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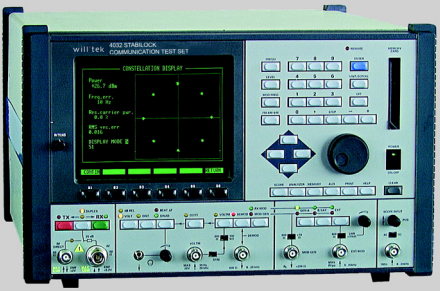
Willtek 4032

STABILOCK®



getting started manual

version 1

Notice Every effort was made to ensure that the information in this document was accurate at the time of printing. However, information is subject to change without notice, and Willtek Communications reserves the right to provide an addendum to this document with information not available at the time this document was created.

Ordering information This guide is issued as part of the **STABILOCK 4032**. The ordering number for a published guide is M 295 088. The ordering number for the product is M 108 802.

EMC Directive Compliance This product was tested and conforms to the EMC Directive, 89/336/EEC as amended by 92/31/EEC and 93/68/EEC for electromagnetic compatibility. A copy of the Declaration of Conformity is provided with this manual.

Low Voltage Directive Compliance This product was tested and conforms to the Low Voltage Directive, 73/23/EEC as amended by 93/68/EEC. Conformity with this directive is based upon compliance with the harmonized safety standard, EN60950. A copy of the Declaration of Conformity is provided with this manual.

Table of Contents

About This Guide

This section contains the following basic information:

Purpose and scope

The purpose of this guide is to help you successfully use the STABILOCK 4032 features and capabilities. This guide includes task-based instructions that describe how to install, configure, use, and troubleshoot the STABILOCK 4032. Additionally, this guide provides a description of Willtek's warranty and repair information.

Assumptions

This guide is intended for novice users who want to use the STABILOCK 4032 effectively and efficiently. We are assuming that you have basic computer and mouse/track ball experience and are familiar with basic telecommunication concepts and terminology.

This manual shall help you getting started. It provides an overview of the functions of the instrument, independent of the firmware and options installed in your 4032. For more detailed information, please refer to the operating instructions (see below).

Related information

Use this guide in conjunction with the following information:

STABILOCK 4032 operating instructions, ordering number M 290 288, and the applicable add-on manuals for hardware and software options**.**

Technical assistance

If you need assistance or have questions related to the use of this product, call or e-mail one of Willtek's technical assistance centers.

Table 1 Technical assistance centers

Region	Phone Number	Fax number, e-mail address
UK	+44 (0) 20 8408 5720	+44 (0) 20 8397 6286 support.uk@willtek.com
Europe, Middle East, Asia, Africa	+49 (0) 89 996 41 386 +49 (0) 89 996 41 227	+49 (0) 89 996 41 440 support.eu@willtek.com
Americas	+1 317 595 2021 +1 866 WILLTEK	+1 317 595 2023 support.us@willtek.com

Conventions

This guide uses naming conventions and symbols, as described in the following tables.

Table 2 Typographical conventions

Description	Example
User interface actions appear in this **typeface**.	On the Status bar, click **Start**.
Buttons or switches that you press on a unit appear in this **TYPEFACE**.	Press the **ON** switch.
Code and output messages appear in this `typeface`.	`All results okay`
Text you must type exactly as shown appears in this **`typeface`**.	Type: **`a:\set.exe`** in the dialog box.
Variables appear in this **<typeface>**.	Type the new **<hostname>**.
Book references appear in this **typeface**.	Refer to **Newton's Telecom Dictionary**
A vertical bar | means "or": only one option can appear in a single command.	`platform [a|b|e]`
Square brackets [ ] indicate an optional argument.	`login [platform name]`
Slanted brackets < > group required arguments.	`<password>`

Table 3 Keyboard and menu conventions

Description	Example
A plus sign + indicates simultaneous keystrokes.	Press **Ctrl+s**
A comma indicates consecutive keystrokes.	Press **Alt+f,s**
A slanted bracket indicates choosing a submenu from menu.	On the menu bar, click **Start > Program Files**.

Table 4 Symbol conventions

This symbol represents a general hazard.

This symbol represents a risk of electrical shock.

NOTE

This symbol represents a Note indicating related information or tip.

Table 5 Safety definitions

WARNING

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

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

Safety Issues

This chapter provides the safety notes for the STABILOCK 4032. Topics discussed in this chapter include the following:

Safety notes

The STABILOCK 4032 has been built and tested in line with DIN 57411 Part I/VDE 0411 Part 1 (protective measures for electronic measuring apparatus). The instrument left the works quite correctly engineered for safety. To maintain this state and ensure safe operation, observe carefully what is said below:

Power fuse Only use fuses of the type stated (see section "Replacing fuse"). Do NOT patch your fuses or short the fuse holder.

Grounding The line plug of the STABILOCK 4032 may only be connected to a socket with a grounding contact. The protection (grounding) that this produces may not be cancelled by using an extension cable that has no safety ground conductor. Nor is it permissible to intentionally interrupt the safety ground conductor either inside or outside the instrument (e.g. by undoing the connection for the safety ground conductor).

WARNING

If there is no grounding through the safety conductor and a defect occurs, the housing of the STABILOCK 4032 could become live, which is highly dangerous!

Shutdown upon defect If you suspect that the 4032 is not safe to operate, shut it down immediately and secure it in such a way that it cannot be switched on again, especially by persons who are unaware of the danger. Then contact a Willtek service agency.

Maintenance

Before any adjustment, maintenance, repair or replacement of parts the instrument must be separated from all voltage sources if it will be necessary to open it. Maintenance or repairs on the instrument while voltage is applied should only be performed by someone who is well aware of the dangers involved by this.

