

### 3.2.20 RF Counter

#### 3.2.20.1 Counter Sensitivity at Connector RF IN/OUT 77

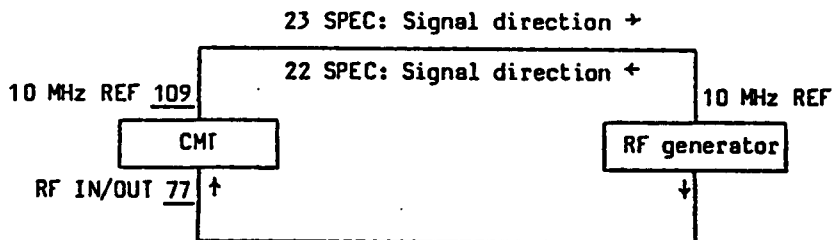
Setting (transmitter test):

Transmitter test FM must be selected if unmodulated signals are counted:   .

Transmitter test AM must be selected if amplitude modulated signals are counted:   .

Call RF counting by pressing the COUNT f key.  
Connect RF IN/OUT 77 by pressing the INPUT SELECT key.

Test setup:



1. Apply unmodulated signals between 400 kHz and 1 GHz.
2. Apply 40% amplitude modulated signals between 400 kHz and 1 GHz.

Test:

Determination of counter sensitivity:

| RF          | 500 kHz | 1 MHz to 1 GHz |
|-------------|---------|----------------|
| Unmodulated | <20 mW* | <5 mW          |
| 40% AM      | <80 mW* | <20 mW         |

\* Internal tolerance

### 3.2.20.2 Counter Sensitivity at Connector INPUT2 79

#### Setting (transmitter test):

Transmitter test FM must be selected if unmodulated signals are counted:   .

Transmitter test AM must be selected if amplitude modulated signals are counted:   .

As in Section 3.2.20.1 except that INPUT2 79 is connected by pressing the INPUT SELECT key.

#### Test setup:

(as in Section 3.2.20.1)

#### Test:

Determination of counter sensitivity:

| RF          | 500 kHz  | 1 MHz to 1 GHz |
|-------------|----------|----------------|
| Unmodulated | < 10 mV* | < 5 mV         |
| 40% AM      | < 20 mV* | < 10 mV        |

\* Internal tolerance

### **3.2.20.3 Counter Accuracy**

#### **Setting:**

(as in Section 3.2.20.1)

#### **Test setup:**

(as in Section 3.2.20.1)

#### **Test:**

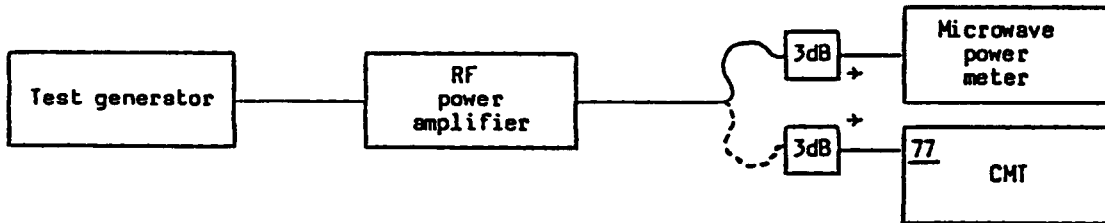
Since the reference frequencies of the counter and generator are related, the frequency set on the RF generator is also displayed on the meter with an error of  $\pm 1$  digit. The reference frequency which also determines the meter accuracy has been tested in Section 3.2.2. A prerequisite for this test is that the RF synthesizer used has no inherent setting errors.

### 3.2.21 Power Meter

Setting (transmitter test):

Call power measurements by pressing **dBm** **POWER** .

Test setup:



To achieve the accuracy guaranteed by the data sheet, ensure that the coaxial 50-Ω resistor is connected to RF -30 dB 111 on the rear of the instrument. The correct impedance of the connection from the output of the power amplifier to the CMT and to the microwave power meter is of great importance for the power measurement. An attenuator at the end of the cable near to the CMT or the microwave power meter improves the impedance conditions. A low-distortion RF signal is required for the test (use a lowpass if applicable) since the CMT power test is based on a peak-value measurement.

Test:

| p \ f  | 1,5 MHz       | 20 MHz        | 500 MHz       | 1000 MHz      |
|--------|---------------|---------------|---------------|---------------|
| 7 dBm  | ±0,6dB + 1dg* | ±0,6dB + 1dg* | ±0,6dB + 1dg* | ±0,6dB + 1dg* |
| 20 dBm | ±0,4dB + 1dg  | ±0,4dB + 1dg  | ±0,4dB + 1dg  | ±0,4dB + 1dg  |
| 47 dBm | ±0,4dB + 1dg  | ±0,4dB + 1dg  | ±0,4dB + 1dg  | ±0,4dB + 1dg  |

\* Internal tolerances  
dg ≙ digit

Record the test parameters listed in the table on the microwave power meter for an unmodulated test signal and compare with the results on the CMT. The table lists the maximum deviation from the nominal value determined on the microwave power meter.

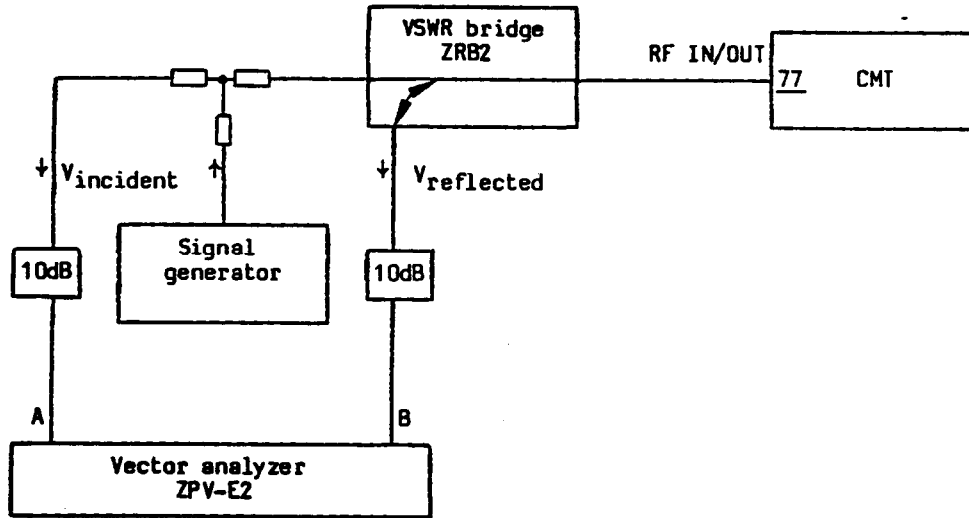
Adjust the power to the correct value at  $P > 33$  dBm and  $f = 50$  MHz (using R672 on the analog unit module)

### 3.2.21.1 VSWR of the Power Meter

#### Setting:

As in Section 3.2.21, but press the  $V_0$  OFF key in addition (RF level off).

