ROHDE&SCHWARZ

Manual

MOBILE TESTER SMFP2

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VOLUME I

Manual consists of 2 volumes

R 43412 - 1

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ROHDE&SCHWARZ

MOBILE TESTERS SMFS2 AND SMFP2

NEW TECHNICAL FEATURES AND ADDITIONAL DATA

Spectral purity of RF signal generator	Phase noise improved by 6-10 dB to -126 dBc/Hz typ. (20 kHz from carrier).
Reference oscillator	temperature-controlled crystal oscillator as standard equipment for improved accuracy of RF signal generator frequency and frequency meter.
Long term Temperature effect	$<\pm 5 \cdot 10^{-8}$/month $<\pm 1 \cdot 10^{-7}$ over nominal-temperature range after 15 min warm up.
2-tone modulation	using additional internal RC generator (1 kHz or 400 Hz) for simultaneous generation of test and pilot-tone modulation. Independent setting of modulation sources: 400 Hz / 1 kHz as 2nd source and RC generator (SMFS2) or AF synthesizer (SMFP2, optional for SMFS2) as 1st source. Sources may be interchanged.
Modulation of 2nd source AM FM φM	setting range / resolution 0 to 100% / 0.1% 0 to 10 kHz / 10 Hz 0 to 1 rad / 0.001 rad
Accuracy	as for single-tone AM/FM/φM modulation + resolution. For the maximum permissible sum modulation (tone 1 + tone 2) refer to data sheet.
Deviation meter	in addition to automatic switchover, the detector can now be locked to peak or rms weighting.
Selective call coder additional settings	(optional for SMFS2) repeat tone as 1st tone alarm tone as 1st or last tone CCIR standard with 70 ms tone length 1st tone length 450 ms or 750 ms
Additional standards	EEA, EIA, Euro Customer defined frequencies.

095.7489-0581

S/N, SINAD meter — integration of 150 measurements for steady display

Memory facilities — battery-supported non-volatile memory with additional capacity for 6 complete instrument settings.

Option Adjacent-Channel Power Meter SMFP-B61

Improved adjacent-channel power meter with increased measurement range.

Measurement limit	f <519 MHz	better than -72 dB (typ. -76 to -80 dB)
	f >519 MHz	better than -68 dB (typ. -72 to -76 dB)

Refer to data sheet, option SMFP-B6, for further data.

Option Duplex Deviation Meter SMFP-B91

Independent deviation meter for SMFS2 and SMFP2 for measurements on repeater stations and full-duplex radios. For integration in instruments with Analog Display SMFS-B9.

Frequency range 10 to 1000 MHz

Further data as in data sheet.

Option Duplex Deviation Meter SMFP-B41

Independent deviation meter as add-on for SMFS2 and SMFP2.

Data as option SMFP-91.

Summary of options available for SMFS2 and SMFP2.

Option		SMFP2	SMFS2	Order No.
1 GHz Frequency Extension	SMFP-B2	x	x	332.9706.50
60-W Power Meter	SMFP2 B3	x	x	357.8610.02
Control Interface	SMFS-B5	o	x	332.9106.02
AF Synth./Selective-Call Coder	SMFS2 B7	o	x	346.6810.02
Selective-call Decoder	SMFS2 B6	x	x [1]	346.7000.02
RF Millivoltmeter	SMFS2 B8	x	x	332.9306.02
Analog Display	SMFS B9	x	x	346.5008.02
Adjacent-channel Power Meter	SMFP B61	x [2]	x [2]	395.7217.02
Duplex Deviation Meter	SMFP B41	x [2]	x [2]	372.1412.02
Duplex Deviation Meter	SMFP B91	x [3]	x [3]	372.0016.02

o = standard x = may be fitted as option

For further data, accessories, recommended extras and ordering information refer to data sheets 332 001 and 332 002.

This Technical Information applies only to SMFS2 and SMFP2 with serial Nos. from 872 508/001

1) only together with SMFS B7

2) add-on, ex-factory fitting only

3) only together with SMFS-B9; ex-factory fitting only

Supplement
to
SMFP2 Manual
332.7790

Page 2.22 Add to section 2.3.3.3.1:

With the setting

[Ø] [MOD]

the modulation display is not changed. The OVERFLOW LED lights.

For Ø modulation the modulation must be switched off (better S/N ratio).

Supplement
to
SMFP2 Manual
322.7790

Page 2.5 — Ref. 20 4th line:
delete "frequency and".

Page 2.6 — Ref. 28:
change "20A" to "10A".

Page 2.9 — Under fivetone modulation:
interchange "switch-on" and "switch-off".

Page 2.17 — Add to section 2.3.1:
At every new switch-on, the main function - transmitter measurement - is set. The generator settings selected before switch-off are maintained. Twotone modulation is switched off.

The Basic state can be recalled with 99 REF; all REF functions are thereby erased.

Page 2.18 — Section 2.3.3.1.1:
change "1040 MHz" to "1000 MHz".

Page 2.23 — Add to section 2.3.3.3.2:
For external modulation the pilot-tone modulation must be switched off with 2000 REF.

Page 2.46 — Section 2.5.4
3rd line from below:
change "BR12" to "BR3".

Page 3.13 — Section 3.2.2.19.2 1st line:
change "700 mV" to "1500 mV"
change "10 mW = 10 dBm" to "50 mW = 17 dBm".

Page 5.10 Lowest case:
change "B6" to "B24";
change "B7, B8, B9" to "B25, B26, B27";
change "B17" to "B15".

Page 5.12 Lowest case:
change "T20" to "T4".

Page 5.59 Change para "Adjustment of A/D converter B6"
as follows:

Adjustment of A/D converter B24

- Apply TTL H level to initiative conversion line.
- Connect BR3 to ground terminal.
- Adjust R50 so that pins 3 to 11 (B24) are at TTL L level, and pin 12 (B24) just changes from TTL H to TTL L level (do not turn any further).
- Apply 10.22 V to BR3.
- Adjust R46 so that pins 3 to 11 (B24) are at TTL H level and pin 12 (B24) at TTL L level.

The modulation processing circuit does not require adjustment.

2. Preparation for Use and Operating Instructions

2.1 Legend for Figs.2-3 and 2-4

The values given in the following section are not guaranteed values. Only the specifications given in the data sheet are binding.

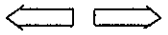
Ref. No.	Labelling	Function
1	HF · RF FREQUENZ MHz	8-digit display of RF frequency set or measured, in MHz.
2	$-\Delta F$ kHz $+\Delta F$ kHz	Keys for varying the frequency of the RF signal generator by defined amounts and for setting the channel spacing of the adjacent-channel power meter. The numerical values are entered in kHz via keyboard 25. When entering standard channel step sizes the following types of internal modulation are automatically set. 12.5 kHz FM 1.5 kHz deviation 20 kHz FM 2.8 kHz deviation 25 kHz FM 3.0 kHz deviation 30 kHz FM 3.0 kHz deviation
3	SIGN. GEN.	Transfer key. After pressing this key, the signal generator is set to the frequency entered viy keyboard 25. This frequency is immediately available at RF level output 48 and is displayed in MHz on 1. As soon as the frequency is displayed on 1 the transfer key lights up. If the key is pressed without having entered a numerical value via keyboard 25, the RF frequency meter is switched off and the previous frequency setting is read out.

Ref. No.	Labelling	Function
4	+6 dB	Pressing this key increases the RF level at output 48 by +6 dB. The next time the key is pressed the previous level is reset. When the level is increased the key lights up.
5	HF · RF PEGEL/LEVEL µV, mV, dBm, dBµV, W, µW, dB	3 1/2-digit display of output level or input power or voltage at RF millivoltmeter or adjacent-channel power.
6	µV, mV, dBm, dBµV	Transfer keys. Pressing one of these keys resets the RF level at output 48 previously selected viy keyboard 25, the physical unit corresponding to the labelling of the key pressed. If one of the other three keys is subsequently pressed without entering other data via keyboard 25 the level is converted to the newly selected physical unit and displayed on 5. Since the attenuator is set in 0.1-dB steps, display 5 read out the dB values set and not the values entered in mV or µV.
7	HF/RF OFF	Key for switching off the RF signal. When the RF signal is switched off, the key lights up. Display 5 reads out 000 without physical unit.
8	MOD. INT.	Key for transfer of modulation depth, frequency or phase deviation after being entered via keyboard 25. Type of modulation must have already been selected by means of 50. Physical unit for entering data: FM in kHz φM in rad AM in % The key 8 lights up when internal modulation is switched on. The modulation is switched off if the key is pressed again without entering other data via keyboard 25. If this key is pressed when the modulation is switched off and without having entered other data via keyboard 25, the previously entered value is set again and the modulation measurement is discontinued .

Ref. No.	Labelling	Function
9	HF · RF MODULATION (kHz, rad, %, INT.)	3-digit display of the set or measured value of FM (kHz), AM (%) or φM (rad).
10	MOD. EXT.	Key for input of the modulation (%, Δf or rad) after entering numerical value via keyboard 25. The voltage at input socket 39 must be 1 V_{rms}. The type of modulation can be selected by means of keys 11. Key 10 lights up when external modulation is switched on. If this key is pressed when the modulation is switched off and without having entered other data via keyboard 25 the previously entered value is set again and the modulation measurement discontinued.
11	FM, φM, AM	Key for selecting type of modulation in the case of external modulation. The key pressed lights up even if external modulation is switched off. The numerical values of the modulation (%, Δf or rad) are entered via keyboard 25 and transferred by pressing the key 10 MOD. EXT.
12	FEST - FIXED FREQ. ⟹ ⟸	Key for selection of the fixed audio frequencies. Each time the left-hand key is pressed, the next higher value is selected. Each time the right-hand key is pressed, the next lower value is selected. The selected frequency is displayed on 13.
13	NF · AUDIO FREQUENZ kHz, Hz	4-digit display of set or measured AF frequency.
14	MOD. GEN.	Key for input of AF level after entering the value in mV via keyboard 25. The AF signal is then available at output 34. As soon as the output level is displayed on 16, key 14 lights up. If this key is pressed without having entered a numerical value on keyboard 25, the previous output voltage setting is read out and the AF or DC measurement discontinued.

Ref. No.	Labelling	Function
15	EXT. NF/AC	Key for connecting the AF voltmeter to the input socket 31. The key lights up when the voltage applied to socket 31 is displayed on 16.
16	NF · AUDIO PEGEL/LEVEL mV, V, A, DC	4-digit display of the AF output level, the AF voltage input to socket 31 or the DC voltage or current input to sockets 28.
17	CCITT	Key for switching CCITT AF filter on or off. The key lights up when the filter is switched on.
18	KLIRRFAKTOR DISTORTION ON ⇕ f	By pressing the ON key the filter and AF generator are set to 1 kHz. Cyclic switching key for test frequencies 1 kHz, 300 Hz, 500 Hz of distortion meter. The AF generator is automatically set to the test frequency. The setting is displayed on 13. By pressing the ON key again the measurement is discontinued.
19	SINAD	Key for switching on the SINAD meter. If no numerical value has been entered via keyboard 25 the SINAD value at the particular RF level setting is indicated. The AF is set to 1 kHz. This value is displayed on 13. After the numerical value in dB has been entered the RF level is automatically adjusted so as to obtain the selected SINAD ratio. The RF level is displayed on 5 and the SINAD ratio on 20. During the SINAD ratio measurement simultaneous quasi-analog display of the units digit is provided on 20. By pressing the key again, the SINAD mode is turned off. Key 19 lights up when the SINAD meter is switched on.