Declaration of EEC conformity

Manufacturer	Willtek Communications GmbH Gutenbergstr. 2 – 4 85737 Ismaning, Germany
Product name	STABILOCK 4032
	This product conforms to the regulations of the following European directives:
Low voltage directive	73/23/EEC, has been superseded by the directive 93/68/EEC
EMC directive	89/336/EEC
	The conformity of this product to the above-mentioned directives is proved by application of the following standards:
EMC	EN 55022, class B (1995) EN 60801, part 2, test level 1 (1994) ENV 50140, test level 2 (1995) IEC 1000-4-4, test level 3 (1995)
Safety	EN 61010, Part 1 (1993)
Ismaning, December 6th, 1996	 Rudi Glotz, Quality Assurance Manager
	This declaration may not be interpreted as an assurance of characteristics. The safety instructions in the product documentation should be observed.

Overview

1

This chapter provides a general description of the STABILOCK 4032. Topics discussed in this chapter include the following:

About the STABILOCK 4032

In excess of 5000 STABILOCK 4032 radio test sets are currently in use worldwide. This success has been due to the versatile design, simple operation and wide variety of system tests which can be made with the "universal" test set.

Applications range from high-speed production tests and quality measurements to servicing and commissioning tests. The wide variety of hardware modules and software options covering frequency ranges up to 2.3 GHz, provide comprehensive capability of analog and digital cellular, cordless and two-way radio systems.

Additional capability includes base station measurements and paging tests.

Systems include TETRA Digital Trunked Radio, Tetrapol as well as CDMA base station testing at 800 MHz and 1900 MHz. The GSM Option of the STABILOCK 4032 now is also capable of testing dual-band mobiles.

Please refer to individual data sheets for further details of system performance.

Features and capabilities

Built-in spectrum analyzer

AUTORUN

IEEE-488 interface

High-speed measurements

Reliability

Options

Recommended extras

- IEEE-488 Interface PC II A (for ARE AUTORUN Editor)
- Telescopic antenna
- Carrying bag
- Transport container
- Protective back panel cover
- 19-inch adapter
- Connector set (N/BNC adapter, 2 x 1 m cable BNC/BNC, 1 x 1 m cable N/N, 1 x 1 m cable BNC/banana)
- Memory card (256 KByte)
- Carrying grip kit
- RF probe
- Oscilloscope probe
- 50-way D connector for control interface
- 25-way connector for control interface
- Carrying rack
- Protective edges
- GSM plug-in SIM card

Test packages

- 4032 STABILOCK with RF-Frequency Extension 2.3 GHz (FEX)
- GSM/GSM 1800/GSM 1900 MS Test Package
- DECT Package
- CDMA BS Test Package
- IS-136 MS Test Package
- Option TETRA-Standard Package Base Station Test
- TETRA/FEX BS Test Package
- TETRA-380 MS Test
- TETRA/FEX MS Test Package

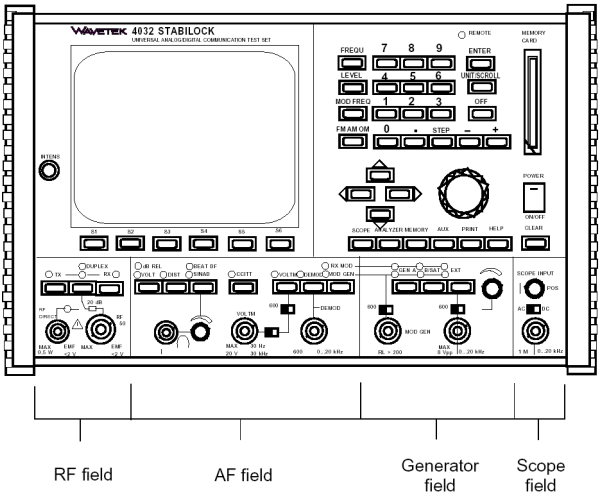
Other available options (extract)

- Duplex FM/ΦM
- Control interfaces
- 2nd Modulation generator
- RS-232/Centronics interface
- SSB kit
- Adjacent Channel Power Meter (ACPM)
- Fast Spectrum Analyzer
- 2nd RF generator
- Option card
- DTMF module
- DC voltmeter/ammeter
- Various highpass, lowpass, bandpass, bandstop filters
- Various notch filters
- ARE Autorun Editor
- NMT
- AMPS, EAMPS, NAMPS
- NATEL-C
- Radiocom 2000 HD
- FMS
- VDEW direct dialing
- VDEW digital
- ZVEI binary
- POCSAG (NRZ, FFSK)
- Cityruf
- Trunking (MPT 1327 / PAA 2424)
- AT&T Microcell
- US Signaling formats
- LTR + US Signaling
- Tracking
- NADC (900 MHz, 450 MHz)

- IS-136 DB (down-banded)
- GSM Base Station Test

Not all of the options can be fitted into one 4032. Some options can only be used in conjunction with other options.

Physical description



Specifications

Please refer to the data sheet for the STABILOCK 4032 as well as to the data sheets for its various options.

Installation

2

This chapter describes how to install the STABILOCK 4032. The topics discussed in this chapter are as follows:

Unpacking the instrument

- Do not throw the packaging of your STABILOCK 4032 away. It will make shipment easier if you want to have your model upgraded later.
- Check that the unit is undamaged.
- Check that the delivery is complete:

Table 6 Standard items supplied with the 4032

Quantity	Product designation
1	STABILOCK 4032
2	protective caps
2	Miniature line fuses 3.15 A
1	Power cable
1	TNC/BNC adapter
1	TNC protective cap
1	Front panel cover
1	Headphones plug
1	Memory card (256 kbytes, blank)
1	CD with user guide
1	This getting started manual

WARNING

Do not attempt to operate a STABILOCK 4032 if there is obvious damage to the device, the power cord or the accessories. Retain the packaging and contact the office who supplied the equipment.

The ordered options are usually already incorporated in the Communication Test Set. You can see what options are in your 4032 at any time by calling up the so-called status mask on the screen. The call-up of the status mask is described in chapter 4 of the operating instructions.