#### Test setup:



#### Test:

Measure the standing wave ratio  $(V_{return}/V_{forwards})^2$  between 10 and 1000 MHz. It must be  $< 1.2$ .

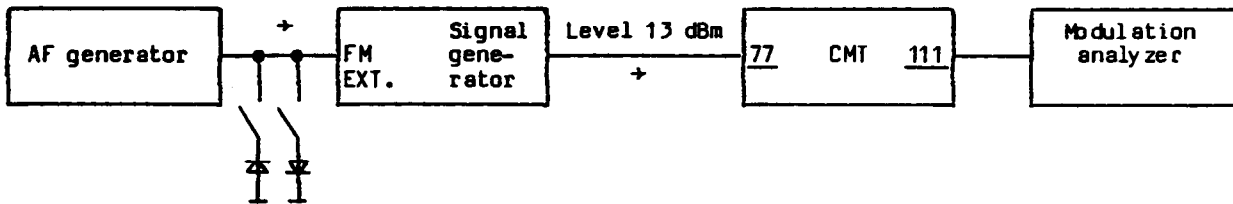
### 3.2.22 Frequency Deviation Meter

#### Setting (transmitter test):

Presetting of CMT for FM transmitter test:    
Carry out the test in the average deviation mode

$\frac{+/-}{2}$  PK by pressing the +  $\frac{+}{2}$  - key twice.

#### Test setup:



#### Test:

First determine the meter accuracy at 50 MHz with a modulation frequency of 1 kHz in the range of the CMT from 0 to 100 kHz and determine the deviation from the nominal value.

Then measure the AF frequency response from 20 Hz to 20 kHz.

The total error of the AF frequency response and the meter accuracy (100 kHz to 1 kHz deviation) must not exceed  $\pm 3\%$ .

The function test of - PK and + PK (press the +  $\frac{+}{2}$  - key twice again) and PK HOLD (press PK HOLD key, then switch off the modulation on the test generator, the display is retained on the CMT with a finite time constant) is made with a deviation and a modulation frequency of 1 kHz.

The function test of the MAX PK modulation with a modulation frequency and a deviation of 1 kHz is made by applying an AF signal with single-sided limiting as an external modulation signal to the test generator.

The CMT indicates the larger of the two deviations in each case.

### 3.2.22.1 300-Hz Highpass Filter

#### Setting:

As in Section 3.2.22 but press the Hp key in addition.

#### Test setup:

(as in Section 3.2.22)

#### Test:

Measure the frequency response at a deviation of 100 kHz and with modulation frequencies between 190 Hz and 20 kHz, preferably at the frequencies in the following table:

|          | Frequency | Indication | Frequency response error |
|----------|-----------|------------|--------------------------|
| Stopband | 190 Hz    | < 1 kHz    |                          |
|          | 240 Hz    | < 10 kHz   |                          |
| Passband | 300 Hz    | 100 kHz    | < 7%                     |
|          | 350 Hz    | 100 kHz    | < 7%                     |
|          | 1 kHz     | 100 kHz    | < 7%                     |
|          | 20 kHz    | 100 kHz    | < 7%                     |

\* In addition to the error determined in Section 3.2.22 (internal tolerance)

The readings in the stopband and the frequency response error in the passband are not guaranteed values on the data sheet.

### 3.2.22.2 Residual FM of the Deviation Meter

#### **Setting:**

As in Section 3.2.22 but press the CCITT key in addition.

#### **Test setup:**

(as in Section 3.2.22)

#### **Test:**

Set the test generator unmodulated to the RF values 499 MHz and 1000 MHz. The RF level is +7 dBm in this case. The indication error must be < 6 Hz at 499 MHz and < 12 Hz at 1000 MHz.

### 3.2.23 Phase Deviation Meter

#### **Setting (transmitter test):**

Presetting of CMT to  $\Phi$ M transmitter test:

#### **Test setup:**

(as in Section 3.2.22)

#### **Test:**

Test the meter accuracy at 50 MHz and a modulation frequency of 1 kHz between 0.1 and 25 rad.

Test the AF frequency response with a phase deviation of 10 rad and at 50 MHz (RF) between 300 Hz and 10 kHz (AF).

The error of the phase deviation meter corresponds to the error of the frequency deviation meter (Section 3.2.22) with an additional error of 2% which may occur in the partial measurement "AF response".



### 3.2.24 Modulation Depth Meter

#### Setting (transmitter test):

Presetting of the CMT to AM transmitter test:

Enter the RF value using the SET f key:

e.g. 30 MHz

#### Test setup:

(as in Section 3.2.22)

#### Test:

Test the meter accuracy at an AF frequency of 1 kHz and at the two RF frequencies of 1.5 MHz and 30 MHz between 1% and 99%.

Test the AF response with a modulation depth of 80% and an RF frequency of 30 MHz at the AF frequencies of 50 Hz and 20 kHz.

The total error of the meter accuracy (3% to 80% modulation depth) and the AF response must not exceed 5%. The meter accuracy can be adjusted using R197 on the analog unit module.

The operating modes +PK, +/-2 PK, -PK, PK HOLD, MAX PK have already been tested in Section 3.2.22. The test can also be carried out in an analogous manner for the modulation depth meter. The 300-Hz highpass filter has also already been tested in Section 3.2.22.

### 3.2.24.1 Residual Modulation of the AM Meter

#### Setting:

As in Section 3.2.24 but press the CCITT TX key in addition.

#### Test setup:

(as in Section 3.2.22)

#### Test:

Set the test generator to unmodulated signal of 30 MHz. Set the RF level to 7 dBm. The modulation depth reading must be < 0.03%.

### 3.2.25 Oscilloscope (CMT Model 54 )

The measured values and tolerances mentioned in this section are not specified as guaranteed values on the data sheet. They are to be used to differentiate between faults/maladjustments and correct functioning.

#### 3.2.25.1 Frequency Response at Connector EXT

##### **Setting (receiver test):**

Set screen cursor to position EXT AC.

##### **Test setup:**

Using an AF generator, apply a signal with a constant amplitude (e.g. 0.707 V) and frequencies between 5 Hz and 200 kHz to the connector EXT.