Ref. No.	Labelling	Function
20	RESULT %, dB	3-digit display of result of distortion, SINAD and S/N measurements. The circular quasi-analog display makes setups easier. It can be assigned to the frequency and level meters (RF and AF), the modulation-depth meter as well as the DC ammeter and voltmeter by meany of the two cursor keys 22. The digit defined by the cursor location is used to drive the circular quasi-analog display by pressing key 1 on keyboard 25 and the REF. key 29.
21	S/N	Key for switching on the S/N meter. The S/N ratio of the transmitter or the receiver section can be measured by pressing key 49 or key 51 respectively. Measurement of S/N ratio of transmitter section: If no data have been entered via keyboard 25 the S/N ratio of the demodulated transmitter signal is measured and displayed on 20. Measurement of S/N ratio of receiver section: If no data have been entered via keyboard 25 the S/N ratio of the signal available at socket 31 (NF · AC METER) is measured at the given modulation and displayed on 20. If a numerical value has been entered in dB, the RF level is automatically adjusted so as to obtain the selected S/N ratio. The RF level is displayed on 5 and the S/N ratio on 20. During the S/N ratio measurement simultaneous quasi-analog display of the units digit is provided on 20. By pressing the key again the measurement is discontinued. Key 21 lights up when the S/N meter is switched on.

Ref. No.	Labelling	Function
22	+  −	Variation and cursor keys. The two keys ⟸ and ⟹ shift the cursor one digit further to the left or to the right. The + and the − keys vary the output setting digit marked by the cursor. If the key is pressed momentarily, the value is varied in individual steps. If the key is held down, the value is varied continuously.
23	OVERFLOW	LED for indication of an illegal entry or of an illegal measured value.
24	REMOTE	LED which lights up if the Tester is remote controlled via the IEC bus.
25	7 8 9 4 5 6 1 2 3 0 . − C STO RCL	Keyboard for entry of numerical values. C cancels the entry. STO together with 0, 1 or 2 stores the RF frequency setting in MHz; STO together with 3, 4 or 5 stores variation of this frequency in kHz. RCL together with 0, 1, 2, 3, 4 or 5 recalls the stored value. Example: Entry: 123.45 SIGN. GEN. (key 3) STO 0 (RF in MHz) 4800 STO 3 (variation in kHz) Recall: RCL 0 (RF in MHz) RCL 3 (+variation in kHz) RCL-3 (-variation) STO 90 to 95 stores full front-panel setup. RCL 90 to 95 recalls the stored setups.
26	LOCAL	Key which is pressed to return to manual operation.
27	NETZ POWER	AC supply and battery switch.
28	U_{DC} I_{DC} < 30 V < 20 A < 200 mA	Input sockets for DC voltage and current measurements.

29 REF Prior to pressing this key the function is to be called by numerical entry on keyboard 25.

Transmitter

			Keys	LED
	Modulation sensitivity (automatic setting of nominal deviation of test item in transmitter measurement mode)		2 REF	
	Reset selective call decoder		1 0 REF	
	Read, reset selective call decoder		1 1 REF	
*)	Transfer of measured transmitter frequency for receiver measurement			
		Simplex	1 0 1 REF	1
		Duplex, receiver in lower band	1 0 2 REF	1
		Duplex, receiver in upper band	1 0 3 REF	1
		Switching off	1 0 0 REF	0
	(With duplex units the duplex band spacing in kHz must be stored with STO 3 .			
*)	Acknowledgement signal	on	1 0 5 REF 0 REF	1
	See 2.3.4.7	off	1 0 6 REF	0
*)	Adj.-channel power	without channel limit	1 1 7 REF 0 REF	1
	See 2.3.4.9	with channel limit	1 1 8 REF	0
	RF measuring diode (prevents RF distorsions at 30-dB output)	off	1 2 0 REF 0 REF	1
	RF measuring diode See 2.3.4.2	on	1 2 1 REF	0
	Modulation measurement	peak only	1 2 6 REF 0 REF	1
		rms only	1 2 7 REF 0 REF	1
		normal	1 2 5 REF	0
	Selective call decoder	base 1 (B10)	1 9 8 REF	
		base 2 (B20)	1 9 9 REF	

LED keys: 0 = switching LED off (The LED is not switched off until all functions that have caused it to be on are off .)
1 = switching LED on.

*) See page 2.11

		Keys	LED
Indication of RF variation	on	1 0 7 REF	0 REF	1
	off	1 0 8 REF		0
Indication of RF frequency variation up to ±99,9 kHz referred to current RF frequency setting. Indication on AF frequency display.				
*) Bandwidth measurement Indication on AF frequency display	without centre-freq. error	1 1 5 REF	0 REF	1/0
	with centre-freq. error	1 1 6 REF	0 REF	1/0
Indication of centre-frequency error on RF frequency display.				
*) Quieting Measurement of RF sensitivity for 20 dB noise suppression. The RF level is indicated on 5 PEGEL/LEVEL, the noise suppression on 20 RESULT. Note on bandwidth and quieting measurements: Prior to calling up the bandwidth test routines, enter nominal RF frequency and, if necessary, modulation frequency in the kHz range. Upon completion of the measurement the device functions are disabled and, by entering 0 via the keyboard and pressing the REF keys SIGN.GEN. and the MOD.GEN., the displays of centre-frequency error and bandwidth must be erased after reading off the measured values.		1 1 9 REF		
Squelch sensitivity See 2.3.4.10		1 2 9 REF	0 REF	0
Changeover of AF generator 2	400 Hz	2 0 0 REF		
See 2.3.3.3.4	1000 Hz	2 0 1 REF		
AF source for doubletone modulation	AF Gen 2	2 0 2 REF		
See 2.3.3.3.4	AF Gen	2 0 3 REF		
Setting the modulation value of the AF of the second modulation Exemple: 2.4 kHz FM deviation 2 2 4 0 REF	2000+mod. value FM: 1000 = 10.00 kHz ΦM: 1000 = 1.000 rad AM: 1000 = 100.0 %	2 0 0 0 REF 3 0 0 0 REF		

LED keys: 0 = switching LED off (The LED is not switched off until all functions that have caused it to be on are off.)
1 = switching LED on.

*) See page 2.11

Other functions:

		Keys LED
Switching off the functions identified with 0 REF	0 REF	0
Cursor	1 REF	
Reinitialization of complete set	9 9 REF	
Setting the BCD outputs via BU 401 Second figure = 1st decade Third figure = 2nd decade Fourth figure = 3rd decade	1 0 0 0 REF 1 9 9 9 REF	

Transmitter and receiver

Average over 15 measurements 50 for SINAD, S/N 150 bandwidth	3 REF 4 REF 1 4 REF		
Taking into account external attenuator Example: 5run 5 REF 3.2 W/dBm for 3.2 dB attenuator See 2.3.4.2	5 REF		
Fivetone modulation switch on Fivetone modulation switch off	6 REF 7 REF		0 1
Selective call standard ZVEI1 (coder/decoder Selective call standard CCIR (coder/decoder	8 REF 9 REF		
RF millivoltmeter 0-dB probe 20-dB probe 40-dB probe	1 7 REF 1 8 REF 1 9 REF	 0 REF 0 REF	0 1 1
Switching of relays via BU 402 First figure = relay number Second figure = 0 = open relay 1 = close relay	2 0/1 REF 3 0/1 REF 4 0/1 REF		

LED Keys: 0 = switching LED off (The LED is not switched off until all functions that have caused it to be on are off.)
1 = switching LED on.

		Keys	LED
Switching of relays via BU 402 (cont.)	5 0/1 REF 6 0/1 REF 7 0/1 REF 8 0/1 REF 9 0/1 REF		
Frequency response indication off	1 1 0 REF		0
AF: Reference value: current measured value	1 1 1 REF	0 REF	1
AF: Reference value: AF level setting	1 1 2 REF	0 REF	1
*) Mod.: Reference value: current measured value	1 1 3 REF	0 REF	1
*) Mod.: Reference value: Modulation level setting Indication of 111 to 114 on result display in dB.	1 1 4 REF	0 REF	1
Rejection filter for AF and modulation measurement switch on	1 2 2 REF	0 REF	1
switch off	1 2 3 REF		0
Frequency selectable with 300 Hz, 500 Hz, 1 kHz			
Selective call standard for coder #) ZVEI1	1 8 0 REF		0
#) coder/decoder #) ZVEI2	1 8 1 REF		0
#) CCIR	1 8 2 REF		0
#) CCIR70	1 8 3 REF		0
EEA	1 8 4 REF		0
EIA	1 8 5 REF		0
EURO	1 8 6 REF		0
Special code (for entry see 300)	1 8 7 REF		0
Selective call coder normal	1 9 0 REF		
First tone 700 ms	1 9 1 REF		1
First tone 450 ms	1 9 2 REF		1

LED keys: 0 = switching LED off (The LED is not switched off until all functions that have caused it to be on are off.)
1 = switching LED on.

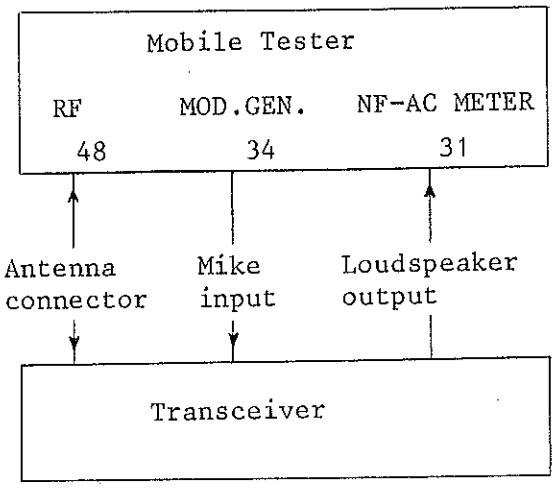
*) See page 2.11

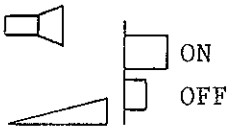
		Keys	LED
Selective call coder	normal	1 9 3 REF	0
Repeat tone	at first place	1 9 4 REF	1
Emergency tone	at first place	1 9 5 REF	1
Emergency tone	at last place	1 9 6 REF	1
Use of AF frequency setting as selective call code for special tone sequence	Code 0	3 0 0 REF	0
	Code 1	3 0 1 REF	0
	Code 2	3 0 2 REF	0
	Code 3	3 0 3 REF	0
	Code 4	3 0 4 REF	0
	Code 5	3 0 5 REF	0
	Code 6	3 0 6 REF	0
	Code 7	3 0 7 REF	0
	Code 8	3 0 8 REF	0
	Code 9	3 0 9 REF	0
Repeat tone		3 1 0 REF	0
Emergency tone		3 1 1 REF	0
Tone length for special tone sequence	70 ms	3 2 0 REF	0
	100 ms	3 2 1 REF	0
	40 ms	3 2 2 REF	0
	33 ms	3 2 3 REF	0

LED keys: 0 = switching LED off
(The LED is not switchd off until all functions that have caused it to be on are off.)
1 = switching LED on.