Preparing for first start-up

Different power supplies

Before switching STABILOCK 4032 on with the [POWER] button, refer to the illustrations below to find out what version of the POWER SUPPLY your Communication Test Set is fitted with.

The power supply without a DC input is standard. If you want to be able to operate STABILOCK 4032 away from a power outlet, you need the optional AC/DC power supply (ordering code 204 033).

Admissible line voltage

The power supply adjusts automatically to the applied line voltage (ie 110 or 230 Vac). The line-voltage tolerances within which the power supply will work correctly can be found on its back panel.

Replacing fuse

You will need the following fuse, regardless of the line voltage:

T3.15/250D (slow-blow; 3.15 A; 5.2 x 20 mm)

NOTE

Note that, with older versions of the power supply, the rating of the fuse depends on the applied line voltage. But you cannot go wrong as long as you look at what is printed on the power supply module.

Line/battery in parallel

When STABILOCK 4032 is being line-powered, this does not mean that an external battery has to be disconnected. This parallel mode of operation will not endanger either the battery or the 4032. The line takes priority, so the battery is neither discharged nor charged.

Preparations for battery powering

Feed-in point

In mobile use STABILOCK 4032 can also be powered from a battery (external). The connecting cable for this should have a cross-section of at least 1.5 mm^2. The feed-in point (3-way flange connector) is located on the back panel on the POWER SUPPLY module).

Battery voltage and power requirement

A battery voltage of between 10.5 and 32 V_{dc} is permissible (at turn-on a minimum voltage of 10.8 V_{dc} is necessary). For 12 V_{dc} the current drain is approx. 7.5 A and for 24 V_{dc} approx. 3.75 A.

Fuse

There is a miniature fuse T16/32 V (slow; 16 A; format 6.3 mm * 32 mm) in the lefthand fuse holder). The rating of this fuse is independent of the battery voltage.

Preparing battery cable

When you connect a lead to the battery connector, it is best to refer to the marking next to the flange connector for the poling. The third terminal of the battery connector is left vacant). The battery connector and the flange connector are non-reversible. If the poling is nevertheless reversed, eg when connecting the battery, an internal protective diode will prevent any damage occurring to STABILOCK 4032. Note that the battery cable must be capable of conducting up to 10 A rated current, and check the ready cable for shorting across the poles before using it.

Battery/line in parallel

If an external battery is connected to STABILOCK 4032, the unit can still be fed from the line. The line takes priority, so the battery will not be discharged in parallel mode, but it will not be charged either.

Permissible RF input power

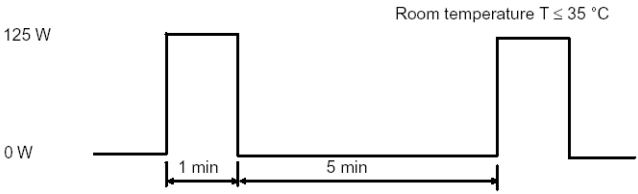
The permissible input power of STABILOCK 4032 means the average value of the applied power ($P_{average}$ or P_{av} for short).

RF DIRECT socket

Make sure under all circumstances that no signal of more than 500 mW is fed into the RF DIRECT input/output socket. If this critical limit is exceeded, the highly sensitive RF input stage of the Communication Test Set will immediately be destroyed. The time during which the maximum permissible average power may be applied to the RF DIRECT socket is not limited.

RF socket

Power of up to P_{av} = 50 W may be applied to the RF socket for any length of time. The Communication Test Set can for a short time sustain higher input power up to P_{av} = 125 W. The following diagram illustrates for P_{av} = 125 W the relationship between permissible duration of application and the waiting time between two measurements:



1 min = permissible duration of application
5 min = waiting time between two measurements

For power of 50 W < P_{av} < 125 W the permissible duration of application is correspondingly lower. When you reach the permissible duration of application, the message `REDUCE RF POWER` appears on the monitor.

CAUTION

When the message `REDUCE RF POWER` appears on the monitor, you must immediately reduce the applied power to $P_{av} < 50$ W. Otherwise the internal power attenuator will be destroyed. Furthermore: For as long as power of $P_{av} \geq 50$ W is applied, STABILOCK 4032 may **not** be switched off (switch-off $\rightarrow$ attenuator = 0 dB $\rightarrow$ **danger for preamplifier**). The `REDUCE RF POWER` message may also remain during the cooling-off phase of the power attenuator, meaning that STABILOCK 4032 is not ready to measure during this time.

Switch-on

Once you have completed the preparations for first-time start-up, you can connect your STABILOCK 4032 to the line without any worry and start it by striking the [POWER] key. Switch-on is confirmed by a short signal tone; after a few seconds one of the so-called screen masks will appear on the monitor. You can adjust the intensity of the display with the INTENS rotary knob.

If you have not made any entries on STABILOCK 4032 for 20 to 25 min, the momentarily displayed mask will be replaced by a screen protection. As soon as a key is pressed, the monitor will again show the mask originally displayed. The GENERAL PARAMETERS foldout tells you how to disable this screen protection (see chapter 4 of the operating instructions).