##### **Test:**

The accuracy is approximately equal to the beam width in the frequency range between 10 Hz and 100 kHz. Triggering stops below 5 Hz; a frequency response or approx.  $\pm 3$  dB occurs between 100 and 200 kHz. The frequency response above 100 kHz is influenced by the position of the wires in the cable harness to the tube.

### 3.2.25.2 Measurement Dynamic Range at Input EXT

**Setting:**

(as in Section 3.2.25.1)

**Test setup:**

(as in Section 3.2.25.1)

**Test:**

Carry out the test at a frequency of 1 kHz and with the following voltages:

|         |         |         |        |
|---------|---------|---------|--------|
| 7.07 mV | 70.7 mV | 0.707 V | 7.07 V |
| 14.1 mV | 141 mV  | 1.41 V  | 14.1 V |
| 28.3 mV | 283 mV  | 2.83 V  | 28.3 V |

A display with a peak-to-peak value of 4 div and an accuracy approximately equal to the beam width appears in each case with the corresponding settings from 5 mV/div to 10 V/div.

The amplitude error, which is the same for all gain settings, can be adjusted using R81 on the oscilloscope. This also acts on the amplitude of the internal signals (BEAT, DEMOD, AF).

### 3.2.25.3 Oscilloscope Time Base

#### **Setting:**

(as in Section 3.2.25.1)

#### **Test setup:**

(as in Section 3.2.25.1)

#### **Test:**

Carry out the test using a squarewave signal at the following frequencies:

25 Hz, 50 Hz, 100 Hz, 250 Hz, 500 Hz,  
1 kHz, 2.5 kHz, 5 kHz, 10 kHz, 25 kHz and 50 kHz.

Half a cycle appears on the screen with a duration of one graticule unit with the corresponding time scales from 20 ms/div to 0.01 ms/div. The accuracy is approximately equal to the beam width. The error, which is the same for all sweeps, can be adjusted using R61 of the oscilloscope (horizontal deflection of the tube) or R208 (XY character generator) (see Service Manual).

### 3.2.25.4 Representation of Internal Signals

#### **Setting:**

As in Section 3.2.16.1 except that the screen cursor is additionally set to position AF.

#### **Test:**

Repeat the test from Section 3.2.16.2.

It is not necessary to test other internal signals on the oscilloscope since the same signal path is always used.

### 3.2.26 DTMF Decoder (Option CM-B11)

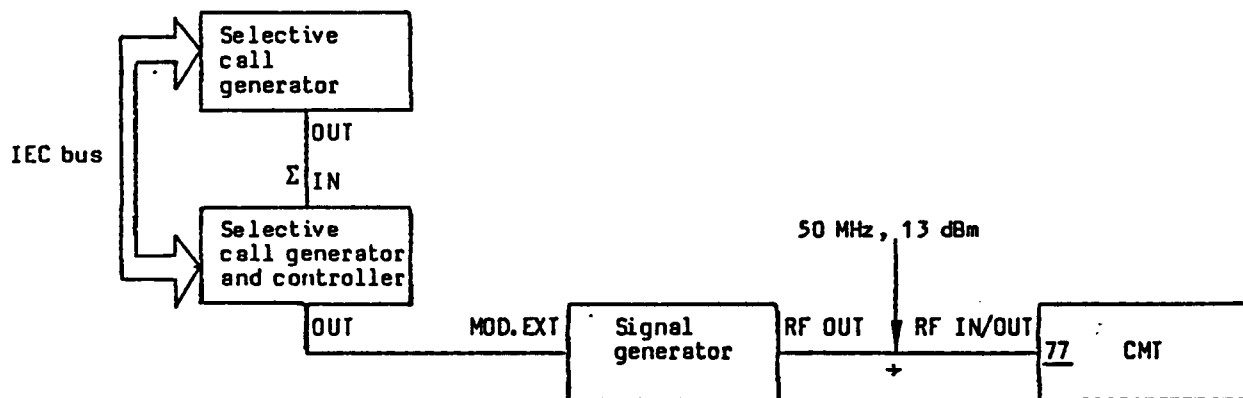
#### Setting (transmitter test):

Presetting of CMT to FM transmitter test:

Select the tone sequence standard using special function  
     .

Press the DECODE key, the CMT now waits for a tone sequence. This is displayed as soon as a sequence has been decoded.

#### Test setup:



#### Test:

The two selective call generators (SCUD) can best generate the two-tone sequences under program control on the IEC bus. A CMT equipped with the option CMT-B7 is itself able to generate the sequences required for the test. Apply the desired deviation to the test generator, but do not feed a signal to the input MOD.EXT, and apply the unmodulated RF signal to the CMT. Subsequently press the DECODE key. A standard tone sequence with at least 5 digits is now generated on the two-tone generator. The code is output in the alphanumeric display at the end of the two-tone sequence.

Evaluation: The dynamic range for the complete deviation is between 250 Hz and 5 kHz for the two-tone sequences. Decoding takes place up to a frequency deviation of approx.  $\pm 2.5\%$ .

### 3.2.27 Adjacent-channel Power Meter (Option CMT-B6)

#### Setting (receiver test):

It is possible to select the channel spacing in the receiver test:

e.g. 10 kHz channel spacing:

The adjacent-channel power measurement is carried out in the transmitter test (FM).

Transmitter test FM:

Enter the reference frequency of the generator using the SET f TX key.

e.g. 60 MHz:

Call adjacent-channel power measurement:

Upper adjacent channel:

Lower adjacent channel:

#### Test setup:

Using a test generator, apply a signal with a power > 20 mW and the RF frequencies 60 MHz, 440 MHz and 900 MHz to connector RF IN/OUT 77, each modulated with 2% AM (modulation frequencies 10 kHz, 12.5 kHz, 20 kHz and 25 kHz). Since the result of the adjacent-channel power measurement is highly dependent on the RF frequency, it is recommendable to either synchronize

the test generator with the CMT (  )

or

the CMT with the test generator (  ).

**Test:**

Measure at the RF frequencies 60 MHz, 440 MHz and 900 MHz; select each channel spacing once as a spot-check (with the corresponding modulation frequency of the transmitter) and measure in the upper and lower adjacent channels.

The result of the test must be 40 dB in all cases (spacing between a sideband and a signal modulated with 2% AM).

The CEPT/FTZ filter specification permits a tolerance of 2 dB at the channel centre. The result with this test configuration must have a maximum error of  $\pm 2$  dB since the measurement comprises a wanted channel measurement and an adjacent-channel measurement.

