock of the film cable plug. Besides, be careful with the ribbon cable connecting to the spinwheel. First loosen the locking brackets of the plug.*

Removing the LCD and/or DC/AC Converter

- Unscrew the two screws of the DC/AC converter shielding and pull off the plug of the connecting cable to the DC/AC converter.
- If required, unscrew the two screws of the DC/AC converter and loosen the connecting cable to the FRONT MODULE CONTROLLER.
- Remove the DC/AC converter.
- Loosen the four screws of the LCD shielding and take off the shielding.
- Loosen the connecting cable to the FRONT MODULE CONTROLLER by unscrewing the two screws and remove.
- Unscrew the four screws of the LCD on the mounting plate and remove the LCD.

Installing the new LCD and/or DC/AC converter and completing the instrument

- Insert new LCD and/or DC/AC converter in the reverse order, connect all connecting cables in the correct position and replace all screws.
- Carefully plug the cable connectors to the controller board without reversing the polarities and replace the mounting plate in the reverse order.
- Replace the old PCMCIA INTERFACE in the FRONT MODULE in the reverse order.

Note: *Make sure to route the cables of the PCMCIA INTERFACE properly, not to catch them and insert them on the MOTHERBOARD before sliding the FRONT MODULE completely into the CRTU Radio Unit.*

- Complete the instrument without causing damage to the cables.

Putting into operation

- Connect the instrument to the mains and switch on.
- The built-in front-module controller registers on the LCD and starts the operating software.

Replacing the Keyboard Membrane and/or Mat on the FRONT MODULE

(see chapter 5, *spare part list, Current No. 140 (Keyboard Mat) / 145 (Keyboard Membrane)* and *explosion drawing 1090.9244.01 D sheet 4*)

The keyboard membrane is the contact film for the rubber keys (mat) behind the labeling panel and the keyboard frame. For replacement proceed as follows:

Opening the instrument and removing the FRONT MODULE

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Unscrew the four screws of the front handles at the instrument frame on both sides and take off the front handles.
- Unscrew a countersunk screw (if present) at the front on the labeling panel next to the spinwheel and pull off the labeling panel towards the front.
- Unscrew two countersunk screws in the front frame at the top and at the bottom as well as two countersunk screws at the front above the AUX1/2 BNC connectors.
- Unscrew a combi screw at the top of the module support for support of the PCMCIA INTERFACE.
- After unscrewing the two countersunk screws at the top left instrument frame slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Slightly push the FRONT MODULE from the rear to the front using little pressure.

  Note: *Note the three ribbon cables for the PCMCIA INTERFACE that are still connected to the MOTHERBOARD1.*
- After sliding out the FRONT MODULE disconnect the three ribbon cables from the MOTHERBOARD1 connector.
- Take the FRONT MODULE completely out of the *CRTU Radio Unit*.

Removing the membrane

- Unscrew the two countersunk screws on the cover of the PCMCIA INTERFACE and carefully pull out the option from the FRONT MODULE towards the front.
- Place the FRONT MODULE onto a clean surface with the aluminum panel pointing downwards.
- Unscrew the four screws on the mounting plate at the top, bottom and right and carefully swing away the mounting plate towards the rear.
- Pull off the connecting cables to the LCD, DC/AC converter, membrane and spinwheel.

  Note: *When pulling off the connecting cables be careful with the cable connecting to the keyboard. It is a film cable which can only be disconnected after sliding up the lock of the film cable plug. Besides, be careful with the ribbon cable connecting to the spinwheel. First loosen the locking brackets of the plug.*
- Place the mounting plate onto the surface with the keyboard frame pointing upwards and unscrew the 10 countersunk screws of the keyboard frame.
- Pull off the knob of the spinwheel.
- Lift off the keyboard frame as well as the mat which is now accessible.
- Lift off the membrane and pull the connecting cable through the hole of the mounting plate.

Installing the new membrane and completing the instrument

- Insert the new membrane and/or mat in the reverse order, insert the mat at the correct position (observe the labeling of the keys!) and fasten the keyboard frame with screws.
- Carefully plug the cable connectors to the controller board without reversing the polarities and replace the mounting plate in the reverse order.
- Install the old PCMCIA INTERFACE in the FRONT MODULE in the reverse order.
- Install the FRONT MODULE in the CRTU Radio Unit in the reverse order.

  Note: *Make sure to route the cables of the PCMCIA INTERFACE properly, not to catch them and insert them on the MOTHERBOARD1 before sliding the FRONT MODULE completely into the CRTU Radio Unit.*
- Complete the instrument without causing damage to the cables.

Putting into operation

- Connect the instrument to the mains and switch on.

The built-in FRONT MODULE CONTROLLER registers on the LCD and starts the operating software.

Replacing the Labeling Panel on the FRONT MODULE

(see chapter 5, *spare part list, Current No. 260* and *explosion drawing 1138.4000.01 D sheet 2*)
The labeling panel is the outer front panel which carries the labeling of all the parts on the front side of the CRTU Radio Unit. For replacement proceed as follows:

Removing the old labeling panel

- Switch off the instrument and pull the mains plug.
- Unscrew the four screws of the front handles at the instrument frame on both sides and take off the front handles.
- Unscrew a countersunk screw (if present) at the front on the labeling panel next to the spinwheel and pull off the labeling panel towards the front.

Installing the new labeling panel and completing the instrument

- Install the new labeling panel and tighten all screws.
- Complete the instrument.

Putting into operation

- Connect the instrument to the mains and switch on.
- The built-in FRONT MODULE CONTROLLER registers on the LCD and starts the operating software.

Replacing the PCMCIA INTERFACE

(see chapter 5, *spare part list, Current No. 500 (PCMCIA INTERFACE,* and *explosion drawing 1138.4000.01 D sheet 2*)

The PCMCIA INTERFACE is fitted on the FRONT MODULE. For replacement proceed as follows:

Opening the instrument and removing the FRONT MODULE

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Unscrew the four screws of the front handles at the instrument frame on both sides and take off the front handles.
- Unscrew a countersunk screw (if present) at the front on the labeling panel next to the spinwheel and pull off the labeling panel towards the front.
- Unscrew two countersunk screws in the front frame at the top and at the bottom as well as two countersunk screws at the front above the AUX1/2 BNC connectors.
- Unscrew a combi screw at the top of the module support for support of the PCMCIA INTERFACE.
- After unscrewing the two countersunk screws at the top left instrument frame slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Slightly push the FRONT MODULE from the rear to the front using little pressure.

  Note: *Note the three ribbon cables for the PCMCIA INTERFACE that are still connected to the MOTHERBOARD1.*
- After sliding out the FRONT MODULE disconnect the three ribbon cables from the MOTHERBOARD1 connector.
- Take the FRONT MODULE completely out of the CRTU Radio Unit.

Replacing the option

- Unscrew the two countersunk screws on the cover of the PCMCIA INTERFACE and carefully pull out the option from the FRONT MODULE towards the front.
- Install the new PCMCIA INTERFACE in the FRONT MODULE in the reverse order.
- Install the FRONT MODULE in the CRTU Radio Unit in the reverse order.

  Note: *Make sure to route the cables of the PCMCIA INTERFACE properly, not to catch them and insert them on the MOTHERBOARD1 before sliding the FRONT MODULE completely into the CRTU Radio Unit.*

Completing the instrument and putting into operation

- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains and switch on.

The built-in FRONT MODULE CONTROLLER registers on the LCD and starts the operating software.

Replacing the RF FRONTEND

(see chapter 5, *spare part list, Current No. 320* and *explosion drawing 1138.4000.01 D sheet 2*)

The RF FRONTEND is installed at the bottom of the CRTU Radio Unit at the front right. For replacement proceed as follows:

Opening the instrument and removing the RF FRONTEND

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Place the instrument upside down to make the bottom accessible.
- Pull off the ribbon cable to the MOTHERBOARD on the RF FRONTEND. Completely unscrew RF SMA coax cables to the RXTX BOARD1/2 (if present, also those to the RXTX2 BOARD and RXTXAUX1/2 connectors) on the RF FRONTEND and RXTX BOARD1/2 using a special wrench*.
- Unscrew the two countersunk screws at the bottom front of the front frame and one countersunk screw on the side panel of the CRTU Radio Unit for supporting the RF FRONTEND.
- Pull the RF FRONTEND approx. 20 mm towards the rear and then swing towards the bottom.

Installing the new RF FRONTEND MODULE and completing the instrument

- Insert the RF FRONTEND into the instrument in the reverse order and connect all cables.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains.
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit.

Automatic module data adjustment

- Boot up within BootMagic® menu into “DOS OPSW / Service” or “Service / WCDMA”.
- During startup observe the display.
- When three BEEPs can be heard, press the MENU SELECT key.
- The version manager is started (see also chapter 4, Firmware update). The display includes the menu item FIRMWARE UPDATE AFTER BOARD CHANGE.
- Press the softkey to the left of the above mentioned menu item.
  The automatic module data adjustment is performed under software control, firmware updates for microprocessors and programmable devices being performed as well. This may take a few minutes.

After the adjustment has been terminated, the operating software starts automatically and the CRTU Radio Unit is ready for use and complies with the specifications, except for the level accuracy.
In order to achieve the level accuracy described in the data sheet, a so-called path error data record is necessary.
To this end, the CRTU Radio Unit must be measured using the test system ACS 100 (see chapter 1, *Performance Test*).

* available in CMU-Service Kit CRTU-Z3 (1139.0509.02)

Replacing the REFERENCE BOARD

(see chapter 5, *spare part list, Current No. 340* and *explosion drawing 1138.4000.01 D sheet 2*)

The REFERENCE BOARD is installed at the front right top of the CRTU Radio Unit as plug-in module in the cage. For replacement proceed as follows:

Opening the instrument and removing the REFERENCE BOARD

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Unscrew the combi screw from the locking bracket of the module in the vicinity of the instrument fan and fold up.
- Pull off all MMCX plug-in cables (using a pull-out tool*) from the top of the REFERENCE BOARD and pull out the module towards the top with the help of the locking bracket.

Installing the new REFERENCE BOARD and completing the instrument

- Insert the new REFERENCE BOARD in the instrument in the reverse order and connect all MMCX plug-in cables.
- Perform manual adjustment +5 VDC reference voltage and TCXO adjustment as described in chapter 2.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains.
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit.

Automatic module data adjustment

- Boot up within BootMagic® menu into “DOS OPSW / Service” or “Service / WCDMA”.
- During startup observe the display.
- When three BEEPs can be heard, press the MENU SELECT key.
- The version manager is started (see also chapter 4, Firmware update). The display includes the menu item FIRMWARE UPDATE AFTER BOARD CHANGE.
- Press the softkey to the left of the above mentioned menu item.
  The automatic module data adjustment is performed under software control, firmware updates for microprocessors and programmable devices being performed as well. This may take a few minutes.

After the adjustment has been terminated, the operating software starts automatically and the CRTU Radio Unit is ready for use and complies with the specifications.

* available in CMU-Service Kit CRTU-Z3 (1139.0509.02)

Replacing the RXTX BOARD1/2

(see chapter 5, *spare part list, Current No. 350/370* and *explosion drawing 1138.4000.01 D sheet 2*)

The RXTX BOARD1/2 is installed in the module support as plug-in module. For replacement proceed as follows:

Opening the instrument and removing the RXTX BOARD1/2

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- After unscrewing the two countersunk screws at the top left instrument frame, slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Place the instrument to the left side and unscrew the two RF SMA coax cables at the bottom of the RXTX BOARD1/2 using a special wrench*. Likewise pull off the MMCX plug-in cable (using a pull-out tool*) from the bottom.
- Pull off all MMCX plug-in cables from the top of the RXTX BOARD1/2 and pull out the board using the two levers on both sides.

Installing the new RXTX BOARD1/2 and completing the instrument

- Insert the new RXTX BOARD1/2 into the instrument in the reverse order and carefully connect all the MMCX plug-in and RF SMA coax cables.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains.
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit.

Automatic module data adjustment

- Boot up within BootMagic® menu into “DOS OPSW / Service” or “Service / WCDMA”.
- During startup observe the display.
- When three BEEPs can be heard, press the MENU SELECT key.
- The version manager is started (see also chapter 4, Firmware update). The display includes the menu item FIRMWARE UPDATE AFTER BOARD CHANGE.
- Press the softkey to the left of the above mentioned menu item.
  The automatic module data adjustment is performed under software control, firmware updates for microprocessors and programmable devices being performed as well. This may take a few minutes.

After the adjustment has been terminated, the operating software starts automatically and the CRTU Radio Unit is ready for use and complies with the specifications, except for the high-precision level accuracy.
In order to achieve the level accuracy as described in the data sheet, a so-called path error data record is necessary.
To this end, the CRTU Radio Unit must be measured using the test system ACS 100 (see chapter 1, *Performance Test*).

* available in CMU-Service Kit CRTU-Z3 (1139.0509.02)

Replacing the TR-CORRECTION MODULE in the RXTX BOARD1/2

(see chapter 5, *spare part list, Current No. 360/380* and *explosion drawing 1100.1733.01 DF sheet 3*)

The TR-CORRECTION MODULE is incorporated in the RXTX BOARD1/2 as sandwich module. For replacement proceed as follows:

Opening the instrument and removing the TR-CORRECTION MODULE

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- After unscrewing the two countersunk screws at the top left instrument frame, slightly lift the cover at the instrument top, slightly push to the right and lift off.
- Place the instrument to the left side and unscrew the two RF SMA coax cables at the bottom of the RXTX BOARD1/2 using a special wrench. Likewise, pull off the MMCX plug-in cable at the bottom.
- Pull off all the MMCX plug-in cables (using a pull-out tool*) from the top of the RXTX BOARD1/2 and pull off the module towards the top using the two levers on the right and left.
- Unscrew one screw of each cooling plate, pull off the cooling plates towards the side and then unscrew all screws of the RXTX aluminum cover shells. Then the cover shells of the top and bottom can be removed.
- Pull off the sandwich module TR-CORRECTION MODULE (using a pull-out tool*) from the RXTX BOARD1/2.

Installing the new TR-CORRECTION BOARD and completing the instrument

- Insert the new TR-CORRECTION MODULE.
- Reinsert the cover shells in the reverse order and fasten with screws. Attach the cooling plates again.
- Insert the RXTX BOARD1/2 into the instrument in the reverse order and carefully connect all the MMCX plug-in cables and RF-SMA coax cables.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains.
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit.

Automatic module data adjustment

- Boot up within BootMagic® menu into “DOS OPSW / Service” or “Service / WCDMA”.
- During startup observe the display.
- When three BEEPs can be heard, press the MENU SELECT key.
- The version manager is started (see also chapter 4, Firmware update). The display includes the menu item FIRMWARE UPDATE AFTER BOARD CHANGE.
- Press the softkey to the left of the above mentioned menu item.
  The automatic module data adjustment is performed under software control, firmware updates for microprocessors and programmable devices being performed as well. This may take a few minutes.

* available in CMU-Service Kit CRTU-Z3 (1139.0509.02)

After the adjustment has been terminated, the operating software starts automatically and the CRTU Radio Unit is ready for use and complies with the specifications, except for the high-precision level accuracy.

In order to achieve the level accuracy as described in the data sheet, a so-called path error data record is necessary.

To this end, the CRTU Radio Unit must be measured using the test system ACS 100 (see chapter 1, *Performance Test*).

Replacing the DIGITAL BOARD

(see chapter 5, *spare part list, Current No. 390* and *explosion drawing 1138.4000.01 D sheet 2*)

The DIGITAL BOARD is incorporated in the module support as plug-in module. For replacement proceed as follows:

Opening the instrument and removing the DIGITAL BOARD

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- After unscrewing the two countersunk screws at the top left instrument frame, slightly lift the cover at the instrument top, slightly push to the right and lift off.
- Pull off all the MMCX plug-in cables (using a pull-out tool*) from the top of the DIGITAL BOARD and pull off the module towards the top using the two levers on the right and left.

Installing the new DIGITAL BOARD and completing the instrument

- Insert the new DIGITAL BOARD into the instrument in the reverse order and connect all the MMCX plug-in cables.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains.
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit.

Automatic module data adjustment

- Boot up within BootMagic® menu into “DOS OPSW / Service” or “Service / WCDMA”.
- During startup observe the display.
- When three BEEPs can be heard, press the MENU SELECT key.
- The version manager is started (see also chapter 4, Firmware update). The display includes the menu item FIRMWARE UPDATE AFTER BOARD CHANGE.
- Press the softkey to the left of the above mentioned menu item.
  The automatic module data adjustment is performed under software control, firmware updates for microprocessors and programmable devices being performed as well. This may take a few minutes.

* available in CMU-Service Kit CRTU-Z3 (1139.0509.02)

After the adjustment has been terminated, the operating software starts automatically and the CRTU Radio Unit is ready for use and complies with the specifications, except for the high-precision level accuracy.
In order to achieve the level accuracy as described in the data sheet, a so-called path error data record is necessary.
To this end, the CRTU Radio Unit must be measured using the test system ACS 100 (see chapter 1, *Performance Test*).

Replacing the Modules: ADC MODULE1/2, DDC MODULE1/2, TXDSP MODULE1/2, AUC MODULE1/2 in the DIGITAL BOARD

(see chapter 5, *spare part list, Current No. 470/480 (ADC MODULE1/2), Current No. 410/420 (DDC MODULE1/2), Current No. 450/460 (TXDSP MODULE1/2), Current No. 430/440 (AUC MODULE1/2)* and *explosion drawing 1100.1791.01 D sheet 2*)

The sandwich modules *ADC MODULE1/2*, *DDC MODULE1/2*, *TXDSP MODULE1/2* and AUC MODULE1/2 are installed in the DIGITAL BOARD as plug-in modules. For replacement proceed as follows:

Opening the instrument and removing the modules

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- After unscrewing the two countersunk screws at the top left instrument frame, slightly lift the cover at the instrument top, slightly push to the right and lift off.
- Pull off all the MMCX plug-in cables (using a pull-out tool*) from the top of the DIGITAL BOARD and pull off the module towards the top using the two levers on the right and left.
- Remove the cover of the higher HVC side (B-side) by loosening the cover screws.
- Carefully lever out the respective sandwich module (using a pull-out tool*) in the case of the ADC MODULE loosen the two fixing screws before.

Installing the new sandwich module and completing the instrument

- Replace by a new module.

Caution!

Take care to insert the module at the correct position.

The heat conducting mats have to be stuck to the components of the modules (see chapter 5, drawing 1100.1791.01 D sheet 2).

- Insert the DIGITAL BOARD into the instrument in the reverse order and connect all the MMCX plug-in cables.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains.
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit.

* available in CMU-Service Kit CRTU-Z3 (1139.0509.02)

Automatic module data adjustment

- Boot up within BootMagic® menu into “DOS OPSW / Service” or “Service / WCDMA”.
- During startup observe the display.
- When three BEEPs can be heard, press the MENU SELECT key.
- The version manager is started (see also chapter 4, Firmware update). The display includes the menu item FIRMWARE UPDATE AFTER BOARD CHANGE.
- Press the softkey to the left of the above mentioned menu item.
  The automatic module data adjustment is performed under software control, firmware updates for microprocessors and programmable devices being performed as well. This may take a few minutes.

After the adjustment has been terminated, the operating software starts automatically and the CRTU Radio Unit is ready for use and complies with the specifications, except for the high-precision level accuracy.
In order to achieve the level accuracy as described in the data sheet, a so-called path error data record is necessary.
To this end, the CRTU Radio Unit must be measured using the test system ACS 100 (see chapter 1, *Performance Test*).

Replacing the Option OCXO REFERENCE OSC. CRTU-B2

*(*see chapter 5, *spare part list, Current No. 530 (OCXO REFERENCE OSC. CRTU-B2)* and *explosion drawing 1138.4000.01 D sheet 2)*

The Option OCXO REFERENCE OSC. is fitted at the right side panel below the instrument fan in the CRTU Radio Unit. For replacement proceed as follows:

Opening the instrument and removing the option OCXO REFERENCE OSC.

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Place the instrument onto the left side, locate the option OCXO *(see chapter 5, explosion drawing 1138.4000.01 D sheet 2)* and unscrew the two combi screws on the module support and one combi screw on the MOTHERBOARD1.
- Pull off option OCXO REFERENCE OSC. from the MOTHERBOARD1 connector, slightly tilt and swing out towards the bottom.

Installing the new option OCXO REFERENCE OSC. and completing the instrument

- Install the new option OCXO REFERENCE OSC. in the reverse order. Tighten the three combi screws again.

  Note: *Make sure that the 10-pin connector to the MOTHERBOARD is inserted correctly.*
- Complete the instrument without causing damage to the cables.

Manual OCXO adjustment

- Connect the instrument to the mains and switch on.
- Check the frequency accuracy and, if necessary, perform manual OCXO adjustment as described in chapter 2.

Replacing the Option LINKHANDLER 1/2 CRTU-B5

(see chapter 5, *spare part list, Current No. 540/590 and explosion drawing 1138.4000.01 D sheet 2*)

The option LINKHANDLER 1/2 is installed in the module support as plug-in module. For replacement proceed as follows:

Opening the instrument and removing the option LINKHANDLER 1/2

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- After unscrewing the two countersunk screws at the top left instrument frame slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Pull off all flat ribbon cables from the top of the option LINKHANDLER.
- Take out the module using the two levers on the right and left.

Installing the new option LINKHANDLER 1/2 and completing the instrument

The casing is provided with ventilation holes on the right and left side. The instrument fan can generate a strong cooling flow through these holes and the module. As the board does not consume very much power, cover one of the two rows of holes towards the fan with a tape to reduce the air flow through the LINKHANDLER and reserve the main cooling capacity for the other boards.

- Insert the new option LINKHANDLER into the instrument in the reverse order.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains.
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit.

Automatic module data adjustment

- Boot up within BootMagic® menu into “DOS OPSW / Service” or “Service / WCDMA”.
- During startup observe the display.
- When three BEEPs can be heard, press the MENU SELECT key.
- The version manager is started (see also chapter 4, Firmware update). The display includes the menu item FIRMWARE UPDATE AFTER BOARD CHANGE.
- Press the softkey to the left of the above mentioned menu item.
  The automatic module data adjustment is performed under software control, firmware updates for microprocessors and programmable devices being performed as well. This may take a few minutes.

After the adjustment has been terminated, the operating software starts automatically and the CRTU Radio Unit is ready for use and complies with the specifications.

Replacing the Modules: DSP MODULE0/1/2/3/4/5 in the LINKHANDLER 1/2

(see chapter 5, *spare part list, Current No. 560/561 and 570/571/572/573,* and *explosion drawing 1135.5406.01 sheet 2*)

The sandwich modules DSP MODULE0 to DSP MODULE5 are installed in the LINKHANDLER as plug-in modules. For replacement proceed as follows:

Opening the instrument and removing the modules

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- After unscrewing the two countersunk screws at the top left instrument frame slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Pull off all flat ribbon cables from the top of the option LINKHANDLER 1/2.
- Take out the option using the two levers on the right and left.
- Take off the cover on the higher side (B-side) by loosening the cover screws.
- Carefully unscrew and take out the respective sandwich module (see chapter 5, *drawing 1135.5406.01 D sheet 2*).

Installing the new sandwich module and completing the instrument

- Replace by new module.

Caution!

Take care to insert the respective module with the correct polarity (see chapter 5, drawing 1135.5406.01 sheet 2).

- Replace the cover and fasten with screws.
- Insert the Option LINKHANDLER 1/2 into the instrument in the reverse order.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains.
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit.

Automatic module data adjustment

- Boot up within BootMagic® menu into “DOS OPSW / Service” or “Service / WCDMA”.
- During startup observe the display.
- When three BEEPs can be heard, press the MENU SELECT key.
- The version manager is started (see also chapter 4, Firmware update). The display includes the menu item FIRMWARE UPDATE AFTER BOARD CHANGE.
- Press the softkey to the left of the above mentioned menu item.