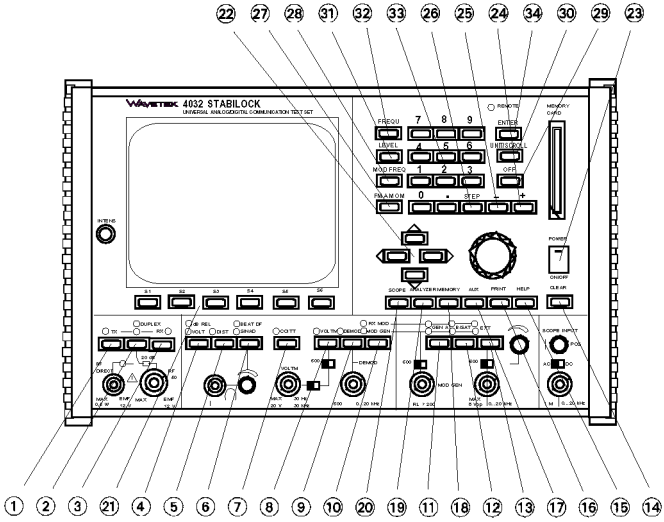
Operation

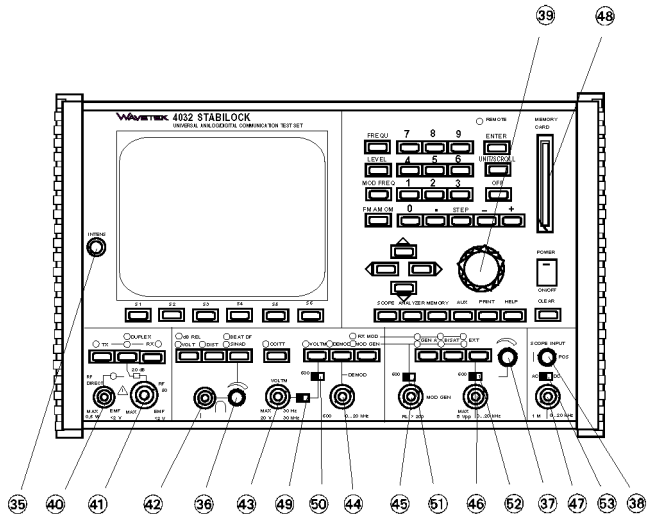
3

This chapter describes the functionality of the instrument. Topics discussed in this chapter are as follows:

Using the front panel

The function of the particular control is explained in this section under the same number.





Keys

1 TX Calls up the basic TX mask (transmitter measurement). **TX** also takes you to the basic TX mask if a submask has been called up. In this case **TX** substitutes for multiple operation of the softkey **RETURN**.

2 Unnamed This is repeatedly tapped to select the modes SIMPLEX, AUTO-SIMPLEX and optionally DUPLEX (basic DUPLEX mask). SIMPLEX = manual switchover between TX and RX; AUTO-SIMPLEX = automatic switchover from RX to TX if the RF power fed in is ≥ approx. 30 mW.

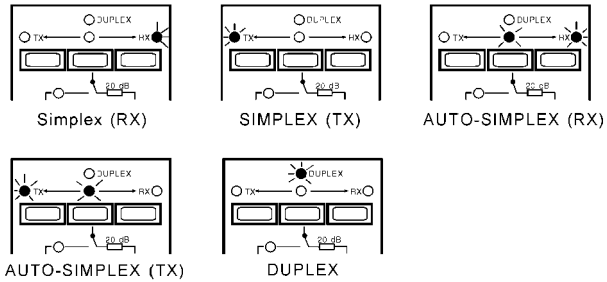


Figure 1 Illuminating LEDs signal the mode selected.

3 RX Calls up the basic RX mask (receiver measurement). **RX** also takes you to the basic RX mask if a submask has been called up. In this case **RX** substitutes for multiple operation of the softkey **RETURN**.

4 VOLT/ DB_REL – Calls up the RMS pointer instrument on the screen (AF voltmeter with RMS display + AF counter), as long as one of the three basic masks (RX, TX, DUPLEX) is current. If display of the AF POWER meter has been declared in the GENERAL PARAMETERS mask, this will appear instead of the RMS meter as long as the VOLTM input is coupled with **VOLTM**.

– If the RMS instrument (or AF POWER) has already been called up, it will be replaced by the dBr meter (relative level measurement). The reference value (0 dB) is the level measured immediately before by the RMS meter. The reference value is maintained if you switch to another AF signal source with **VOLTM**, **DEMOD** or **RX_MOD/MOD_GEN** (important for SAT loop measurement for example).

5 DIST Calls up the DIST (distortion factor) pointer instrument on the screen if one of the three basic masks is current.

6 BEAT/SINAD
– Calls up the SINAD meter on the screen if the RX or DUPLEX mask is present.
– Enables an RF frequency offset (beat) to be listened to on the internal loudspeaker if the TX mask is present (beat = frequency offset between input signal and tuned frequency of test receiver).
– If the BEAT function is not called up in TX mode, the loudspeaker reproduces the AF signal momentarily applied to the AF instruments of the 4032 (signal selection with **VOLTM**, **RX_MOD/MOD_GEN** or **DEMOD**).

7 CCITT Inserts the CCITT P53 A filter (psophometric weighting) into the signal path to the AF instruments of the 4032. Tapping the key again takes the filter out of the signal path. By selecting a scroll variable the CCITT filter can also be cut into the signal path to the DEMOD instrument (see "OPTION CARD" in chapter 4 of the operating instructions).

8 VOLTM Conducts the signal from the input socket of the same name VOLTM to the momentarily called AF instruments. The **VOLTM** key is interlocked with the **DEMOD** and **RX_MOD/MOD_GEN** keys.

9 DEMOD Conducts the demodulated signal from the 4032 test receiver internally to the momentarily called AF instruments. This function is disabled if the RX mask is called. The **DEMOD** key is interlocked with the **VOLTM** and **RX_MOD/MOD_GEN** keys.

10 RX_MOD/ MOD_GEN Conducts the modulation signal of the current modulation signal source(s) GEN A, EXT and GEN B (option) to the momentarily called AF instruments. The **RX_MOD/MOD_GEN** key is interlocked with the **VOLTM** and **DEMOD** keys.

11 GEN_A Activates the modulation generator GEN A with the settings (frequency, level) selected on the screen. Striking the key again will cut out generator GEN A. If the RX or DUPLEX mask is called up, GEN A can be switched to the RX or TX signal path by repeatedly striking the **GEN_A** key (level input field = **Mod.** or **Lev.**). But in the TX mode only the TX signal path is possible (level input field = **Lev.**).