### 3.2.28 RF Millivoltmeter (Option CM-B8)

#### Preliminary remarks:

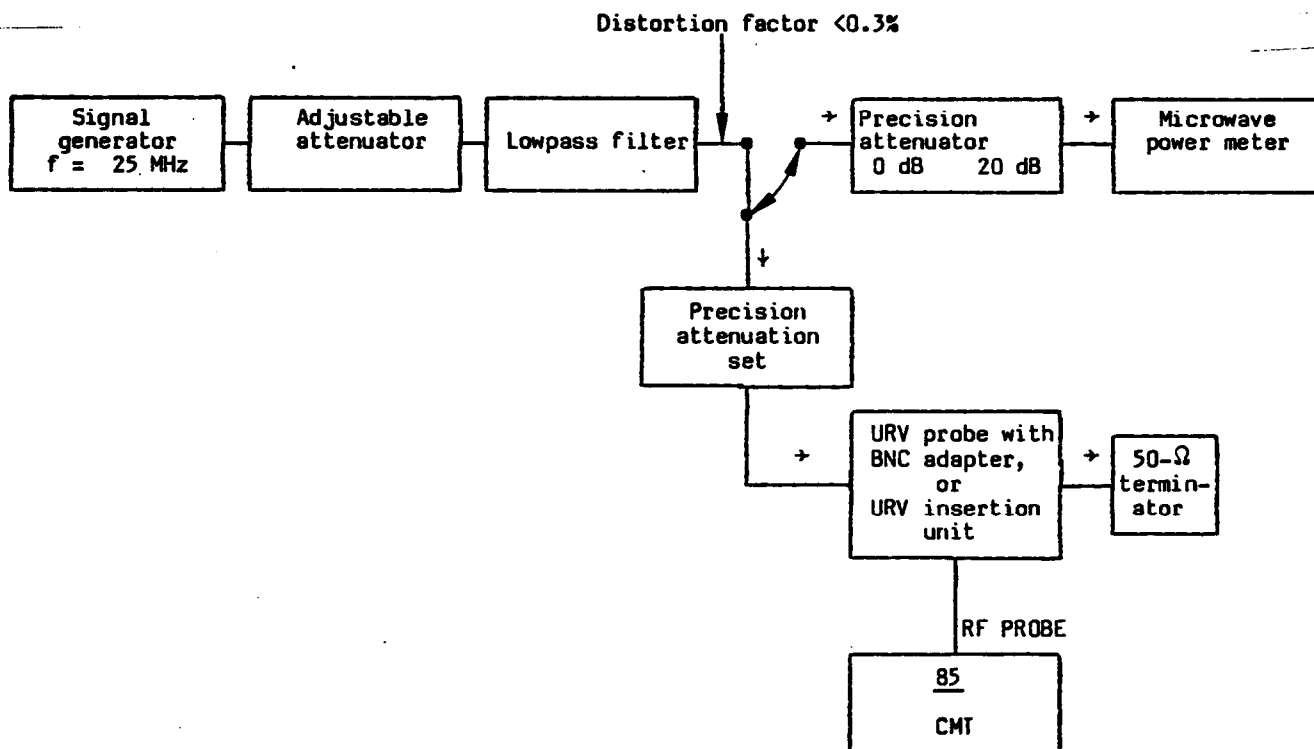
The option attains rated values after a warm-up time of 10 minutes.

The accuracy is slightly dependent on the probe used since the signal is processed in the probe. The fault could be in the instrument itself or in the probe if the display varies considerably. It is essential to connect a correctly operating probe in order to check the accuracy.

#### Setting (transmitter or receiver test):

Select measurement by pressing the PROBE key. The unit can be selected by first pressing the unit key.

#### Test setup:





**Test:**

Select the amplitude of the test generator at a frequency of approx. 25 MHz such that the power meter indicates exactly 20 mW (calibrated value) with the attenuation set and attenuating element settings as in the table.

The deviation from the nominal value is then determined on the display of the RF millivoltmeter by reconnecting the signal path.

**Calibration**

|                                |       |       |       |       |
|--------------------------------|-------|-------|-------|-------|
| Test generator voltage         | 10 V  | 10 V  | 10 V  | 10 V  |
| Attenuation of attenuation set | 0 dB  | 20 dB | 40 dB | 60 dB |
| Precision attenuating element  | 20 dB | 0 dB  | 0 dB  | 0 dB  |
| Indication on power meter      | 20 mW | 20 mW | 20 mV | 20 mW |

**Determination of measuring accuracy**

|                                      |      |     |        |       |
|--------------------------------------|------|-----|--------|-------|
| Nominal reading on RF millivoltmeter | 10 V | 1 V | 100 mV | 10 mV |
| Maximum deviation from nominal value | 5%   | 5%  | 5%     | 5%    |

### 3.2.29 Autorun Control/Printer Interface (Option CM-B5)

#### 3.2.29.1 Memory Function

A short program is to be read into the memory which is then run to check whether the activated instrument functions correspond to the program. The read and write operations of the memory are tested in this manner.

Instrument setup:

- Connect the output of a test generator (e.g. SMPC from R&S) to output RF IN/OUT 77 of the CMT.
- Set a frequency of 100.000 000 MHz on the test generator with a modulation frequency of 1000 Hz and a modulation depth of 2800 Hz.
- Set the output level of the test generator to 13 dBm.

The program is to measure the transmitter frequency, the output power and the modulation depth.

Program input (see following table)

The instrument must automatically switch to the transmitter test mode when the entered program has been started, and the values for the transmitter frequency, transmitter power and modulation depth appear in the associated displays for 4 s each.

| Explanation   | Line No.   | Key sequence                              |
|---|------------|---|
| Call LEARN Mode   |            | A 100 SPEC                                |
| Select transmitter test mode<br>(XMITTER LED lights up)   | 001        | TXRX STORE                                |
| Measure transmitter frequency<br>(transmitter frequency appears in the frequency display: "100.000 00 MHz")               | 002<br>003 | COUNTf STORE<br>4 0 0 0 STOP<br>STORE     |
| Measure the transmitter power<br>(RF power appears in the RF level display: "0.02 W")                                     | 004<br>005 | POWER STORE<br>4 0 0 0 STOP<br>STORE      |
| Measure the modulation depth<br>(the deviation appears in the modulation display: "2.80 kHz")                             | 006<br>007 | kHz MAX PK STORE<br>4 0 0 0 STOP<br>STORE |
| Leave the LEARN mode  |            | A 200 SPEC                                |
| The program has now been completely entered. The instrument is now set to the receiver test mode and the program started. |            |   |
| Select receiver test mode<br>(RECEIVER LED lights up, displays switch over)   |            | TXRX                                      |
| Program 00 of the autorun controller starts at line No.1  |            | 1 0 0 START                               |

### 3.2.29.2 Printer Function

The printer interface can be easily tested following input of the program specified for the function test of the autorun controller. It is only necessary to enter the instruction to print program XX(00<XX<99). The CMT must not be in LEARN mode. Connect a printer (e.g. PUD3 from R&S) and enter the following key sequence to activate printing:

**1** **0** **0** **PRINT**

The printer must now output the program 0 entered in LEARN mode.