The automatic module data adjustment is performed under software control, firmware updates for microprocessors and programmable devices being performed as well. This may take a few minutes.

After the adjustment has been terminated, the operating software starts automatically and the CRTU Radio Unit is ready for use and complies with the specifications.

Replacing the Option MAC SPEECH CRTU-B6

(see chapter 5, *spare part list, Current No. 580 and explosion drawing 1138.4000.01 D sheet 2*)

The option MAC SPEECH is installed in the module support as plug-in module. For replacement proceed as follows:

Opening the instrument and removing the option MAC SPEECH

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- After unscrewing the two countersunk screws at the top left instrument frame slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Pull off all flat ribbon cables from the top of the option MAC SPEECH.
- Pull off all MMCX plug-in cables (using a pull-out tool*) and the flat ribbon cables from the top of the MAC SPEECH.
- Take out the module using the two levers on the right and left.

Installing the new option MAC SPEECH and completing the instrument

The casing is provided with ventilation holes on the right and left side. The instrument fan can generate a strong cooling flow through these holes and the module. As the board does not consume very much power, cover one of the two rows of holes towards the fan with a tape to reduce the air flow through the MAC SPEECH and reserve the main cooling capacity for the other boards.

- Insert the new option MAC SPEECH into the instrument in the reverse order.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains.
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit.

Automatic module data adjustment

- Boot up within BootMagic® menu into “DOS OPSW / Service” or “Service / WCDMA”.
- During startup observe the display.
- When three BEEPs can be heard, press the MENU SELECT key.
- The version manager is started (see also chapter 4, Firmware update). The display includes the menu item FIRMWARE UPDATE AFTER BOARD CHANGE.
- Press the softkey to the left of the above mentioned menu item.
  The automatic module data adjustment is performed under software control, firmware updates for microprocessors and programmable devices being performed as well. This may take a few minutes.

After the adjustment has been terminated, the operating software starts automatically and the CRTU Radio Unit is ready for use and complies with the specifications.

* available in Service Kit CRTU-Z3 (1139.0509.02)

Replacing the Modules: DSP MODULE in the MAC SPEECH

(see chapter 5, *spare part list, Current No. 600/601* and *explosion drawing 1135.5793.01 sheet 2*)

The DSP sandwich module is installed in the MAC SPEECH as a plug-in module. For replacement proceed as follows:

Opening the instrument and removing the modules

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- After unscrewing the two countersunk screws at the top left instrument frame slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Pull off all MMCX plug-in cables (using a pull-out tool*) and the flat ribbon cables from the top of the MAC SPEECH.
- Take out the option using the two levers on the right and left.
- Take off the cover on the higher side (B-side) by loosening the cover screws.
- Carefully unscrew and take out the sandwich module (see chapter 5, *drawing 1135.5793.01 sheet 2*).

Installing the new sandwich module and completing the instrument

- Replace by new module.

Caution!

Take care to insert the respective module with the correct polarity (see chapter 5, drawing 1135.5793.01 sheet 2).

- Replace the cover and fasten with screws.
- Insert the Option MAC SPEECH into the instrument in the reverse order.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains and switch on.

* available in Service Kit CRTU-Z3 (1139.0509.02)

Replacing the Option IQIF BOARD CRTU-B7

(see chapter 5, *spare part list, Current No. 610 and explosion drawing 1138.4000.01 D sheet 2*)

The option IQIF BOARD is installed in the module support as plug-in module. For replacement proceed as follows:

Opening the instrument and removing the option IQIF BOARD

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- After unscrewing the two countersunk screws at the top left instrument frame slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Pull off all MMCX plug-in cables (using a pull-out tool*) from the top of the IQIF BOARD.
- Take out the module using the two levers on the right and left.

Installing the new option IQIF BOARD and completing the instrument

- Insert the new option IQIF BOARD into the instrument in the reverse order.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains.
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU Radio Unit.

Automatic module data adjustment

- Boot up within BootMagic® menu into “DOS OPSW / Service” or “Service / WCDMA”.
- During startup observe the display.
- When three BEEPs can be heard, press the MENU SELECT key.
- The version manager is started (see also chapter 4, Firmware update). The display includes the menu item FIRMWARE UPDATE AFTER BOARD CHANGE.
- Press the softkey to the left of the above mentioned menu item.
  The automatic module data adjustment is performed under software control, firmware updates for microprocessors and programmable devices being performed as well. This may take a few minutes.

After the adjustment has been terminated, the operating software starts automatically and the CRTU Radio Unit is ready for use and complies with the specifications.

* available in Service Kit CRTU-Z3 (1139.0509.02)

Replacing the POWER SUPPLY

*(*see chapter 5, *spare part list, Current No. 520* and *explosion drawing 1138.4000.01 D sheet 2)*

The POWER SUPPLY is fitted at the rear of the instrument frame of the CRTU Radio Unit. For replacement proceed as follows:

Removing the POWER SUPPLY

- Switch off the instrument and pull the mains plug.
- Unscrew the ten screws at the rear of the POWER SUPPLY. Pull out the power supply approx. 10 mm to 20 mm towards the rear, slightly tilt towards the bottom and then pull out completely.

Installing the new POWER SUPPLY

- Install the new POWER SUPPLY in the reverse order.

  Note: *Make sure that the 96-pin connector to the MOTHERBOARD1 locks in place correctly.*
- Connect the instrument to the mains and switch on.

Replacing the Instrument Fan

(see chapter 5, spare part list, Current No. 20, and explosion drawing 1138.4000.01 D sheet 2)

The fan is fitted at the right side panel of the CRTU Radio Unit in an air duct. For replacement proceed as follows:

Opening the instrument and removing the fan

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Place the instrument onto the left side and locate the fan connecting cable. Coming from the air duct, the cable leads to connector X211 at MOTHERBOARD1 near the Option OCXO REFERENCE OSC.. If this is installed, it can as well be removed in order to enable easier access to the fan connector (see replacing the option OCXO REFERENCE OSC.).
- Pull off the connector from MOTHERBOARD1. To this end, press the locking lever at the top of the connector towards the connector and lift off the cable.
- Lever off the cover of the air duct and unscrew the four countersunk screws of the fan in the right side panel of the CRTU Radio Unit. Carefully take out the fan towards the top and pull the connecting cable through the hole in the air duct (Take off the adhesive tapes of the cable entry and keep them for later).

Installing the new fan and completing the instrument

- Replace the new fan in the reverse order.

  Note: *Make sure that the air direction of the fan is such that air is sucked in from the right side of the CRTU Radio Unit and pressed through the air duct. Note the arrows on the fan casing.*
- Reconnect the fan connecting cable to MOTHERBOARD1 (Fix again the adhesive tapes of the cable entry).
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains and switch on.

Replacing the MOTHERBOARD

(see chapter 5, spare part list, Current No. 490)

The MOTHERBOARD consists of five parts: MOTHERBOARD1, MOTHERBOARD2, FRONTPANEL BOARD1, FRONTPANEL BOARD2 and REARPANEL BOARD.
For replacement of the individual parts proceed as follows:

MOTHERBOARD1 (Big MOTHERBOARD)

Opening the instrument and removing MOTHERBOARD1

- Switch off the instrument, pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- After unscrewing the two countersunk screws at the top left instrument frame slightly lift the cover at the top of the instrument, slightly shift towards the right and lift off.
- Loosen all connecting cables to the boards, then lever out all boards as described above using the two levers at the right and at the left.
- Likewise, remove the POWER SUPPLY and the FRONT MODULE, disconnect the ribbon cable connections to the RF-FRONTEND, MOTHERBOARD2, FRONTPANEL BOARD1, FRONTPANEL BOARD2, REARPANEL BOARD. Disconnect the fan connecting cable and remove the Option OCXO REFERENCE OSC, if installed.
- Place the instrument upside down and unscrew all the eleven combi screws on MOTHERBOARD1, the ten screws fixing the standard connectors and the two screws fixing the metal angle of the USB connector at the rear of the instrument frame. Then slightly swing it out towards the top.

Installing the new MOTHERBOARD1 and completing the instrument

- Insert new MOTHERBOARD1 and connect all connectors and modules in the reverse order.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains and switch on.

MOTHERBOARD2 (Small MOTHERBOARD)

Opening the instrument and removing MOTHERBOARD2

- Switch off the instrument and pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Unscrew the combi screw of the module locking bracket near the instrument fan and swing away the locking bracket towards the top.
- Disconnect all the MMCX plug-in cables (using a pull-out tool*) from the top of the REFERENCE BOARD and pull off the module.
- If installed, remove any other optional module next to the REFERENCE BOARD.
- Disconnect the two ribbon cables from the MOTHERBOARD2. Unscrew the four screws from MOTHERBOARD2 and take out.

Installing the new MOTHERBOARD2 and completing the instrument

- Replace new MOTHERBOARD2, fasten with screws and connect all connectors and modules in the reverse order.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains and switch on.

FRONTPANEL BOARD1 (at the front of the instrument frame)

Opening the instrument and removing the FRONTPANEL BOARD1

- Switch off the instrument and pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Remove the FRONT MODULE as described above.
- Unscrew the three countersunk screws of part of the mounting plate in the front frame at the bottom and the top, loosen the ribbon cable from MOTHERBOARD1 and the MMCX coax cables (using a pull-out tool*) on the option (if installed).
- Loosen the two interface screws on part of the mounting plate and take out the FRONTPANEL BOARD1.

Installing the new FRONTPANEL BOARD1 and completing the instrument

- Install new FRONTPANEL BOARD1, fasten with screws and connect all connectors and modules in the reverse order.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains and switch on.

* available in CMU-Service Kit CRTU-Z3 (1139.0509.02)

FRONTPANEL BOARD2 (at the front of the instrument frame)

Opening the instrument and removing the FRONTPANEL BOARD2

- Switch off the instrument and pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Remove the FRONT MODULE as described above.
- Unscrew the three countersunk screws of part of the mounting plate in the front frame at the bottom and the top, loosen the ribbon cable from MOTHERBOARD1 and the MMCX coax cables (using a pull-out tool*) on the option (if installed).
- Loosen the two interface screws on part of the mounting plate as well as the connector of the interface cable on the FRONT MODULE and take out the FRONTPANEL BOARD2.

Installing the new FRONTPANEL BOARD2 and completing the instrument

- Install new FRONTPANEL BOARD2, fasten with screws and connect all connectors and modules in the reverse order.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains and switch on.

REARPANEL BOARD (Interface Board for Further Connectors at the Rear of the Instrument Frame)

Opening the Instrument and removing the REARPANEL BOARD

- Switch off the instrument and pull the mains plug and unscrew the rear-panel feet.
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- Slightly lift the cover at the top of the instrument after unscrewing the two countersunk screws on the left, slightly shift to the right and lift off.
- Place the instrument onto the left side.
- Disconnect the two ribbon cables of the REARPANEL BOARD from MOTHERBOARD1.
- Unscrew the 6 combi screws of the rear-panel cover and disconnect all coax cables of the BNC connectors at the respective modules. Disconnect any option connectors mounted on the integrated rear panel. Pull the rear panel towards the rear.
- Loosen all interface screws to the REARPANEL BOARD on the integrated rear panel and take out REARPANEL BOARD.

Installing the new REARPANEL BOARD and completing the instrument

- Install new REARPANEL BOARD, fasten with screws and connect all connectors in the reverse order.
- Complete the instrument without causing damage to the cables.
- Connect the instrument to the mains and switch on.

Troubleshooting

Faulty functions may sometimes originate in simple causes, but sometimes they also result from faulty components.

These troubleshooting instructions permit to trace the fault down to module level and make the instrument ready for use again by means of module adjustment.

For the module adjustment and further error elimination, we recommend to send the instrument to our authorized service (see list of addresses, *preface*).

Warning!

Live modules must not be removed or plugged in!

Do not produce short-circuits when measuring voltages!

For simple troubleshooting, the CRTU Radio Unit provides the following tools:

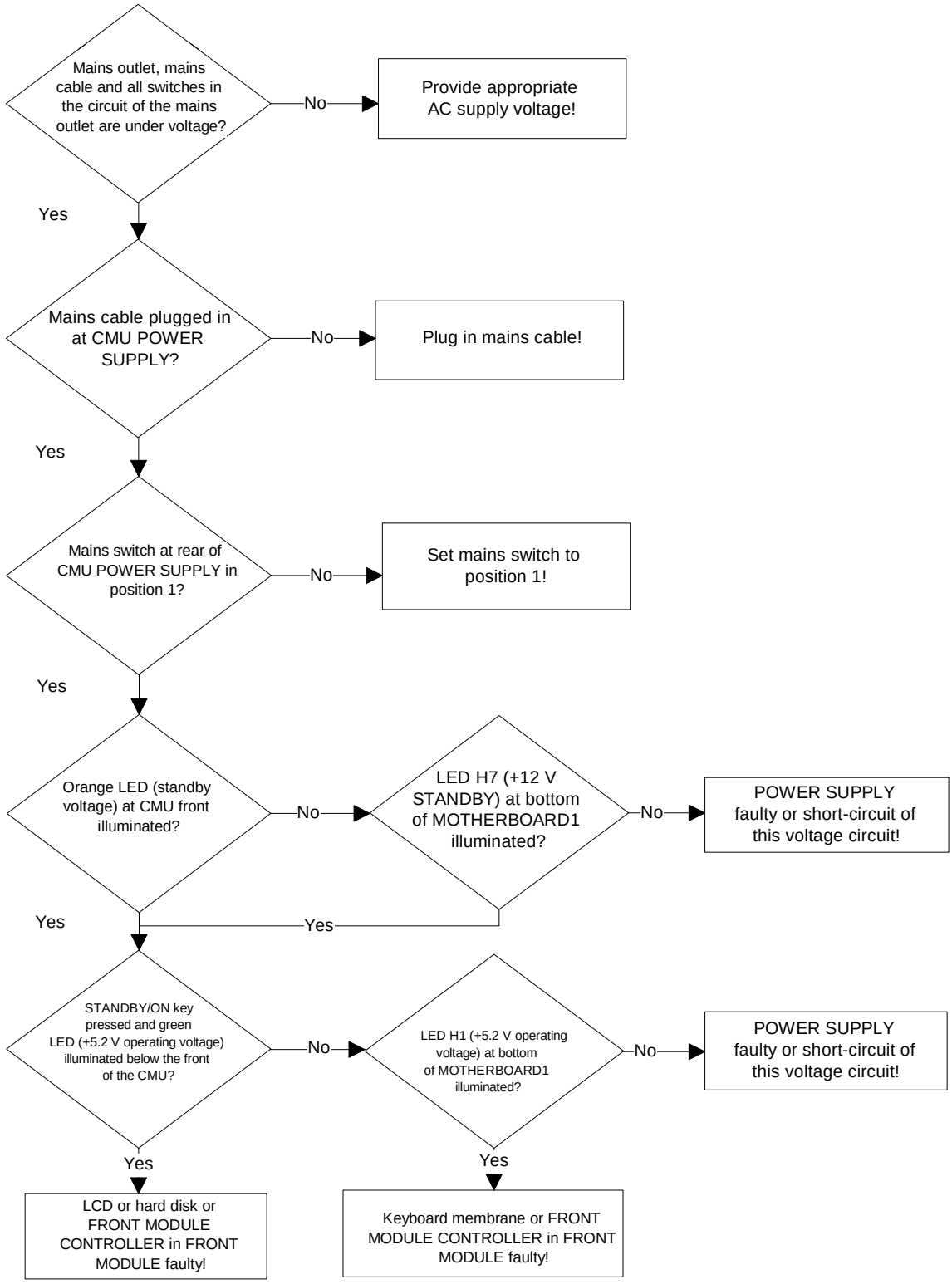
- Nine green LEDs (H1 to H9) at the bottom of MOTHERBOARD1, which indicate the operating voltages.
- A SELFTEST and INFO menu, which presents voltages via the module-internal diagnosis and RF loop-measurements with internal RF generator and RF analyzer. These menus are available if the *Service/WCDMA* partition is booted in the *BootMagic*™ menu; see description of CRTU-RU software structure and hard disk partitions in chapter 4.
- ERROR messages on the LCD display with references to sources of error.

Note: *In the case of problems first check all connections for damage (cables, plug-and-socket connections etc.) or wrong positions.*

For advanced troubleshooting on board-level, see Service Manual Modules.

Troubleshooting using the LEDs (H1 to H9) on the MOTHERBOARD

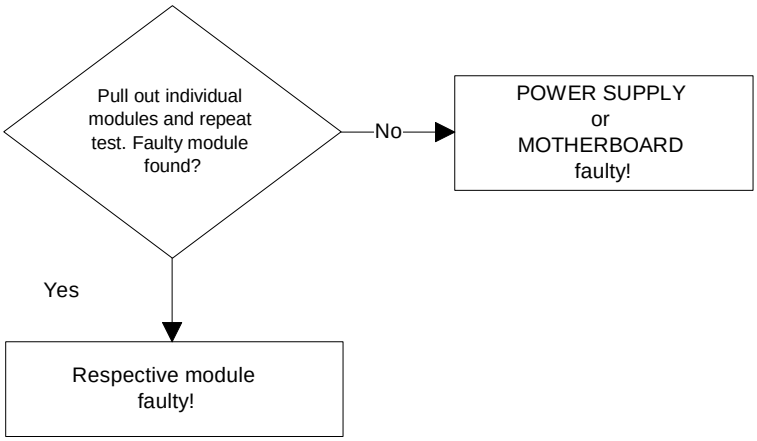
- **Fault: CRTU Radio Unit cannot be switched on.**



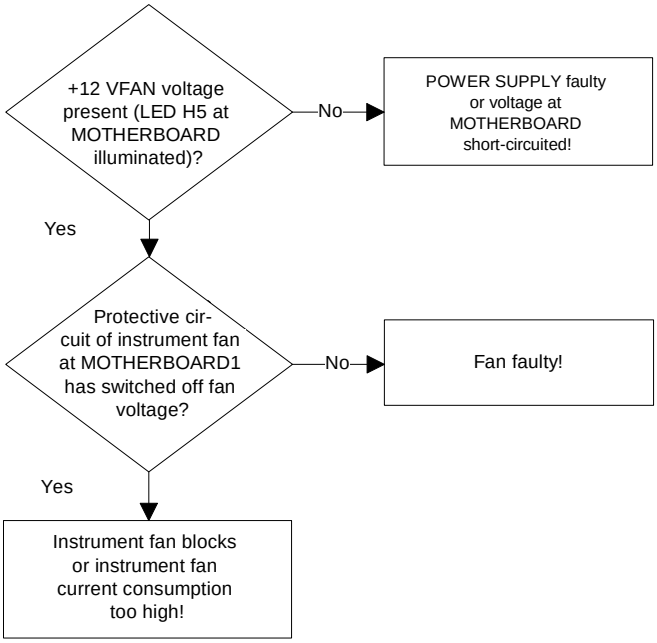
- Fault: Short-circuit of one or several operating voltages

➢ Check LEDs (H1 to H9) at the bottom of MOTHERBOARD1 to determine which voltage is short-circuited.

Note: *In the case of a short-circuit, the power supply switches off all voltages after a short period of time.*
Restart is possible using the STANDBY/ON key.



- **Fault: Instrument fan does not work.**



Note: *Measure instrument fan voltage at connector X 211! By pressing the STANDBY/ON key again, the protective circuit of the instrument fan can be restarted.*

Troubleshooting using the SELFTEST Menu for Modules

The SELFTEST menu indicates the diagnostic voltages for modules with exactly defined module settings. It provides specific selftests of several modules. In addition, this menu provides internal RF power measurements which are designed as RF loops with internal generator and analyzer. This is why a simple RF path is possible.

The SELFTEST menu is available if the *Service/WCDMA* partition is booted in the *BootMagic*™ menu; see description of CRTU-RU software structure and hard disk partitions in chapter 4. It can be called up via the *MENU SELECT* key on the front panel of the CRTU Radio Unit: Use the spinwheel in the *MENU SELECT* menu to select BASE and confirm with ENTER. The individual selftests can be selected via the *SELECT* softkey and the spinwheel.

The following selftests are available:

- Continuous Selftest — Continous selftest via System Selftest and Internal RF Loop Selftest, passed/failed with error output is only indicated; additionally in case of errors, it is created an error file 'cst.err'*
- Internal RF Loop Selftest — Selftest RF path by power measurements via internal generator and analyzer, in this case all measured values are indicated.
- System Selftest — Selftest instrument for diagnostic voltages, passed/failed with error output is only indicated.
- FE Selftest — Selftest Module RF FRONTEND for diagnostic voltages, in this case all measured values are indicated.
- REF Selftest — Selftest Module REFERENCE BOARD for diagnostic voltages, in this case all measured values are indicated.
- DIG Selftest — Selftest Module DIGITAL BOARD for diagnostic voltages, in this case all measured values are indicated.
- RXTX1 Selftest — Selftest Module RXTX BOARD1 for diagnostic voltages, in this case all measured values are indicated.
- 1→4/3→2 RF Loop — Selftest RF Path RF1→RF4IN and RF3OUT→RF2 via external N-coax cable by power measurements via internal generator and analyzer, in this case all measured values are indicated.

A selected test can be started by means of the TEST softkey and the ON key. The generated test report can be scrolled by pressing the REPORT softkey and turning the spinwheel. Errors detected during the test are indicated in red color and eliminated, if possible.

* ***Note:*** *The error file 'cst.err' can be read as follows:*
- *Connect the external keyboard connector to the rear panel of the CRTU-RU.*
- *Switch on the CRTU-RU and wait until it is booted.*
- *Start the Continuous Selftest (only when errors have occurred, the file 'cst.err' is created. Don't finish the Continuous Selftest with OFF, otherwise the 'cst.err' file will be deleted.)*
- *Press the keys ALT and F4 of the external keyboard to get to the DOS mode.*
- *Read the file with the DOS editor: 'edit cst.err'*
- *Quit the DOS editor and start CRTU operating software with: 'cmu.bat'.*

Troubleshooting using the INFO Menu for Modules

The INFO menu is available if the *Service/WCDMA* partition is booted in the *BootMagic*™ menu; see description of CRTU-RU software structure and hard disk partitions in chapter 4. It can be called up via the *INFO* key on the front panel of the CRTU Radio Unit.

The INFO menu provides diagnostic voltages and configuration information about several hardware modules, e.g. to determine whether a PLL has locked. The modules can be selected via the *SELECT* softkey and the spinwheel.

The following info menus are available:

- FE State — Diagnostic voltages for RF FRONTEND. All measured values are indicated.
- REF State — Diagnostic voltages for MODULE REFERENCE BOARD. All measured values are indicated.
- DIG State — Diagnostic voltages for DIGITAL BOARD. All measured values are indicated.
- RXTX1 State — Diagnostic voltages for RXTX BOARD1. All measured values are indicated.

A selected test can be started by means of the TEST softkey and the ON key. The generated test report can be scrolled by pressing the REPORT softkey and turning the spinwheel.