- If the TX signal path is switched (red LED illuminated), the modulation signal is output AC-coupled on socket MOD GEN and DC-coupled on socket Bu 29 (back panel).
- If the RX signal path is switched (green LED illuminated), the modulation signal feeds the modulator of the 4032 signal generator. This modulation signal can be brought out DC-coupled but only on socket Bu 27 (back panel).
- If further modulation-signal sources are activated (EXT and optionally GEN B), the result will be a sum modulation signal (modulation overlaying).

12 B/SAT Activates the modulation generator GEN B (option) with the settings (frequency, level) selected on the screen. Tapping the key again will cut the generator out.

If the RX or DUPLEX mask is called up, GEN B can be switched to the RX or TX signal path (see **GEN_A**) by repeatedly tapping the **B/SAT** key. In the TX mode only the TX signal path is possible (see operating instructions, chapter 8, Modulation Generator GEN B).

The green LED assigned to the **B/SAT** key has a special function when the optional data module is used for testing radiotelephones. In such cases the LED will only illuminate when there is background signaling (SAT; cf operating instructions,chapter 10).

13 EXT Couples the signal fed in on socket EXT MOD into the RX/TX signal path of the modulation generators. Tapping the key again will disconnect the signal.

In DUPLEX mode the external modulation signal can be coupled into the RX or TX signal path of the modulation generators (see **GEN_A**) by repeatedly tapping the **EXT** key.

14 CLEAR Triggers a reset pulse for the microprocessors of the 4032 but without deleting the set test parameters. **CLEAR** will generally eliminate any blockage of the internal digital signal processing. A total reset eliminates stubborn blockages, but replaces test parameters set by the user with works settings (defaults) and calls up the status mask.

To execute a total reset, press the **OFF** key, keep it depressed and additionally press the **CLEAR** key for a short time.

15 HELP

- Shows up all entry fields of a mask by briefly brightening them up (inverted display), ie provided that no entry field has been opened.
- Following **HELP** the individual entry fields show a number between 0 and 99. The numbers serve for identifying the fields if they are assigned contents by AUTORUN or controller programs.
- Reports permissible entry values for that field which is momentarily open.

NOTE

TX + **MOD_FREQ** + **HELP** → Message `Range: 30 Hz - 30 kHz` at the foot of the mask

16 PRINT Causes printout of the momentary screen content. First the 4032 has to be adapted to the printer: the **`Printer`** field of the GENERAL PARAMETERS mask (call: **AUX** + **DEF.PAR** + **ETC**) permits selection from the available printer-driver software. On the ink-jet printer option the DIP switches have to be set to LISTEN ALWAYS.

17 AUX Leads to the submask OPTION CARD, enabling the optional modules (eg AF filter) to be cut in and out. The softkey functions of the mask permit further branching into lower mask levels, which are mostly tied to options.

18 MEMORY Calls up the MEMORY mask. This mask offers several functions in conjunction with the memory cards:

- Storage of several complete device settings.
- Storage of screen contents (eg measured results or scope curves).
- Storage and starting of AUTORUN test routines.
- Loading and starting of system programs (software options) for testing radio-data sets and cellular radiotelephones.

19 ANALYZER

- Calls up the spectrum analyzer (entry fields and panoramic display) on the screen if the TX mask is selected.
- Calls up the sweep generator (see operating instructions, chapter 6) if the RX mask is selected.

20 SCOPE Inserts the oscilloscope (entry fields and oscilloscope display) in the lower half of the TX, RX and DUPLEX mask.

21 S1 to S6 Softkeys of the 4032. The functions of the individual softkeys are always stated in the bottommost line of the screen. A displayed function is not executed until **after** the associated softkey has been struck. So you do not see the called function but the one that can be called at the moment.

NOTE

RF_DIR couples socket RF DIRECT as the current RF input/output; at the same time the softkey shows RF as the new function that can be called.

22 Cursor block

- As long as no entry field has been opened, the individual entry fields of a mask can be located with the four cursor keys (sustained pressing of a cursor key produces a repeat function).
- If an entry field for numeric values has been opened, eg with **ENTER**, the keys pointing to the left and right will move the cursor **within** the entry field.

23 POWER The power button of the 4032. When it is switched on again, the Communication Test Set has the same operating status as before it was switched off, meaning that interrupted chores can rapidly be resumed.

A total reset replaces all settings on the 4032 with works settings (defaults) and causes the status mask to be called up. To execute a total reset, press the **OFF** key, keep it depressed and additionally switch on the 4032 with the **POWER** key.

24 +

- Leads together with the sign into the **`Offset`** entry field of the RX mask or DUPLEX mask (option), provided that the **`RF Frequency`** field was opened immediately beforehand.

NOTE

FREQU + **+** → **`Offset`** field is opened with plus sign

– Increases the frequency value in the **RF Frequency** field or the level value in the **Level** field by the defined stepping width every time it is tapped, ie provided that the corresponding entry field (**STEP**) for stepping width has been opened (see also explanations to **STEP** key).

NOTE

RX + **FREQU** + <150 (MHz)> + **ENTER** + **FREQU** + **STEP** + <20> + **ENTER** + **+** → every time **+** is tapped, the frequency of the 4032 signal generator is incremented by 20 kHz: 150.02 MHz; 150.04 MHz etc.

– Issues the plus sign if the RF level is to be set with dBm or dB units, ie provided that the **Level** field is open.

– If it is tapped several times, it displays scroll variables when the currently active field is a scroll field. When the top end of the list of scroll variables is reached, **+** produces no more reaction, ie scroll back with **-**.

25 - This function is analogous to **+**.

26 STEP – Displays the **STEP** entry field for defining a stepping width (see also 24 **+**). The entry must be terminated with **ENTER**. The prerequirement for calling the **STEP** field is that the **RF Frequency** field with the unit MHz or the **Level** field has been opened (frequency or level variation).

NOTE

RX + **LEVEL** + **STEP** + **6** + **ENTER** → the level of the signal generator can now be altered in 6-dB increments with **+** and **-** if the **STEP** field has been opened.

– If the **STEP** field is already on-screen but not inverted, **STEP** will relocate and open this field, ie provided that no entry field has been opened.