### 3.2.29.3 Relay Functions

The relay functions can be tested by entering relay switching instructions via the CMT keys and checking the positions of the contacts using a suitable instrument (e.g. ohmmeter).

The relays of the autorun controller can be addressed via code A. The numbers 1 to 3 in agreement with the inscription on the option support plate at the rear of the CMT are used to differentiate between the 3 relays.

| Explanation              | Key sequence                           | Effect on contacts: |
|--------------------------|--|---------------------|
| Relay A1 opens<br>closes | <b>A</b> <b>1</b> <b>0</b> <b>SPEC</b> | Opened              |
|                          | <b>A</b> <b>1</b> <b>1</b> <b>SPEC</b> | Closed              |
| Relay A2 opens<br>closes | <b>A</b> <b>2</b> <b>0</b> <b>SPEC</b> | Opened              |
|                          | <b>A</b> <b>2</b> <b>1</b> <b>SPEC</b> | Closed              |
| Relay A3 opens<br>closes | <b>A</b> <b>3</b> <b>0</b> <b>SPEC</b> | Opened              |
|                          | <b>A</b> <b>3</b> <b>1</b> <b>SPEC</b> | Closed              |

### 3.2.29.4 Battery

#### a) Checking the battery charge

The battery charge can be measured using the CMT. Enter special function    . The battery voltage is then output for 3 s in the  $\alpha$  display. Storage of the program in the autorun controller can no longer be guaranteed if the battery voltage is below 2.20 V in which case it is recommended to replace the battery.

#### b) Replacing the battery

To replace the battery, first remove the option support plate at the rear of the CMT (6 Phillips screws). Remove the options connected to the support plate from its location. Unsolder the lithium battery which is now accessible (axial connections of standard size 1/2 AA (3.4 V, 850 mAh)) and replace by a new battery.

**Caution:** Programs stored in the autorun controller are lost when the battery is replaced. In order to save the programs, first print them out and then enter again following battery replacement.

A more convenient method is to use a transfer memory into which the programs in the autorun controller are copied and then reloaded again later (see Section 2).

Ensure correct polarity.

The autorun controller is protected against incorrect polarity, but programs cannot be protected with the incorrect polarity.

A new battery of the specified type guarantees protection of programs for at least 2.5 years, typically for a period of 10 years.

### 3.2.30 Transfer Memory (Accessory CM-Z1)

#### 3.2.30.1 Memory Function

The CMT contains a special program to test the memory function. This program can be started using special function    . The message TRANS OK or TRANS ERROR appears in the  $\alpha$ -display for approx. 3 s at the end of the test.

#### 3.2.30.2 Battery

##### a) Checking the battery charge

The battery charge can be measured using the CMT. Enter special function    . The battery voltage is then output for 3 s in the  $\alpha$  display. Storage of the program in the transfer memory can no longer be guaranteed if the battery voltage is below 2.20 V in which case it is recommended to replace the battery.

##### b) Replacing the battery

To replace the battery, first open the housing of the transfer memory (4 phillips screws). The battery is accessible with the cover removed and can be desoldered. Replace by a battery with axial connections of standard size 1/2 AA (3.4 V, 850 mAh).

**Note:** Programs stored in the transfer memory are lost when the battery is replaced. In order to save the programs, first print them out and then enter again following battery replacement.

A more convenient method is to use a second transfer memory or an autorun controller into which the programs in the autorun controller are copied and then reloaded again later (see Section 2).

The transfer memory is protected against incorrect polarity, but programs cannot be protected with the incorrect polarity.

A new battery of the specified type guarantees protection of programs for at least 5 years, typically for a period of 10 years.

### 3.2.31 IEC Bus (Option CM-B4)

An IEC-bus-compatible controller (e.g. PCA5 from R&S) is required to test the IEC-bus function.

#### 3.2.31.1 Listener Function

Program the controller with several functions to be executed by the CMT. Establish the IEC-bus connection and send the program from the controller to the CMT. The LED REMOTE must light up on the CMT and the individual functions are executed.

The IEC bus mode can be left by pressing the LOCAL key.

#### 3.2.31.2 Talker Function

Enter a program into the controller which e.g. calls the values from the CMT displays. Set the CMT to receiver test mode by pressing the TXRX key. Start the controller program and check whether the controller has correctly read the values from the CMT displays.

### 3.2.31.3 Relay Functions

The relay functions can be tested by entering relay switching commands via the CMT keys and checking the position of the contacts using a suitable instrument (e.g. ohmmeter). The relays of the IEC bus (option CM-B4) can be addressed via code B. The numbers 1 to 8 in agreement with the inscription on the option support plate at the rear of the CMT are used to differentiate the 8 relays.

| Explanation                    | Key sequence   | Effect on change-over contacts |
|--------------------------------|--|--------------------------------|
| Relay B1    inactive<br>active | <input type="text" value="B"/> <input type="text" value="1"/> <input type="text" value="0"/> <input type="text" value="SPEC"/> | Unenergized pos.               |
|                                | <input type="text" value="B"/> <input type="text" value="1"/> <input type="text" value="1"/> <input type="text" value="SPEC"/> | Energized pos.                 |
| Relay B2    inactive<br>active | <input type="text" value="B"/> <input type="text" value="2"/> <input type="text" value="0"/> <input type="text" value="SPEC"/> | Unenergized pos.               |
|                                | <input type="text" value="B"/> <input type="text" value="2"/> <input type="text" value="1"/> <input type="text" value="SPEC"/> | Energized pos.                 |