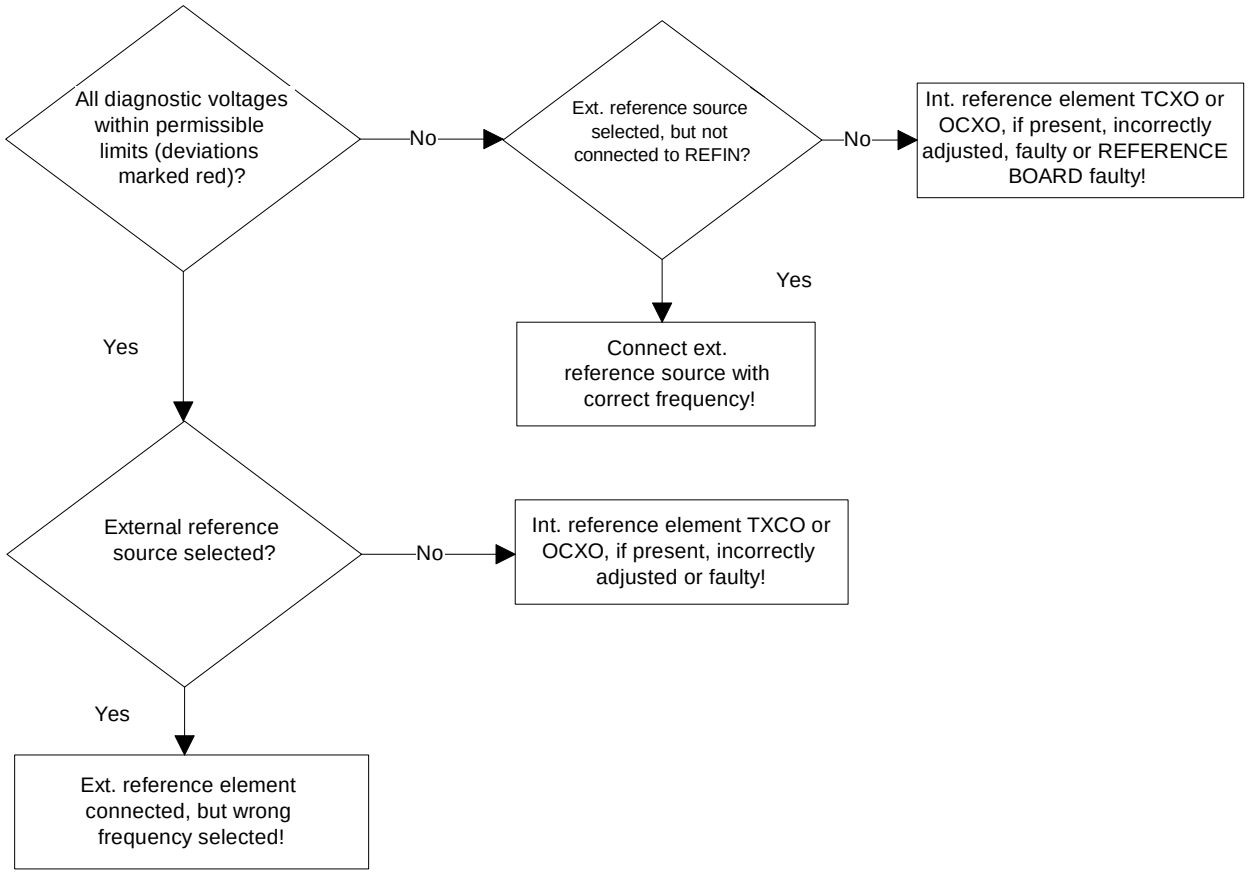
Note: *Some of the diagnostic voltages retrieved by means of the INFO key depend on whether or not the tested board is active. A value may be erroneously indicated in red color (out of tolerance) if the corresponding instrument function is not used during the test.*

If the fault is not clear, it is useful to call up the SELFTEST Menu and check all diagnostic voltages of the modules to determine whether there are discernible deviations.

- **Example: Info menu REFERENCE BOARD**

Fault: The frequency accuracy of the RF signal deviates.

Call the Maintenance Menu via the *INFO* Key select REFERENCE BOARD, start the diagnosis measurement using the *TEST* Key and activate the *ON* hardkey.



Troubleshooting using the ERROR messages on the LC display

Error message	Error description	Troubleshooting to
These clocks are not present: NET_CLOCK_1 NET_CLOCK_2	Netclock 1 / 2 not present	REFERENCE BOARD, DIGITAL BOARD, MMCX cable W31/W32
These clocks are not present: FIXED_CLOCK	110.8MHz Reference clock not present	REFERENCE BOARD, DIGITAL BOARD, MMCX cable W33
DIG diag adc cal error	Calibration error of the diagnosis AC/DC converter	DIGITAL BOARD
FE pow adc cal error	Calibration error of the power meter AC/DC converter	RF FRONTEND
FE eprom data error FE pow meter data error	General eprom data error Eprom power meter data error	RF FRONTEND RF FRONTEND
timeout in 331 handshake	Communication error correction processor	TR-CORRECTION MODULE on RXTX BOARD1/2

Motherboard Test CRTU-RU and CRTU-G

Please refer to section *Control- and Sync-Bus (CSB) and Trigger Test of CRTU-RU* in chapter 1for detailed test instructions.

More troubleshooting

General errors on the transmitter side of the CRTU Radio Unit

Error description	**Troubleshooting to**
Setting frequency in the module test faulty	REFERENCE BOARD MMCX cable W12 RXTX BOARD1/2 TR-CORRECTION MODULE1/2 MMCX cable W17 AUC MODULE1/2 TXDSP MODULE1/2
Setting frequency in the signalling test faulty	LINKHANDLER1/2 DIGITAL BOARD
Setting level in the module test faulty	RF FRONTEND SMA-cable W13 RXTX BOARD1/2 TR-CORRECTION MODULE1/2 MMCX cable W17 AUC MODULE1/2 TXDSP MODULE1/2
Setting level in the signalling test faulty	LINKHANDLER1/2 DIGITAL BOARD
Modulation in the module test faulty	DIGITAL BOARD AUC MODULE1/2 TXDSP MODULE1/2
Modulation in the signalling test faulty	DIGITAL BOARD AUC MODULE 1/2 LINKHANDLER1/2

General errors on the receiver side of the CRTU Radio Unit

Error description	**Troubleshooting to**
Received frequency in the module test faulty	REFERENCE BOARD MMCX cable W12 RXTX BOARD1/2 TR-CORRECTION MODULE1/2 MMCX cable W19 ADC MODULE1/2 DDC MODULE1/2
Received frequency in the signalling test faulty	LINKHANDLER1/2 DIGITAL BOARD
Received level in the module test faulty	RF FRONTEND SMA-cable W14 RXTX BOARD1/2 TR-CORRECTION MODULE1/2 MMCX cable W19 ADC MODULE1/2 DDC MODULE1/2
Received level in the signalling test faulty	RF FRONTEND SMA-cable W14 RXTX BOARD1/2 TR-CORRECTION MODULE1/2 MMCX cable W19 ADC MODULE1/2 DDC MODULE1/2 LINKHANDLER 1/2
Trigger releases no measurement RF POWER IF POWER	 RF FRONTEND DIGITAL BOARD DDC-MODULE1/2 RXTX BOARD1/2 DIGITAL BOARD DDC-MODULE1/2

Contents

4 Software Update/Installing Options

This chapter contains information on extensions and modifications of the CRTU Radio Unit. The handling of the GSM Operational Software CR02P2P and GSM Protocol Testing Test Packages is described in the CR02P2P Software Manual. Information or manuals obtained together with a software/firmware update of the CRTU Radio Unit or with additional hardware options can be fined at the end of this chapter.

Software / Firmware Structure

The software / firmware for CRTU-RU consists of the following packages:

1. The Front Module Controller Bios (see section 4.7 on p. 4.7 ff.)
2. The CRTU-RU MS software (see section 4.8 on p. 4.8 ff.)
3. The GSM Protocol Testing, Windows 2000-based, Operational Software and Test Packages. Installation and operation of the GSM Protocol Testing software is described in the CR02P2P software manual.

Besides the firmware contains additional software tools for organizing the hard disk partitions, running different software packages and generating images; see section *Maintaining and Restoring Hard Disk Partitions* on p. 4.5 ff. and operating manual for CRTU-G/S and CRTU-W. The software packages are stored in different partitions of the CRTU-RU hard disk and can be booted separately in the *BootMagic*™ startup menu; see Table 4-1 on p. 4.3.

Note: *The CRTU Radio Unit does not have a boot drive for floppy disks or for CDs. So it is not possible to boot from an external storage medium, e.g. a Windows Installation CD-ROM, and reinstall software from scratch. A defective hard disk must be exchanged by a programmed hard disk with a complete basic software installation on it (see part list in chapter 5 for programmed exchange hard disks: current number 310). Replacement of the hard disk is described in chapter 3, section* Replacing the Hard Disk in the FRONT MODULE*. In case of a faulty file system but properly working hard disk, it is possible to restore the complete partition on that hard disk (see details in section* Maintaining and Restoring Hard Disk Partitions *below).*

Structures of Hard Disk Partitions

To improve software installation, maintenance and reliability a new partition structure on the CRTU-RU hard disks has been introduced.

Detection of Different Hard Disk Structures

The partition structure on your instrument can be detected by launching to the following menu path within Windows 2000:

Start → Settings → Control Panel → Administration Tools → Computer Management → Disk Management

If the D: drive is not mapped and the F: drive is mapped then the hard disk has the "old" partition structure. If not so, it has the "new" one (see Fig. 4-1 below).

Volume	Layout	Type	File System	Status	Capacity	Free Space
CRTU_OS (F:)	Partition	Basic	NTFS	Healthy (System)	1.47 GB	677 MB
CRTU_SW (C:)	Partition	Basic	NTFS	Healthy (Page File)	6.98 GB	4.41 GB
IMAGES (E:)	Partition	Basic	FAT32	Healthy	9.76 GB	9.35 GB
MAINTAIN	Partition	Basic	FAT	Healthy	101 MB	86 MB
SERV WCDMA	Partition	Basic	FAT	Healthy	305 MB	185 MB

"Old" partition structure

Volume	Layout	Type	File System	Status	Capacity	Free Space
CRTU_SW (C:)	Partition	Basic	NTFS	Healthy (System)	61.76 GB	60.61 GB
IMAGES (D:)	Partition	Basic	NTFS	Healthy	9.77 GB	6.48 GB
MAINTAIN	Partition	Basic	FAT	Healthy	517 MB	484 MB
RAMDISK	Partition	Basic	NTFS	Healthy	517 MB	513 MB
SERV WCDM...	Partition	Basic	FAT	Healthy	1.99 GB	1.88 GB

"New" partition structure

Fig. 4-1 "New" vs. "old" partition structure on the CRTU-RU hard disk

"Old" Partition Structure

The hard disk with the "old" structure of a CRTU Radio Unit is divided into 4 partitions:

1. SERV_WCDMA partition, 306 MB, FAT16 format
2. MAINTAIN partition, 102 MB, FAT16 format
3. CRTU_OS partition, 1.47 GB, NTFS format
4. Extended partition, 16.75 GB

The extended partition contains two logical drives:

1. IMAGES drive, 9.77GB, FAT32 format
2. CRTU_SW drive, 6.98GB, NTFS format

Note: *Behind the extended partition there is some unallocated space which is necessary for the hard disk cloning process during device production.*

If the Service/WCDMA partition is booted, only one drive will be visible:

- SERV_WCDMA (C:)

If the Maintenance (backup) partition is booted, the following drives will be visible:

- MAINTAIN (C:)
- IMAGES (D:)

If the GSM Operation Software partition is booted, the following drives will be visible:

- CRTU_SW (C:)
- IMAGES (E:)
- CRTU_OS (F:)

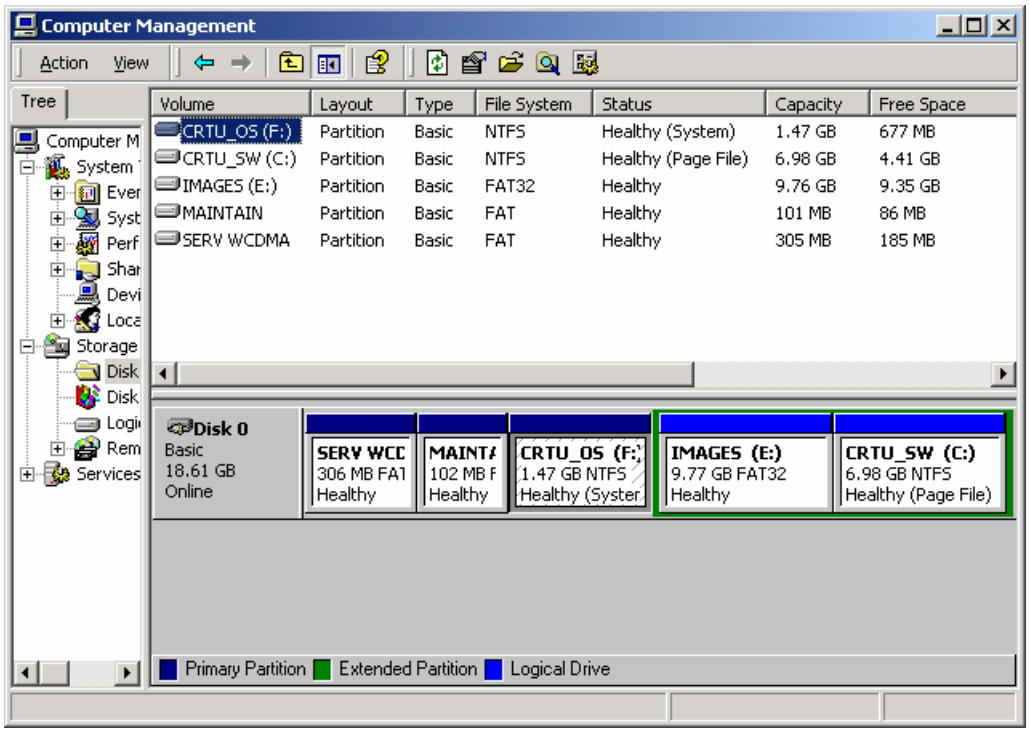


Fig. 4-2 Drive mapping after booting the GSM Operation Software (old partition structure)

Table 4-1 Software packages, boot partitions and hard disk partitions

Software package		**Hard disk partition**
CRTU-RU MS software		SERV_WCDMA
Additional software tools (software organization, backup)		MAINTAIN
GSM operational software and test packages		CRTU_OS

"New" Partition Structure

The hard disk with the "new" structure of a CRTU Radio Unit is divided into 4 partitions:

1. SERV_WCDMA partition, 1.99 GB, FAT format
2. MAINTAIN partition, 517 MB, FAT format
3. CRTU_SW partition, 61.76 GB, NTFS format
4. Extended partition, 10.287 GB

The extended partition contains two logical drives:

1. IMAGES drive, 9.77 GB, NTFS format
2. RAMDISK drive, 517 MB, NTFS format

Note: *Behind the extended partition there is some unallocated space which is necessary for the hard disk cloning process during device production.*

If the DOS OPSW / Service partition is booted, only one drive will be visible:

- SERV_WCDMA (C:)

If the Maintenance (backup) partition is booted, the following drives will be visible:

- MAINTAIN (C:)
- PCMCIA Card 1 (D:) (right slot)
- PCMCIA Card 2 (E:) (left slot)

If the Windows OPSW partition is booted, the following drives will be visible:

- CRTU_SW (C:)
- RAMDISK (D:)
- IMAGES (E:)

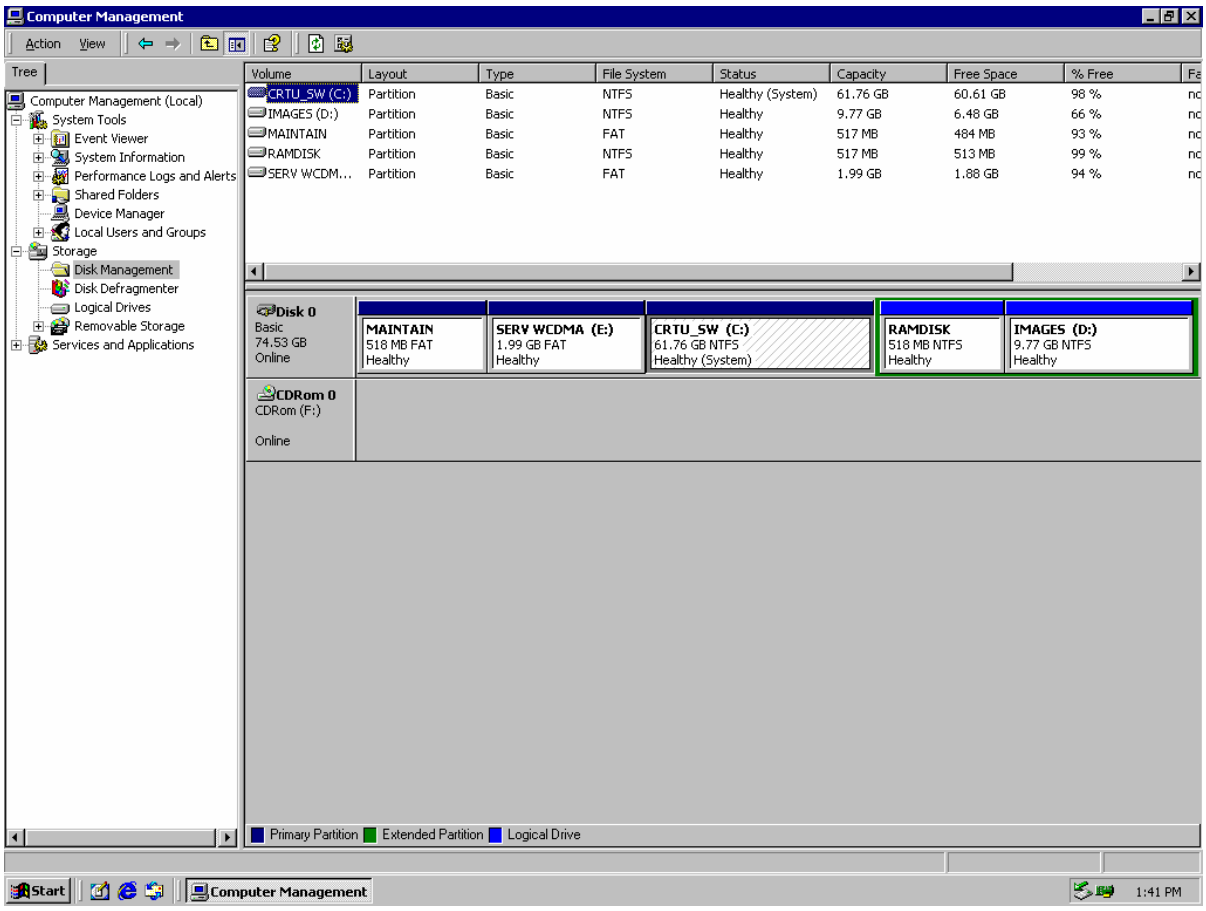
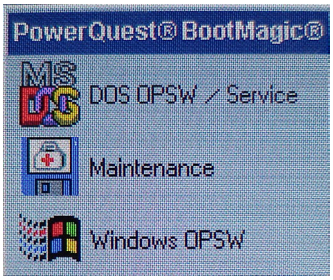


Fig. 4-3 Drive mapping after booting the Windows OPSW (new partition structure)

Table 4-2 Software packages, boot partitions and hard disk partitions

Software package		**Hard disk partition**
CRTU-RU MS software		SERV_WCDMA
Additional software tools (software organization, backup)		MAINTAIN
GSM operational software and test packages		CRTU_SW

Maintaining and Restoring Hard Disk Partitions

The tool Drive Image (please refer to the original Drive Image documents provided with the CRTU Radio Unit to learn how to create and restore images) is used to create images of the used partitions and logical drives. So it is easily possible to restore a faulty partition from these images.

Location of the images (when booting from MAINTENANCE partition):

- Standard images created ex factory or by service personnel:
  D:\stdimage for "old" partition structure
  \\.\disk1.part5\stdimage for "new" partition structure
- Images created by the user:
  D:\usrimage for "old" partition structure
  \\.\disk1.part5\usrimage for "new" partition structure

Start Drive Image:

- Connect the instrument to the mains.
- Connect the external USB keyboard and USB mouse to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU-Radio Unit.
- Select the *Maintenance* software module of the BootMagic startup menu.
- Select: *Drive Image Backup and Restore Software*

Note: *It is possible that Drive Image produces one or more error messages on partition table errors which can be ignored according to Power Quest support. In case one of these error messages appears, press the OK button, because otherwise Drive Image will not work properly.*

Note: *It is also possible to select a Netware or Windows network access configuration. This enables the operator to directly create or restore images on a network drive. But this requires to configure the network access for DOS and to be familiar with a DOS network client and the corresponding settings for the company network.*

As the Windows network access is usually much easier and most likely to be configured it is recommended to save and restore the images from the local hard disk.

It is possible to access the local hard disk image user directory (e:\usrimage) and the standard image directory (e:\stdimage) from the Windows environment.

Images Provided Ex Factory (\Stdimage)

Table 4-3 Images and image files

	Name of PowerQuest Image File	
	"old" part. structure	**"new" part. structure**
Service/WCDMA resp. DOS OPSW / Service partition image	service.pqi	SERV3_21.PQI
Maintenance (backup) partition image	maintain.pqi	MAINT4_2.PQI
Windows system logical drive image	ecrtu_os.pqi	crtu_sw.pqi
GSM operational software logical drive image	ecrtu_sw.pqi	

Updating Factory Images

Note: *For R&S production and service only.*

Any time when the "CRTU-RU MS Base SW" or "CRTU-RU MS GSM SW" or "CRTU-RU MS WCDMA SW" is updated or modified, the Service/WCDMA resp. DOS OPSW / Service partition image must be recreated: **service.pqi resp. SERV3_21.PQI**.

Creating User-Specific Images

Please refer to the original Drive Image documents provided with the CRTU Radio Unit to learn how to create images.

Note: *This is the recommended backup procedure for the Windows environment. Only applicable for hard disks with "old" partition structure.*

In order to backup the Windows environment, always create both images (Windows system drive and Windows CRTU-G software drive). Otherwise consistency is not guaranteed.

Restoring Existing Images

Please refer to the original Drive Image documents provided with the CRTU Radio Unit to learn how to restore images.

Note: *In order to restore the Windows environment, always restore both images (Windows system drive and Windows CRTU-G software drive). Otherwise consistency is not guaranteed. Only applicable for hard disks with "old" partition structure.*

Front Module Controller Bios

The Bios configures the Front Module Controller to support the CRTU-RU MS software and the GSM Protocol Testing software. Special settings allow Windows 2000 to access the hardware without conflicts.

Only the CRTU Radio Unit default settings are guaranteed to work properly.

Front Module Controller Bios Update

- Connect the instrument to the mains.
- Connect the external keyboard to an USB connector of the CRTU Radio Unit.
- Switch on the CRTU-Radio Unit.
- Select the Service/WCDMA resp. DOS OPSW / Service software module of the BootMagic startup menu.
- During startup observe the display.
- When three BEEPS can be heard, press the softkey to the left upper side of the LCD: C:\ will appear.
- Insert a flash disk with the program FLASH FMR6 including the batch FLASHFM6.bat (all this is available on R&S Lotus Notes Service Board) in the PCMCIA slot 0 (right drive D:).
- Call the batch with D:\FLASHFM6.BAT.
- During the programming of the flash EEPROM the CRTU Radio Unit must not be switched off.
- When the prompt C:\ appears then switch off and on the CRTU Radio Unit.
- Press the key DEL (delete) on the external keyboard in order to access the Setup menu.
- Choose the item LOAD CRTU RU DEFAULTS and press ENTER; quit with y and ENTER.
- Exit Bios Setup with key ESC and quit with y (save changes and exit) and press ENTER.

CRTU-RU MS Software

In the framework of GSM Protocol Testing the CRTU-RU MS software is only used for service purposes. It enables remote-controlled automatic determination of compensation data and calibration of the CRTU Radio Unit. In the framework of WCDMA Testing the software is also used as a regular operational software. The CRTU-RU MS software is booted by selecting the *Service/WCDMA* resp. DOS OPSW / Service option in the *BootMagic*™ menu.

The Correction Processor firmware is part of the CRTU-RU MS software. It is installed and activated automatically during CRTU-RU MS software installation.