*) Prior to calling up these functions make sure that a radio set in perfect working order is connected according to the drawing, otherwise the automatic measuring procedure might never come to an end and consequently no (or a useless) result might appear on the display.

Test setup:



Ref. No.	Labelling	Function
30	U/I DC	Key for DC voltage and current measurements. The test items are connected to input sockets 28.
31	NF-AC METER 1 mV - 10 V	Input socket for AF voltage and frequency measurements. Press key 15 to connect the AF voltmeter to input socket 31 and key 33 to connect the frequency counter to input socket 31.
32	+20 dB	Key for increasing the AF generator output level at socket 34 by 20 dB. If the level is increased, the key lights up. If the key is pressed again, the original level is set again.
33	EXT. NF/AC	Key for connecting the AF frequency meter to input socket 31 for external frequency measurement. The measured AF frequency is displayed on 13.
34	MOD. GEN.	Output socket of the AF generator.
35	BEAT FREQ.	Key for measuring the beat frequency between the RF frequency set and the RF signal applied to the socket FREQ. METER 47. The result is displayed on 13. The modulation is switched off.
36	DEMOD. FREQ.	Key for measuring the audio frequency of a demodulated RF signal applied to input socket 48.
37	DEMOD. SIGN. $R_i \approx 50\ \Omega$	Output socket for the demodulated signal
38	MOD. GEN.	Key for setting the frequency of the AF generator after entering the desired frequency via keyboard 25.
39	MOD. EXT. 1 Vrms $R_i = 600\ \Omega$	Input socket for external modulation signals. For input voltages required see sections 2.3.3.3.2 and 2.3.3.3.3.
40	$-\frac{PK+PK}{2}+$	Keys for switching on the modulation meter. The "-" key measures the negative and the "+" key the positive peak value. The $\frac{PK+PK}{2}$ measures the mean value of the modulation. The key selected lights up.
40.1	HF-RF PROBE	Socket for connection of RF probe or insertion unit for Option SMFS2B8.
41	PROBE	Key for switching on RF Millivoltmeter SMFS2B8, if provided. The voltage is displayed in V or dBm on 5. By pressing the key again, the display is changed over from V to dBm, or vice versa.
42		Potentiometer for adjusting the volume for the headphones connected to socket 44 or the internal loudspeaker; also on/off switch for the internal loudspeaker.

Ref. No.	Labelling	Function
43	NKL dBµW	Key for switching on the adjacent-channel power meter (if option SMFP-B6 is fitted). The power is displayed on 5 in dB relative to the input power (lower key) or in µW (upper key).
44	 $R_i \approx 2\ k\Omega$	Headphones socket
45	W/dBm	Key for switching on the power meter. The power is displayed in W or dBm on 5. By pressing the key again, the display is changed over from W to dBm, or vice versa.
46	FREQ. MET.	Key for connecting the frequency meter to RF input socket 47
47	FREQ. METER R_i = 50 Ω 10 mV - 1 V	Input socket for the frequency meter
48	HF · RF R_i = 50 Ω	Socket for connecting the radio-telephone set. RF output from the signal generator and RF input to the test facilities.
49	SEND. TR.	This key must be pressed for transmitter measurements.
50	FM φM AM	Keys for selecting the type of modulation.
51	EMPF. REC.	This key must be pressed for receiver measurements.
52		Air filter.
53	IEC 625 BUS	IEC-bus connector.
54	HF · RF 30 dB	RF socket to which the signal applied to socket 48 is brought out after attenuation by 30 dB.

Ref. No.	Labelling	Function
55	ADDRESS	10-way switch for setting the IEC-bus address.
56	NF . AF 1 kHz	Output socket for a 1-kHz AF signal with a 1.7-V output level.
57	BU402	15-way output socket which can be controlled via the IEC bus.
58	REF. 10 MHz	Input socket for an external 10-MHz reference signal.
59	BU401	15-way output socket which can be controlled via the IEC bus.
60	47 - 420 Hz	AC supply connector.
61	M1C M2E	Power fuse.
62	200 - 255 V 105 - 135 V	Voltage selector.
63	BATT. T16A	Battery fuse.
64	+ 11-33 V -	Battery terminals.

2.2 Preparation for Use

The Mobile Tester SMFP2 can be powered from the mains or from a battery.

AC supply operation is possible in two voltage ranges, from 105 to 135 V and from 200 to 255 V. The Tester is factory-adjusted for operation over the voltage range from 200 to 255 V. For adaptation to the voltage range 105 to 135 V, change over the voltage selector 62 (Fig. 2-4) and exchange the power fuse.

Fuses required:	105 to 135 V	M2E DIN 41571
	200 to 255 V	M1C DIN 41571.

Spare fuses are supplied with the Tester.

A voltage between 11 V and 33 V is required for battery operation. The battery is connected to terminals 64. The battery input is protected against wrong polarity and fused with a 16-A fuse DIN 41571. The fuse is screwed into fuse holder 63. A spare fuse is supplied with the Tester.

The Mobile Tester SMFP2 has the basic width of a 19" unit. A rack adapter (332.7978.02) is required for mounting it in a 19" rack. To do so, remove the screws on either side, and take off the panels and the side strips as well as the carrying handle. There are holes provided for screwing down the rack adapter. The RF socket cannot be moved to the rear panel.

2.3 Operating Instructions

The operator controls the SMFP2 by pressing keys, with the exception of the volume control for which a potentiometer is used.

The digital displays and the keys are logically organized in horizontal and vertical sections (Fig. 2-1).

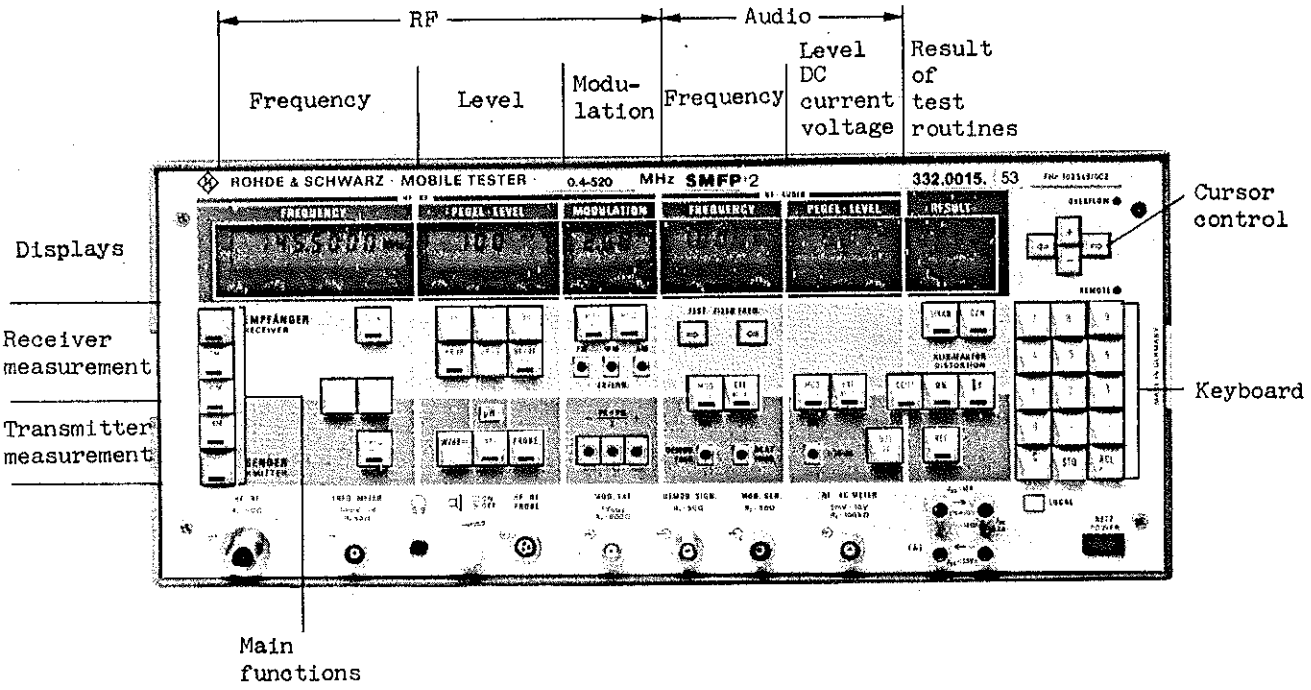


Fig. 2-1 Organization of the front panel

All data to be set must first be entered via keyboard 25 (Fig. 2-3). Then by pressing a key in the section assigned to the desired function the entered value is transferred and the physical unit defined at the same time.

Illegal settings are not accepted. If, for example, an RF frequency above or below the frequency range of the Tester is entered, the LED 23 OVERFLOW lights. The same is true for the other functions. The LED signals that the last entry cannot be transferred or that the test value is not within the measurement range. If, subsequently, an admissible value or instruction is entered, or if the key C is pressed on keyboard 25 the LED goes off.

2.3.1 Switch-on State

The SMFP2 is switched on by pressing key 27 (Fig. 2-3). At switch-on the Tester assumes the following defined basic state:

Main function: transmitter measurement "FM".

Display 20 simultaneously reads out the program version, e.g. P 0.

The RF signal frequency is 100 MHz. The frequency deviation is 2.8 kHz and the modulation frequency is 1 kHz.

The RF level is 1 µV.

The settings can be displayed by pressing key 51 EMPF. REC.

The AF output level is set to 1 mV.

2.3.2 Basic Setting

The keys 49 XMITTER and 51 RECEIVER (Fig. 2-3) allow selecting transmitter or receiver measurement, respectively. The type of modulation is selected by means of the three keys 50 FM, φM and AM.

If an input power of > 0.5 W is applied to socket 48 RF the Tester switches automatically over from receiver measurement to transmitter measurement.

2.3.3 Receiver Measurement

If the key 51 RECEIVER (Fig. 2-3) is pressed the receiver measurement mode is selected, with an RF signal being output to the test item via socket 48 RF. In addition, the AF level meter is switched on.

2.3.3.1 Setting and Varying RF Frequency (Carrier)

Setting the RF frequency

To set the RF frequency, first enter the desired numerical value in MHz via keyboard 25 (Fig. 2-3). Zeros behind the decimal point at the end of a figure need not be filled in. For example, "423" can be entered for 423.000 MHz or "423.2" for 423.20.

After the RF value has been entered press key 3 SIGN. GEN.. This defines that the value entered is an RF frequency in MHz and sets the signal generator immediately to this frequency. The RF frequency is displayed on 1.

Varying the RF frequency

A frequency entered via the keyboard 25 can be varied either in decade steps or in steps of any selected size:

For variation in decade steps set the cursor (marker on the display) to the digit which is to be varied by means of the keys 22 ⟸ ⟹. The frequency is varied by pressing either of the keys 22 "+" or "-".

