



**ROHDE & SCHWARZ**

GA 082

6 STEP = 0 LEN = 49

|||||

0 M/S = .98 L = 2.131  
1 389 95998

# FSK ANALYZER GA 082

0 PERIOD = 28 -ASY

0 ARQ-56 NO9

0 IDLE 1.1 NO1

1 E AVEC AUTORITE.

0 ASY-ASCII N10

18 1199 75.00 178

IEC 625 Bus  
IEEE 488



- Measurement of shift
- Measurement of baud rate (crystal-accurate)
- Continuous code analysis

17 398 50088  
0 BAUDOT -NO7

# CHARACTERISTICS

- 4-digit readout of shift (resolution 1 Hz)
- Tuning indication for demodulator (bar indicator)
- 8-digit readout of baud rate accurate to max.  $10^{-5}$  baud
- Indication of synchronous difference (i. e. signal quality) between measured and actual baud rate (bar indicator)
- 3-digit readout of measuring time in minutes
- 16-digit display of code analysis (alphanumeric display)
- Display of 48 code bits in seven different modes (bar indicator)
- 3-digit readout of centre frequency
- Built-in interfaces to IEC 625-1 (IEEE 488) and CCITT V.24/V.28 (RS-232-C)
- Self-test facility
- Microprocessor-controlled function keys for simple manual operation
- Extension for user-specific analysis programs possible

The major part of **radiocommunications traffic in the VLF-HF range** is in the form of frequency-shift-keyed F1B or F7B emissions. In addition to the standard methods (CCITT, CCIR) there are user-specific systems and specific codes for military and diplomatic networks, which operate with different transmission speeds and shifts.

The **identification of a radioteletype signal** by conventional means is time-consuming and requires elaborate equipment. Due to the use of modern scrambling methods, evaluation of the information content is practically no longer possible. The signal source can however be identified by accurate measurement of all parameters of the emissions (and localized by direction finding): repeatedly occurring equipment-specific deviations in the parameter data of individual emissions make it possible to recognize transmitters and thereby to detect whole radio networks.

## Characteristics of the GA 082

Supported by a microprocessor, the **FSK Analyzer GA 082 automatically** analyzes with high accuracy all parameters of teletype signals of F1B (F1) and F7B (F6) emissions and simultaneously displays the measurement results together with all essential information. Radioteletype signal identification is thus greatly facilitated and speeded up. The GA 082 can be used both as a stand-alone unit for **manual control** and as a **system unit** for computer-aided radiomonitoring by postal, military and intelligence authorities.

**Measurement tasks** The analyzer performs the following main tasks with the aid of a powerful microprocessor:

- measurement of shift,
- measurement of baud rate,
- measurement of stop-bit length,

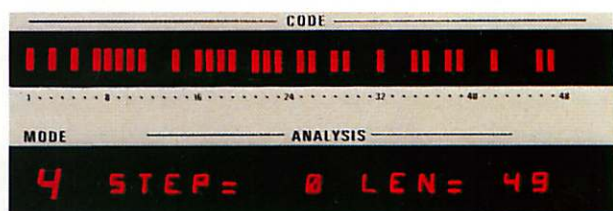
- continuous analysis of transmission code (using standard programs or specific user programs), and
- text output for standard-code signals.

**Microprocessor, program memory** The 16-bit microprocessor system 8086 of the GA 082 controls the analysis sequence and simplifies manual control via the function keys. A 24-kbyte program memory contains framing programs for the analyses as well as the standard programs. For user-specific programs a memory capacity (EPROM) of about 8 kbyte is available. Alternatively, a lockable storage unit (option) with the same capacity can be plugged into the rear panel.

**Displays** The measurement results and essential additional information such as operating mode, demodulator tuning and measuring time are simultaneously indicated on the four displays of the GA 082:

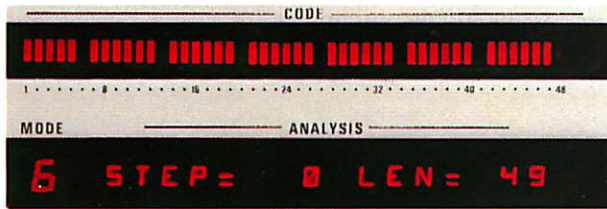
Either the **shift** in Hz or the **centre frequency** in kHz and the **baud rate** in baud with the number of digits being automatically adapted are indicated on the lower left display on the front panel (photo see page 4).