CRTU-RU MS Software Installation or Update

The CRTU-RU MS software is loaded or updated using the instrument's PCMCIA INTERFACE. The software update is considerably facilitated by the *VersionManager*. This tool enables convenient installation, deletion and activation of different software versions. It also permits to perform a firmware update of modules after module replacement (see chapter 2, *Automatic Adjustment of Module Data)*.

The CRTU Radio Unit is always supplied with the latest software version including the *VersionManager*.

Note: *The newest CRTU software is also available for download on the R&S Lotus Notes Service Board.*

The PCMCIA INTERFACE provides two drive slots. Both slots can be used for a software update. On start-up, the CRTU Radio Unit automatically searches for an installation medium in both slots. The flash disks and the hard disk (type 3) have a small groove on one side; the disks are to be inserted into the drive slot with the groove pointing upwards. Hard disks can be inserted into the right drive slot (Slot 0) only .

To perform the software update, the instrument must be switched off, then the software update flash disk or hard disk must be inserted into the PCMCIA INTERFACE and the instrument switched on. If the CRTU-RU detects an update flash disk/hard disk in one of the two PCMCIA slots, the *VersionManager* is started:

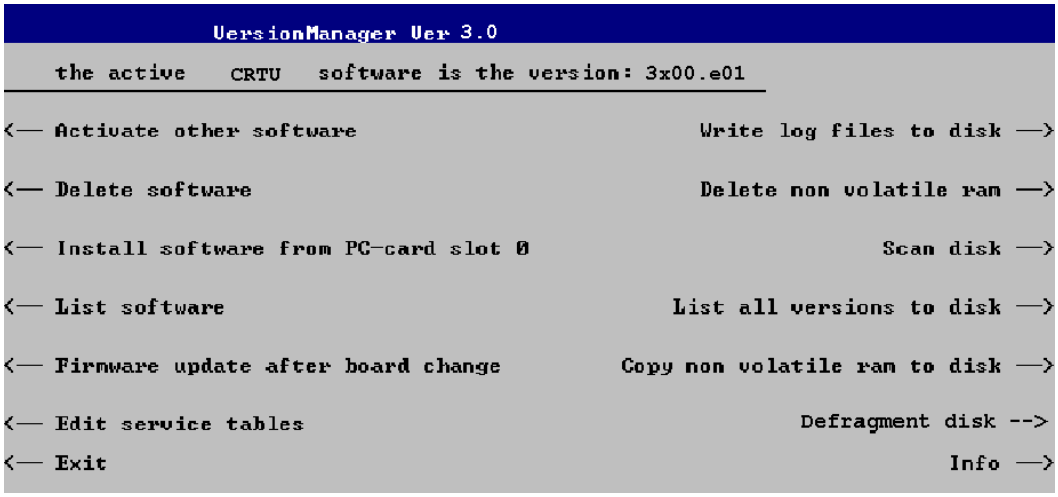


Fig. 4-4 VersionManager

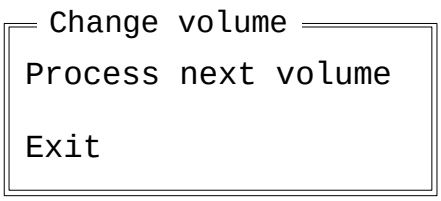
In the above menu, an action can be selected using the softkey located to the left or right of the arrow.

➢ For the software update select *Install software from PC-card slot 0 (1)*.

A list of all firmware installation versions available on the PCMCIA card is displayed.

- Use the cursor keys or the spinwheel to scroll through the list and select the desired version.
- Press *Install* to start the installation.

The software update starts automatically. If necessary, the CRTU-RU issues the *Change volume* message to indicate that the flash disk or hard disk must be changed.



- Replace the current disk with the next one.
- Use the cursor up/down keys to select “Process next volume” (default setting).
- Press *ENTER* to confirm that the new disk has been inserted and to continue the installation.

After processing the last disk the CMU displays a screen providing the *Finish installation* option.

- Remove all disks from the drive and press *Finish installation*.

The *VersionManager* is closed and the CMU is rebooted. The new firmware is now operational and automatically activated in the next measurement session.

Reinstalling Old Software

As described above, each software version, even older versions, can be simply loaded from a appropriate flash disk or hard disk using the *VersionManager*. It is also possible to keep several software versions stored on the internal hard disk of the CRTU Radio Unit and reload them, if required, using the *VersionManager*. To this end, proceed as follows:

- Switch on the CRTU-RU.
- After the boot-up sequence is terminated (from the moment when the CRTU-RU display turns black until the end of the 3-beep acoustic signal), press the *MENU SELECT* key.

The *VersionManager* is started. The display is as shown in Fig. 4-4 above.

- Press *Activate other software* to retrieve a list of the software versions that are already installed on the internal hard disk of the CRTU Radio Unit.
- Use the cursor keys or the spinwheel to scroll through the list and select the desired version.
- Press *Activate* to activate the selected version.

The selected software version is activated. After terminating the firmware update of the hardware boards, the CRTU-RU starts the new software version and is ready for use.

Note: *If the* VersionManager *on the CRTU-RU hard disk is inadvertently deleted, it is not easily possible to reinstall a new version. We recommend to replace the hard disk by a programmed hard disk with a complete basic software installation on it (see part list for programmed exchange hard disks: current number 310). Replacement of the hard disk is described in chapter 3, section* Replacing the Hard Disk in the FRONT MODULE*.*

Installing Hardware Options

The following hardware options are available for the CRTU Radio Unit:

Option OCXO REFERENCE OSC. $2*10^{-7}$ Aging/year	CRTU-B2	1139.0396.02
Option LINKHANDLER	CRTU-B5	1139.0209.02
Option MAC SPEECH	CRTU-B6	1139.0280.02
Option IQIF BOARD	CRTU-B7	1139.0009.02

In addition, the 19" adapter ZZA-411 (standard installation kit with bracket), stock no. 1096.3283.00, is available for mounting the instrument into a rack.

Depending on the model ordered and the software configuration, the CRTU Radio Unit comes with part of the options installed in the factory. For retrofitting, the instrument must be opened. Proceed according to the mounting instructions enclosed with the option; see also chapter 3, section *Module Replacement*. Please observe the safety instructions at the beginning of this manual and the general hints given below. Mounting instructions can be filed into the service manual so they are available whenever they are required.

Caution!

Disconnect the instrument from the mains before opening the casing. Also note the safety instructions at the beginning of this manual.

The components used in the instrument are sensitive to electrostatic discharges which is why they are to be handled in accordance with the ESD regulations.

When installing hardware options please note the following:

- Switch off instrument and pull the mains plug.
- Unscrew rear panel feet of the rear side (four Torx screws, size 20).
- Place the instrument onto the front carrying handles, push the tube upwards and take off.
- After installing the option replace the tube and fasten the rear panel feet again.

Caution!

When replacing the tube take care not to damage or pull off cables.

- Switch on CRTU Radio Unit. Install additional software, if supplied, according to the instructions (see previous sections) or enable the additional software functions (see installation instructions for the software options).

The software will then automatically detect the installed option. If an adjustment is required for this option, the necessary instructions are included in the installation instructions for the option.

Contents

5 Documents

This chapter contains the documents for the CRTU Radio Unit. The documents for the modules with the description of function, adjustment and interfaces are relegated to the Service Manual, Stock no. 1110.4903.92. To order replacement parts and modules please contact our *spare parts express service* or your Rohde & Schwarz service representative and note the hints given in the following section, *Module and Cable Exchange*.

The address of our *spare parts express service* and a list of Rohde & Schwarz representatives can be found at the beginning of this service manual.

Module and Cable Exchange

Table 5-1 at the end of this section lists all power cables available. The stock numbers necessary for ordering replacement parts and modules can be found in the component lists further down.

Important Note!

When replacing a module please note the safety instructions and the repair instructions given in chapter 3 of this service manual.

Ordering replacement parts

To deliver replacement parts promptly and correctly we need the following indications:

- Stock number (see component lists in this chapter)
- Designation
- Component number according to component list
- Number of pieces
- Instrument type the replacement part belongs to
- Contact person for possible questions

Replaced modules

Replaced modules are an economic alternative for original modules. It should be kept in mind that replaced modules are not new, but repaired and fully tested parts. They may have traces from use but they are electrically and mechanically equivalent to new modules.

To find out which replaced modules are available, please refer to your Rohde & Schwarz representative (or to the central service division, Rohde & Schwarz Munich). The identification number is usually the same as for the original module, but with a variant index .95, .96, .97 or .98.

Ordering and delivery of replaced modules

For ordering replaced modules, the same indications as for ordinary parts are required, however, with the corresponding variant index appended to the stock number.

Taking back defective replacement modules

Defective modules of the replacement program which can be repaired are taken back within **3 months** after delivery of the replaced module. A repurchasing value is credited.

Excluded are parts which can not be repaired, e.g. PCBs that are burnt, broken or damaged by repair attempts, incomplete modules, parts which are heavily damaged mechanically.

The defective parts must be sent back with a **returned accompanying document** containing the following information:

- Stock number, serial number and designation of the dismounted part,
- **Precise** description of the error,
- Stock number, serial number and designation of the instrument the part was dismounted from,
- Date of dismounting,
- Name of the technician who exchanged the part.

A returned accompanying document is provided with each replacement module.

Table 5-1 List of power cables available

Stock No.	**Earthed-contact connector**	**Preferably used in**
DS 006.7013	BS1363: 1967 complying with IEC 83: 1975 standard B2	Great Britain
DS 006.7020	Type 12 complying with SEV-regulation 1011.1059, standard sheet S 24 507	Switzerland
DS 006.7036	Type 498/13 complying with US-regulation UL 498, or with IEC 83	USA/Canada
DS 006.7107	Type SAA3 10 A, 250 V, complying with AS C112-1964 Ap.	Australia
DS 0025.2365 DS 0099.1456	DIN 49 441, 10 A, 250 V, angular DIN 49 441, 10 A, 250 V, straight	Europe (except Switzerland)

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Overview of Spare Parts

for CRTU Radio Unit

List of Spare Parts for CRTU Radio Unit

The CRTU Radio Unit is constructed in accordance with R&S design 2000.

Overall dimension: W x H x L, 465 mm x 193 mm x 517 mm

Rackmount: 4E 1/1 T450

Note: *The parts which are fitted with a Current No. can be ordered as spare parts.*

Current No.	Designation	Stock No.	Electr. No.
10	Instrument frame	1090.9221.00	
20	Instrument fan	1091.1001.00	
30	Instrument fan cover	1091.0840.00	
40	Cover	1100.0872.00	
50	Maintenance label	1138.4352.00	
60	Part of the mounting plate	1138.4346.00	
70	Locking bracket	1091.0405.00	
80	Power Splitter 2way	1138.6490.00	A101
90	Attenuator 3dB	1127.9441.00	R1
100	Cover hood medium	0528.8500.00	
110	Front panel	1138.4400.00	
120	FRONT MODULE MODEL 16 = COLOR DISPLAY Model 16, 256 MB / FMR6/5	1090.9244.16	A 1
130	Keyboard frame	1091.2572.00	
140	Keyboard mat	1091.2543.00	
145	Keyboard membrane	1091.2550.00	A 15
150	Mounting plate	1090.9521.00	

Current No.	Designation	Stock No.	Electr. No.
160	Shielded filter plate	1091.2014.00	
170	RF Spring long	1069.3011.00	
180	RF Spring short	1069.3105.00	
190	Plate support	0852.0844.00	
200	LCD	0048.6980.00	A 14
210	Display connector	1091.2620.00	A 15
220	Spinwheel VAR 12	0852.1134.00	B 12
230	Rotary knob	0852.1086.00	
240	DC/AC converter	0048.6996.00	T 13
250	Converter connector	1091.2643.00	W 13
260	Panel	1090.9538.00	
270	FRONT MODULE CONTROLLER Var. 16	1091.2520.00	A 4
280	Lithium battery CR 2032	0858.2049.00	
290	Memory MODULES 256 MB (SODIMM –144)	1138.6578.00	
300	Fan	1091.0292.00	E 10
310	Hard disk programmed	1138.4223.00	D 1
320	RF FRONTEND	1100.3120.02	A 20
330	Fan	1100.3088.00	
340	REFERENCE BOARD	1100.2600.02	A 10
350	RX/TX BOARD1	1100.1733.02 1135.6702.02[1]	A 3
360	TR CORRECTION MODULE	1100.1604.02	A 301

1 New RXTX BOARD1 1135.6702.02 replaces old RXTX BOARD1 1100. 1733.02

Current No.	Designation	Stock No.	Electr. No.
370	RX/TX BOARD2	1100.1733.02 1135.6702.02[2]	A 4
380	TR CORRECTION MODULE	1100.1604.02	A 301
390	DIGITAL BOARD	1100.1791.03	A 7
400	DIGITAL BOARD	1100.1804.02	A 700
410	DDC MODULE1	1100.2300.03	A 710
420	DDC MODULE2	1100.2300.03	A 730
430	AUC MODULE1	1100.2500.02	A 760
440	AUC MODULE2	1100.2500.02	A 780
450	TXDSP MODULE1	1100.2100.03	A 750
460	TXDSP MODULE2	1100.2100.03	A 770
470	ADC MODULE1	1100.2200.02	A 720
480	ADC MODULE2	1100.2200.02	A 740
490	MOTHERBOARD Set consists of 5 parts	1138.5607.02	A 200
500	PCMCIA INTERFACE	1100.5616.02	A 102
510	Card slot	1047.2006.00	
520	POWER SUPPLY	1091.1982.00	A 100
	CRTU-B2 OCXO REFERENCE OSC.	1139.0396.02	
530	OCXO REFERENCE OSC.	1100.2900.04	
	CRTU-B5 LINKHANDLER	1139.0209.02	
540	LINKHANDLER	1135.5406.02	A 6

[2] New RXTX BOARD1 1135.6702.02 replaces old RXTX BOARD1 1100. 1733.02

Current No.	Designation	Stock No.	Electr. No.
545	LINKHANDLER	1135.5406.02	A 8
550	LINK HANDLER BOARD	1135.5412.02	
560	DSP MODULE (56311)	1135.4600.02	
561	DSP MODULE (56311)	1135.4600.02	
570	DSP MODULE (56301)	1135.5506.03	
571	DSP MODULE (56301)	1135.5506.03	
572	DSP MODULE (56301)	1135.5506.03	
573	DSP MODULE (56301)	1135.5506.03	
575	FLAT RIBBON CABLE	1138.4452.00	
576	FLAT RIBBON CABLE	1138.4469.00	
	CRTU-B6 MAC SPEECH	1139.0280.02	
580	MAC SPEECH	1135.5793.02	A9
590	MAC SPEECH BOARD	1135.5806.02	
600	DSP MODULE (56301)	1135.5506.03	
605	DSP MODULE (56301)	1135.5506.03	
	CRTU-B7 IQ/IF INTERFACE	1139.0009.02	A 420
610	IQ/IF INTERFACE	1135.6125.02	
620	RF cable	1139.0044.00	W 500*
630	RF cable	1139.0050.00	W 502*
640	RF cable	1139.0073.00	W 506*
650	RF cable	1139.0080.00	W 507*

* as shown in drawing 1138.4352.00 sheet 1.

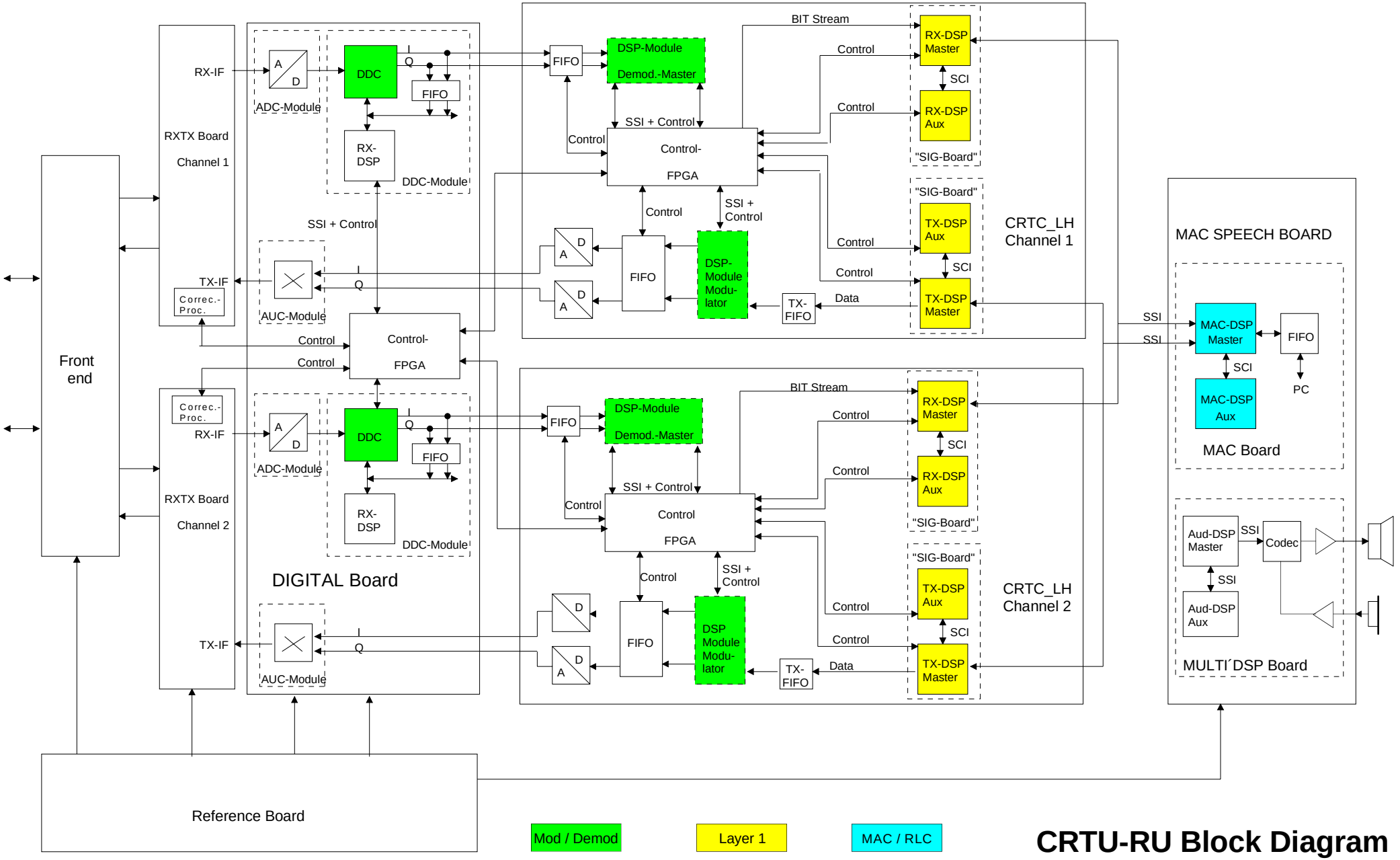
Current No.	Designation	Stock No.	Electr. No.
660	RF cable	1139.0096.00	W 508*
670	RF cable	1139.0109.00	W 509*
680	RF cable	1139.0115.00	W 511*
690	RF cable	1139.0138.00	W 516*
700	RF cable	1139.0144.00	W 517*
710	RF cable	1139.0150.00	W 518*
720	RF cable	1139.0167.00	W 519*
730	RF cable	1139.0173.00	W 521*
740	RF cable	1139.0373.00	W704*
750	RF cable	1100.3894.00	W 5*
760	RF cable	1100.3907.00	W 6*
770	RF cable	1138.4481.00	W 7*
780	RF cable	1138.4475.00	W 8*
790	RF cable	1100.3965.00	W 12*
800	RF cable	1100.3971.00	W 13*
820	RF cable	1100.3988.00	W 14*
830	RF cable	1100.4010.00	W 17*
840	RF cable	1100.4032.00	W 19*
850	RF cable	1100.4061.00	W 22*
860	RF cable	1100.4078.00	W 23*
870	RF cable	1100.4084.00	W 24*

* as shown in drawing 1138.4352.00 sheet 1.

Current No.	Designation	Stock No.	Electr. No.
880	RF cable	1100.4110.00	W 27*
890	RF cable	1100.4132.00	W 29*
900	RF cable	1138.6249.00	W 41*
910	RF cable	1138.6255.00	W 42*
920	RF cable	1138.6261.00	W 43*
930	RF cable	1138.6278.00	W 44*
940	RF cable	1100.4155.00	W 31*
950	RF cable	1100.4161.00	W 32*
960	RF cable	1100.4178.00	W 33*
970	RF cable	1100.4190.00	W 35*
980	RF cable	1100.4203.00	W 36*
990	RF cable	1100.4210.00	W 37*
1000	RF cable	1138.5707.00	W 201
1010	RF cable	1138.5713.00	W 202
1020	RF cable	1138.5720.00	W 203
1030	RF cable	1138.5736.00	W 204
1040	RF cable	1138.5742.00	W 205
1050	RF cable	1138.5759.00	W 206
1060	RF cable	1138.0067.00	W 504
1070	RF cable	1138.0121.00	W514
1080	Tube	1100.0743.00	
1090	Front grip	1096.1480.00	

* as shown in drawing 1100.0872 sheet 1.