The frequency can be switched using any desired channel spacing by entering the numerical value of the desired step size in kHz via the keyboard 25 and subsequently pressing one of the two keys 2 "- ΔF" or "+ ΔF". The step size entered is stored and the frequency can be increased or decreased by the stored value as often as desired by repeatedly pressing one of the keys 2. Any frequency step can be entered, from 0.1 kHz to the maximum step size, the entire frequency range. Just make sure that the entry is always in kHz.

If the frequency range is exceeded by decade frequency variation or variation in channel steps, LED 23 OVERFLOW lights indicating that the last command cannot be executed; e.g. it is not possible to increase 515 MHz by a step of 10 MHz. If then, however, the frequency is varied by, say, +1 MHz, the overflow indication goes off and the frequency is increased by 1 MHz. The overflow indication can also be turned off by pressing key "C" on keyboard 25.

2.3.3.1.1 Setting and Varying the Frequency Using the 1-GHz-Frequency Extension SMFP-B2

If the Tester is fitted with the Option SMFP-B2 the frequency range is extended to 1040 MHz, and the overflow indication 23 (Fig. 2-3) lights up only if this value is exceeded.

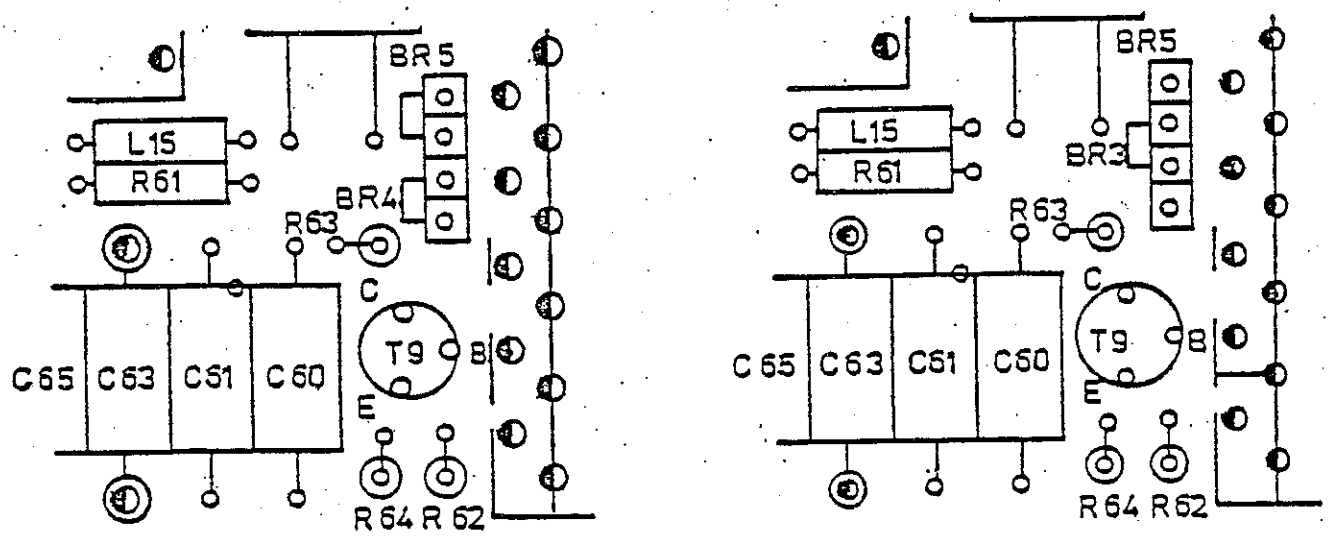
The frequency is set and varied in the same way as described in section 2.3.3.1.

The resolution of the indication is 200 Hz over the frequency range 520 to 1040 MHz. If the frequency is entered via the keyboard, if it is varied in decade steps or steps of any size the frequency setting is rounded to the nearest 200 Hz.

2.3.3.1.2 Reference Frequency

The signal generator contains an internal 10-MHz crystal reference oscillator from which the output frequency is derived using a synthesizer circuit. A TTL output at the reference frequency is available at BNC socket 58 REF. 10 MHz (Fig. 2-4) for external control purposes. The signal generator can, however, also be supplied with an external reference frequency of 10 MHz, if, for example, it is to be driven from another unit or from a central standard frequency. To this end, it must be internally modified. After this conversion the socket 58 REF. 10 MHz is used as an input for the external reference frequency. A sinewave signal of 10 MHz and 0.5 V will do; a TTL level can also be applied.

The Tester is supplied with BNC socket 58 REF. 10 MHz wired as an output. To convert the socket to serve as a reference frequency input, a link on reference board 302.6215 must be changed. To do so, first remove the bottom cover after loosening the screws on either side, and then lift off the lid of the large shielding box. The location of the circuit board 302.6215 is shown on the lid. After unplugging the circuit board the plug-in contacts at the lower right-hand edge are accessible and the link can be changed as required in accordance with Fig. 2-2.



a) Reference frequency output b) Reference frequency input

Fig. 2-2 Location of the plug-in link

If the reference board is fitted with the option SMS-B1 (temperature-controlled reference oscillator) the option must be removed if an external reference frequency is to be applied.

2.3.3.2 Setting and Varying the RF Output Level

Setting the RF output level

To set the RF output level first enter the desired value in either µV, mV, dBµV or dBm via keyboard 25 (Fig. 2-3). In the case of negative dBµV and dBm values enter a minus sign ("-" key) before the numerical value. Zeros behind the decimal point at the end of a figure need not be entered.

After entering the level value press key 6 µV, mV, dBµV or dBm corresponding to the physical unit of the value entered previously. This defines firstly that the value entered is for an output level or output voltage and immediately sets the level or voltage at output 48 RF. The level or voltage is displayed together with the physical unit on 5 LEVEL.

Since the attenuator is set in 0.1-dB steps, display 5 reads out the dB values set and not the values entered in mV or µV.

Permissible level or voltage range:

Unmodulated, FM and φM	AM
0.03 µV to 1000 mV	0.03 µV to 500 mV
-30 dBµV to +120 dBµV	-30 dBµV to +114 dBµV
-137 dBm to +13 dBm	-137 dBm to +7 dBm

If another physical unit key 6 is pressed after the level has been set without a new numerical value being entered via keyboard 25, the level setting is converted into the new physical unit and displayed on 5.

Varying the RF output level

An output level entered via keyboard 25 can be varied in decade steps. To do so, adjust the cursor to the digit on display 5 that is to be varied using the keys 22 ⟸ ⟹. By pressing one of the two keys 22 "+" or "-" momentarily, the level is increased or decreased by one unit of the selected decade. If the key is held down the level is varied continuously, first slowly and after three steps in a fast sequence.

If the level is varied beyond the limits of the range of adjustment the LED 23 OVERFLOW lights up.

Continuous, electronically controlled fine variation of the level down to -10 dB is possible by means of key 22 "-" if the cursor is adjusted to the extreme right digit of the level displayed on 5. This does not interrupt the signal at output 48. The approximate value of the fine variation is indicated by a vertical marker row on display 5. In addition, the numerical value displayed on 5 is always correct, changing with the fine variation.

If fine variation exceeds the -10-dB limit the attenuator switches over and fine variation starts again with 0 dB and so does the marker indication on display 5. The level at output 48 is cut off for the short period of time the attenuator switches over. Starting from this setting fine variation is now again possible continuously down to -10 dB and without the signal being interrupted.

2.3.3.2.1 Physical Units of Level Indication

All the values entered via keyboard 25 (Fig. 2-3) and the output levels displayed on 5 are valid for voltage or power with a resistance termination of 50 Ω. In all cases the actual output voltage is indicated. The EMF is double the value.

The physical unit dBμV is a logarithmic measure of the output voltage relative to 1 μV. With an output voltage V_{out} (V)

$$V\ (dB\mu V) = 20 \log \frac{V_{out}\ (V)}{1\ \mu V} .$$

Hence, an output voltage of exactly 1 μV corresponds to 0 dBμV. If the voltage is greater than 1 μV a positive dBμV value is obtained and if the voltage is smaller than 1 μV a negative dBμV value is obtained.

The unit dBm defines the output power that would be dissipated in a resistive termination, as a logarithmic measure relative to 1 mW. With a power P (W)

$$P\ (dBm) = 10 \log \frac{P\ (W)}{1\ mW}$$

or with a voltage V_{out} (V)

$$P\ (dBm) = 10 \log \frac{V_{out}^2\ (V)}{50 \times 1\ mW} .$$

If the test item or load is not 50 Ω the effective power is reduced by reflection.
Hence, depending on the VSWR the output power

$$P_{(load)} = P_{(indication)} \frac{4 \times VSWR}{(1 + VSWR)^2} .$$

2.3.3.2.2 Level with Amplitude Modulation

If the amplitude modulation is switched on the maximum output level is reduced by 6 dB. The LED 23 OVERFLOW (Fig. 2-3) lights up as soon as 500 mV or 7 dBm or 114 dBµV are exceeded when entering or varying the output level. Settings above this level limit are not possible. If a higher level is set in unmodulated operation and amplitude modulation is switched on only afterwards, 23 OVERFLOW lights up and the amplitude modulation is not activated.

There is no level reduction for level settings below this limit. The level entered and displayed with amplitude modulation is the mean value of the carrier.

2.3.3.2.3 Output Cut-off

The RF signal at output 48 can be switched off by means of key 7 HF/RF OFF (Fig. 2-3) without affecting the frequency, modulation or level setting. Key 7 lights up when the signal is cut off. Display 5 reads out 000 without unit. The RF signal reappears at output 48 if key 7 is pressed again.

2.3.3.3 Setting the Modulation

2.3.3.3.1 Internal Modulation

For internal modulation the built-in AF generator is used as a modulation generator and the desired modulation frequency is entered according to section 2.3.3.4.

First select the type of modulation by means of keys 50 FM, φM or AM (Fig. 2-3). The key pressed lights up.

Next select the numerical value for the modulation depth in %, the frequency deviation in kHz or the phase deviation in rad via keyboard 25. The zeros behind the decimal point at the end of the numerical value entered need not be filled up.

The numerical value entered is transferred by pressing key 8 MOD. INT., immediately set, and read out on the 3-digit display 9. The key 8 is lit during internal modulation. By pressing the key again the modulation is switched off. The entries remain, however , stored and the same modulation is obtained as before when the key is pressed again.

The resolution of the setting and display depends on the value entered:

for amplitude modulation

with	m	=	0	to	9.95 %	..... 0.05 %
	m	=	10	to	99 %	..... 0.5 %;

for frequency modulation

with	Δf	=	0	to	9.95 kHz	..... 0.05 kHz
	Δf	=	10	to	99.5 kHz	..... 0.5 kHz
	Δf	=	100	to	125 kHz	..... 1 kHz;

for phase modulation

with $\Delta f/f_{mod}$ = 0 to 5 rad ..... 0.05 rad.

If the values entered are in still smaller steps the SMFP2 rounds off automatically to the next value.

2.3.3.3.2 External Modulation

An external modulation signal can be applied to socket 39 MOD. EXT. (Fig. 2-3).

First select the type of modulation by means of keys 11 FM, φ M or AM EXTERN. The key pressed lights up.