The **bit pattern display** (48 bits) on the upper right display is – depending on the operating mode – either static or dynamic and with a possible shift to the left or right, single-bit display or code line superimposition being selectable (illustration below and on top of next page).



Static single-bit display of code in mode 4 (top), no shift (STEP = 0; with negative steps, STEP-... is indicated); line length is adjusted to 49 bits for output

# CHARACTERISTICS



Dynamic code-line superimposition in mode 6 (start bits of Baudot code can be clearly recognized); otherwise same as illustration on preceding page

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01111100100110110001010000100011010100101
010000100101010001001010011101000010011001
001011101000010001111010000101010010101001
010000100011010110111000111100010010111111
001101101110010110101011000100010010011111
010000100101010110011001100101000010101001
000100100110010011011010000100101010101001
000011101000010001101001001100110010011101
000101101111010100001001100100000110100001
000110100010010111001000110100101110110001
001010100011010101001000100101110010001100
010010100010010100101010000100101010001000
00001010010001011111101111101000010001101
000001101100110011001001110101111010100001
00100110000011010000100011010001001011101
01100010011011011011101101100011110001001
    
```

Printed out lines of dynamic code line superimposition; start and stop bits can be clearly recognized

The **analysis result** is indicated together with the mode number (see specifications) on the alphanumeric display in the lower right part of the front panel. If there is a decode program, texts appear in running mode. For examples of possible displays see page 6.

**Demodulation** For connection to the IF or AF output of a monitoring receiver, the FSK Analyzer GA 082 is fitted with a demodulator which is automatically adjusted for F1B or F7B signals. Connectors for external demodulators (VF telegraph transmission systems) and for operation from the line current of a teletype line are also provided. In these cases measurement of the shift is not possible and the associated displays remain unlit.

**Analysis methods** The software of the GA 082 contains programs for the analysis of the following codes (for details see page 6):

No.	CODE (DISPLAY)		DECODE PROGRAM