| Explanation                 | Key sequence   | Effect on switching contacts |
|-----------------------------|--|------------------------------|
| Relay B3    opens<br>closes | <input type="text" value="B"/> <input type="text" value="3"/> <input type="text" value="0"/> <input type="text" value="SPEC"/> | Opened                       |
|                             | <input type="text" value="B"/> <input type="text" value="3"/> <input type="text" value="1"/> <input type="text" value="SPEC"/> | Closed                       |
| Relay B4    opens<br>closes | <input type="text" value="B"/> <input type="text" value="4"/> <input type="text" value="0"/> <input type="text" value="SPEC"/> | Opened                       |
|                             | <input type="text" value="B"/> <input type="text" value="4"/> <input type="text" value="1"/> <input type="text" value="SPEC"/> | Closed                       |
| Relay B5    opens<br>closes | <input type="text" value="B"/> <input type="text" value="5"/> <input type="text" value="0"/> <input type="text" value="SPEC"/> | Opened                       |
|                             | <input type="text" value="B"/> <input type="text" value="5"/> <input type="text" value="1"/> <input type="text" value="SPEC"/> | Closed                       |
| Relay B6    opens<br>closes | <input type="text" value="B"/> <input type="text" value="6"/> <input type="text" value="0"/> <input type="text" value="SPEC"/> | Opened                       |
|                             | <input type="text" value="B"/> <input type="text" value="6"/> <input type="text" value="1"/> <input type="text" value="SPEC"/> | Closed                       |
| Relay B7    opens<br>closes | <input type="text" value="B"/> <input type="text" value="7"/> <input type="text" value="0"/> <input type="text" value="SPEC"/> | Opened                       |
|                             | <input type="text" value="B"/> <input type="text" value="7"/> <input type="text" value="1"/> <input type="text" value="SPEC"/> | Closed                       |
| Relay B8    opens<br>closes | <input type="text" value="B"/> <input type="text" value="8"/> <input type="text" value="0"/> <input type="text" value="SPEC"/> | Opened                       |
|                             | <input type="text" value="B"/> <input type="text" value="8"/> <input type="text" value="1"/> <input type="text" value="SPEC"/> | Closed                       |



**3.3 Performance Test Report**

Rohde & Schwarz

Date .....

**RADIOCOMMUNICATION TESTER CMT**

Name .....

Ord.No. 802.2020...

Serial No. ....

| Item No. | Characteristic                   | Measurement as in Section | Min. | Actual value | Max. | Unit     |
|----------|----------------------------------|---------------------------|------|--------------|------|----------|
| 1        | Display, keyboard and spin wheel | 3.2.1                     | -    | ...          | -    | -        |
| 2        | Reference frequency standard     | 3.2.2                     |      |              |      |          |
|          | Aging                            |                           | -10  | ...          | 10   | Hz/month |
|          | Temperature influence            |                           | -10  | ...          | 10   | Hz/°C    |
|          | Option CMT-B1                    |                           |      |              |      |          |
|          | Aging                            |                           | -10  | ...          | +10  | Hz/day * |
| 3        | Frequency setting and accuracy   | 3.2.3                     |      |              |      |          |
|          | Frequencies                      |                           |      |              |      |          |
|          | 1000 MHz                         |                           | -10  | ...          | +10  | Hz       |
|          | 830 MHz                          |                           | -10  | ...          | +10  | Hz       |
|          | 820 MHz                          |                           | -10  | ...          | +10  | Hz       |
|          | 660 MHz                          |                           | -10  | ...          | +10  | Hz       |
|          | 500.0004 MHz                     |                           | -10  | ...          | +10  | Hz       |
|          | 499.9 MHz                        |                           | -10  | ...          | +10  | Hz       |
|          | 250 MHz                          |                           | -10  | ...          | +10  | Hz       |
|          | 125 MHz                          |                           | -10  | ...          | +10  | Hz       |
|          | 62.5 MHz                         |                           | -10  | ...          | +10  | Hz       |
| 31 MHz   | -10                              | ...                       | +10  | Hz           |      |          |
| 0.1 MHz  | -10                              | ...                       | +10  | Hz           |      |          |

\* Measure with 1 GHz at connector X1

| Item No. | Characteristic  | Measurement as in Section | Min.   | Actual value   | Max.   | Unit   |
|----------|---|---------------------------|--|--|--|--|
| 4        | Setting error and frequency response of RF output level   | 3.2.4                     | -0.7   | ...  | +0.7   | dB   |
| 5        | RF attenuator<br>Deviation from correct CMT level<br><br>10 dBm<br>5 dBm<br>0 dBm<br>-5 dBm<br>-10 dBm<br>-30 dBm<br>-50 dBm<br>-90 dBm | 3.2.5                     | -<br>-0.2<br>-0.3<br>-0.35<br>-0.4<br>-0.8<br>-0.8<br>-0.8 | ...<br>...<br>...<br>...<br>...<br>...<br>...<br>... | -<br>+0.2<br>+0.3<br>+0.35<br>+0.4<br>+0.8<br>+0.8<br>+0.8 | dB<br>dB<br>dB<br>dB<br>dB<br>dB<br>dB<br>dB |
| 6        | Fine level setting<br><br>Reduction to -4.9 dBm<br>to -14.9 dBm   | 3.2.6                     | -1<br>-2   | ...<br>...   | +1<br>+2   | dB<br>dB                                     |
| 7        | Harmonics   | 3.2.7                     | -  | ...  | 30   | dB   |
| 8        | Non-harmonics<br><br>37.502 MHz line<br>6.253 MHz line  | 3.2.8                     | -<br>-   | ...<br>...   | 60<br>60   | dB<br>dB                                     |
| 9        | Spurious FM (CCITT)<br>f = 499 MHz<br>f = 1000 MHz<br><br>Spurious FM (30 Hz to 20 kHz)<br>f = 300 MHz<br>f = 1000 MHz                  | 3.2.9                     | -<br>-<br><br>-<br>-                                       | ...<br>...<br><br>...<br>...                         | 6<br>12<br><br>16<br>32                                    | Hz<br>Hz<br><br>Hz<br>Hz                     |

| Item No. | Characteristic  | Measurement as in Section | Min.  | Actual value | Max.  | Unit |
|----------|---|---------------------------|-------|--------------|-------|------|
| 10       | Spurious AM (CCITT)<br>Spurious AM (30 Hz to 20 kHz)  | 3.2.10                    | -     | ...          | 0.02  | %    |
|          |   |                           | -     | ...          | 0.3   | %    |
| 11       | RF response of modulation deviation   | 3.2.11.1.1                | -2    | ...          | +2    | %    |
| 12       | AF response of modulation deviation<br>f < 150 Hz<br>300 Hz < f < 30 kHz<br>150 Hz < f < 300 Hz<br>30 kHz < f < 100 kHz | 3.2.11.1.2                | -3    |              | +3    | dB   |
|          |   |                           | -2.5  |              | +2.5  | %    |
|          |   |                           | -4    |              | +4    | %    |
|          |   |                           | -4    |              | +4    | %    |
| 13       | Total FM error  | 3.2.11.1.3                | -5    | ...          | +5    | %    |
| 14       | FM distortion   | 3.2.11.1.4                | 0     | ...          | 1     | %    |
| 15       | Ext. modulation   | 3.2.11.2                  | 23.75 | ...          | 26.25 | kHz  |
| 16       | Ext. modulation with calibration<br><br>Calibration error   | 3.2.11.2.1                |       |              |       |      |
|          |   |                           | -5    | ...          | +5    | %    |
| 17       | Multitone modul.<br><br>Deviation 1<br>Deviation 2<br>Deviation 3   | 3.2.11.3                  |       |              |       |      |
|          |   |                           | 4.75  | ...          | 5.25  | kHz  |
|          |   |                           | 4.75  | ...          | 5.25  | kHz  |
|          |   |                           | 4.75  | ...          | 5.25  | kHz  |
| 18       | Frequency response of the modulation depth  | 3.2.12.1.1                | -     | ...          | 3     | %    |