If the modulation voltage at socket 39 is exactly 1 V the desired numerical value entered via keyboard 25 for the modulation depth in %, the frequency deviation in kHz or the phase deviation in rad is correctly transferred, set and displayed on 9 as soon as key 10 MOD. EXT. is pressed. Key 10 is lit during external modulation.

2.3.3.3.3 Double Modulation

Simultaneous internal and external modulation is possible with the following combinations:

Internal	External
FM	AM
ΦM	AM
AM	FM or ΦM.

Set the modulation frequency as well as modulation depth, frequency or phase deviation or the internal modulation generator in accordance with section 2.3.3.3.1 while setting the same values for the external modulation on the modulation voltage source. The relationship between the voltage of the modulation generator and the modulation quantities is as follows:

FM 1 V_{rms} = 100 kHz

ΦM 1 V_{rms} = 5 rad

AM With double modulation the external modulation input is DC coupled for external amplitude modulation. Thus it can be used for external level control or as ALC input. The input voltage required is between 0 and +2.83 V, 0 V corresponding to the full carrier level and 2.83 V to a carrier reduction of about 40 dB.

For AM with sinewave modulation voltages and simultaneous superposition of a DC voltage of +1.41 V the relationship between modulation voltage and modulation depth is as follows:

1 V_{rms} = 100%. The internal modulation setting is displayed on 9 MODULATION.

2.3.3.3.4 Doubletone Modulation

The SMFP2 has two internal AF signal sources for the internal modulation:

1. a synthesizer for the frequency range 10 Hz to 25 kHz; for frequency setting see 2.3.3.4.
2. an AF generator 2 with the frequencies 400 Hz and 1 kHz.
   400 Hz is set with 200 REF,
   1 kHz is set with 201 REF.

Both signal sources are used for doubletone modulation. The modulation values can be separately adjusted for the two signals. The first signal is set through the normal modulation entry, the second is set with xxxx REF according to the relation xxxx = 2000 + modulation value (1000 max.)

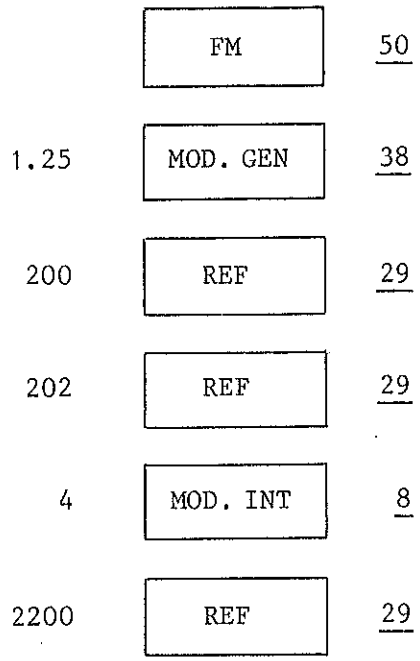
FM 1000 = 10.00 kHz
ΦM 1000 = 1.000 rad
AM 1000 = 100.0 %

The AF synthesizer is chosen as the 1st signal source with 202 REF.
The AF generator 2 is chosen as the 1st signal source with 203 REF.

Example:

1st frequency 1.25 kHz from AF synthesizer with 4 kHz deviation

2nd frequency 400 Hz from AF generator 2 with 2 kHz deviation.



2.3.3.4 Setting and Varying the AF (Audio frequency, modulation frequency)

Setting the AF frequency

To set the AF frequency, enter the desired numerical value in kHz via keyboard 25 (Fig. 2-3). Then press key 38 MOD. GEN. which defines the entered numerical value as an AF frequency. You need not enter either leading zeros before the decimal point, or trailing zeros after the decimal point; e.g. .01 kHz.

Moreover, with keys 12 FIXED FREQ. , one of the seven fixed frequencies

0.3, 0.4, 1, 1.25, 2.7, 3 and 6 kHz

can be selected.

If key 12 on the left-hand side is pressed 0.3 kHz is selected first, by pressing the next key 0.4 kHz is selected, etc. If key 12 on the right-hand side is pressed, 6 kHz is selected first.

The frequency selected according to the one or the other method is available at socket 34 MOD. GEN. It is displayed on 13 FREQUENZ NF/AUDIO. For setting the AF level, see section 2.3.3.5.

Varying the AF frequency

The frequency entered via key 25 can be varied in decade steps. To do so, set the cursor to the digit to be varied by means of the keys ⟸ ⟹. By pressing one of the keys 22 "+" or "-" momentarily, the digit marked by the cursor is increased or decreased by one unit of the selected decade. If the key is held down the AF frequency is varied continuously, first slowly, then after three steps at a faster rate. If the variation reaches the limit of the frequency range, LED 23 OVERFLOW lights up, indicating that the last command cannot be executed. The LED goes out if a new value which is within the frequency range is entered or key 25 "C" is pressed.

2.3.3.4.1 Selective Call Encoder

The AF Synthesizer also delivers selective calling signals according to CCIR or ZVEI. It is switched over to operate as a selective call encoder after entering 7 via the keyboard 25 and pressing the REF. key 29.

Then a 1-to 8-digit tone sequence can be called up by entering the tone codes 0 to 9 via the keyboard 25 and pressing the MOD. GEN. key 38. The entered tone sequence is repeated if either the MOD. GEN. key 38 or RECEIVER key 51 or TRANSMITTER key 49 is pressed.

When two successive tones are identical the repeat tone is used for the second tone.

ZVEI or CCIR tone code is selected by entering 8 or 9, respectively via the keyboard 25 and pressing the REF. key 29. At switch-on of the SMFP2 the ZVEI code is selected.

The selective call encoder is switched off by entering 6 via the keyboard 25 and pressing the REF. key 29.

NOTE: If the continuous tone present during normal operation is not desired prior and after the tone sequence, enter 0 via the keyboard 25 and press the MOD, GEN. key 38.

2.3.3.5 Setting and Varying the AF Level

Setting the AF level

The AF level at output socket 34 MOD. GEN. (Fig. 2-3) is selected by entering the desired numerical value in mV via keyboard 25. The numerical value entered is defined as the AF level by pressing the key 14 MOD. GEN.. The level is immediately set and displayed on 16 LEVEL. Key 14 lights up. Trailing zeros after the decimal point need not be filled in.

Varying the AF level

The AF level entered via keyboard 25 can be varied in decade steps. To do so, set the cursor to the digit on display 16 which is to be varied, by means of keys 22 ⟸ ⟹. By pressing keys 22 "+" or "-" momentarily the level increases or decreases by one unit of the selected decade. If the key is held down, the AF level is varied continuously, first slowly, then after three steps more rapidly.

If key 32 +20 dB is pressed the AF level is increased by 20 dB. The new value is then displayed on 16 and key 32 lights. If the key is pressed again the level is reduced by 20 dB to its previous value and the LED in the key goes out.

By pressing key 14 (MOD. GEN.) the increased level is transferred and the indicator in key 32 +20 dB goes off.

If the variation exceeds the limit of the range of adjustment LED 23 OVERFLOW lights.

2.3.3.6 Measurement of Level of External AF Signals

If key 15 EXT. NF/AC (Fig. 2-3) is pressed the AF level meter is switched on which permits the level of the signal externally applied to the socket NF-AC METER to be measured and displayed on 16 in mV. If key 17 CCITT is pressed a CCITT filter (300 Hz to 3 kHz) is switched into circuit and the level measured over a frequency range of 30 Hz to 20 kHz with CCITT weighting.

By entering 122 via the keyboard 25 and pressing the REF. key 29 a rejection filter can be cut into circuit during modulation or AF level measurement if no other measurement is switched on. The rejection filter (1 kHz, 300 Hz or 500 Hz) is selected by pressing the ⇕f key 18. The selected frequency is displayed on 13.

The rejection filter can be switched off by entering 123 via the keyboard 25 and pressing the REF. key 29.

2.3.3.7 SINAD Ratio Measurement

For measuring the SINAD ratio, to determine the receiver sensitivity, two measuring procedures are provided in the SMFP2. SINAD ratio measurement is only possible at 1 kHz. With the simple measuring procedure the SINAD ratio of the signal applied to socket 31 NF · AC METER is measured at the RF level and modulation given. This measuring procedure is called up by pressing key 19 SINAD if no numerical values have been entered. The measured value is displayed on 20. The circular quasi-analog display is assigned to the units digit.

With the automatic measuring procedure the SINAD ratio is measured and the RF level varied - but not above -27 dBm - until the SINAD ratio entered via keyboard 25 and by pressing key 19 SINAD is reached. The SINAD ratio is displayed as with the simple measuring procedure. The RF level is displayed on 5.

With the automatic measuring procedure the measuring limit is ±2 dB.
The average noise level is determined from 15 measurements.

By entering 4 via the keyboard 25 and pressing the REF. key 29 the measuring limit is switched over to ±1 dB. The average noise level is then determined from 50 measurements.

Reset to measuring limit ±2 dB by entering 3 via the keyboard 25 and pressing the REF. key 29.

2.3.3.8 S/N Ratio Measurement

The S/N ratio can be measured in the transmitter measurement mode or in the receiver measurement mode by pressing key 49 or key 51 respectively.
The S/N ratio measurement is initiated by pressing key 21 and discontinued by pressing key 21 again.

Measurement of S/N ratio of transmitter section:
If no numerical values have been entered via keyboard 25, the S/N ratio of the demodulated transmitter signal is measured and displayed on 20.

Measurement of S/N ratio of receiver section:
If no numerical values have been entered via keyboard 25, the S/N ratio of the signal at socket 31 NF · AC METER is measured at the given modulation and displayed on 20.

If a numerical value has been entered in dB the RF level is automatically adjusted so as to obtain the selected S/N ratio - but not above -27 dBm to prevent the receiver from being damaged.

The RF level is read out on display 5 and the S/N itself on display 20.
In the S/N measurement mode simultaneous quasi-analog display of the units digit is provided on 20.

With the automatic measuring procedure the measuring limit is ±2 dB.
The average noise level is determined from 15 measurements.

By entering 4 via the keyboard 25 and pressing the REF. key 29 the measuring limit is switched over to ±1 dB. The average noise level is then determined from 50 measurements.

Reset to measuring limit ±2 dB by entering 3 via the keyboard 25 and pressing the REF. key 29.

During the automatic S/N ratio measurement the computer can be inhibited by pressing the RF OFF key 7. When this key is pressed again and the cable disconnected from the NF · AC METER socket 31, the inhibition is cancelled.

2.3.4 Transmitter Measurement

The transmitter measurement mode is selected by pressing key 49 TR. (Fig. 2-3) or by applying an RF signal > 0.5 W to socket 48 RF. In this operating mode, the SMFP2 measures the frequency, the power and the modulation of the signal applied to socket 48 RF. The values are displayed on 1, 5 and 9.
The AF generator supplies a frequency of 1 kHz.

2.3.4.1 RF Frequency Measurement

In the transmitter measurement mode, the frequency of the signal applied to socket 48 RF is measured. The result is displayed on 1.

If key 46 FREQ. MET. is pressed, the built-in frequency counter can be connected to the more sensitive input 47 FREQ. METER. The test result is also displayed on 1 in this case. The same is possible in the receiver measurement mode.