00	STOP-MOD	N00	—
01	IDLE 1:1	N01	—
02	IDLE 1:6	N02	—
04	IDLE 1:4	N04	—
05	IDLE 28	N05	—
06	IDLE 56	N06	—
07	BAUDOT	N07	YES meas. stop-bit *)
08	ARQ-28	N08	YES
09	ARQ-56	N09	YES
10	ASY-ASCII	N10	YES

11	CODE 3:4	N11	—
12	SITOR	N12	YES
13	SIFEC	N13	YES
14	PARITY 14	N14	—
15	ARQ-1A	N15	YES
16	SIEM-FEC	N16	YES
17	BAUER 10	N17	YES
18	SPREAD 21	N18	YES
19	SPREAD 51	N19	YES

78 PERIOD = aa bbb      periodicity check  
 79 M/S = ccc L = ddd BIT      code statistics

— user 10 program package (option)

\*) Also Cyrillic letters possible.

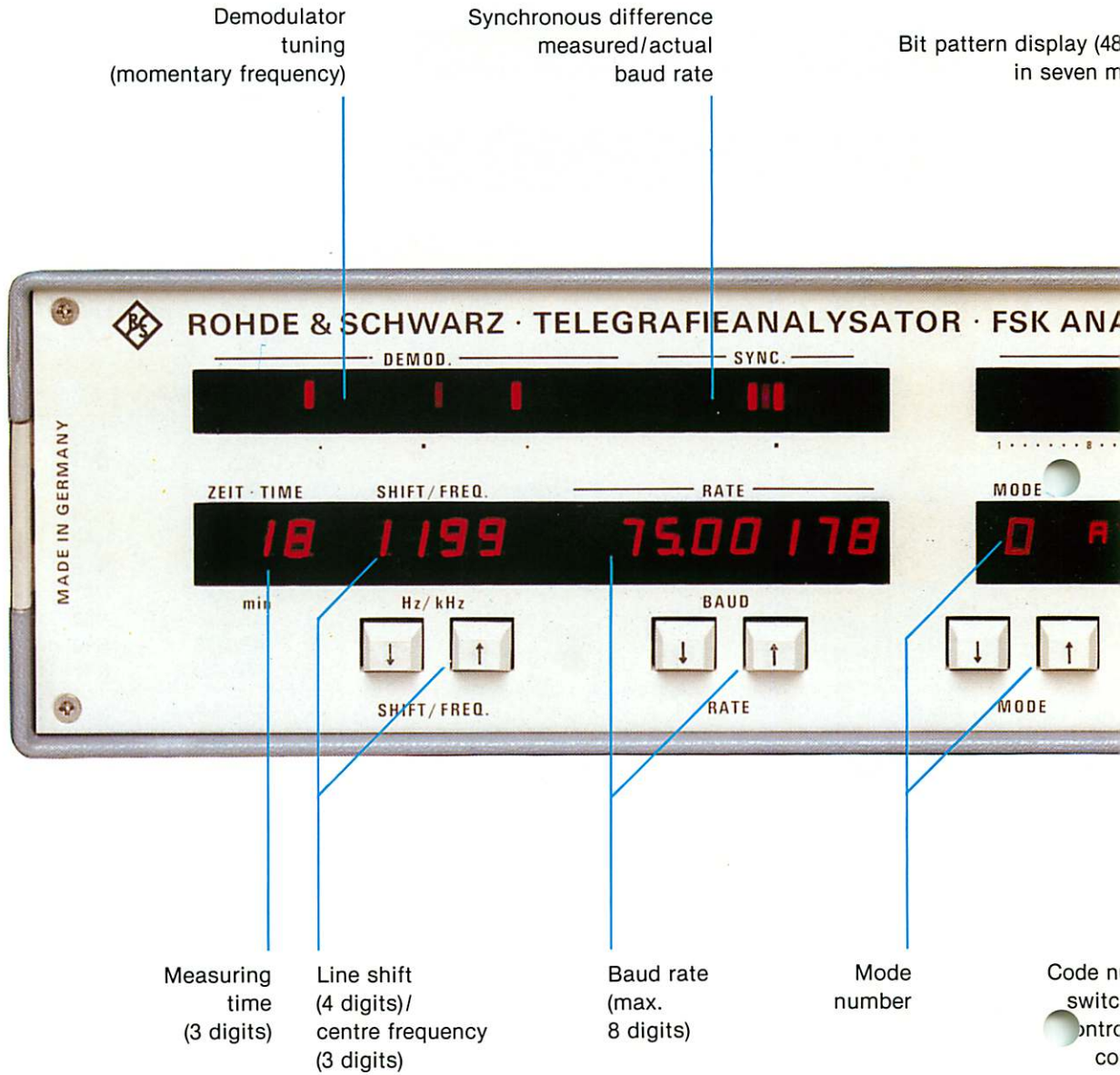
In addition, it is possible to have the firmware extended by Rohde & Schwarz for about 15 to 25 **special codes**. The number of programs that can be stored depends on the code structure.

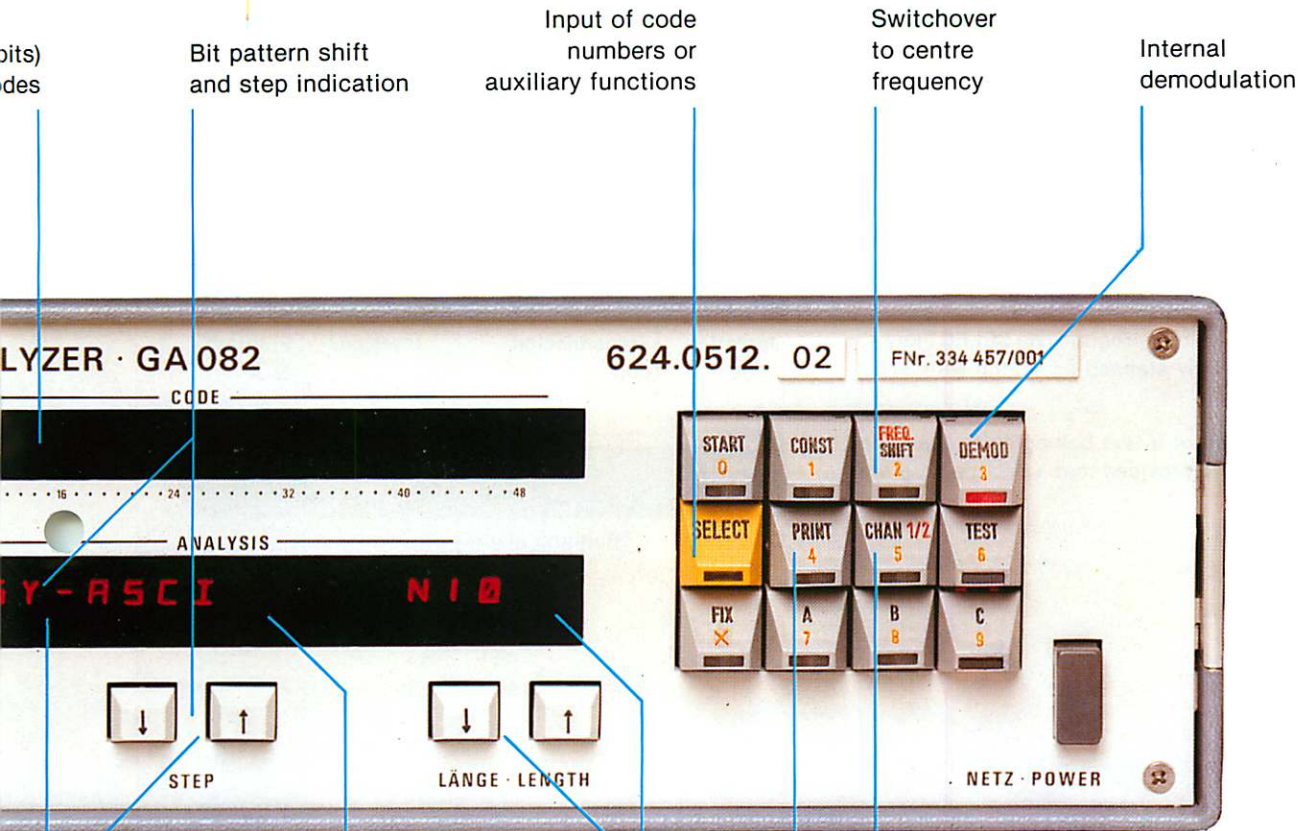
**Inputs/Outputs** Various interfaces are built in (photo see page 5) for feeding in test signals, for the system use of the GA 082 and for improving the measuring accuracy:

- Input for demodulated signal, single current
- Floating input for two demodulated channels, single or double current
- IF/AF input (IF internally programmable)
- IEC 625-1 (IEEE 488) interface
- V.24/V.28 (RS-232-C) interface
- Reference frequency input (1/5/10 MHz)

**Self-test facility** For checking proper functioning, the GA 082 has facilities enabling memory tests, display tests and testing with a defined 75-baud signal.

# FSK ANALYZER GA 082





(bits)  
des

Bit pattern shift  
and step indication

Input of code  
numbers or  
auxiliary functions

Switchover  
to centre  
frequency

Internal  
demodulation

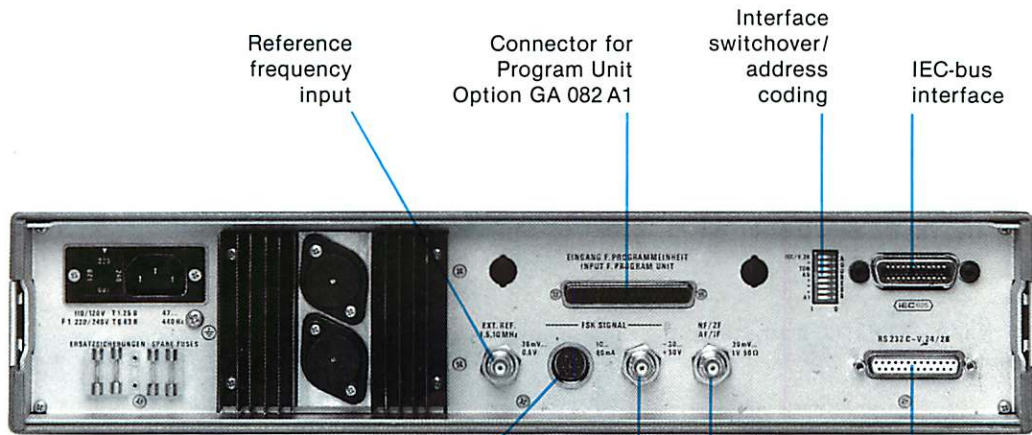
number  
over/  
time  
start

Analysis result (16 digits,  
alphanumeric),  
text in running mode/  
operating status

Line  
length  
for  
output

Output of  
measured data

Switchover  
to channel 2 (F7B)



Reference  
frequency  
input

Connector for  
Program Unit  
Option GA 082 A1

Interface  
switchover/  
address  
coding

IEC-bus  
interface

2-channel-input  
(demod.) / output  
for clock and signal

Input  
for demodu-  
lated signal

AF/IF  
input

CCITT V.24  
interface