Current No.	Designation	Stock No.	Electr. No.
1100	Screw	1096.4780.00	
1110	Rear panel foot	1096.2493.00	
1120	Instrument foot	1096.2506.00	
1130	Carrying handle	1096.2670.00	
1140	Tube hood	1096.2558.00	



CRTU-RU Block Diagram

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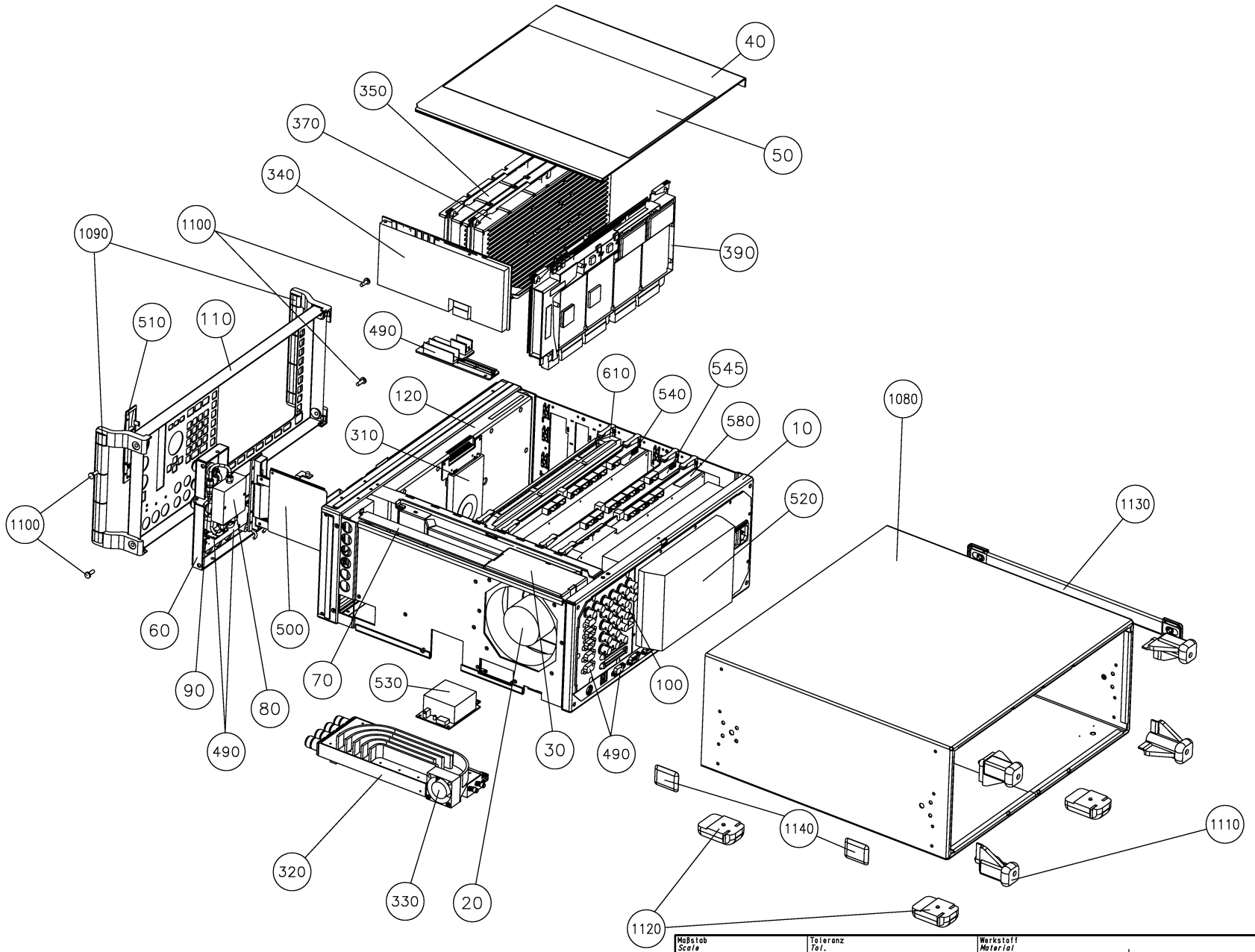
Drawings

of all

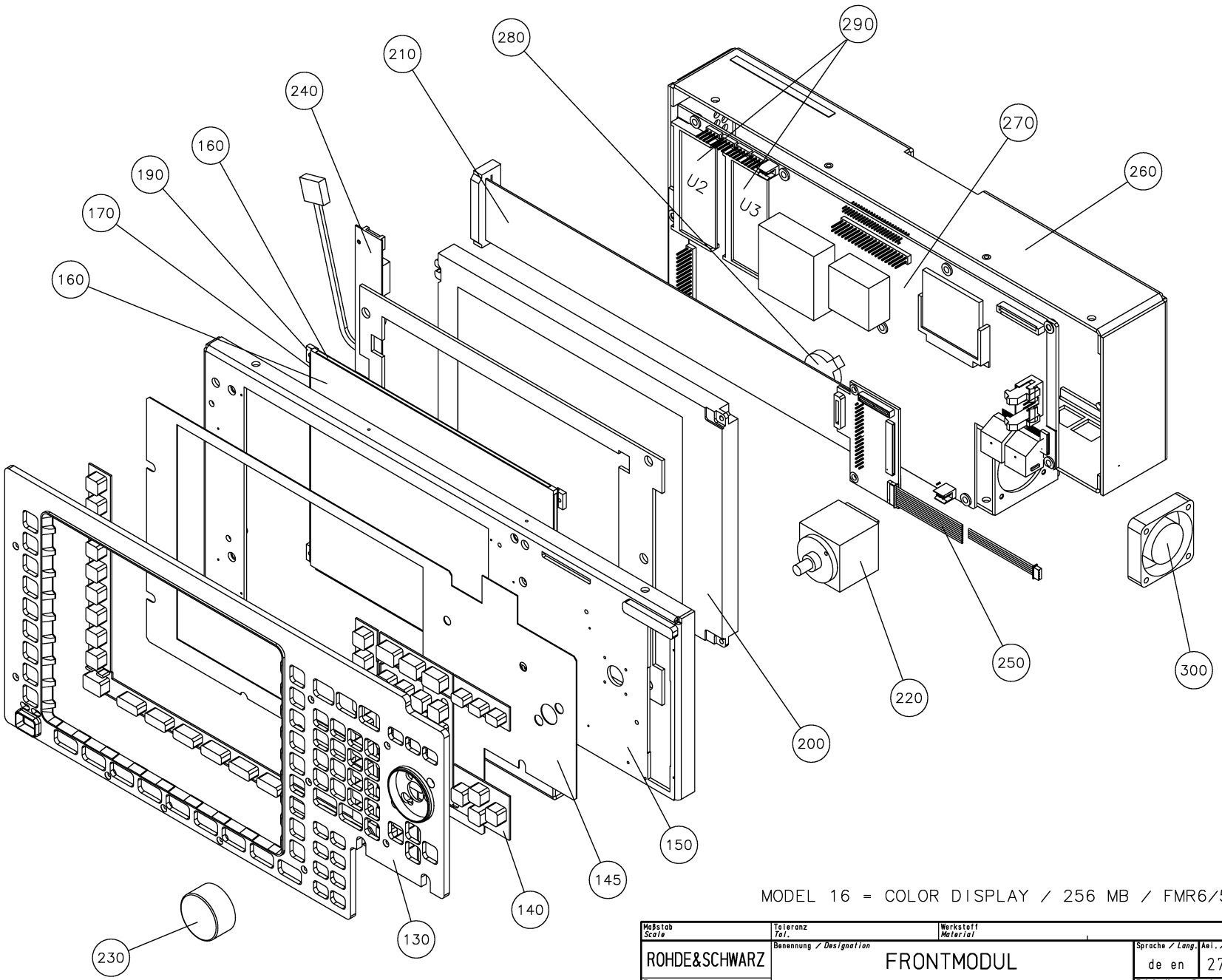
Radio Unit R&S CRTU-RU Modules



Projektions-methode

Projection Method

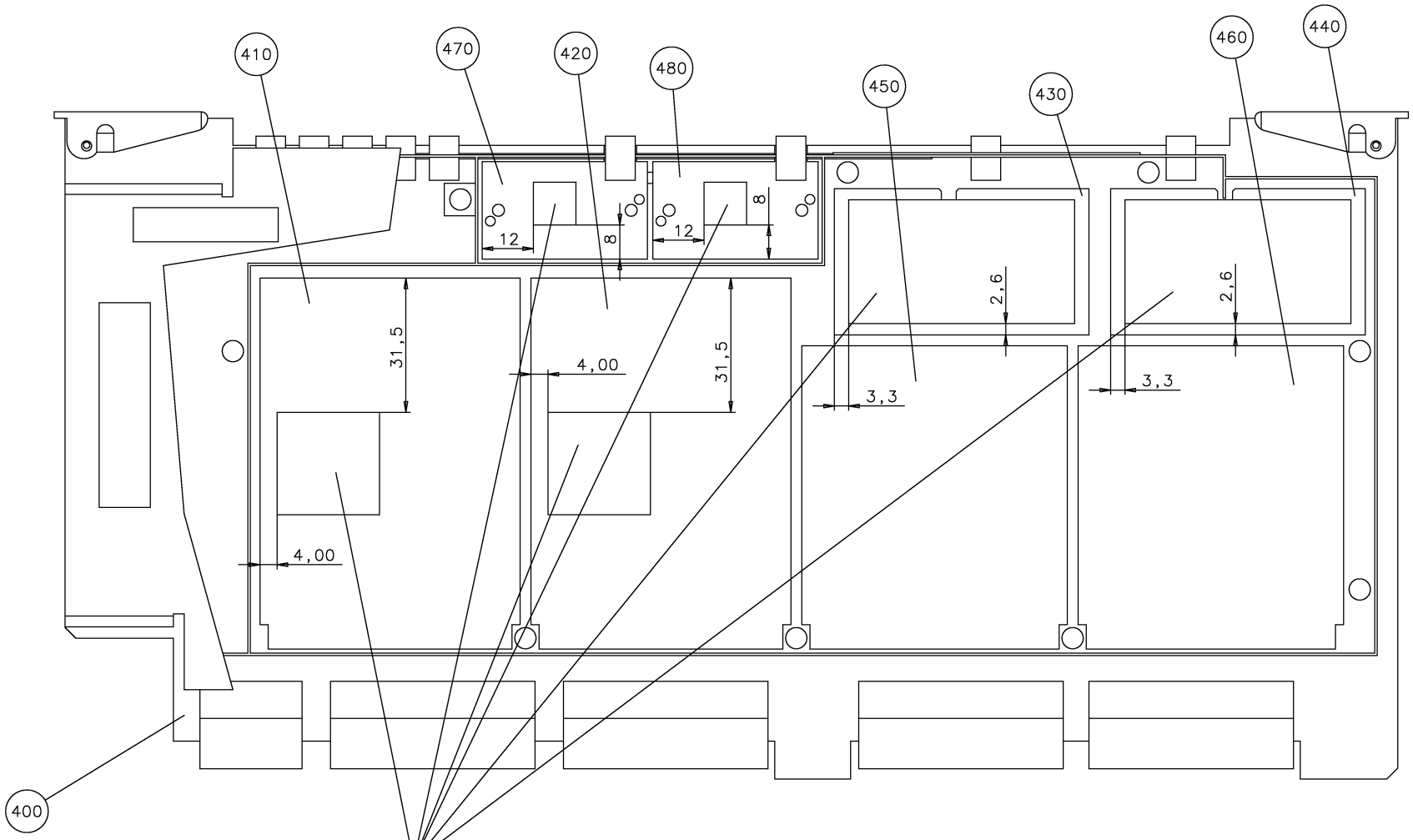
Maßstab *Scale*	Toleranz *Tol.*		Werkstoff *Material*				
ROHDE&SCHWARZ	Benennung / *Designation* CRTU-RU RADIO UNIT				Sprache / *Lang.* de en	Aei. / *C.I.* 10.00	Blatt / *Sh.* 2
Typ *Type* CRTU-RU					Zeichn.Nr. / *Drawing No.* 1138.4000.01		D
I.Z. *used in*	Datum *Date* 25.06.2001	Abteilung *Dept.* 1CMK	Name *Name* Bi				



MODEL 16 = COLOR DISPLAY / 256 MB / FMR6/5

Projektions-methode
Projection Method

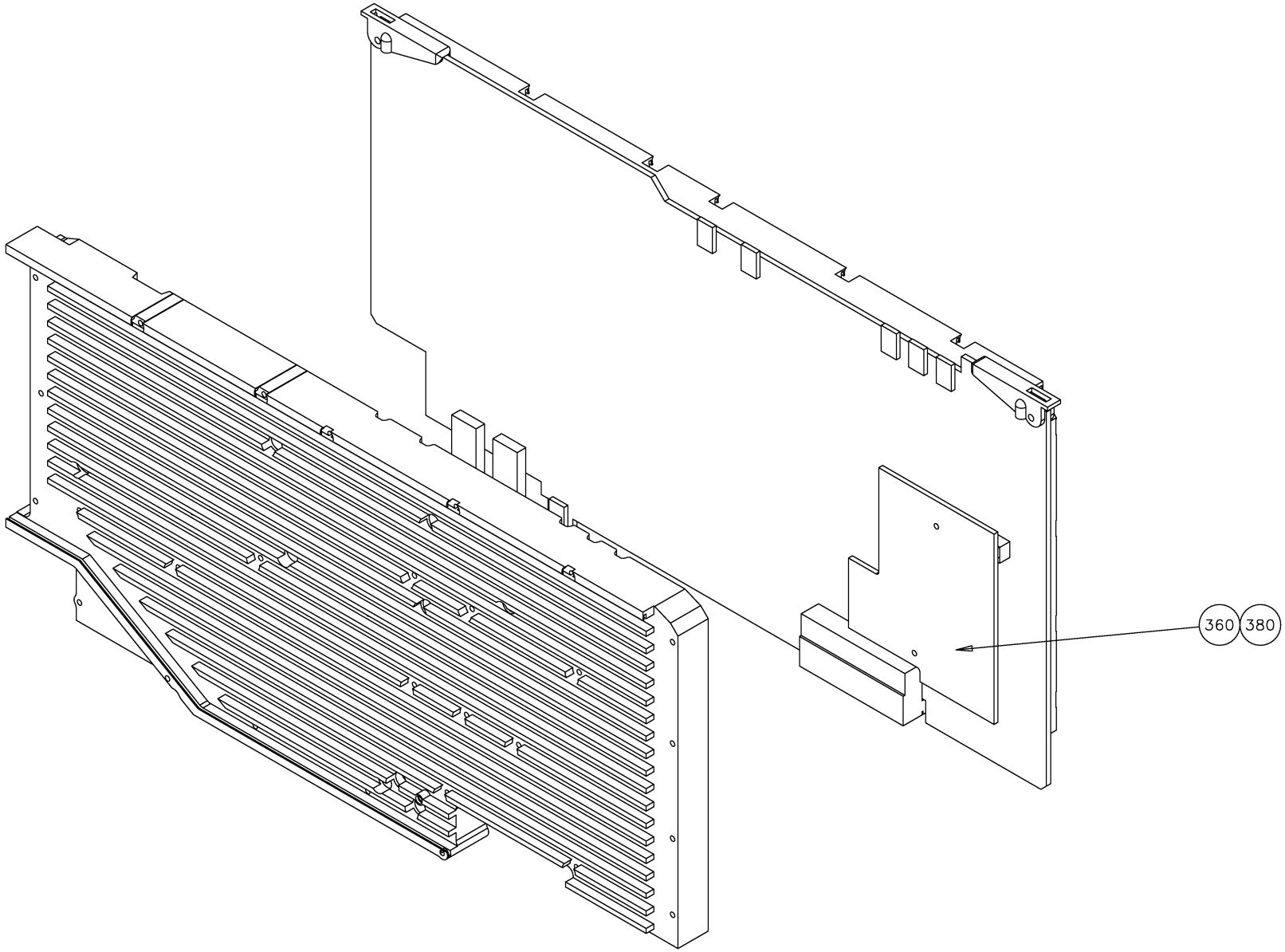
Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*			
ROHDE&SCHWARZ	Benennung / *Designation* FRONTMODUL			Sprache / *Lang.* de en	Ael. / *C.I.* 27.00	Blatt / *Sh.* 7
Typ *Type* PSP				Zeichn.Nr. / *Drawing No.* 1090.9244.01 D	
i.Z. *used in*	Datum *Date* 25.06.2001	Abteilung *Dept.* 1CMK	Name *Name* Bi		



Affix the supplied heat conducting mat with its adhesive side to the sandwich module as shown

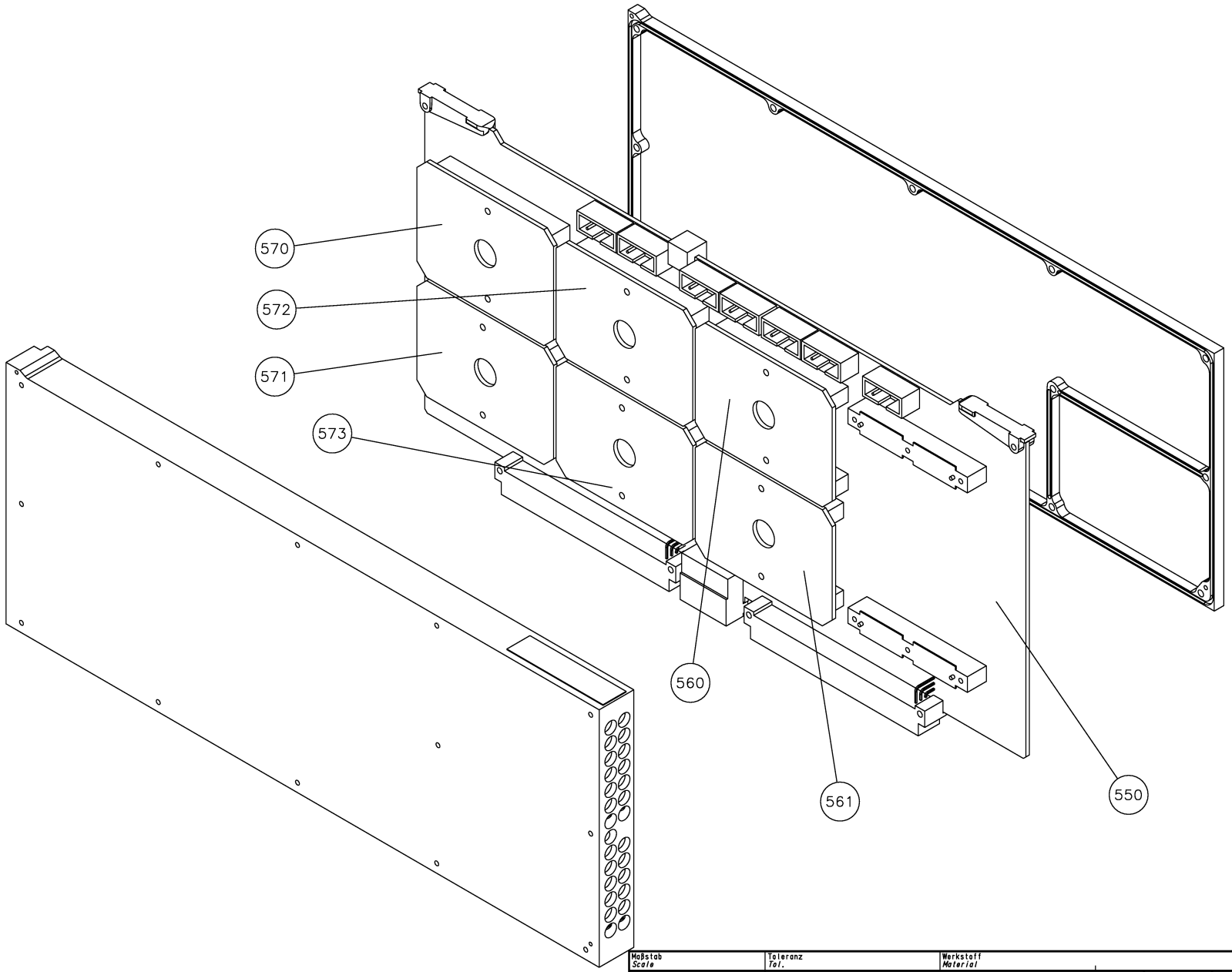
Projektions-methode
Projection Method

Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*			
ROHDE&SCHWARZ	Benennung / *Designation* DIGITALBOARD			Sprache / *Lang.* de en	Aei. / *C.I.* 05.00	Blatt / *Sh.* 3
Typ *Type* CMU				Zeichn.Nr. / *Drawing No.* 1100.1791.01 D	
1.Z. *used in*	Datum *Date* 26.06.2001	Abteilung *Dept.* 1CMK	Name *Name* Bi		



Projektions-methode
Projection Method

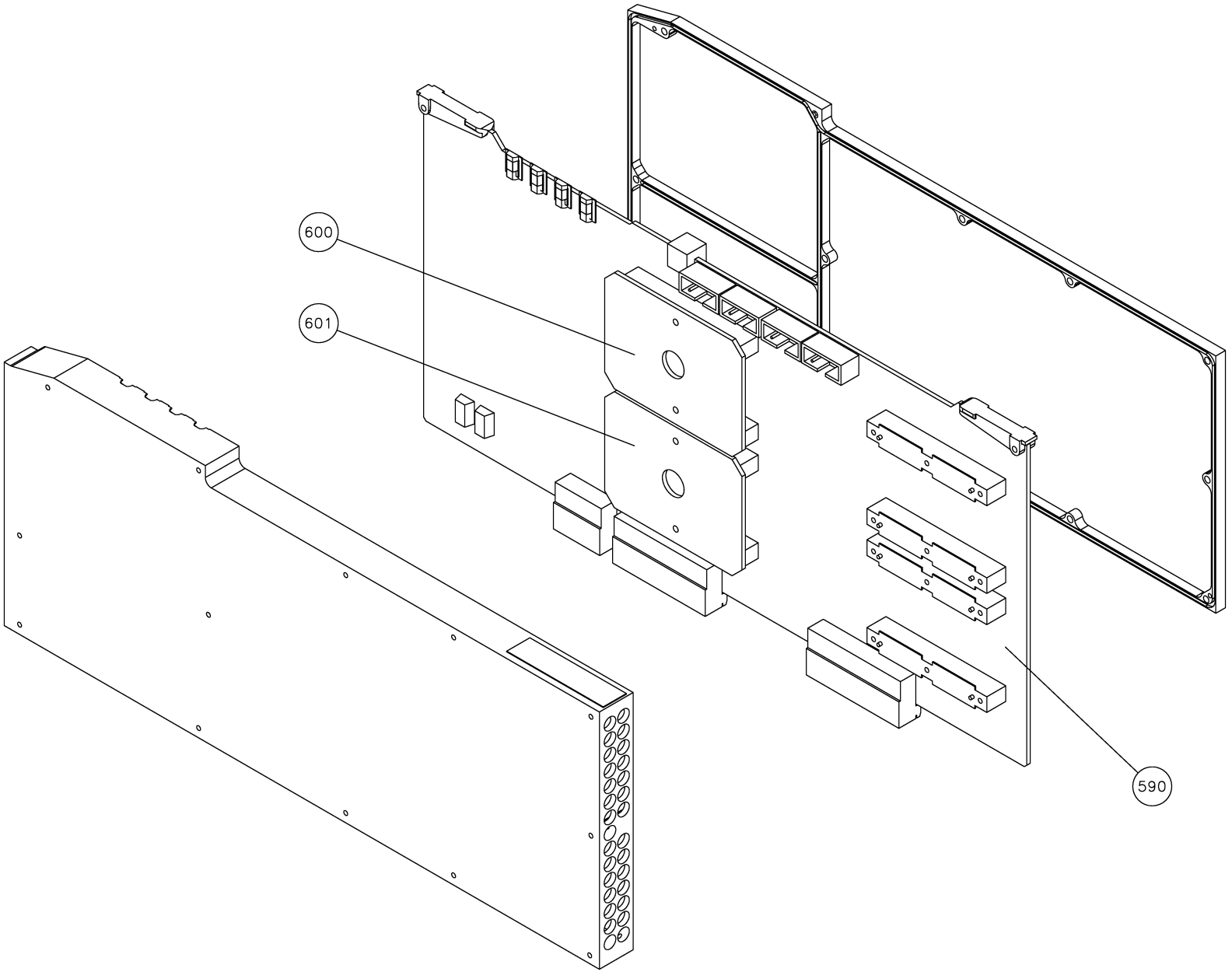
Maßstab *Scale*		Toleranz *Tol.*		Werkstoff *Material*			
ROHDE&SCHWARZ		Benennung / *Designation*	RX/TX BOARD			Sprache / *Lang.* de en	Aei. / *C.I.* 11.00	Blatt / *Sh.* 12
Typ *Type*	CMU					Zeichn.Nr. / *Drawing No.*		
1.Z. *used in*	1100.0008.01	Datum *Date*	27.06.2001	Abteilung *Dept.*	1CMK	Name *Name*	BI	1100.1733.01 DF



Projektions-methode

Projection Method

Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*	
ROHDE&SCHWARZ	Benennung / *Designation*	LINKHANDLER	Sprache / *Lang.* de en; Ausl. / *C.I.* 06.00; Blatt / *Sh.* 2
Typ *Type*			Zeichn.Nr. / *Drawing No.* 1135.5406.01 D
1.Z. *used in* 1138.4000.01	Datum *Date* 26.06.2001	Abteilung *Dept.* 1CMK	Name *Name* Bi