By entering 1 via keyboard 25 and pressing TRANSMITTER key 49 or FREQ. MET. key 46, the resolution of the frequency counter can be switched over from 10 Hz to 1 Hz. Reset to 10 by entering 10 via the keyboard 25 and pressing the key 49 or 46, respectively.

2.3.4.2 RF Level Measurement

In the transmitter measurement mode or by pressing key 45, the power at the RF socket 48 is measured. The result is displayed on 5 in W or dBm. By pressing key 45 again, the display is changed over from W to dBm, or vice versa.

In order to achieve the measurement accuracy guaranteed in the data sheet, it may be necessary to fit the coaxial 50-Ω resistor, which is supplied with the instrument, to rear socket 54.

An attenuator from 0 to 30 dB connected to the RF socket 48 can be taken into account when measuring power. To do so, the attenuation value must be entered. This is accomplished by entering 5 via the keyboard 25 and pressing the REF. key 29. Then enter the attenuation value, e.g. 6.3 via the keyboard 25 and press the W/dBm key 45. The entered attenuation value is also taken into account in the RF level setting. Thus the maximum output level is reduced by this value.

The RF level measurement cannot be performed when the measuring diode of the power meter is switched off. To avoid RF distortion of the attenuated signal at socket 54, the measuring diode of the power meter must be switched off. To do so, enter 120 via the keyboard 25 and press the REF. key 29. The measuring diode can be switched on again by entering 121 via the keyboard 25 and pressing the REF. key 29.

2.3.4.3 Modulation Measurement

In the transmitter measurement mode the modulation depth, frequency or phase deviation of the signal applied to socket 48 (Fig. 2-3) is measured depending on the modulation type selected by means of keys FM, φM or AM. Keys 11 are disabled.

Keys 40 "-", $\frac{PK + PK}{2}$, "+" permit indication of the negative or the positive peak value or of the arithmetic mean to be selected. The selected value is displayed on 9.

Frequency deviations of < 100 Hz are considered spurious deviations and are indicated accordingly (rms weighting).

When measuring frequency and phase modulation audio frequencies over the range 5 Hz to 8 kHz are weighted. By pressing key 17 CCITT a filter is switched into circuit which permits the measurements to be weighted in accordance with CCITT (300 Hz to 3 kHz).
The AM measurement cannot be performed when the measuring diode of the power meter is switched off (see 2.3.4.2).

For rejection filter see 2.3.3.6.

2.3.4.4 AF Frequency Measurement

In the receiver measurement mode as well as in the transmitter measurement mode the frequency of a signal applied to socket 31 NF . AC METER (Fig. 2-3) can be measured. To do so, press key 33 EXT. NF/AC. The result is displayed on 13.

If key 36 DEMOD. FREQ. is pressed the frequency of the modulation signal is measured in the transmitter measurement mode (key 49 pressed) and displayed on 13.

If key 35 BEAT FREQ. is pressed the beat frequency between the signal applied to socket 47 FREQ. METER and the RF frequency from the signal entered via the keyboard is measured in the transmitter measurement mode. The result is displayed on 13.

The resolution of the RF counter can be switched over from 1 Hz to 0.1 Hz by entering 1 via the keyboard 25 and pressing the EXT. NF/AC key 33 or DEMOD. FREQ. key 36 or BEAT FREQ. key 35.

To reset it, enter 1 via the keyboard 25 and press 33 or 36 or 35.

2.3.4.5 DC Measurement

If key 30 U/I DC (Fig. 2-3) is pressed, the DC voltage applied to sockets 28 is measured and displayed on 16.

If key 30 is pressed again, the SMFP measures the direct current which flows via a resistance between the terminals + and -20 A (precision resistor 10 mΩ) or + and -200 mA (precision resistor 10 Ω). The result is displayed on 16. The Tester automatically switches over from the measurement range 20 A to 200 mA, and vice versa.

Watch for correct polarity when carrying out these measurements (see front panel). No indication is obtained if the polarity is not correct. Off-earth voltage and current sources may make it necessary to establish a reference earth.

2.3.4.6 Measurement on Transceivers with Acknowledgement Signal

- Initial settings

  Set the transmitter frequency to be measured, in the receiver measurement mode, and store with STO Ø. Then set the receiver frequency and the appropriate FM modulation (see section 2.1, function of the REF key 29).

- Measurement

  Switching selective call coder on with 7 REF:

  To call up acknowledgement signal measurement, enter the number 105 via the keyboard 25 and press the REF key 29.

  Send tone sequence with [CODE] NF GEN:

  After the transmitter has been keyed off, the Mobile Tester switches automatically to FM modulation measurement. The deviation meter is ready to measure within 70 ms (about 65 ms).

  The tone sequence received is indicated in display 1.

- Repeat measurement

  Select receiver measurement mode with EMPF 51.

  Send tone sequence with NF GEN.

- Switching off

  To cancel the measurement, enter the numerical value 106 via the keyboard 25 and press the REF. key 29.

2.3.4.7 High-speed Deviation Meter

The deviation meter can be preset which allows high-speed measurements, i.e. immediately at switch-on of the transmitter the demodulated signal is available at the demodulation output for further evaluation.

- Select transmitter measurement mode.
- Enter transmitter frequency minus 200 kHz (internal IF) via keyboard 25 and press SIGN. GEN. key.

  Example: Transmitter frequency ..... 100 MHz
  Enter via keyboard ..... 99.8 MHz
  and press SIGN. GEN. key.

2.3.4.8 Adjacent-channel Power Measurement (Only in conjunction with Option SMFPB 61)

Press key 49 to select transmitter test. Enter channel spacing (10 kHz, 12.5 kHz, 20 or 25 kHz) of the transceiver to be tested via keyboard 25 and store with one of the keys 2. The wanted-channel frequency in MHz of the transceiver under test can be entered via the keyboard 25 and stored by means of the SIGN. GEN. key 3.

The REF. 117 key 29 allows any channel spacing to be entered. Prior to such entry, measure the adjacent-channel power to select the appropriate measuring filters (bandwidth 4 kHz or 8 kHz at channel spacing 10/12.5 or 20/25 kHz, respectively. Reset to adjacent-channel power measurement with REF. 118 key.

The power in the upper adjacent channel can be called up by means of the "µW" key 43 and in the lower adjacent channel by means of pressing the "-" key on the keyboard 25 and then the "µW" key 43. The measured value is read out on the display 5. For display of the ratio of the adjacent-channel power to the wanted-signal power, press the "NKL dB" key 43 in place of the "µW" key.

2.3.4.9 Selective Call Decoding

All signals available at DEMOD. SIGN. output 37 are applied to the selective call decoder. If key 15 is pressed, the AF signal applied to socket 31 is also available at this output.

The decoder decodes and stores the frequencies listed in the following table; each tone of the CCIR or ZVEI tone sequence is evaluated as a code number if it is longer than 20 ms (also applies to continuous tone). The last seven codes are either displayed directly or interpreted accordingly if it is a repeat tone.

The tone code is selected according to section 2.3.3.4.2.

The memory content can be read out on display 1 any time by entering 11 via the keyboard 25 and pressing the REF. key 29.

After the content of the memory has been read out, the memory is cleared automatically to get ready for a new read-in process.

The memory of the selective call decoder can also be cleared manually by entering 10 via the keyboard 25 and pressing the REF. key 29.

Table

No.	CCIR(Hz)	ZVEI (Hz)	Readout	Explanation
0	1981	2400	0	Code number
1	1124	1060	1	
2	1197	1160	2	
3	1275	1270	3	
4	1358	1400	4	
5	1446	1530	5	
6	1540	1670	6	
7	1640	1830	7	
8	1747	2000	8	
9	1860	2200	9	
A	2400	2800	L	Group call
B	930	810	H	Data prefix
C	2247	970	P	
D	991	886	A	
E	2110	2600	like the preceding tone ("-" if it is the first tone of the sequence)	Repeat tone (invalid if it is the first tone of the sequence)
F	No tone	No tone	(blank)	Pause > 25 ms or no tone of standard sequence

2.3.4.10 Squelch Sensitivity

Call with 129 REF.

Function:

Reduce RF level until squelch function starts.

Increase RF level until squelch function stops.

Display on RESULT 20: squelch hysteresis in dB.

Display on LEVEL 5: RF level at which squelch function stops.

2.3.5 IEC Bus

The Mobile Tester SMFP2 can also be remote controlled. The data on the settings is transferred on a byte-serial bus using an interface that complies with the IEC 625-1 (formerly IEC 66.22) and IEEE 488-1975 standards as well as the DIN standard IEC 66.22. Connection is made at the rear of the Tester via the IEC 625 Bus socket 53 (Fig. 2-4). Fig. 2-5 shows the pin allocation.

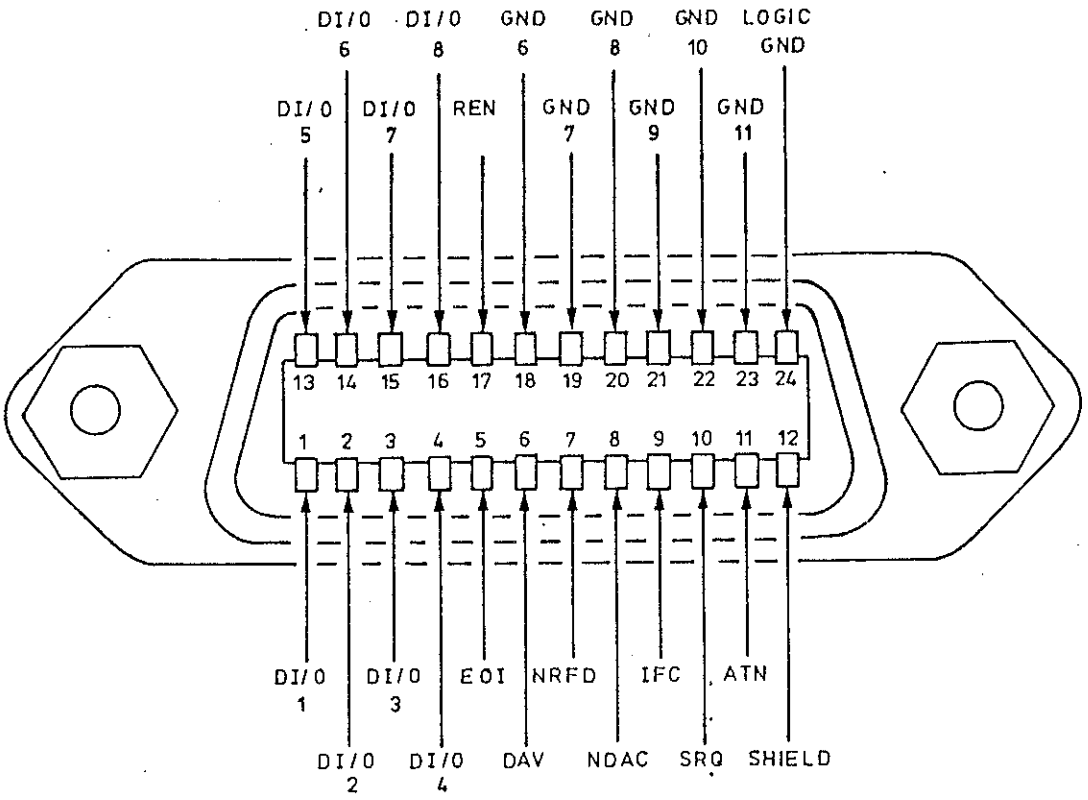


Fig. 2-5 Pin allocation

The interface connector specified by the American standard 488-1975 differs from that required by the international IEC standard. The SMFP2 is fitted with the 24-way interface connector, in accordance with the American standard 488-1975 which is more commonly used. Interconnection with instruments fitted with a 25-way interface connector in accordance with the IEC standard is readily possible by means of an adapter. Control functions and data transfer are identical in both cases.