| Item No. | Characteristic   | Measurement as in Section | Min.   | Actual value | Max.     | Unit   |
|----------|--|---------------------------|--------|--------------|----------|--------|
| 25       | Distortion of modulation generator<br>f < 10 kHz<br>f > 10 kHz | 3.2.15.2                  | -<br>- | ...<br>...   | 0.5<br>1 | %<br>% |
| 26       | Output voltage of modulation generator                         | 3.2.15.3                  | -      | ...          | -        | mV     |
|          | Frequency response of mod.generator                            | 3.2.15.3.1                | -      | ...          | -        | %      |
|          | Total error of mod.generator                                   | 3.2.15.3.1                | -3     | ...          | +3       | %      |
| 27       | Frequency setting of 2nd AF Synthesizer                        | 3.2.15.4                  |        |              |          |        |
|          | Frequencies  |                           |        |              |          |        |
|          | 22.32 kHz  |                           |        | ...          |          | kHz    |
|          | 22.31 kHz  |                           |        | ...          |          | kHz    |
|          | 22.30 kHz  |                           |        | ...          |          | kHz    |
|          | 22.27 kHz  |                           |        | ...          |          | kHz    |
|          | 22.22 kHz  |                           |        | ...          |          | kHz    |
|          | 22.12 kHz  |                           |        | ...          |          | kHz    |
|          | 21.93 kHz  |                           |        | ...          |          | kHz    |
|          | 21.55 kHz  |                           |        | ...          |          | kHz    |
|          | 20.83 kHz  |                           |        | ...          |          | kHz    |
| 28       | Frequency response of AF voltmeter                             | 3.2.16.1                  |        |              |          |        |
|          | Frequency response   |                           |        | ...          |          | %      |
|          | Frequency response with 150 Hz cut-off frequency               |                           |        | ...          | 5        | %      |
| 29       | Measuring accuracy of AF voltmeter                             | 3.2.16.2                  |        |              |          |        |
|          | Deviation from nominal value                                   |                           | -3     | ...          | +3       | %      |

| Item No. | Characteristic                          | Measurement as in Section | Min.                     | Actual value | Max. | Unit |    |
|----------|---|---------------------------|--------------------------|--------------|------|------|----|
| 30       | Frequency response of CCITT filter      | 3.2.16.3                  |                          |              |      |      |    |
|          | Fre-<br>quency<br>(Hz)                  |                           | Nominal<br>value<br>(dB) |              |      |      |    |
|          | 50                                      |                           | -63                      |              | ...  |      | dB |
|          | 100                                     |                           | -41                      |              | ...  |      | dB |
|          | 150                                     |                           | -29                      |              | ...  |      | dB |
|          | 200                                     |                           | -21                      |              | ...  |      | dB |
|          | 300                                     |                           | -10.6                    |              | ...  |      | dB |
|          | 400                                     |                           | -6.3                     |              | ...  |      | dB |
|          | 500                                     |                           | -3.6                     |              | ...  |      | dB |
|          | 600                                     |                           | -2.0                     |              | ...  |      | dB |
|          | 800                                     |                           | 0                        |              | ...  |      | dB |
|          | 1000                                    |                           | 1                        |              | ...  |      | dB |
|          | 1200                                    |                           | 0                        |              | ...  |      | dB |
|          | 1500                                    |                           | -1.3                     |              | ...  |      | dB |
|          | 2000                                    |                           | -3.0                     |              | ...  |      | dB |
|          | 2500                                    |                           | -4.2                     |              | ...  |      | dB |
|          | 3000                                    |                           | -5.6                     |              | ...  |      | dB |
| 3500     | -8.5                                    |                           | ...                      |              | dB   |      |    |
| 4000     | -15                                     |                           | ...                      |              | dB   |      |    |
| 5000     | -36                                     |                           | ...                      |              | dB   |      |    |
| 6000     | -43                                     |                           | ...                      |              | dB   |      |    |
| >6000    | <-43                                    |                           | ...                      |              | dB   |      |    |
| 31       | Distortion meter                        |                           |                          |              |      |      |    |
|          | Inherent distortion                     | 3.2.17.1                  | -                        | ...          | 0.3  | %    |    |
| 32       | Indication accuracy of distortion meter | 3.2.17.2                  |                          |              |      |      |    |
|          | Nominal value                           |                           |                          |              |      |      |    |
|          | 10%                                     |                           | 9.2                      | ...          | 10.8 | %    |    |
|          | 3%                                      |                           | 2.5                      | ...          | 3.5  | %    |    |
|          | 1%                                      |                           | 0.7                      | ...          | 1.3  | %    |    |
|          | 0.3%                                    | 0                         | ...                      | 0.6          | %    |      |    |

| Item No.           | Characteristic                                      | Measurement as in Section | Min. | Actual value | Max. | Unit  |
|--------------------|---|---------------------------|------|--------------|------|-------|
| 33                 | SINAD meter   | 3.2.18                    |      |              |      |       |
|                    | Stopband attenuation                                |                           | 50   | ...          | -    | dB    |
|                    | Inherent noise                                      |                           | 47   | ...          | -    | dB    |
|                    | 20 dB   |                           | 19.3 | ...          | 20.5 | dB    |
|                    | 30.5 dB   |                           | 28.7 | ...          | 30.5 | dB    |
|                    | 40 dB   |                           | 37.2 | ...          | 40.5 | dB    |
|                    | 46 dB   | 46.5                      | ...  | 50.5         | dB   |       |
| 34                 | AF counter  | 3.2.19                    |      |              |      |       |
|                    | Deviation from correct value with 0.1 Hz resolution |                           | -0.1 | ...          | +0.1 | Hz    |
|                    | 1 Hz resolution                                     |                           | -1   | ...          | +1   | Hz    |
|                    | Counter sensitivity                                 |                           |      |              |      |       |
|                    | for f < 30 kHz                                      | 3                         | ...  | -            | mV   |       |
|                    | for f > 30 kHz                                      | 30                        | ...  | -            | mV   |       |
| 35                 | RF counter  | 3.2.20                    |      |              |      |       |
|                    | RF IN/OUT   | 3.2.20.1                  |      |              |      |       |
|                    | Unmodulated 40% AM                                  |                           | -    | ...          | 5    | mW    |
|                    |   |                           | -    | ...          | 20   | mW    |
|                    | INPUT2  | 3.2.20.2                  |      |              |      |       |
| Unmodulated 40% AM | -   |                           | ...  | 5            | mV   |       |
|                    |   |                           | -    | ...          | 10   | mV    |
| 36                 | Counter accuracy                                    | 3.2.20.3                  |      |              |      |       |
|                    | Error   |                           | -1   | ...          | +1   | Digit |