# ANALYSIS

## Analysis programs (basic programs for standard codes)

### Framing program

The framing program organizes the execution of the analysis of the incoming bit stream both for standard and for user-specific transmission code programs.

**Mode 0** Search run of analysis programs in fixed sequence; the designation contained in the program descriptor is indicated when the code is recognized.

**Mode 2** Manual selection of a program (via SELECT key + program code number or by stepped switching with STEP key).

**Mode 1** Running display of a text belonging to the code recognized in mode 0 or 2 (provided that a decode program is stored).



### Programs for standard-code analyses

**Idling programs** They recognize idling cycles which might be misinterpreted.

**N00 STOP-MOD**

Permanent start or stop polarity.

**N01 IDLE 1:1**

Idle signal; 1 mark and 1 space are sent alternately.

**N02 IDLE 1:6**

Idle signal; 1 mark and 6 spaces are sent alternately.

**N04 IDLE 14**

**N05 IDLE 28**

**N06 IDLE 56**

Idle signals; periods of 14, 28 and 56 bits are repeated (the format of the idling cycle is irrelevant).



### Programs for CCITT codes No. 2, 3 and 5

**N07 BAUDOT**

Asynchronous signal (CCITT No. 2); 7.5 bits (1 start bit, 5 data bits, 1.5 stop bits).

**N08 ARQ-28**

Synchronous signal (CCITT No. 3); 7 bits (3 marks and 4 spaces); every 4th character is inverted.

**N09 ARQ-56**

Same as N08, however every 8th character is inverted.

**N10 ASY-ASCII**

Asynchronous signal (CCITT No. 5); 10 bits (1 start bit, 7 data bits, 1 parity bit with even parity, 1 stop bit).



## Statistic programs

**N78** Periodicity check (if no code is recognized)  
Periods between 2 and 64 bits are checked for periodically occurring bits or bit groups.

Indication for

periodic idling cycle	IDLE
periodic mark bits	MARK
periodic space bits	SPAC
periodic change in mark/space	ASY
periodic change in space/mark	-ASY

**N79** Statistics program (always furnishes an analysis result)

It calculates the mark/space ratio (M/S) and the average number of bits (L) between the polarity changes.



Period of 28 bits with periodic change in space/mark



Mark/space ratio 0.98, polarity change after 2.1 bits on average

## Documentation via printer

In mode 1 a printer produces a hardcopy of the running text.