– Changes over the lower and upper sideband in duplex mode. Example: Before **STEP** the Communication Test Set transmits in the lower sideband and receives in the upper sideband. After **STEP** the Communication Test Set transmits in the upper sideband and receives in the lower sideband. Requirement: the **`RF Frequency`** field is opened and the units in the field are NoL or NoU.

27 FM_AM_ΦM In the RX and DUPLEX mask (option) this immediately opens the **`Mod`** entry field and in the TX mask the **`Lev.`** entry field. **FM_AM_ΦM** also automatically triggers switch-on of the modulation generator GEN A.

– If the **UNIT/SCROLL** key is operated several times immediately after **FM_AM_ΦM**, this will select the class of modulation in the mask header (at the same time the matching unit is set in the **`Mod`** field).

NOTE

TX + **FM_AM_ΦM** + **UNIT/SCROLL** → TX-FM, TX-ΦM, TX-AM

– If a numeric value is entered in the **`Mod`** field (RX mask) following **FM_AM_ΦM**, this value will specify the modulation (eg frequency deviation). The matching unit (kHz, rad, %) can subsequently be assigned with **UNIT/SCROLL**, provided the **`Mod`** field is open. A selected modulation value (eg 2.4 kHz) is stored if you set another class of modulation (eg 60%).

NOTE

RX + **FM_AM_ΦM** + <2.4> + **UNIT/SCROLL** → 2.4 rad, 2.4%, 2.4 kHz

– If a numeric value is entered in the **`Lev.`** field (TX mask) following **FM_AM_ΦM**, this value will specify the output level of mod. generator GEN A. **UNIT/SCROLL** then selects the unit (mV, V or dBm).

NOTE

TX + **FM_AM_ΦM** + **4** + **UNIT/SCROLL** → 4 mV, 4 V, 4 dBm

28 MOD_FREQ Leads to immediate opening of the **AF GEN A** entry field (modulation frequency of GEN A). **MOD_FREQ** also automatically triggers switch-on of the modulation generator GEN A.

NOTE

TX + **MOD_FREQ** + **2** + **ENTER** + **FM_AM_ΦM** + <1.2 (V)> + **ENTER** → a signal with f = 2 kHz and V = 1.2 V appears on socket MOD GEN

29 OFF

- Cuts out the 4032 signal generator, ie provided that the **Level** entry field has been opened. Switch on again (with original level value) using **LEVEL**.
- Removes a **STEP** entry field from the screen that has been fetched with **STEP**, ie provided that the **STEP** field has been opened.

30 UNIT/ SCROLL a) Operating this key several times permits assignment of the required unit to the entered numeric value in the current (brightened up) mixed numeric field, ie provided that the **UNIT/ SCROLL** key is pressed immediately after entering the numeric value (and before **ENTER**).

NOTE

RX + **LEVEL** + **4** + **UNIT/SCROLL** → 4 mV, 4 µV, 4 dBm, 4 dBµ

b) Operating the key several times shows the available entry variants of the current scroll field.

c) Operating the key several times produces conversion of the numeric value in the **Level** field to the required unit (dB, V/mV or dBm), ie provided that the entry in the **Level** field was terminated immediately beforehand with **ENTER**.

NOTE

RX + **LEVEL** + <12 (mV)> + **ENTER** + **UNIT/ SCROLL**→ the display in the **Level** field changes between -25.4 dBm, 81.6 dBµ, 12 mV

d) Operating the key several times immediately after **FM_AM_ΦM** produces selection of the class of modulation (indicated in the mask header).

31 LEVEL Leads in the RX and DUPLEX mask (option) to immediate opening of the **Level** entry field.

32 FREQU Leads to immediate opening of the **RF Frequency** entry field.

33 Numeric cluster Used to enter numerics in the current (brightened up) field. The start of the entry opens the field and clears the previously contained value. If only one digit is to be altered, it is better to open the field with **ENTER** and mark the digit concerned with the cursor.

34 ENTER
- Terminates entries in numeric fields as long as the entered value is legal. Any attempt to create an illegal value is advised by a warning tone; the numeric field will then show that value again which it had before the illegal entry.
- Opens numeric fields without altering their content.

Rotary knobs

35 INTENS Adjusts the intensity of the screen display. Automatic cutout prevents burns on the monitor. This is activated if no entry is made for about 20 to 25 min. If this automatic cutout is disabled, you must reduce screen intensity to prevent burns (see also operating instructions, chapter 4, "GENERAL PARAMETERS").

36 Unnamed Volume control; effective when monitoring a current AF signal or a frequency offset (cf 6 **BEAT/SINAD**). Current AF signal = signal applied to AF instruments; selection of signal with **VOLTM**, **DEMOD** or **RX_MOD/MOD_GEN**.

37 Unnamed Attenuator for the level of the modulation signal fed in on socket EXT MOD. With this control it is possible, for example, to vary the frequency deviation produced by the external modulation signal in a receiver measurement. The attenuator control is only active if the adjacent slide switch is set to VAR > 35 kΩ.

38 POS Positions the zero line of an oscillogram on the vertical axis, ie provided that the SCOPE function has been called up.

39 Unnamed Multifunction handwheel for continuously altering numeric values and calling up entry variables for the scroll field. The handwheel always governs the current (brightened up) field.

- Alteration of numeric values: open the entry field with **ENTER** for example, move the cursor to the required position $\rightarrow$ **turning the handwheel alters the value of the position, carries also being allowed for. The alteration immediately affects the display of the measured results concerned.**

NOTE

TX + **VOLT** + **GEN_A** + **RX_MOD/MOD_GEN** + **FM_AM_ΦM** + <value> ⟶ the alteration of the level value in the **Lev** entry field (with the handweel) is immediately shown on the RMS meter

– Call-up of entry variables for the scroll field: the entry variables are shown by slowly turning the handwheel clockwise or counterclockwise.