| Item No.   | Characteristic   | Measurement as in Section | Min. | Actual value | Max. | Unit |  |
|------------|--|---------------------------|------|--------------|------|------|--|
| 37         | Power meter  | 3.2.21                    |      |              |      |      |  |
|            | Power stage<br>7 dBm                                     |                           |      |              |      |      |  |
|            | f 1.5 MHz  |                           |      | ...          |      | dBm  |  |
|            | f 20 MHz   |                           |      | ...          |      | dBm  |  |
|            | f 500 MHz  |                           |      | ...          |      | dBm  |  |
|            | f 1000 MHz   |                           |      | ...          |      | dBm  |  |
|            | Power stage<br>20 dBm                                    |                           |      |              |      |      |  |
|            | f 1.5 MHz  |                           | 19.5 | ...          | 20.5 | dBm  |  |
|            | f 20 MHz   |                           | 19.5 | ...          | 20.5 | dBm  |  |
|            | f 1000 MHz   |                           | 19.5 | ...          | 20.5 | dBm  |  |
|            | Power stage<br>47 dBm                                    |                           |      |              |      |      |  |
|            | f 1.5 MHz  |                           | 46.5 | ...          | 47.5 | dBm  |  |
| f 20 MHz   | 46.5   | ...                       | 47.5 | dBm          |      |      |  |
| f 1000 MHz | 46.5   | ...                       | 47.5 | dBm          |      |      |  |
| 38         | VSWR of power meter                                      | 3.2.21.1                  | -    | ...          | 1.2  | -    |  |
| 39         | Frequency deviation meter                                | 3.2.22                    |      |              |      |      |  |
|            | Deviation from nominal value when testing meter accuracy |                           |      | ...          |      | %    |  |
|            | Frequency response                                       |                           |      | ...          |      | %    |  |
|            | Total error  |                           | -    | ...          | 3    | %    |  |
|            | Function test  |                           |      |              |      |      |  |
|            | +PK  |                           |      | ...          |      |      |  |
|            | -PK  |                           |      | ...          |      |      |  |
|            | PK HOLD  |                           |      | ...          |      |      |  |
| MAX PK     |  | ...                       |      |              |      |      |  |



| Item No. | Characteristic   | Measurement as in Section | Min. | Actual value | Max. | Unit |
|----------|--|---------------------------|------|--------------|------|------|
| 40       | 300-Hz highpass filter                                   | 3.2.22.1                  |      |              |      |      |
|          | Test frequencies   |                           |      |              |      |      |
|          | 170 Hz   |                           | -    | ...          | 316  | Hz   |
|          | 190 Hz   |                           | -    | ...          | 1    | kHz  |
|          | 240 Hz   |                           | -    | ...          | 10   | kHz  |
|          | 300 Hz   |                           | 93   | ...          | 107  | kHz  |
|          | 350 Hz   |                           | 93   | ...          | 107  | kHz  |
|          | 1 kHz  |                           | 93   | ...          | 107  | kHz  |
| 20 kHz   | 93   | ...                       | 107  | kHz          |      |      |
| 41       | Residual FM of deviation meter                           | 3.2.22.2                  |      |              |      |      |
|          | RF = 499 MHz   |                           | -    | ...          | 6    | Hz   |
|          | RF = 1000 MHz  |                           | -    | ...          | 12   | Hz   |
| 42       | Phase deviation meter                                    | 3.2.23                    |      |              |      |      |
|          | Additional frequency response error                      |                           | -    | ...          | 2    | %    |
| 43       | Modulation depth meter                                   | 3.2.24                    |      |              |      |      |
|          | Deviation from nominal value when testing meter accuracy |                           |      | ...          |      | %    |
|          | Frequency response                                       |                           |      | ...          |      | %    |
|          | Total error  |                           | -    | ...          | 5    | %    |
| 44       | Residual modulation of AM meter                          | 3.2.24.1                  | -    | ...          | 0.03 | %    |



| Item No. | Characteristic                      | Measurement as in Section | Min. | Actual value | Max. | Unit |
|----------|-------------------------------------|---------------------------|------|--------------|------|------|
| 50       | RF millivoltmeter                   | 3.2.28                    |      |              |      |      |
|          | Deviation from nominal value        |                           |      |              |      |      |
|          | 10 V                                |                           | 9.5  | ...          | 10.5 | V    |
|          | 1 V                                 |                           | 0.95 | ...          | 1.05 | V    |
|          | 100 mV                              | 95                        | ...  | 105          | mV   |      |
|          | 10 mV                               | 9.5                       | ...  | 10.5         | mV   |      |
| 51       | Autorun control / printer interface | 3.2.29.1                  |      |              |      |      |
|          | Memory function                     |                           |      | ...          |      |      |
|          | Relay function                      |                           |      | ...          |      |      |
|          | Printer function                    |                           |      | ...          |      |      |
| 52       | Transfer memory                     | 3.2.30                    |      |              |      |      |
|          | Memory function                     |                           |      | ...          |      |      |
| 53       | IEC bus                             | 3.2.31                    |      |              |      |      |
|          | Listener function                   |                           |      | ...          |      |      |
|          | Talker function                     |                           |      | ...          |      |      |
|          | Relay function                      |                           |      | ...          |      |      |

## 3.4 Maintenance

### 3.4.1 Electrical Maintenance

The self-test carried out each time the instrument is switched on provides information on any faults.

All special functions containing the letter D are intended for maintenance (List of special functions: Section 2.3.8).

Since some adjustments in the instrument are performed via the firmware, the firmware adjustment is not only required following maintenance on the respective module, but also following maintenance on the digital unit (e.g. following battery replacement) or after RAM-ERROR in the self-test.

It is recommended to readjust the reference frequency once a year (see Section 4, Service manual).

### 3.4.2 Mechanical Maintenance

No mechanical maintenance is required under normal operating conditions.

## 3.5 Storage

The storage temperature may be between -40 and +70°C. Note that the service life of the batteries is reduced when storing at high temperatures. The special functions D20, 21, 22 provide information on the battery condition when the instrument is used again.



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