In the other operating modes the measurement and analysis results as well as bit patterns are recorded (see also illustration on page 3).

F1B reception; printout of the front panel information from an automatic code analysis (mode 0)

FREQ	SHFT	Q	S	MIN	BAUD	ANALYSE
2.24	402	0	0		50,0	E
2.24	402	0	0		49,99	BAUDOT NO7
2.24	401	0	0		49,979	BAUDOT NO7
2.24	401	0	0	1	49,975	BAUDOT NO7
2.24	401	0	0	1	49,973	BAUDOT NO7
2.24	402	0	0	1	49,972	BAUDOT NO7
2.24	401	0	0	2	49,971	BAUDOT NO7
2.24	402	0	0	2	49,970	BAUDOT NO7

Q = Quality of demodulation  
S = Quality of synchronisation  
MIN = Observation time

F1B reception; text printout (mode 1) of an identified code (Baudot)

IMMENSE CHALLENGES HAVE TO BE SURMOUNTED AND CONSIDERABLE WORK HAS TO BE DONE IN THE NEAR FUTURE IN ORDER TO OVERCOME THE EXISTING PROBLEMS IN THE AGRICULTURAL SECTOR. AS WAS STRESSED IN THE RECENT NATIONAL SEMINAR. THE DUTIES OF DEVELOPMENT-ORIENTED GOVERNMENT AND MASS ORGANIZATIONS WERE OUTLINED AT THE OPENING SESSION OF THE SEMINAR, AND THE ORGANIZATIONS CONCERNED WERE CALLED UPON TO CO-ORDINATE

F7B reception; printout of displayed information from the automatic identification of diplex operation with automatic analysis (mode 0)

FREQ	SHFT	Q	S	MIN	BAUD	ANALYSE
2.24	288	1	0		200,1	F6
2.24	292	4	0		200,19	ASY-ASCII -N10
2.24	294	5	0		200,196	ASY-ASCII -N10
2.24	295	5	0		200,198	ASY-ASCII -N10
2.24	297	5	0		200,199	ASY-ASCII -N10
2.24	298	5	0		200,199	ASY-ASCII -N10
2.24	298	4	0		200,1989	ASY-ASCII -N10
2.24	299	5	0		200,1992	ASY-ASCII -N10

F7B reception; text printout (mode 1) of one of the channels (ASCII coding)

Oslo (dpa) - Die norw=ische Marine sucht nahe des NATO-Flottenstützpunktes Andou (nIdnorwegen) ein fremdes U-Boot. Wie am Donnerstag beichtet wurde, feuerten Schiffe in der Nacht nach vorausgegangenen Sonar-Kontakten erfolglos sechs Raketenab. An der U-Boot-Jagd beteiligen sich sechs Schiffe und ein Flugzeug.

Printout of bit patterns in hexadecimal notation

6125192F2C64E2B1CE4C2D1925125194712D58855A099E7BB11A44FBF1CC4AB01B84  
E74A31B254231B0612558A45A01B67C642AC843F58453A01B251251C841B39A84126  
A2223F19251251A44FBF5EC42B11E24AA19C24C225C666A29BB612659063A11C4662  
1BD1F84F3E990AC6E2A99853225E