Sockets

40 RF DIRECT 

RF input/output (input for transmitter measurement; output for receiver measurement). Coupling to the internal RF input/output stage with the softkey function **RF_DIR**. The power of a signal that is fed in may under no circumstances exceed 500 mW, otherwise the input stage/attenuator will be destroyed! RF DIRECT is to be used primarily for very small RF input signals. In DUPLEX mode RF DIRECT may be selected as a separate signal-generator output (see also explanations to RF socket).

41 RF RF input/output (input for transmitter measurement; output for receiver measurement) with a 20-dB attenuator in the signal path. Coupling to the internal RF input/output stage with the softkey function **RF**. The permissible input power of a signal that is applied constantly is 50 W, and shortterm (1 min) 125 W is permissible. If the TX-ΦM or TX-FM mask is called up, a squelch suppresses weak RF input signals onwards from the IF stage (switching threshold approx. –40 dBm).

In DUPLEX mode the RF socket is to be used as a common input/output, as long as there is a difference of at least 60 dB between output level and input level. If the difference is smaller (transponder measurements), select the RF DIRECT socket with

RF_DIR. The latter is then the output and socket RF the input (the RF socket remains active because the DUPLEX output coupling is not affected by the switchover).

42 Unnamed Jack socket for connecting headphones of any impedance (the internal loudspeaker is then disconnected).

43 VOLTM Input for the AF signal. The signal can only be applied to the AF meters of the 4032 if the **VOLTM** key is tapped (cf points 49 and 50).

44 DEMOD AF output for the demodulated TX signal. The **DEMOD** key has no effect on the DEMOD socket.

45 MOD GEN AF output for the modulation signal, ie provided that the TX signal path is switched for the modulation-signal source(s). If several modulation-signal sources are activated – GEN A, EXT and optionally GEN B – the sum signal appears on the MOD GEN socket. The output is shortcircuit-proof; a transformer balances the output signal (cf point 51).

46 EXT MOD AF input for an external modulation signal (cf point 52).

47 SCOPE INPUT AF input for the 4032 oscilloscope (cf point 53).

48 MEMORY CARD Slot for memory cards (a memory card is a battery-buffered RAM data medium for software options, AUTORUN programs, complete device settings and screen contents).

Slide switches

49 SYM Determines whether the earthy pole of the VOLTM socket is connected to ground (unbalanced input) or not (balanced input).

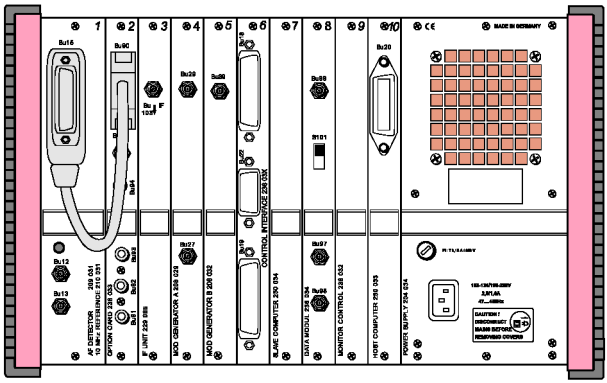
50 600 Ω/ 100 kΩ Puts the input impedance of the VOLTM socket on 600 Ω or on 100 kΩ.

51 600 Ω/10 Ω Puts the output impedance of the MOD GEN socket on 600 Ω or on 10 Ω.

52 600 Ω/ VAR > 35 kΩ Puts the input impedance of the EXT MOD socket on 600 Ω or on 35 kΩ. In the VAR > 35 kΩ setting it is possible to reduce the level of the applied modulation signal with the adjacent attenuator (37).

53 AC/DC Determines whether the input socket of the oscilloscope (47) is DC-coupled or AC-coupled.

Using the back panel



Standard Configuration:

Stage 1	AF DETECTOR + 10 MHz REFERENCE
Stage 3	IF UNIT
Stage 4	MOD GENERATOR A
Stage 7	SLAVE COMPUTER
Stage 9	MONITOR CONTROL
Stage 10	HOST COMPUTER
–	POWER SUPPLY

AF DETECTOR + 10 MHz REFERENCE (module 1)

Socket 15 (Bu 15) Interface for connecting module 2 (OPTION CARD) with adapter cable 384 752 (see also operating instructions, chapter 9, section "OPTION CARD") or for connecting external filters.

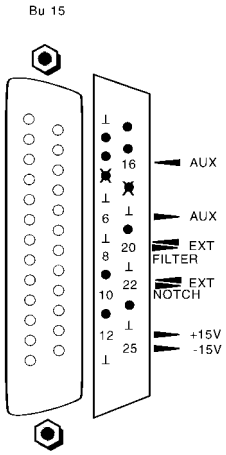


Figure 2 Socket Bu 15: pinning

- Point = pin not used
- Cross = pin conducts control signal used internally
- Pin 6 = TTL control output
- Pin 8 = output (to external AF filter)
- Pin 10 = output (to external notch filter)
- Pin 12 = +15 V to GND (I_{max} = 50 mA)
- Pin 16 = TTL control input
- Pin 20 = input (from external AF filter)
- Pin 22 = input (from external notch filter)
- Pin 25 = –15 V to GND (I_{max} = 50 mA)

Socket 12 (Bu 12) Input for synchronizing the internal 10-MHz reference oscillator (see data sheet for specifications) with an external signal. Synchronization range approx. 1 x 10^{-6} Hz
$0.2\ V \leq V_{syn} \leq 1\ V$
$R_i = 200\ \Omega$

Socket 13 (Bu 13) Output for synchronizing external oscillators with the 10-MHz reference oscillator.
f = 10 MHz
P_{out} = 4 mW
$R_i = 50\ \Omega$

IF UNIT (module 3)

The IF unit performs the AM, FM or ΦM demodulation of the IF signal. The frequency-offset measurement, the selective power measurement and the analyzer signal are also evaluated in the IF unit.