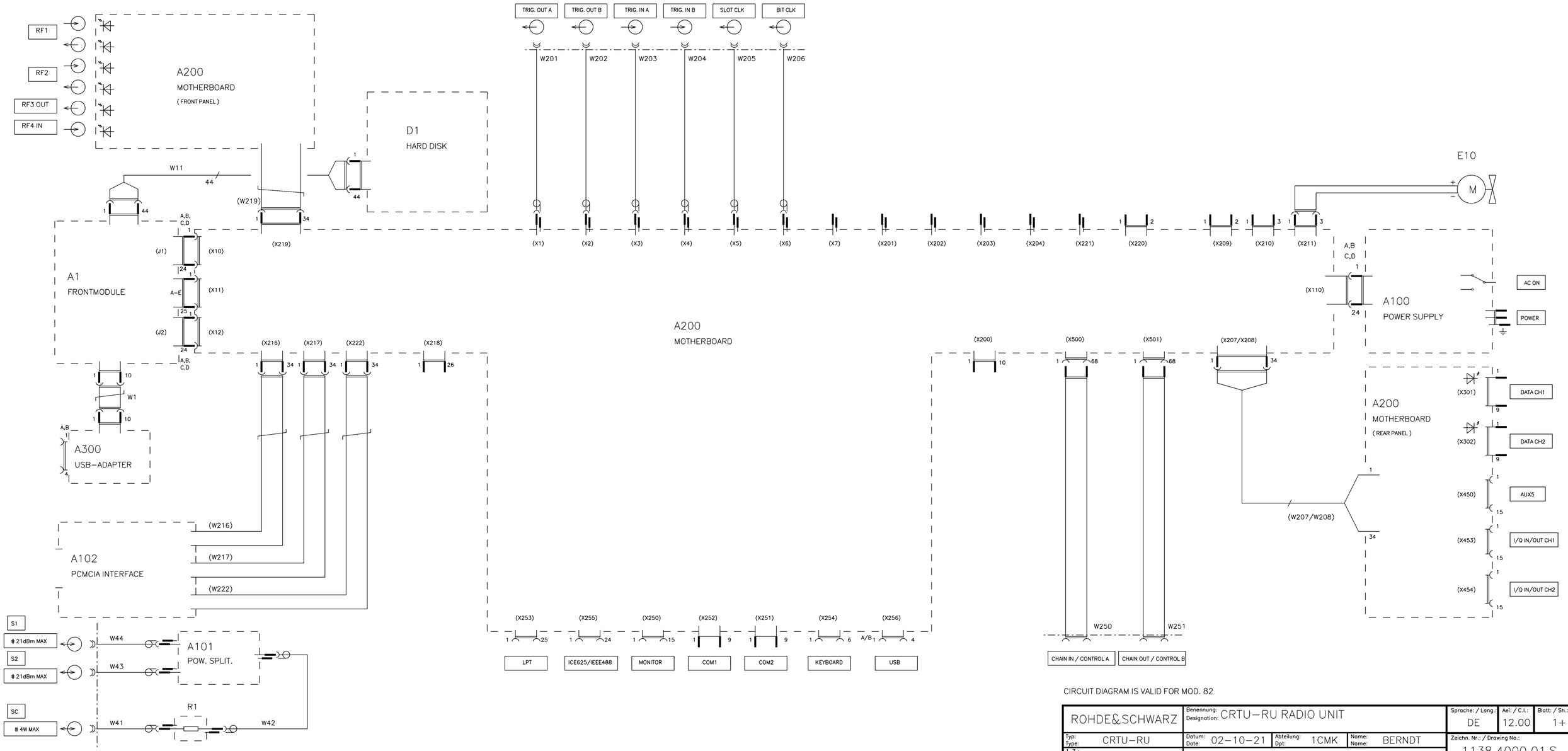
Projektions-methode
Projection Method

Maßstab *Scale*	Toleranz *Tol.*	Werkstoff *Material*					
ROHDE&SCHWARZ	Benennung / *Designation*	MAC SPEECH				Sprache / *Lang.* de en	Aei. / *C.I.* 05.00	Blatt / *Sh.* 2
Typ *Type*						Zeichn.Nr. / *Drawing No.*		
1.Z. *used in* 1138.4000.01	Datum *Date* 26.06.2001	Abteilung *Dept.* 1CMK	Name *Name* Bi			1135.5793.01	D	

ROHDE&SCHWARZ

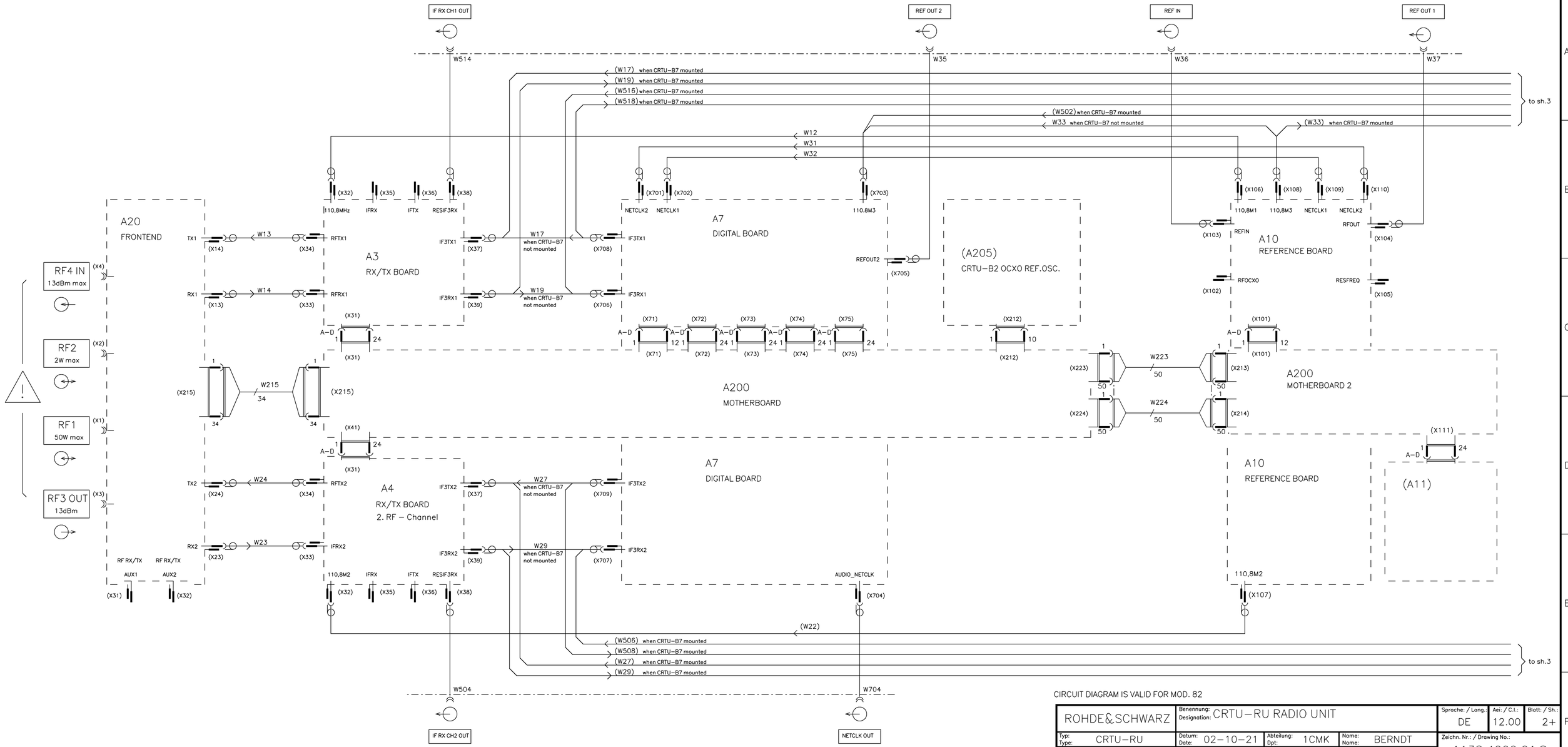
Circuit Diagrams

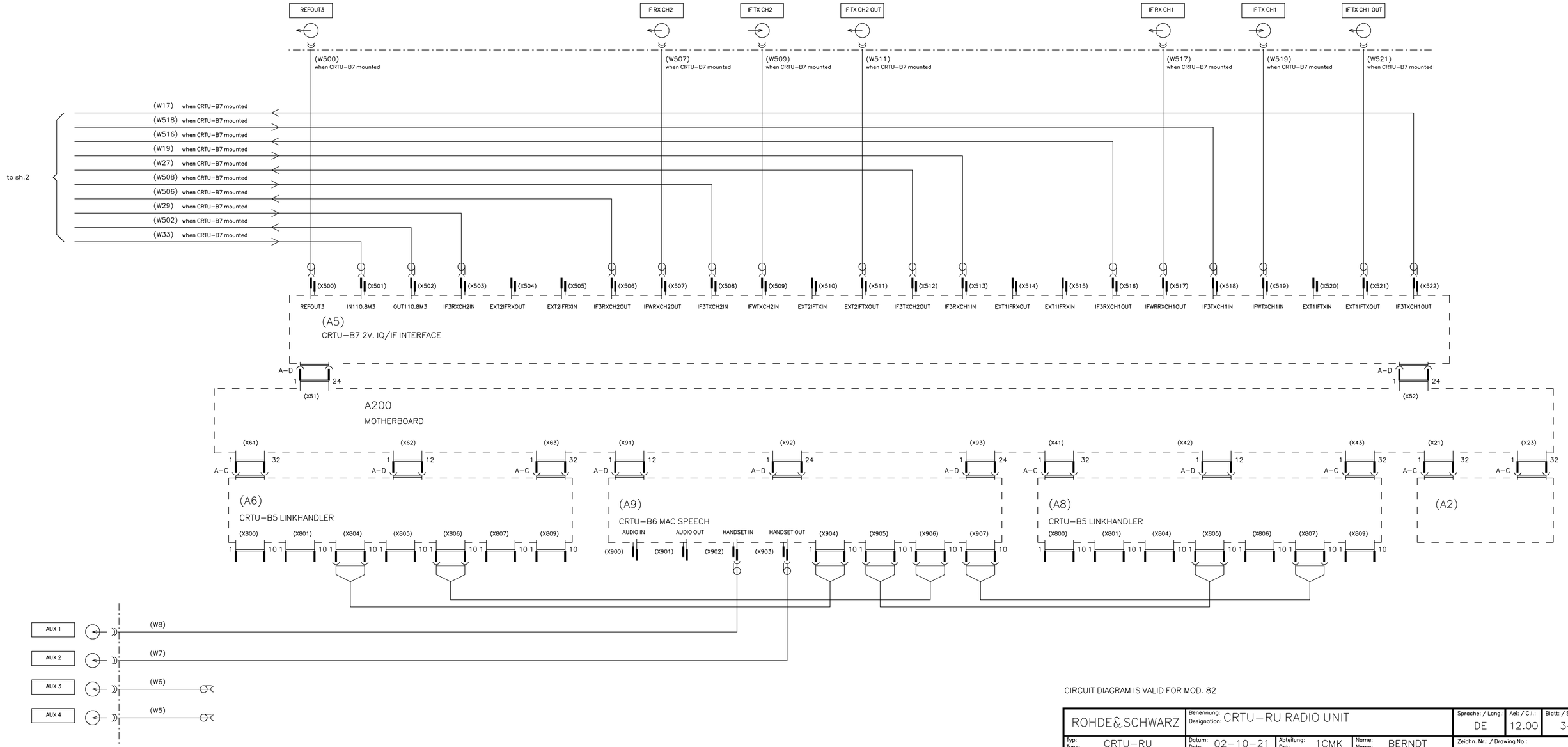
for Radio Unit R&S CRTU-RU



CIRCUIT DIAGRAM IS VALID FOR MOD. 82

ROHDE&SCHWARZ	Benennung: / Designation: CRTU–RU RADIO UNIT		Sprache: / Lang.: DE	Aei: / C.I.: 12.00	Blatt: / Sh.: 1+
Typ: / Type: CRTU–RU	Datum: / Date: 02–10–21	Abteilung: / Dpt: 1CMK	Name: / Name: BERNDT	Zeichn. Nr.: / Drawing No.: 1138.4000.01 S	
1. Z.: / used in:			TOP/TOP.1		



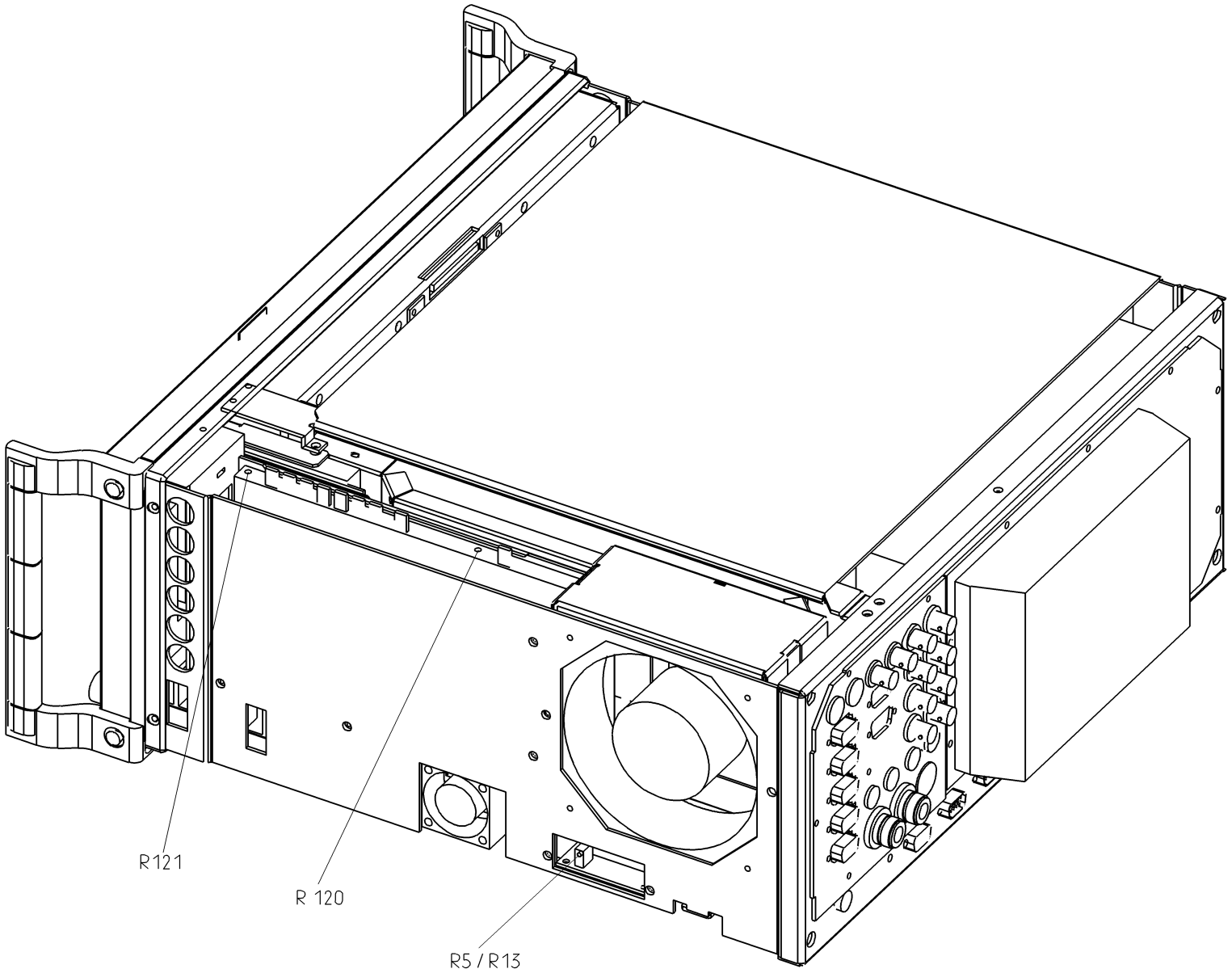


CIRCUIT DIAGRAM IS VALID FOR MOD. 82

ROHDE&SCHWARZ	Benennung: / Designation: CRTU-RU RADIO UNIT			Sprache: / Lang.: DE	Aei: / C.I.: 12.00	Blatt: / Sh.: 3-
Typ: / Type: CRTU-RU	Datum: / Date: 02-10-21	Abteilung: / Dpt: 1CMK	Name: / Name: BERNDT	Zeichn. Nr.: / Drawing No.: 1138.4000.01 S		
1. Z.: / used in:	TOP/TOP.3					

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
	ACHTUNG EGB /ATTENTION ESD VARIANTENERKLAERUNG VAR82=GRUNDAUSFUEHRUNG MOD82=BASIC MODEL VAR83=AUSF. F. CRTU–W MOD83=MODEL F. CRTU–W				
A1	ZE FRONTMODUL FRONT MODULE	1090.9244.16			1138.4000.01
A3 A4	EE RX/TX BOARD RX/TX BOARD	1100.1733.02			1138.4000.01
A7	ZE DIGITAL BOARD DIGITAL BOARD	1100.1791.05			1138.4000.01
A10	EE REFERENCE BOARD REFERENCE BOARD	1100.2600.02			1138.4000.01
A20	ED RF_FRONTEND RF FRONTEND	1100.3120.02			1138.4000.01
A100	GJ NETZTEIL 250W UL/CSA POWER SUPPLY	1091.1982.00	PULS	SN250 ÄNDERUNGSZUSTAND 03.01	1138.4000.01
A101	ER 2WEG–LEIST.TEILER3XSMA 2 WAY POWER SPLITTER	1138.6490.00	MINI–CIRCU	ZAPD–21–SMA	1138.4000.01
A102	ED PCMCIA INTERFACE CMU B12 PCMCIA INTERFACE	1100.5616.02			1138.4000.01
A200	ED MOTHERBOARD CRTU/RF MOTHERBOARD	1138.5607.02			1138.4000.01
A300	ED USB ADAPTER USB Adapter	1090.9280.02			1138.4000.01
D1	ZE HARD DISK PROGR. HARD DISK PROGR.	1138.4223.00			1138.4000.01
R1	FJ DAEMPFUNGSGL.3DB 2W K ATTENUATOR 3DB	1127.9441.00	INMET	40AH–03DB	1138.4000.01
W5	DV HF–KABEL CMU200 RF–CABLE	1100.3894.00			1138.4000.01
W6	DV HF–KABEL RF–CABLE	1100.3907.00			1138.4000.01
W7	DV HF–KABEL RF–CABLE	1138.4481.00			1138.4000.01
W8	DV HF–KABEL RF–CABLE	1138.4475.00			1138.4000.01
W11	DY FLACHBANDKABEL W11 CABLE W11	1091.0734.00			1138.4000.01
W12	DV HF KABEL RF CABLE	1100.3965.00			1138.4000.01
W13	DV HF–KABEL RF–CABLE	1100.3971.00			1138.4000.01
W14	DW HF–KABEL RF–CABLE	1100.3988.00			1138.4000.01
W17	DV HF KABEL RF CABLE	1100.4010.00			1138.4000.01
W19	DV HF KABEL RF CABLE	1100.4032.00			1138.4000.01
W22	DV HF KABEL RF CABLE	1100.4061.00			1138.4000.01
W23	DW HF KABEL W23	1100.4078.00			1138.4000.01
W24	DW HF KABEL W24	1100.4084.00			1138.4000.01
W27	DV HF KABEL RF CABLE	1100.4110.00			1138.4000.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller Bezeichnung *Manufacturer Designation*	enthalten in *contained in*
W29	DV HF KABEL RF CABLE	1100.4132.00		1138.4000.01
W31	DV HF KABEL RF CABLE	1100.4155.00		1138.4000.01
W32	DV HF–KABEL RF CABLE	1100.4161.00		1138.4000.01
W33	DV HF–KABEL RF CABLE	1100.4178.00		1138.4000.01
W35	DV HF KABEL RF CABLE	1100.4190.00		1138.4000.01
W36	DV HF KABEL RF CABLE	1100.4203.00		1138.4000.01
W37	DV HF KABEL RF CABLE	1100.4210.00		1138.4000.01
W41	DW HF KABEL W41	1138.6249.00		1138.4000.01
W42	DW HF KABEL W42	1138.6255.00		1138.4000.01
W43	DW HF KABEL W43	1138.6261.00		1138.4000.01
W44	DW HF KABEL W44	1138.6278.00		1138.4000.01
W201	DV HF–Kabel CABLE	1138.5707.00		1138.4000.01
W202	DV HF–Kabel	1138.5713.00		1138.4000.01
W203	DV HF–Kabel CABLE	1138.5720.00		1138.4000.01
W204	DV HF_Kabel CABLE	1138.5736.00		1138.4000.01
W205	DV HF–Kabel CABLE	1138.5742.00		1138.4000.01
W206	DV HF–Kabel CABLE	1138.5759.00		1138.4000.01
W215	DY KABEL W215 CABLE W215	1100.1227.00		1138.4000.01
W223	DY KABEL W223 CABLE W223	1100.1233.00		1138.4000.01
W224	DY KABEL W224 CABLE W224	1100.1240.00		1138.4000.01
W250	DY KABEL CABLE	1138.5765.00		1138.4000.01
W251	DY KABEL CABLE	1138.5765.00		1138.4000.01
W504	DV HF–KABEL	1139.0067.00		1138.4000.01
W514	DV HF–KABEL	1139.0121.00		1138.4000.01



06.00				1CMK	Datum	Name
				Bearb.	03.05.99	Bi
				Gepr.		
Änd. Index	Änderungs-Mitteilung	Datum	Name	Norm		
				Plot		

ROHDE&SCHWARZ

zu Gerät

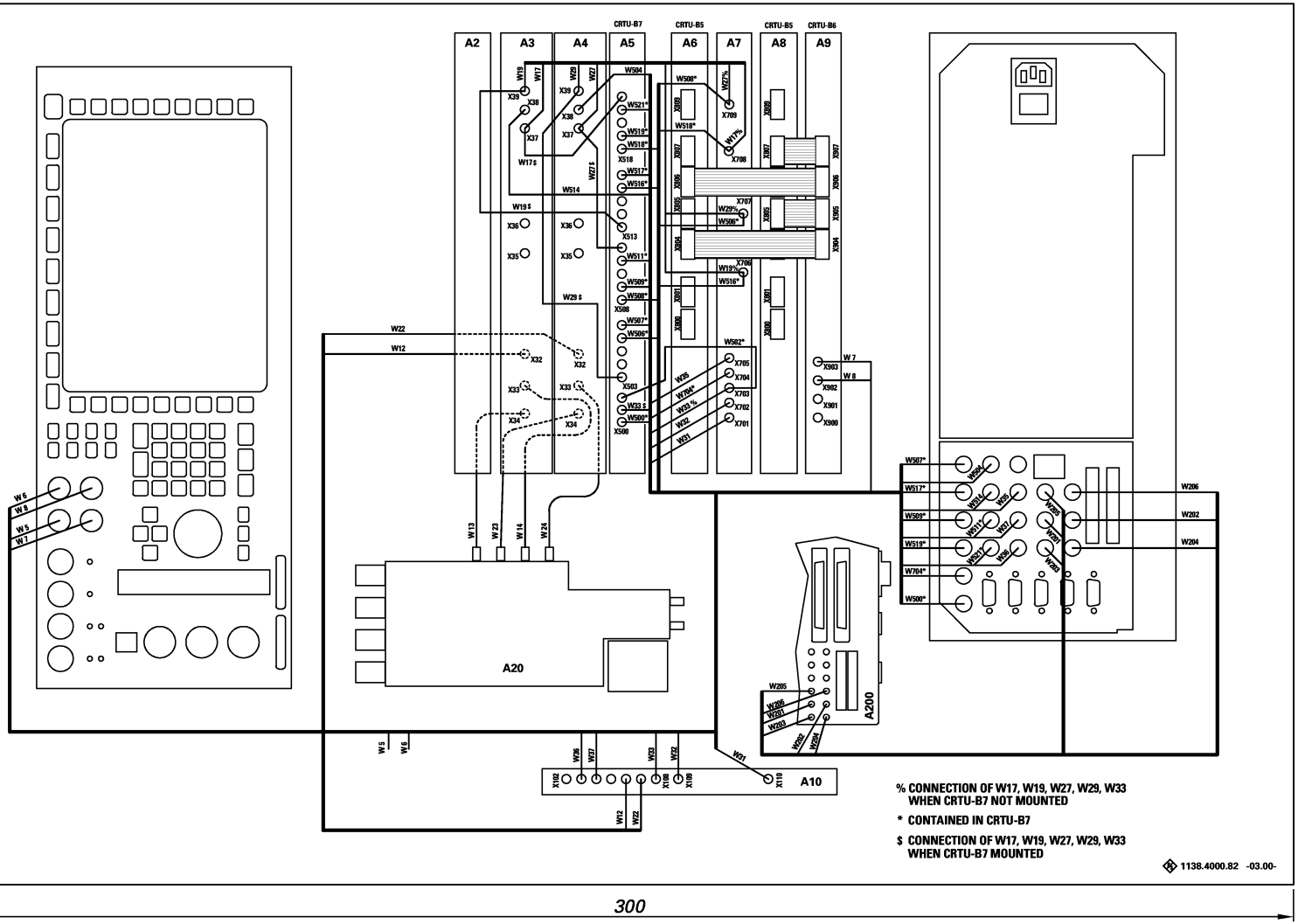
Benennung: GG CMU200 UNIV.RADIOCOM.