The standard interface features three groups of bus lines:

1. Data bus - 8 lines DI/O to DI/O 8.
   Data transfer is bit-parallel and byte-serial, the characters being transferred in the ISO 7-bit or ASCII code. DI/O is the least significant bit and DI/O 8 the most significant.

2. Control bus - 5 lines.

This is used for the transfer of control functions:

ATN (Attention)	is active at low level during the transfer of an address to the connected device.
REN (Remote Enable)	is used for switching the device over to the remote control mode.
SRQ (Service Request)	By activating this line, a connected device can request the intervention of the controller.
IFC (Interface Clear)	is activated to bring the connected device into a defined initial condition.
EOI (End or Identify)	This signal can be used to mark the end of data transfer and is also used for polling after a service request. EOI signals are not processed in the SMFP2.

3. Handshake bus - 3 lines.

This is used for controlling the data transfer sequence:

NRFD (Not Ready for Data)	An active-low NRFD line indicates to the controller that one of the connected devices is not ready for data transfer.
DAV (Data Valid)	is activated by the controller shortly after a new data byte has been applied to the data bus.
NDAC (Not Data Accepted)	is kept active-low by the connected device until it has accepted the data present on the data bus.

In the IEC-bus system, the Mobile Tester functions as a listener or talker, i.e. it is capable of accepting data and executing setting commands from the controller and outputting the results of measurements.

2.3.5.1 Setting the Address

Before the Tester is connected to the IEC bus, set a suitable device address on the Tester by means of address switches A1 to A5. The address switch A6 must always be in the OFF position.

The coding switch ADDRESS 55 (Fig. 2-6) is located on the rear panel (Fig. 2-4).

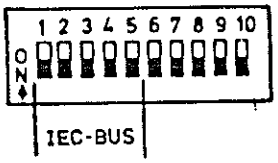


Fig. 2-6 Coding switch.

The following table shows the settings required for the various possible addresses. The SMFP2 is supplied from the factory with device address setting 30.

Table 2-1

ASCII character		Binary address					Decimal equivalent
Listen address	Talk address	Address switch A5	A4	A3	A2	A1	
(SPACE)	@	0	0	0	0	0	0
!	A	0	0	0	0	1	1
"	B	0	0	0	1	0	2
#	C	0	0	0	1	1	3
$	D	0	0	1	0	0	4
%	E	0	0	1	0	1	5
&	F	0	0	1	1	0	6
'	G	0	0	1	1	1	7
(	H	0	1	0	0	0	8
)	I	0	1	0	0	1	9
*	J	0	1	0	1	0	10
+	K	0	1	0	1	1	11
,comma	L	0	1	1	0	0	12
-	M	0	1	1	0	1	13
.	N	0	1	1	1	0	14
/	O	0	1	1	1	1	15
0	P	1	0	0	0	0	16
1	Q	1	0	0	0	1	17
2	R	1	0	0	1	0	18
3	S	1	0	0	1	1	19
4	T	1	0	1	0	0	20
5	U	1	0	1	0	1	21
6	V	1	0	1	1	0	22
7	W	1	0	1	1	1	23
8	X	1	1	0	0	0	24
9	Y	1	1	0	0	1	25
:	Z	1	1	0	1	0	26
;		1	1	0	1	1	27
<		1	1	1	0	0	28
=		1	1	1	0	1	29
>		1	1	1	1	0	30

When entering data, the setting range limits must be observed. When the range limits are exceeded, the LED OVERFLOW 23 lights. If the resolution of the entries is higher than the setting resolution of the Tester, the entries will be rounded to the nearest possible value.

2.3.5.2 Data Format

In accordance with the IEC draft standard the SMFP2 requires the following format for data transfer (Table 2-2):

Each instruction to change a setting consists of at least an initial character (header) and a final character (delimiter). When data on a setting is to be transferred, enter the data between these two limiting characters. All characters are transmitted in ISO 7-bit (ASCII) code.

After a measurement has been completed, the result of the measurement must be called up before a new measurement is made, since otherwise the data of the second measurement would be written over the data of the first measurement.

The delimiter for the output is defined in the Tester as CR. If a faulty string is entered, a Service Request (SRQ) is sent via the IEC bus.

With the Mobile Tester, three decade BCD outputs and nine relays can be activated via the IEC bus. These outputs are brought out at the two 15-way sockets BU401 and BU402 (57, 59) Fig. 2-4.

The control contacts and control instructions are listed in Tables 2-2 to 2-4.

Manually-controlled functions that are not mentioned here cannot be remote controlled.

Table 2-2 SMFP2 keyboard control via IEC bus

CONTROL FUNCTIONS:		CODE	
REC.		AR	
XMTR		(AT)	
AM	(INT)	AA	
FM	(INT)	AB	
PHIM	(INT)	AC	
FM	(EXT)	BI	
PHIM	(EXT)	BJ	
AM	(EXT)	BK	
RF OFF	(ON)	D@	
RF OFF	(OFF)	E@	
CCITT	(ON)	EC	
CCITT	(OFF)	DC	
STORE	90	DSØ	
	.	.	
	.	.	
	.	.	
STORE	95	DS5	
RECALL	90	DRØ	
	.	.	
	.	.	
	.	.	
RECALL	95	DR5	
FUNCTIONS OF REF KEY		BO (value)	(value = numerical value of function)
INPUT FUNCTIONS:			
SIGN GEN		AG	VALUE IN MHZ
MYV	<with fine adj.>	AI <XI>	VALUE IN MYV
MIV	<with fine adj.>	AJ <XJ>	VALUE IN MIV
DBM	<with fine adj.>	AK <XK>	VALUE IN DBM
DMBYV	<with fine adj.>	AL <XL>	VALUE IN DBMYV
-Ø.1DB RF LEVEL		DK	
+Ø.1DB RF LEVEL		EK	
MOD INT (ON)		AM	VALUE IN %,KHZ OR RAD
MOD INT (OFF)		EM	
MOD EXT (ON)		AZ	VALUE IN %,KHZ OR RAD
MOD EXT (OFF)		EZ	
MOD GEN (FREQ)		AO	VALUE IN KHZ
MOD GEN (LEVEL)		AQ	VALUE IN MIV
-DELTA F		AD	VALUE IN KHZ
+DELTA F		AE	VALUE IN KHZ
STORE Ø		B@,ZZØ	
1		B@,ZZ1	
2		B@,ZZ2	
3		B@ (VALUE),ZZ3	VALUE IN KHZ
4		B@ (VALUE),ZZ4	VALUE IN KHZ
5		B@ (VALUE),ZZ5	VALUE IN KHZ
RECALL Ø		A←,ZZØ	
1		A←,ZZ1	
2		A←,ZZ2	
3		A←,ZZ3	BZW A←,ZZ-3
4		A←,ZZ4	BZW A←,ZZ-4
5		A←,ZZ5	BZW A←,ZZ-5

ASCII CHARACTERS:	DEZ.	HEX.
	@64	40H
	←95	5FH

TEST FUNCTIONS:		OUTPUT:	
FREQ MET	AF	AF.....E-.	MHZ
RF FREQ	AT	AF.....E-.	MHZ
POWER IN W	AW	AW....E-.	WATT
POWER IN DBM	BL	BL....E-.	DBM
NKL DB (LOWER CHANNEL)	AN+ OR AN-	AN....E-.	DB
NKL MYW (LOWER CHANNEL)	BZ+ OR BZ-	BZ....E-.	MYW
+	BF	BF....E-.	%, KHZ, RAD
PK+PK/2	BG	BG....E-.	%, KHZ, RAD
-	BH	BH....E-.	%, KHZ, RAD
EXT AF(FREQ)	AP	AP.....E-.	KHZ
DEMOD FREQ	AU	AU.....E-.	KHZ
BEAT FREQ	AV	AV.....E-.	KHZ
EXT.AF(LEVEL)	AX	AX....E-.	VOLT
V/I	EY	EY....E-.	VOLT
CURRENT	DY	DY....E-.	AMPERE
DISTORTION 1KHZ	EE	EE... E-.	%
3ØØHZ	ED	ED...E-.	%
5ØØHZ	EG	EG...E-.	%
SINAD	AS	AS...E-.	DB
SINAD (AUT.)	AS(VALUE)	AS...E-.DBM	
REC. S/N	BB	BB...E-.	DB
REC. S/N (AUT.)	BB(VALUE)	BB...E-.DBM	
XMTR S/N	BB	XB... E-.	DB
PROBE IN V	FL1	FL....E-.V	VOLT
PROBE IN DBM	FLØ	FL....E-.D	DBM
BANDWIDTH MEASUREMENT	BO115	EH.....E-.	MHZ
BANDWIDTH MEASUREMENT	BO116	EI.....E-.	MHZ
QUIETING	BO119	QU....E-.	DB
SQUELCH SENSITIVITY	BO129	SQ....E-.DBM,..E-.	DB
AUT.NOM.DEVIATION ADJUSTMENT	BO2	AQ....E-.	MV
SELECTIVE CALL DECODER	BO11	TD.....	FOR EXPLANATION OF THE CHARACTERS SEE TABLE 2-4

SRQ CALLS:

STATUS (READ IN BY SERIAL POLL)

68 ERROR IN IEC INSTRUCTION (INPUT ERROR)
70 OVERFLOW
71 MEASUREMENT TERMINATED
72 MEASUREMENT TERMINATED WITH OVERFLOW

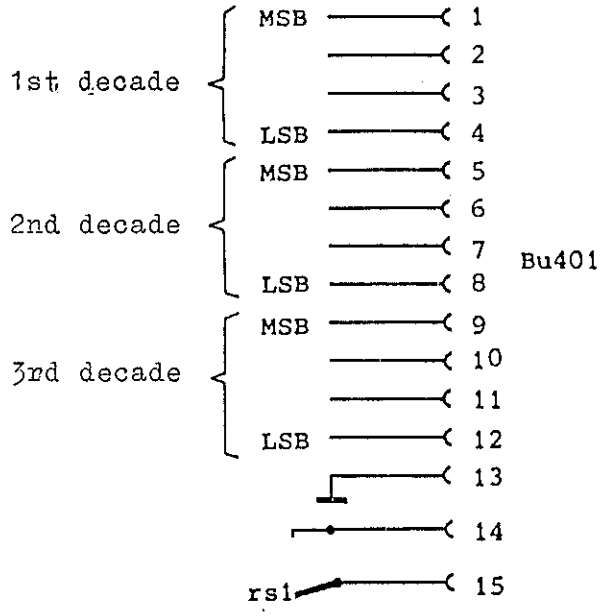
EXAMPLE IN BASIC WITH PPC:

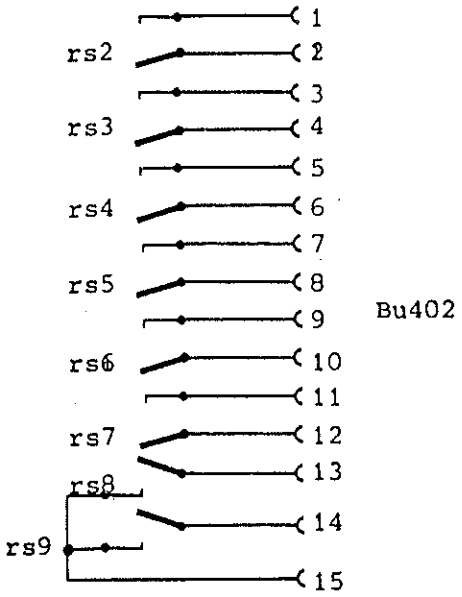
READOUT OF TEST RESULT AFTER SRQ CALL:

```
1ØØ IECTERM13:IECTIMES
12Ø IECSRQ THEN GOTO 1ØØØ
13Ø B$="AX":REM AF LEVEL MEASUREMENT
14Ø IECOUT3Ø,B$
15Ø X=Ø
16Ø IECTERM13:IFX=Ø THEN GOTO16Ø
17Ø END
1ØØØ IECSPL3Ø,V%
1Ø1Ø IFV%=68 THEN PRINT "INPUT ERROR"
1Ø2Ø IFV%=7Ø THEN PRINT "OVERFLOW"
1Ø3Ø IFV%=71 THEN GOSUB2ØØØ
1Ø4Ø IFV%=72:PRINT "OVERFLOW":GOSUB2ØØØ
1Ø5Ø IECRETSRQ
2ØØØ IECIN3Ø,Y$:PRINT Y$
2Ø1Ø X=1
2Ø3Ø RETURN
```

Table 2-3 IEC OUTPUTS BU401, BU402

Pin allocation:





Relay I is switched on by means of key 49 TR and switched off by means of key 51 REC.

Table 2-4 IEC instruction code

Decades: EA XYZ
X : numerical value 1st decade
Y : numerical value 2nd decade
Z : numerical value 3rd decade

HEX	Dec	X,Y or Z as ASCII character
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
A		:
B		;
C		<
D		=
E		>
F		?

Relays: EF XY

X : relay number
Y = 0 : open relay
Y = 1 : close relay

Table 2-5

Examples of IEC-bus instructions

Instructions	Tektronix 4051,4052	hp 9825	hp 9835/9845	Commodore PET 2001/3001	R&S PPC
Presettings	---	---	---	Open 1,30	---
Frequency 123.5 MHz	PRINT@ 30:"AG123.5 "	wrt730,"AG123.5 "	OUTPUT730;"AG123.5 "	PRINT # 1,"AG123.5 "	IECOUT30,"AG123.5 "
Frequency as a variable	LET F=123.5 PRINT@ 30:"AG";F;	F=123.5 wrt730,"AG",F	LET F=123.5 OUTPUT730;"AG";F;	LET F=123.5 PRINT # 1,"AG";STR$(F);	F=123.5 **) IECOUT30,"AG"+STR$(F)+
Level -24.8 dBm	PRINT@ 30:"AK-24.8 "	wrt730,"AK-24.8 "	OUTPUT730;"AK-24.8 "	PRINT # 1,"AK-24.8 "	IECOUT30,"AK-24.8 "
Fine variation -0.1 dBm +0.1 dBm	 PRINT@ 30:"DK " PRINT@ 30:"EK "	 wrt730,"DK " wrt730,"EK "	 OUTPUT730;"DK " OUTPUT730;"EK "	 PRINT # 1,"DK " PRINT # 1,"EK "	 IECOUT30,"DK " IECOUT30,"EK "
Modulation FM internal 2.8 kHz deviation	 PRINT@ 30:"AB " PRINT@ 30:"AM2.8 "	 wrt730,"AB " wrt730,"AM2.8 "	 OUTPUT730;"AB " OUTPUT730;"AM2.8 "	 PRINT # 1,"AB " PRINT # 1,"AM2.8 "	 IECOUT30,"AB " IECOUT30"AM2.8 "
Measurements +) Frequency/MHz	 PRINT@ 30:"AF " INPUT@ 30,F$	 wrt730,"AF " red730, F$	 OUTPUT730;"AF " ENTER730;F$	 PRINT# 1,"AF " INPUT# 1,F$	 IECOUT30,"AF " IECIN30,F$ *)
Level/W	PRINT@ 30:"AW " INPUT@ 30,F$	wrt730,"AW " red730,F$	OUTPUT730;"AW " ENTER730;F$	PRINT# 1,"AW " INPUT# 1,F$	IECOUT30,"AW " IECIN30,F$ *)
AM/% Pos.modulation depth	PRINT@ 30:"AA " PRINT@ 30:"BF " INPUT@ 30,F$	wrt730,"AA " wrt730,"BF " red730,F$	OUTPUT730;"AA " OUTPUT730;"BF " ENTER730,F$	PRINT# 1,"AA " PRINT# 1,"BF " INPUT# 1,F$	IECOUT30,"AA " IECOUT30,"BF " IECIN30,F$ *)

+) The test result of these examples is stored under the variable F$ (cf. Table SMFP keys IEC bus).

*) Preparation of PPC for reading in: IECTIME50 (waiting time)
IECTERM13 (<CR> as delimiter)

**) For string processing make sure that no unwanted characters are included. This is absolutely essential with the commands for relay control and the BCD outputs.

Example with PPC: IECOUT30, "EA" + MID$ (STR$(F), 2)+","

Table 2-6

	Tektronix 4051/4052	hp 9825	hp 9835/9845	Commodore PET 2001/3001	R&S PPC
Go to Local	WBYTE@ 62,1:	lcl730	LOCAL730 or LOCAL7	No capability	IECLAD30 IECGTL IECUNL
Local lockout	WBYTE@ 62,17: or WBYTE@ 17:	llo7 (for all devices)	LOCAL LOCKOUT7 (for all devices)	" "	IECLLO
Remote	WBYTE@ 62:	rem730 or rem7	REMOTE730 or REMOTE7	Only in connection with an output	IECREN and IECLAD30,"
Selected device clear	WBYTE@ 62,4:	clr730	RESET730	No capability	IECLAD30 IECSDC IECUNL

Table 2-6 lists examples of the output of particular instructions. The decimal address of the SMFP2 is assumed to be 30. This decimal address corresponds to the full decimal equivalent 62.

2.5 Retrofitting Options

Before fitting an option, pull out power plug. Never change circuit boards unless the SMFP2 is switched off.

2.5.1 Fitting the Reference Oscillator Option SMS-B1

Remove bottom of case and open bottom of cassette. Pull out reference circuit board Y6 (302.6215; yellow/red colour coding). Unplug the two links BR1 and BR2 on the circuit board. Insert the SMS-B1 and screw in place by means of the three screws supplied with it. Replace circuit board Y6 in the cassette and put cover of cassette back on. Replace bottom of case.

2.5.2 Fitting the 1-GHz Frequency Extension Option SMFP-B2

Space for accommodation of this option is reserved in the rear left-hand corner of the SMFP2.

Preparations:

- Remove bottom and top sections of the cabinet.
- Remove strip from the left side panel.
- Remove RF cable K2 between ST15 of the cassette and the attenuator.

Mounting the option:

Insert the option in the rear left-hand corner of the SMFP2 with the RF connectors pointing upwards and loosely fix to the side panel with four screws M 2.5 x 8. After fixing it to the rear panel with two screws M 2.5 x 8, tighten down the four screws on the side panel.

Routing of the cables supplied with the option: *

- Run the RF cable K2 between ST15 of the cassette and ST442 of the option.
- Run the RF cable K441 between ST441 of the option and the RF terminal (BU1) of the attenuator.
- Connect the flat cable K45 to ST45 of the Motherboard III (for location of ST45 and pin numbers, see Components Location Plan 332.3114, sheet 3).

* Note: Use a torque wrench for fitting the SMA sockets of the attenuator.
Torque range: 80 to 120 N/cm.

Retrofitting the option reduces the RF output level of the SMFP2 by about 0.8 dB.

It is therefore necessary to readjust the Modulation Control board Y10 (302.7011) accordingly.

a) Level correction:
   Settings on the SMFP2: UNMOD, 3 dBm
   Adjust the RF output power to 3 dBm by means of potentiometer R76 on Y10.
   Determine frequency response between 400 kHz and 520 MHz.

b) Modulation depth correction:
   Settings on the SMFP2: 130 MHz, 80% AM INT., 1 kHz, 3 dBm
   Adjust the modulation depth of the RF output signal to 80% by means of the potentiometer R79 on Y10.
   Determine the frequency response between 400 kHz and 520 MHz.

The IC supplied extends the count range of the RF counter.
To fit
- loosen subminax cable on board 332.2118
- remove board
- loosen shielding cover
- insert IC (B23 in circuit diagram or components location plan 332.2118)
- close cover. Then insert and connect the board.

Change the frequency range plate on the front panel to show the extended frequency range, i.e. 0.4 to 1000.

Replace bottom and top of case.

2.5.3 Fitting the Adjacent-channel Power Meter Option SMFPB61

- Remove cable K3 (2nd RF generator output - mixer).
- Insert board in the space provided for this purpose (black/green colour coding).
- Connect cables supplied with the option:
  RF generator - Adjacent-channel Power Meter board and Adjacent-channel Power Meter board - mixer.

2.5.4 Fitting the 60-W Option SMFP2B3

- Remove upper and lower cover panels.
- Remove carrying handle.
- Remove left trim strip (four screws).
- Remove left side wall (nine screws).
- Remove cable K1.

In the place of cable K1 fit the 60-W Option with the two cables supplied with it.

Reassemble the SMFP2. Screw the heat sink of the Option to the inside of the left side wall by means of the four screws supplied.

Connect the link BR12 on the computer board Y21 to ⊥ (identification signal changed over).

Close the unit again.

2.5.5 Fitting the RF Millivoltmeter Option SMFS2B8

Remove upper and lower cover panels.

Remove the plastic cover from the front panel and mount in its place the 3-way connector and cable supplied with the option.

Insert the RF Millivoltmeter Option board instead of the adapter board (colour code white-white, at the front, on the left-hand side).

Wire as follows:

- Connect cable from the front panel to connector 2.
- Connect the RF Millivoltmeter Option to connector 122 on the front mother-board. Prior to do so, remove the plugs from the motherboard.
- If the Analog Display Option SMFS-B9 is fitted, connect it to the RF Millivoltmeter via the 2-core cable of B9 (B8, ST4 - B9, ST91).

Close the unit again.

2.5.6 Fitting the Selective Call Decoder Option SMFS2B6

The SMFS2B6 is mounted on top of the digital section (colour code white-yellow).

Remove the upper cover panel.
Pull out the digital PC board towards the top.

Connect the option to the base plate via the 16-way connector ST243 and tighten down with three screws. Replace the PC board, connect it and close the SMFP2 again.