Socket 103 (Bu 103) Delivers IF signal for GSM or DAMPS option. Do not feed any signal into this socket!

MOD GENERATOR A (module 4)

Socket 29 (Bu 29) DC-coupled output for the modulation signal in TX mode (transmitter testing). If several modulation-signal sources are connected into the TX signal path (GEN A, EXT MOD and optionally GEN B), an output amplifier adds the individual signals and produces the sum signal on Bu 29 (modulation overlay).

$V_{max} = 5\ V_{rms}$ (EMF)
$R_i = 600\ \Omega$

The signal on the MOD GEN socket (front panel) is identical to that on Bu 29 but AC-coupled (output transformer).

Socket 27 (Bu 27) DC-coupled output for the modulation signal in RX mode (receiver testing). The signal corresponds to that which is fed to the modulators of the 4032 internally. If several modulation-signal sources are connected into the RX signal path (GEN A, EXT MOD and optionally GEN B), an output amplifier adds the individual signals and produces the sum signal on Bu 27 (modulation overlay). There is no signal (0 V) on Bu 27 in TX mode.

The maximum output level of 2 V (peak) into 600 Ω represents, depending on the class of modulation, 100% AM or 40 kHz FM (35.3 mV = 1 rad ΦM).

SLAVE COMPUTER (module 7)

The slave computer is responsible for all internal measurements and the control signals required for them.

MONITOR CONTROL (module 9)

The monitor control is responsible for displaying the screen masks and for the scope and analyzer display.

HOST COMPUTER (module 10)

The host computer is responsible for the operation, the Memory Card and IEEE-bus interface and the AUTORUN function.

Socket 20 (Bu 20) IEEE-488 interface of STABILOCK 4032. An IEEE-bus printer can be connected to Bu 20 for logging measured results (set DIP switches on printer to LISTEN ALWAYS).

POWER SUPPLY See "Different power supplies" on page 9.

Connecting test leads

The use of the connectors depends mainly on the application. The figure below only depicts one out of many different applications and connection charts. Refer to the full operating instructions for more information about different applications and connections.

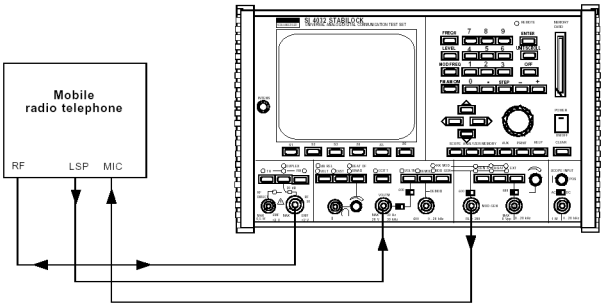


Figure 3 Cable connections for RF, loudspeaker and microphone

Warranty and Repair

This chapter describes the customer services available through Willtek. Topics discussed in this chapter include the following:

Warranty information

Willtek warrants that all of its products conform to Willtek's published specifications and are free from defects in materials and workmanship for a period of one year from the date of delivery to the original buyer, when used under normal operating conditions and within the service conditions for which they were designed. This warranty is not transferable and does not apply to used or demonstration products.

In case of a warranty claim, Willtek's obligation shall be limited to repairing, or at its option, replacing without charge, any assembly or component (except batteries) which in Willtek's sole opinion proves to be defective within the scope of the warranty. In the event Willtek is not able to modify, repair or replace nonconforming defective parts or components to a condition as warranted within a reasonable time after receipt thereof, the buyer shall receive credit in the amount of the original invoiced price of the product.

It is the buyer's responsibility to notify Willtek in writing of the defect or nonconformity within the warranty period and to return the affected product to Willtek's factory, designated service provider, or authorized service center within thirty (30) days after discovery of such defect or nonconformity. The buyer shall prepay shipping charges and insurance for products returned to Willtek or its designated service provider for warranty service. Willtek or its designated service provider shall pay costs for return of products to the buyer.

Willtek's obligation and the customer's sole remedy under this hardware warranty is limited to the repair or replacement, at Willtek's option, of the defective product. Willtek shall have no obligation to remedy any such defect if it can be shown: (a) that the product was altered, repaired, or reworked by any party other than Willtek without Willtek's written consent; (b) that such defects were the result of customer's improper storage, mishandling, abuse, or misuse of the product; (c) that such defects were the result of customer's use of the product in conjunction with equipment electronically or mechanically incompatible or of an inferior quality; or (d) that the defect was the result of damage by fire, explosion, power failure, or any act of nature.

The warranty described above is the buyer's sole and exclusive remedy and no other warranty, whether written or oral, expressed or implied by statute or course of dealing shall apply. Willtek specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. No statement, representation, agreement, or understanding, oral or written, made by an agent, distributor, or employee of Willtek, which is not contained in the foregoing warranty will be binding upon Willtek, unless made in writing and executed by an authorized representative of Willtek. Under no circumstances shall Willtek be liable for any direct, indirect, special, incidental, or consequential damages, expenses, or losses, including loss of profits, based on contract, tort, or any other legal theory.

Equipment return instructions

Please contact your local service center for Willtek products via telephone or web site for return or reference authorization to accompany your equipment. For each piece of equipment returned for repair, attach a tag that includes the following information:

- Owner's name, address, and telephone number.
- Serial number, product type, and model.
- Warranty status. (If you are unsure of the warranty status of your instrument, include a copy of the invoice or delivery note.)
- Detailed description of the problem or service requested.
- Name and telephone number of the person to contact regarding questions about the repair.
- Return authorization (RA) number (US customers), or reference number (European customers).

If possible, return the equipment using the original shipping container and material. Additional Willtek shipping containers are available from Willtek on request. If the original container is not available, the unit should be carefully packed so that it will not be damaged in transit. Willtek is not liable for any damage that may occur during

shipping. The customer should clearly mark the Willtek-issued RA or reference number on the outside of the package and ship it prepaid and insured to Willtek.

Room for your notes

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