Zeichn.-Nr.: 1100.0008.01 D

Blatt-Nr.: 3 v. Bl.

reg.i.V. | erste Z.

ISO-Projektion Methode E



Beschriftung: tiefschwarz RAL 9005 (WU 0002.2823)

hierzu Druckvorlage 1138.4352 DV -03-

Maßstab: *Scale:* 1 : 1	Toleranz: *Tol.:*	Werkstoff: *Material:* WT 0088.5255.00 , Al Klebefolie			
ROHDE & SCHWARZ	Benennung: *Designation:* **Wartungsbeschriftung CRTU**			Sprache: / *Lang.:* de	Aei.: / *C.I.:* 03.00	Blatt: / *Sh.:* 1
Typ: *Type:* CRTU-RU				Zeichn. Nr.: / *Drawing No.:* **1138.4352.00 , D**		
1. Z.: *used in:* 1138.4000.01	Datum: *Date:* 02.2001	Abteilung: *Dept.:* 1CMK	Name: *Name:* Bi			

Projektions-methode

Projektions Method

SHEET 2

X10 X11 X12	FRONT MODULE CONTROLLER

SHEET 3

X21 X22	E1–T1/ DUT–SUPPLY BOARD

SHEET 4

X31	RX/TX BOARD 1
X41	RX/TX BOARD 2

SHEET 5

X51 X52	A/B TEST / IQ/IF–INTERFACE BOARD /LOW FREQ BOARD

SHEET 6+7

X61 X62 X63	UNIVERSAL SIGN. UNIT 2

SHEET 8+9+10+24

X71 X72 X73 X74 X75	DIGITAL BOARD	X1 TRIG_OUT_A X2 TRIG_OUT_B X3 TRIG_IN_A X4 TRIG_IN_B X5 SLOT_CLK X6 BT_CLK X7 NC

SHEET 11+12

X81 X82 X83	UNIVERSAL SIGN. UNIT 1

SHEET 13

X91 X92	USU1 CO–PROCESSOR

SHEET 14

X93	USU1 CO–PROCESSOR
	ISA– TERMINATION

SHEET 15

X216 X217 X222	PC CARD
	BUFFERS

SHEET 16

X219	FRONT PANEL BOARD
X212	OCXO BOARD
X218	FLOPPY
X215	FRONTEND BOARD

SHEET 17

X207 X208	REAR PANEL BOARD CRTU

SHEET 18

X200	ABISSYM 1/2
X209 X210 X211 X220 X225	FAN
X201 X202	ABISASYM2
X203 X204	ABISASYM1
X110	POWER SUPPLY

SHEET 19

X223 X224	MOTHERBOARD 1 1/2 CONNECTOR
X213 X214	MOTHERBOARD 2 1/2 CONNECTOR
X221	+5VREF

SHEET 20

MOTHERBOARD 2

X101	REFERENZ BOARD
X111	AUDIO BOARD

SHEET 21

MOTHERBOARD 1

X253	LPT
X255	IEC 625 / IEEE 488
X250	MONITOR
X252	COM 1
X251	COM 2
X256	USB

SHEET 22

FRONT PANEL BOARD

W219	

SHEET 23

REAR PANEL BOARD CRTU

X450	AUX 5
X301	DATA CH1
X302	DATA CH2
X453	I/Q 1
X454	I/Q 2

SHEET 25

CONTROL SYNC BUS CONTROL A

X500

SHEET 26

CONTROL SYNC BUS CONTROL B

X501

Bindende Angaben ueber Varianten, Trimmwerte, Bauteile und nicht bestueckte Bauteile siehe SA.

FOR BINDING INFORMATION ON MODELS, TRIMMING AND COMPONENTS VALUES AND NONFITTED COMPONENTS SEE PARTS LIST

ACHTUNG: EGB !
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION ESD !
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING

ROHDE&SCHWARZ	Benennung: / Designation: MOTHERBOARD CRTU/RF MOTHERBOARD CRTU/RF			Sprache: / Lang.: DE	Aei: / C.I.: 04.00	Blatt: / Sh.: 1+
Typ: / Type:	Datum: / Date: 02–09–24	Abteilung: / Dpt: 1CMK	Name: / Name: SEIFFE_T	Zeichn. Nr.: / Drawing No.: 1138.5607.01 S		
1. Z.: / used in: 1138.4000.01	TOP/TOP.1					

DARSTELLUNG SEITE B
VIEW ON SIDE B

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION: ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING.

BINDENDE ANGABEN UEBER VARIANTEN, TRIMMWERTE, BAUTEILWERTE UND NICHT BESTUECKTE BAUTEILE SIEHE SA.

FOR BINDING INFORMATION ON MODELS, TRIMMING AND COMPONENT VALUES AND NONFITTED COMPONENTS SEE PARTS LIST.

ROHDE&SCHWARZ	Benennung: Designat.:	MOTHERBOARD CRTU/RF MOTHERBOARD CRTU/RF	Spr./Lang.:	Aen./C.I.:	Blatt/Sh.:
			de	04.00	1+
Typ: Type:	Datum: Date: 02-09-24	Abteilung: Dept.: 1CMK	Name: SEIFFE_T	Zeichn.Nr./Drawing No.: 1138.5607.01 D	
T.Z.: used in: 1138.4000					

DARSTELLUNG SEITE A
VIEW ON SIDE A

ACHTUNG: EGB!
ELEKTROSTATISCH GEFAEHRDETE BAUELEMENTE ERFORDERN EINE BESONDERE HANDHABUNG.
ATTENTION: ESD!
ELECTROSTATIC SENSITIVE DEVICES REQUIRE A SPECIAL HANDLING.

BINDENDE ANGABEN UEBER VARIANTEN, TRIMMWERTE, BAUTEILWERTE UND NICHT BESTUECKTE BAUTEILE SIEHE SA.

FOR BINDING INFORMATION ON MODELS, TRIMMING AND COMPONENT VALUES AND NONFITTED COMPONENTS SEE PARTS LIST.

ROHDE&SCHWARZ	Benennung:/Designat.: MOTHERBOARD CRTU/RF MOTHERBOARD CRTU/RF		Spr.:/Lang.: de
Typ:/Type:	Datum:/Date: 02-09-24	Abteilung:/Dept.: 1CMK	Name:/Name: SEIFFE_T
i.Z.:/used in: 1138.4000			Aei:/C.I.: 04.00
			Blatt:/Sh.: 2-
			Zeichn.Nr.:/Drawing No.: 1138.5607.01 D

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
	ACHTUNG EGB /ATTENTION ESD VARIANTENERKLAERUNG VAR02=GRUNDAUSFUEHRUNG MOD02=BASIC_MODEL				
C1	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C2	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C3	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C4	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C5	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C6	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C7	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C8	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C9	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C10	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C11	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C12	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C13	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C14	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C15	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C16	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C17	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C18	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C19	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C20	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C21	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C22	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C23	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C24	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C25	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C26	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C27	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
C28	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C29	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C30	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C31	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C32	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C33	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C34	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C35	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C36	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C37	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C38	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C39	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C40	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C41	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C42	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C43	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C44	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C45	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C46	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C47	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C48	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C49	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C50	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C51	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C52	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C53	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C54	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C55	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C56	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C57	CC 470P 1% 50V NP0 0603	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
	CERAMIC CAPACITOR				
C58	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C59	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C60	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C61	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C62	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C63	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C64	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C65	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C66	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C67	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C68	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C69	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C70	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C71	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C72	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C73	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C74	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C75	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C76	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C77	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C78	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C79	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
C80	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C81	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C82	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C83	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C84	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C85	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C86	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C87	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C88	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C89	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C90	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C91	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C92	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C93	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C94	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C95	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C96	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C97	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
	NOT FITTED				
C98	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C99	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C100	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C101	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C102	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C103	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C104	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C105	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C106	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C112	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C113	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C114	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C115	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C116	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C117	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C118	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C119	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C120	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C121	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C122	CC 1.0PF0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR	0009.8304.00	AVX	0603 5A *** FAT00J	1138.5607.01
C123	CC 1.0PF0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR	0009.8304.00	AVX	0603 5A *** FAT00J	1138.5607.01
C124	CC 1.0PF0.1PF50V NP0 0603	0009.8304.00	AVX	0603 5A *** FAT00J	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
	SMD–CERAMIC–CAPACITOR				
C125	CC 1.0PF0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR	0009.8304.00	AVX	0603 5A *** FAT00J	1138.5607.01
C126	CC 1.0PF0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR	0009.8304.00	AVX	0603 5A *** FAT00J	1138.5607.01
C127	CC 1.0PF0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR	0009.8304.00	AVX	0603 5A *** FAT00J	1138.5607.01
C128	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C129	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C130	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C131	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C132	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C133	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C134	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C135	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C136	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C137	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C138	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C139	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C140	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C141	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C142	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C143	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C144	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C145	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C146	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C147	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C148	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C149	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C150	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C151	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C152	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C153	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
C154	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C155	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C156	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C157	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C158	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C159	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C160	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C161	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C162	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C163	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C164	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C165	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C166	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C167	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C168	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C169	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C170	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C171	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C172	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C173	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C174	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C175	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C176	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
C177	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C178	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C179	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C180	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C181	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C182	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C183	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C184	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C185	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C186	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C187	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C188	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C189	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C190	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C191	CE 100UF+–20%16V RUND SMD SMD–ELECTOLYTIC CAPACIT.	0009.6553.00	SANYO DENK	16CV100GA	1138.5607.01
C192	CE 100UF+–20%16V RUND SMD SMD–ELECTOLYTIC CAPACIT.	0009.6553.00	SANYO DENK	16CV100GA	1138.5607.01
C195	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C196	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C199	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C200	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C201	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C202	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
C203	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C204	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C205	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C206	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C207	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C208	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C209	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C210	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C211	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C212	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C213	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C214	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C215	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C216	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C217	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C218	CC 470NF+–10%50V X7R 1812 CERAMIC CHIP CAPACITOR	0007.7498.00	AVX	1812 5C 474K(J)AT1A	1138.5607.01
C219	CE 10UF+–20%16V RUND SMD SMD ELECTROLYTIC CAPACIT.	0010.7914.00	PANASONIC	EEV–HB1C100R	1138.5607.01
C220	CE 10UF+–20%16V RUND SMD SMD ELECTROLYTIC CAPACIT.	0010.7914.00	PANASONIC	EEV–HB1C100R	1138.5607.01
C222	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR NICHT BESTUECKT NOT FITTED	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C223	CC 100NF+–10%16V X7R 0603 CERAMIC CHIP CAPACITOR NICHT BESTUECKT NOT FITTED	1097.6292.00	AVX	0603YC104KAT	1138.5607.01
C224	CC 470P 1% 50V NP0 0603 CERAMIC CAPACITOR	0048.6680.00	KEMET	C0603C471F5GAC	1138.5607.01
C225	CE 100UF+–20%16V RUND SMD SMD–ELECTOLYTIC CAPACIT.	0009.6553.00	SANYO DENK	16CV100GA	1138.5607.01
C226	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C227	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C228	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C229	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
C230	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C231	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C232	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C233	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C234	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C235	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C236	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C237	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C238	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C239	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C240	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C241	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C242	CC 10NF+–10% 50VHDK 0603 SMD–CERAMIC–CAPACITOR	0009.4844.00	AVX	0603 5C *** KAT00J	1138.5607.01
C243	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C244	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C245	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C246	CC 10P+–0.1PF50V NP0 0603 SMD–CERAMIC–CAPACITOR NICHT BESTUECKT NOT FITTED	0009.4567.00	AVX	0603 5A *** FAT00J	1138.5607.01
C247	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
C248	CC 68PF+–1% 50VNP0 0603 SMD–CERAMIC–CAPACITOR	0009.9746.00	AVX	0603 5A***FAT00J	1138.5607.01
D1	BL 74CBTLV1G125DCK LV SINGLE FET BUS SWITCH	1135.7073.00	TEXAS	SN74CBTLV1G125DCKR	1138.5607.01
D2	BL 74CBTLV1G125DCK LV SINGLE FET BUS SWITCH	1135.7073.00	TEXAS	SN74CBTLV1G125DCKR	1138.5607.01
D4	BL 74HCT245D 8XTRANSC OCTAL BUS TRANSCEIVER	0007.5414.00	PHILIPS_SE	(PC)74HCT245(D/T)	1138.5607.01
D5	BL 74HCT245D 8XTRANSC OCTAL BUS TRANSCEIVER	0007.5414.00	PHILIPS_SE	(PC)74HCT245(D/T)	1138.5607.01
D6	BL 74HCT245D 8XTRANSC OCTAL BUS TRANSCEIVER	0007.5414.00	PHILIPS_SE	(PC)74HCT245(D/T)	1138.5607.01
D7	BL 74HCT245D 8XTRANSC OCTAL BUS TRANSCEIVER	0007.5414.00	PHILIPS_SE	(PC)74HCT245(D/T)	1138.5607.01
D8	BL 74HCT245D 8XTRANSC OCTAL BUS TRANSCEIVER	0007.5414.00	PHILIPS_SE	(PC)74HCT245(D/T)	1138.5607.01
D60	BL 74CBTLV3257PW 4–BIT 1–OF–2 MUX/DEMUX	1135.7409.00	TEXAS	SN74CBTLV3257PWR	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
D61	BL 74CBTLV3257PW 4–BIT 1–OF–2 MUX/DEMUX	1135.7409.00	TEXAS	SN74CBTLV3257PWR	1138.5607.01
D62	BL 74CBTLV3257PW 4–BIT 1–OF–2 MUX/DEMUX	1135.7409.00	TEXAS	SN74CBTLV3257PWR	1138.5607.01
D63	BJ MAX3232ECAE 2TX2RX RS–232 TRANSCEIVER	2083.7017.00	MAXIM	MAX3232ECAE	1138.5607.01
D64	BL 74ALVT16244DGG 16XBUFF 16BIT BUFFER/DRIVER	2083.7130.00	PHILIPS_SE	74ALVT16244DGG	1138.5607.01
D70	BL 74ALVT16244DGG 16XBUFF 16BIT BUFFER/DRIVER	2083.7130.00	PHILIPS_SE	74ALVT16244DGG	1138.5607.01
D71	BL 74LVT14PW 6XINV.SCHM 3.3V 6–INV SCHMITT–TRIGG.	1093.9200.00	PHILIPS_SE	74LVT14PW	1138.5607.01
D80	BL 74CBTLV3257PW 4–BIT 1–OF–2 MUX/DEMUX	1135.7409.00	TEXAS	SN74CBTLV3257PWR	1138.5607.01
D81	BL 74CBTLV3257PW 4–BIT 1–OF–2 MUX/DEMUX	1135.7409.00	TEXAS	SN74CBTLV3257PWR	1138.5607.01
D82	BL 74CBTLV3257PW 4–BIT 1–OF–2 MUX/DEMUX	1135.7409.00	TEXAS	SN74CBTLV3257PWR	1138.5607.01
D83	BJ MAX3232ECAE 2TX2RX RS–232 TRANSCEIVER	2083.7017.00	MAXIM	MAX3232ECAE	1138.5607.01
D84	BL 74ALVT16244DGG 16XBUFF 16BIT BUFFER/DRIVER	2083.7130.00	PHILIPS_SE	74ALVT16244DGG	1138.5607.01
D85	BL 74LVC1G125DCK SINGLE TRISTATE BUFFER	4060.4572.00	TEXAS	SN74LVC1G125DCKR	1138.5607.01
D86	BL 74LVC1G125DCK SINGLE TRISTATE BUFFER	4060.4572.00	TEXAS	SN74LVC1G125DCKR	1138.5607.01
D87	BL 74LVC1G125DCK SINGLE TRISTATE BUFFER	4060.4572.00	TEXAS	SN74LVC1G125DCKR	1138.5607.01
D88	BL 74LVC1G125DCK SINGLE TRISTATE BUFFER	4060.4572.00	TEXAS	SN74LVC1G125DCKR	1138.5607.01
D90	BC X24645S8I–2.7 8KBITX8 I2C–BUS SERIAL EEPROM	1100.4355.00	XICOR	X24645 S8I–2.7	1138.5607.01
D91	BC PCF8575TS 16BIT–EXPAND I/O–EXPANDER FOR I2C–BUS	1133.7253.00	PHILIPS_SE	PCG8575TS–F1	1138.5607.01
D100	BJ DS90LV032ATM QUAD DIFF. LINE RECEIVER	1093.6723.00	NSC	DS90LV032ATM	1138.5607.01
D101	BJ DS90LV032ATM QUAD DIFF. LINE RECEIVER	1093.6723.00	NSC	DS90LV032ATM	1138.5607.01
D102	BJ DS90LV032ATM QUAD DIFF. LINE RECEIVER	1093.6723.00	NSC	DS90LV032ATM	1138.5607.01
D103	BJ DS90LV032ATM QUAD DIFF. LINE RECEIVER	1093.6723.00	NSC	DS90LV032ATM	1138.5607.01
D104	BJ DS90LV032ATM QUAD DIFF. LINE RECEIVER	1093.6723.00	NSC	DS90LV032ATM	1138.5607.01
D105	BJ DS90LV032ATM QUAD DIFF. LINE RECEIVER	1093.6723.00	NSC	DS90LV032ATM	1138.5607.01
D106	BJ DS90LV032ATM QUAD DIFF. LINE RECEIVER	1093.6723.00	NSC	DS90LV032ATM	1138.5607.01
D107	BL 74LVC1G04DCK 1XINV SINGLE INVERTER GATE	0041.4952.00	TEXAS	SN74LVC1G04DCKR	1138.5607.01
D110	BJ DS90LV031ATM LVDS QUAD DIFF. LINE DRIV	1093.6730.00	NSC	DS90LV031ATM(X)	1138.5607.01
D111	BJ DS90LV031ATM LVDS QUAD DIFF. LINE DRIV	1093.6730.00	NSC	DS90LV031ATM(X)	1138.5607.01
D112	BJ DS90LV031ATM LVDS QUAD DIFF. LINE DRIV	1093.6730.00	NSC	DS90LV031ATM(X)	1138.5607.01
D113	BJ DS90LV031ATM LVDS QUAD DIFF. LINE DRIV	1093.6730.00	NSC	DS90LV031ATM(X)	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
D114	BJ DS90LV031ATM LVDS QUAD DIFF. LINE DRIV	1093.6730.00	NSC	DS90LV031ATM(X)	1138.5607.01
D115	BJ DS90LV031ATM LVDS QUAD DIFF. LINE DRIV	1093.6730.00	NSC	DS90LV031ATM(X)	1138.5607.01
D116	BJ DS90LV031ATM LVDS QUAD DIFF. LINE DRIV	1093.6730.00	NSC	DS90LV031ATM(X)	1138.5607.01
F3	RK 1.5A FUSE PTC 15V SMD RESETTABLE FUSE	1081.0290.00	BOURNS	MF–SM–150–2	1138.5607.01
F16	RK 0.14A FUSE PTC 0.8WSMD RESETTABLE FUSE	4055.3594.00	BOURNS	MINI SMDC014–2	1138.5607.01
F17	RK 0.14A FUSE PTC 0.8WSMD RESETTABLE FUSE	4055.3594.00	BOURNS	MINI SMDC014–2	1138.5607.01
F18	RK 1.1A FUSE PTC 30V SMD RESETTABLE FUSE	1058.2777.00	BOURNS	MF–SM–100	1138.5607.01
F19	RK 1.1A FUSE PTC 30V SMD RESETTABLE FUSE	1058.2777.00	BOURNS	MF–SM–100	1138.5607.01
F20	RK 0.14A FUSE PTC 0.8WSMD RESETTABLE FUSE	4055.3594.00	BOURNS	MINI SMDC014–2	1138.5607.01
F21	RK 0.14A FUSE PTC 0.8WSMD RESETTABLE FUSE	4055.3594.00	BOURNS	MINI SMDC014–2	1138.5607.01
F22	RK 0.14A FUSE PTC 0.8WSMD RESETTABLE FUSE	4055.3594.00	BOURNS	MINI SMDC014–2	1138.5607.01
F23	RK 0.14A FUSE PTC 0.8WSMD RESETTABLE FUSE	4055.3594.00	BOURNS	MINI SMDC014–2	1138.5607.01
F24	RK 0.14A FUSE PTC 0.8WSMD RESETTABLE FUSE	4055.3594.00	BOURNS	MINI SMDC014–2	1138.5607.01
F25	RK 0.14A FUSE PTC 0.8WSMD RESETTABLE FUSE	4055.3594.00	BOURNS	MINI SMDC014–2	1138.5607.01
F26	RK 0.2A FUSE PTC 0.8W SMD RESETTABLE FUSE	2080.6990.00	BOURNS	MF–MSMD020	1138.5607.01
F27	RK 0.2A FUSE PTC 0.8W SMD RESETTABLE FUSE	2080.6990.00	BOURNS	MF–MSMD020	1138.5607.01
H1	AF HSMG–C190 LED GN LED GREEN	1135.7344.00	HEWLETT_PA	HSMG–C190	1138.5607.01
H2	AF HSMG–C190 LED GN LED GREEN	1135.7344.00	HEWLETT_PA	HSMG–C190	1138.5607.01
H3	AF HSMG–C190 LED GN LED GREEN	1135.7344.00	HEWLETT_PA	HSMG–C190	1138.5607.01
H4	AF HSMG–C190 LED GN LED GREEN	1135.7344.00	HEWLETT_PA	HSMG–C190	1138.5607.01
H5	AF HSMG–C190 LED GN LED GREEN	1135.7344.00	HEWLETT_PA	HSMG–C190	1138.5607.01
H6	AF HSMG–C190 LED GN LED GREEN	1135.7344.00	HEWLETT_PA	HSMG–C190	1138.5607.01
H7	AF HSMG–C190 LED GN LED GREEN	1135.7344.00	HEWLETT_PA	HSMG–C190	1138.5607.01
H8	AF HSMG–C190 LED GN LED GREEN	1135.7344.00	HEWLETT_PA	HSMG–C190	1138.5607.01
H9	AF HSMG–C190 LED GN LED GREEN	1135.7344.00	HEWLETT_PA	HSMG–C190	1138.5607.01
H10	AF HLMP1719 LED3 GELB YELLOW LED	0099.9140.00	QUALITY	HLMP–1719.L31S	1138.5607.01
H11	AF HLMP1719 LED3 GELB YELLOW LED	0099.9140.00	QUALITY	HLMP–1719.L31S	1138.5607.01
H12	AF HLMP1719 LED3 GELB YELLOW LED	0099.9140.00	QUALITY	HLMP–1719.L31S	1138.5607.01
H13	AF HLMP1719 LED3 GELB YELLOW LED	0099.9140.00	QUALITY	HLMP–1719.L31S	1138.5607.01
H14	AF HLMP1719 LED3 GELB	0099.9140.00	QUALITY	HLMP–1719.L31S	1138.5607.01

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	YELLOW LED				
H15	AF HLMP1719 LED3 GELB YELLOW LED	0099.9140.00	QUALITY	HLMP–1719.L31S	1138.5607.01
H16	AF HLMP1719 LED3 GELB YELLOW LED	0099.9140.00	QUALITY	HLMP–1719.L31S	1138.5607.01
H17	AF HLMP1719 LED3 GELB YELLOW LED	0099.9140.00	QUALITY	HLMP–1719.L31S	1138.5607.01
L1	LD Z=50 OHM/100M 3A 1206 FERRITE BEAD	2083.3086.00	MURATA	BLM31PG500SN1L	1138.5607.01
L2	LD Z=50 OHM/100M 3A 1206 FERRITE BEAD	2083.3086.00	MURATA	BLM31PG500SN1L	1138.5607.01
L3	LD Z=50 OHM/100M 3A 1206 FERRITE BEAD	2083.3086.00	MURATA	BLM31PG500SN1L	1138.5607.01
L4	LD Z=50 OHM/100M 3A 1206 FERRITE BEAD	2083.3086.00	MURATA	BLM31PG500SN1L	1138.5607.01
N140	BO LM2904D 2X VF OPAMP VOLTAGE FEEDBACK OPAMP	6024.4010.00	PHILIPS_SE	LM2904D	1138.5607.01
N141	BO LM2904D 2X VF OPAMP VOLTAGE FEEDBACK OPAMP NICHT BESTUECKT NOT FITTED	6024.4010.00	PHILIPS_SE	LM2904D	1138.5607.01
R1	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R2	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R3	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R4	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R5	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R6	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R7	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R8	RG 33K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7066.00	DALE	CRCW 0603	1138.5607.01
R9	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R10	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R11	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R12	RG 75K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	2074.8937.00	DALE	CRCW 0603	1138.5607.01
R13	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R14	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R15	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R16	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R17	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R18	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R19	RG 100R +–1% TK100 0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
	SMD RESISTOR EIA0603				
R20	RG 1K37 +–1% TK100 0603 SMD RESISTOR EIA0603	1097.6111.00	DALE	CRCW 0603	1138.5607.01
R21	RG 3K01+–1% TK100 0603 SMD RESISTOR EIA0603	0010.9298.00	DALE	CRCW 0603	1138.5607.01
R22	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R23	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R24	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R25	RG 680R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6982.00	DALE	CRCW 0603	1138.5607.01
R26	RG 909R +–1% TK100 0603 SMD RESISTOR EIA0603	2074.8943.00	DALE	CRCW 0603	1138.5607.01
R27	RG 2K2 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7008.00	DALE	CRCW 0603	1138.5607.01
R28	RG 2K2 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7008.00	DALE	CRCW 0603	1138.5607.01
R29	RG 2K2 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7008.00	DALE	CRCW 0603	1138.5607.01
R30	RG 2K2 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7008.00	DALE	CRCW 0603	1138.5607.01
R31	RG 243R +–1% TK100 0603 SMD RESISTOR EIA0603	0010.9800.00	DALE	CRCW 0603	1138.5607.01
R32	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R33	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R34	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R35	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R36	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R37	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R38	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R39	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R40	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R41	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R42	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R43	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R44	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R45	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R46	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R47	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R48	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
R49	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R50	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R51	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R52	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R53	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R54	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R55	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R56	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R57	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R58	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R59	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R60	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R61	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R62	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R63	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R64	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R65	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R66	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R67	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R68	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R69	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R70	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R71	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R72	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R73	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R74	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R75	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R76	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R77	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
R78	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R79	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R80	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R81	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R82	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R83	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R84	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R85	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R86	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R87	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R88	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R89	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R90	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R91	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R92	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R93	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R94	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R95	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R96	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R97	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R98	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R99	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R100	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R101	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R102	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R103	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R104	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R105	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R106	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
R107	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R108	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R109	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R110	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R111	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R112	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R113	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R114	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R115	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R116	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R117	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R118	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R119	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R120	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R121	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R126	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R127	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R128	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R129	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R130	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R131	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R132	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R133	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R134	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R135	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R136	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R137	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
R138	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R139	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R140	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R141	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R142	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R143	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R144	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R145	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R146	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R147	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R148	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R149	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R150	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R151	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R152	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R153	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R154	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R155	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R156	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R157	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R158	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R159	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R160	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R161	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R162	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R163	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R164	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R172	RG 68R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6930.00	DALE	CRCW 0603	1138.5607.01
R173	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
R174	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R175	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R176	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R177	RG 0R75 5% 1W 1218 SMD RESISTOR	1100.3671.00	DALE	CRCW1218 0R75 1% TK	1138.5607.01
R178	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R179	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R180	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R181	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R182	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R183	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R184	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R185	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R186	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R187	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R188	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R189	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R190	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R191	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R192	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R193	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R194	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R195	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R196	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R197	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R198	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R199	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01
R200	RG 27R4 +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9046.00	DALE	CRCW 0603	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
R201	RG 0R1 5% 1W 1218 SMD–RESISTOR	6100.7785.00	DALE	CRCW1218 0R1 5%TK200	1138.5607.01
R202	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R203	RG 200K +–1% TK100 0603 SMD RESISTOR EIA0603	1093.6200.00	DALE	CRCW 0603	1138.5607.01
R204	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R205	RG 1K37 +–1% TK100 0603 SMD RESISTOR EIA0603	1097.6111.00	DALE	CRCW 0603	1138.5607.01
R206	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R207	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R208	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R209	RG 2K2 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7008.00	DALE	CRCW 0603	1138.5607.01
R210	RG 22K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7050.00	DALE	CRCW 0603	1138.5607.01
R211	RG 22K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7050.00	DALE	CRCW 0603	1138.5607.01
R212	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R213	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R214	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R215	RG 4K32 +–1% TK100 0603 SMD–RESISTOR EIA0603	0048.6438.00	DALE	CRCW 0603	1138.5607.01
R216	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R224	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R225	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R226	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R227	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R228	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R229	RG 1K0 +–1% TK100 1206 CHIP RESISTOR	0006.7271.00	BOURNS	CR 1206 FX–...– E	1138.5607.01
R230	RG 100K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5363.00	DALE	CRCW 0603	1138.5607.01
R231	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R232	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R233	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R234	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R235	RG 10K +–1% TK100 0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
	SMD RESISTOR EIA0603				
R236	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R237	RG 61R9 +–1%TK100 0603 SMD RESISTOR EIA0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01
R238	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R239	RG 20K +–1% TK100 0603 SMD RESISTOR EIA0603	0010.9100.00	DALE	CRCW 0603	1138.5607.01
R240	RG 15K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7043.00	DALE	CRCW 0603	1138.5607.01
R241	RG 15K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7043.00	DALE	CRCW 0603	1138.5607.01
R242	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R243	RG 12K1 +–1% TK100 0603 SMD RESISTOR EIA0603	0010.8462.00	DALE	CRCW 0603	1138.5607.01
R244	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R245	RG 392K+–1% TK100 0603 RESISTOR	1097.6528.00	DALE	CRCW 0603	1138.5607.01
R246	RG 220K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7108.00	DALE	CRCW 0603	1138.5607.01
R247	RG 220K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7108.00	DALE	CRCW 0603	1138.5607.01
R248	RG 1K91 +–1% TK100 0603 SMD RESISTOR EIA0603	1097.6128.00	DALE	CRCW 0603	1138.5607.01
R249	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R250	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R251	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R252	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R253	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R254	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R255	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R256	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R257	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R258	RG 220R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6953.00	DALE	CRCW 0603	1138.5607.01
R259	RG 220R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6953.00	DALE	CRCW 0603	1138.5607.01
R260	RG 220R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6953.00	DALE	CRCW 0603	1138.5607.01
R261	RG 220R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6953.00	DALE	CRCW 0603	1138.5607.01
R262	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R263	RG 61R9 +–1%TK100 0603	0048.4841.00	DALE	CRCW 0603	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
	SMD RESISTOR EIA0603				
R264	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R265	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R266	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R267	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R268	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R269	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R270	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R271	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R272	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R273	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R274	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R275	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R276	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R277	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R278	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R279	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R280	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R281	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R282	RG 100R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5334.00	DALE	CRCW 0603	1138.5607.01
R283	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R284	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R285	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R286	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R287	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R288	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R289	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R290	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R291	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R292	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
R293	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R294	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R295	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R296	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R297	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R298	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R299	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R300	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R301	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R302	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R303	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R304	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R305	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R306	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R307	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R308	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R309	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R310	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R311	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R312	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R313	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R314	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R315	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R316	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R317	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R318	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R319	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R320	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R321	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
R322	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R323	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R324	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R325	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R326	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R327	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R328	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R329	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R330	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R331	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R332	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R333	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R334	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R335	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R336	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R337	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R338	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R339	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R340	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R341	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R342	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R343	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R344	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R345	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R346	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R347	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT	0009.5357.00	DALE	CRCW 0603	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
	NOT FITTED				
R348	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R349	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R350	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R351	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R352	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R353	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R354	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R355	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R356	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R357	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R358	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R359	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R360	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R361	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R362	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R363	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R364	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R365	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R366	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
R367	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R368	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R369	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R370	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R371	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R372	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R373	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R374	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R375	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R376	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R377	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R378	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R379	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R380	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R381	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R382	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R383	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R384	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R385	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R386	RG 10K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5357.00	DALE	CRCW 0603	1138.5607.01
R387	RG 301R +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9123.00	DALE	CRCW 0603	1138.5607.01
R388	RG 301R +–1%TK100 0603 SMD RESISTOR EIA0603	0009.9123.00	DALE	CRCW 0603	1138.5607.01
R389	RG 47R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6924.00	DALE	CRCW 0603	1138.5607.01
R390	RG 47R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6924.00	DALE	CRCW 0603	1138.5607.01
R391	RG 47R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6924.00	DALE	CRCW 0603	1138.5607.01
R392	RG 47R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6924.00	DALE	CRCW 0603	1138.5607.01
R393	RG 100K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5363.00	DALE	CRCW 0603	1138.5607.01
R394	RG 100K +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5363.00	DALE	CRCW 0603	1138.5607.01
R395	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT	0009.5340.00	DALE	CRCW 0603	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
	NOT FITTED				
R396	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R397	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R398	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R399	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R400	RG 1K0 +–1% TK100 0603 SMD RESISTOR EIA0603 NICHT BESTUECKT NOT FITTED	0009.5340.00	DALE	CRCW 0603	1138.5607.01
R403	RG 4K7 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7020.00	DALE	CRCW 0603	1138.5607.01
R404	RG 4K7 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7020.00	DALE	CRCW 0603	1138.5607.01
R405	RG 4K7 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7020.00	DALE	CRCW 0603	1138.5607.01
R406	RG 4K7 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7020.00	DALE	CRCW 0603	1138.5607.01
R407	RG 4K7 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7020.00	DALE	CRCW 0603	1138.5607.01
R408	RG 4K7 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7020.00	DALE	CRCW 0603	1138.5607.01
R409	RG 4K7 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7020.00	DALE	CRCW 0603	1138.5607.01
R410	RG 4K7 +–1% TK100 0603 SMD RESISTOR EIA0603	0009.7020.00	DALE	CRCW 0603	1138.5607.01
R415	RG 3K01+–1% TK100 0603 SMD RESISTOR EIA0603	0010.9298.00	DALE	CRCW 0603	1138.5607.01
R420	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R421	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R422	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R423	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R424	RG 47R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6924.00	DALE	CRCW 0603	1138.5607.01
R425	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R426	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R427	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R428	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R429	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R430	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R431	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R432	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
R433	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R434	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R435	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R436	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R437	RG 47R +–1% TK100 0603 SMD RESISTOR EIA0603	0009.6924.00	DALE	CRCW 0603	1138.5607.01
R438	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R439	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R440	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R441	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R442	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R443	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R444	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R445	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R446	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R447	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R448	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R449	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R450	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R451	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R452	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
R453	RG 0–OHM WIDERSTAND 0603 SMD RESISTOR EIA0603	0009.9369.00	BEYSCHLAG	MCT 0603 JUMPER	1138.5607.01
V1	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V2	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V3	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V4	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V5	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V6	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V22	AK BC856BW P 65V 100MA PNP AF TRANSISTOR	6104.8611.00	SIEMENS	BC856BW	1138.5607.01
V23	AK BC846BW NPN 65V 100MA NPN AF TRANSISTOR	6104.8605.00	SIEMENS	BC846BW Q62702–C2279	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
V24	AD BAS216 75V SWI HIGHSPEED SWITCHING DIODE	0010.9346.00	PHILIPS_SE	BAS216	1138.5607.01
V25	AG PBYR245CT 2XSGL 45V 2A DOUBLE SCHOTTKY RECTIFIER	0009.5311.00	PHILIPS_SE	PBYR245CT	1138.5607.01
V26	AD BAS216 75V SWI HIGHSPEED SWITCHING DIODE	0010.9346.00	PHILIPS_SE	BAS216	1138.5607.01
V27	AK BCP68–16 NPN 20V 1A NPN TRANSISTOR	0008.2019.00	PHILIPS_SE	BCP68–25	1138.5607.01
V28	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V29	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V30	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V31	AG PBYR245CT 2XSGL 45V 2A DOUBLE SCHOTTKY RECTIFIER	0009.5311.00	PHILIPS_SE	PBYR245CT	1138.5607.01
V32	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V70	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V71	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V72	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V76	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V77	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
V78	AG BYG70J 600V 0A4 UDI RECTIFIER	6104.9276.00	PHILIPS_SE	BYG70J	1138.5607.01
W207	DY KABEL W207 CABLE W207	1100.1056.00			1138.5607.01
W208	DY KABEL W208 CABLE W208	1100.1062.00			1138.5607.01
W219	DY KABEL W219 CABLE W219	1138.5688.00			1138.5607.01
X1	FJ EINBAUSTECKER F.GS SMB PLUG	0063.5168.00	IMS	588.11.1510.001	1138.5607.01
X2	FJ EINBAUSTECKER F.GS SMB CONNECTOR	0017.6271.00	IMS	81.1510.001	1138.5607.01
X3	FJ EINBAUSTECKER F.GS SMB PLUG	0063.5168.00	IMS	588.11.1510.001	1138.5607.01
X4	FJ EINBAUSTECKER F.GS SMB CONNECTOR	0017.6271.00	IMS	81.1510.001	1138.5607.01
X5	FJ EINBAUSTECKER F.GS SMB PLUG	0063.5168.00	IMS	588.11.1510.001	1138.5607.01
X6	FJ EINBAUSTECKER F.GS SMB CONNECTOR	0017.6271.00	IMS	81.1510.001	1138.5607.01
X7	FJ EINBAUSTECKER F.GS SMB PLUG	0063.5168.00	IMS	588.11.1510.001	1138.5607.01
X10	FP BUCHSENLEISTE 96P.WINK CONNECTOR	1100.4361.00	AMP	2X 536511–2	1138.5607.01
X11	FP BU.LEISTE COMP.BUS110P CONNECTOR	1093.6546.00	CANNON	CHMF–A25–P1–S–2	1138.5607.01
X12	FP BUCHSENLEISTE 96P.WINK CONNECTOR	1100.4361.00	AMP	2X 536511–2	1138.5607.01
X21	FP BUCHSENLEISTE 96P CONNECTOR	1051.5564.00	ERNI	594.833	1138.5607.01
X22	FP BUCHSENLEISTE 96P	1051.5564.00	ERNI	594.833	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
	CONNECTOR				
X31	FP STECKERLEISTE 96P.GER CONNECTOR	1100.4378.00	AMP	536514–3	1138.5607.01
X41	FP STECKERLEISTE 96P.GER CONNECTOR	1100.4378.00	AMP	536514–3	1138.5607.01
X51	FP STECKERLEISTE 96P.GER CONNECTOR	1100.4378.00	AMP	536514–3	1138.5607.01
X52	FP STECKERLEISTE 96P.GER CONNECTOR	1100.4378.00	AMP	536514–3	1138.5607.01
X61	FP BUCHSENLEISTE 96P CONNECTOR	1051.5564.00	ERNI	594.833	1138.5607.01
X62	FP STECKERLEISTE 48P.GER CONNECTOR	0386.6340.00	AMP	536514–2	1138.5607.01
X63	FP BUCHSENLEISTE 96P CONNECTOR	1051.5564.00	ERNI	594.833	1138.5607.01
X71	FP STECKERLEISTE 48P.GER CONNECTOR	0386.6340.00	AMP	536514–2	1138.5607.01
X72	FP STECKERLEISTE 96P.GER CONNECTOR	1100.4378.00	AMP	536514–3	1138.5607.01
X73	FP STECKERLEISTE 96P.GER CONNECTOR	1100.4378.00	AMP	536514–3	1138.5607.01
X74	FP STECKERLEISTE 96P.GER CONNECTOR	1100.4378.00	AMP	536514–3	1138.5607.01
X75	FP STECKERLEISTE 96P.GER CONNECTOR	1100.4378.00	AMP	536514–3	1138.5607.01
X81	FP BUCHSENLEISTE 96P CONNECTOR	1051.5564.00	ERNI	594.833	1138.5607.01
X82	FP STECKERLEISTE 48P.GER CONNECTOR	0386.6340.00	AMP	536514–2	1138.5607.01
X83	FP BUCHSENLEISTE 96P CONNECTOR	1051.5564.00	ERNI	594.833	1138.5607.01
X91	FP STECKERLEISTE 48P.GER CONNECTOR	0386.6340.00	AMP	536514–2	1138.5607.01
X92	FP STECKERLEISTE 96P.GER CONNECTOR	1100.4378.00	AMP	536514–3	1138.5607.01
X93	FP STECKERLEISTE 96P.GER CONNECTOR	1100.4378.00	AMP	536514–3	1138.5607.01
X101	FP STECKERLEISTE 48P.GER CONNECTOR	0386.6340.00	AMP	536514–2	1138.5607.01
X110	FP BUCHSENLEISTE 96P.WINK CONNECTOR	1100.4361.00	AMP	2X 536511–2	1138.5607.01
X111	FP STECKERLEISTE 96P.GER CONNECTOR	1100.4378.00	AMP	536514–3	1138.5607.01
X200	FP STECKERLEISTE 10P.GER CONNECTOR 10P	0846.4593.00	TYCO AMPDE	V23535–A2200–A102	1138.5607.01
X201	FJ EINBAUSTECKER F.GS SMB CONNECTOR	0017.6271.00	IMS	81.1510.001	1138.5607.01
X202	FJ EINBAUSTECKER F.GS SMB CONNECTOR	0017.6271.00	IMS	81.1510.001	1138.5607.01
X203	FJ W.EINBAUST F.GS SMB PLUG	0063.5180.00	IMS	142.11.1520.003	1138.5607.01
X204	FJ W.EINBAUST F.GS SMB PLUG	0063.5180.00	IMS	142.11.1520.003	1138.5607.01
X207	FP STIFTLEISTE 34P.COD. CONNECTOR	1100.3788.00	SAMTEC	STMM–117–02–G–D	1138.5607.01
X208	FP STIFTLEISTE 34P.COD. CONNECTOR	1100.3788.00	SAMTEC	STMM–117–02–G–D	1138.5607.01
X209	FP STIFTLEISTE 2P.R2,54 PIN CONNECTOR	0009.5992.00			1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
X210	FP STIFTLEISTE 3P.R2,54 PIN CONNECTOR	0009.6101.00			1138.5607.01
X211	FP STECKERLEISTE 3P.GER CONNECTOR	6014.4324.00	J_S_T_DEUT	B3P–VH	1138.5607.01
X212	FP BUCHSENLEISTE 10P.WINK CONNECTOR	1091.2366.00	MPE	BL22–47AGG–10 BZ0457	1138.5607.01
X213	FP STECKERLEISTE 50P.WIN CONNECTOR 50P.	1051.4545.00	BERG_ELEKT	86453–550	1138.5607.01
X214	FP STIFTLEISTE 50P.COD. CONNECTOR	1100.3794.00	SAMTEC	STMM–125–02–G–D	1138.5607.01
X215	FP STIFTLEISTE 34P.COD. CONNECTOR	1100.3788.00	SAMTEC	STMM–117–02–G–D	1138.5607.01
X216	FP STIFTLEISTE 34P.COD. CONNECTOR	1100.3788.00	SAMTEC	STMM–117–02–G–D	1138.5607.01
X217	FP STIFTLEISTE 34P.COD. CONNECTOR	1100.3788.00	SAMTEC	STMM–117–02–G–D	1138.5607.01
X218	FP BUCHSENLEISTE 26P.ZIF CONNECTOR NICHT BESTUECKT NOT FITTED	1091.2137.00	MOLEX	52030–2610	1138.5607.01
X219	FP STIFTLEISTE 34P.COD. CONNECTOR	1100.3788.00	SAMTEC	STMM–117–02–G–D	1138.5607.01
X220	FP STIFTLEISTE 2P.R2,54 PIN CONNECTOR	0009.5992.00			1138.5607.01
X221	FJ EINBAUSTECKER F.GS SMB CONNECTOR	0017.6271.00	IMS	81.1510.001	1138.5607.01
X222	FP STIFTLEISTE 34P.COD. CONNECTOR	1100.3788.00	SAMTEC	STMM–117–02–G–D	1138.5607.01
X223	FP STIFTLEISTE 50P.COD. CONNECTOR	1100.3794.00	SAMTEC	STMM–125–02–G–D	1138.5607.01
X224	FP STIFTLEISTE 50P.COD. CONNECTOR	1100.3794.00	SAMTEC	STMM–125–02–G–D	1138.5607.01
X230	FP STECKERLEISTE 4P.2R. CONNECTOR 4POL	0831.9442.00			1138.5607.01
X231	FP STECKERLEISTE 4P.2R. CONNECTOR 4POL	0831.9442.00			1138.5607.01
X250	FM BU–LEISTE WIN 15P. HD CONNECTOR	1065.8902.00	AMP	748390–5	1138.5607.01
X251	FM STECKERLEISTE 9P WIN CONNECTOR	1081.0102.00	ERNI	064 840	1138.5607.01
X252	FM STECKERLEISTE 9P WIN CONNECTOR	1081.0102.00	ERNI	064 840	1138.5607.01
X253	FM BUCHSENLEISTE 25P.WINK FEMALE CONNECTOR STRIP	0570.4345.00	FCT	F25S5G1–K407	1138.5607.01
X255	FM BUCHSENLEISTE 24POL. CONNECTOR	0392.5971.00	AMPHENOL	57LE–20240–77CO–D35	1138.5607.01
X256	FT USB–DOPPELWINKELBU.4P CONNECTOR	2083.2638.00	AMP	787617–1	1138.5607.01
X301	FM STECKERLEISTE 9P.WRAP CONNECTOR	0614.3777.00	FCT	F09P4G1	1138.5607.01
X302	FM STECKERLEISTE 9P.WRAP CONNECTOR	0614.3777.00	FCT	F09P4G1	1138.5607.01
X450	FM BUCHSENLEISTE 9P.WRAP CONNECTOR	0614.3760.00	FCT	F09S4G1	1138.5607.01
X453	FM BUCHSENLEISTE 15P. HD CONNECTOR	1091.2189.00	AMP	216281–1	1138.5607.01
X454	FM BUCHSENLEISTE 15P. HD CONNECTOR	1091.2189.00	AMP	216281–1	1138.5607.01
X500	FM BUCHSENLEISTE 68P.SCSI	2083.2580.00	AMP	786555–7	1138.5607.01

el. Kennz. *Part*	Benennung *Designation*	Sachnummer *Stock No.*	Hersteller *Manufacturer*	Bezeichnung *Designation*	enthalten in *contained in*
	CONNECTOR				
X501	FM BUCHSENLEISTE 68P.SCSI CONNECTOR	2083.2580.00	AMP	786555–7	1138.5607.01
Z1	LD GLEICHTAKTDROSSEL 10UH COMMON MODE CHOKE	1138.9625.00	WUERTH	744226	1138.5607.01
Z2	LD GLEICHTAKTDROSSEL 10UH COMMON MODE CHOKE	1138.9625.00	WUERTH	744226	1138.5607.01

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