# SPECIFICATIONS

## Specifications

### Analysing tasks

Analysed teletype signals (automatic switchover)	F1B (previously F1), teletype telegraphy without modulating audio frequency; F7B (previously F6), four-frequency duplex telegraphy
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### Measurement of line shift

Measurement range	30 to 2000 Hz
Error limits	±1 % of reading
Readout	4 digits in Hz and individual LED bars as indicator

### Measurement of baud rate

Measurement range via FSK signal (demodulated signal)	2 to 9600 baud
via IF/AF input	2 to 200 baud
Resolution for < 1000 baud	10 µbaud
≧ 1000 baud	100 µbaud
2450 to 9600 baud	1 baud
Error limits	±1 digit of last place ± crystal accuracy ±1 × 10 <sup>-6</sup>
Crystal accuracy	±1 × 10 <sup>-6</sup>
Indication	8-digit readout; decimal point after third or fourth digit; number of digits indicated is automatically adapted to measuring accuracy

Difference indication (measured/actual baud rate)	16 LED bars of 0.5 bit each
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### Measurement of stop-bit length (Baudot)

#### Code analysis

(see also "operating modes"; detailed information on page 6)	
Standard analysis programs	for CCITT code No. 2 (Baudot) CCITT code No. 3 (ARQ 28 and ARQ 56) CCITT code No. 5 (ASCII)
Additional transmission codes	with user10 program package for any codes
Memory for special programs	8 kbyte (EPROM), sufficient for 15 to 25 codes
Memory capacity	
or with Program Unit GA 082 A1 (option)	lockable plug-in unit (memory capacity as above)

Measurement range for analysis of transmission code	2 to 2400 baud
Indication of measuring time	3 digits in minutes
Start of measurement	automatic; restart in case of baud rate deviation

### Measurement of centre frequency

Measurement range	1 to 7.99 kHz
Error limits	±1 % of reading
Indication	3 digits in kHz

## Operating modes

### Analysis of transmission methods (code analysis)

Display	16-digit alphanumeric display
Mode 0	search run through all stored analysis programs (user programs and standard programs)
Mode 1	running display of text if code is identified and decode program is available
Mode 2	selection of a certain analysis program

### Bit pattern display (code display)

Display	48 LED bars
Mode of display	illuminated LED corresponds to mark bit (high)
inverted	illuminated LED corresponds to space bit (low)
Single-bit display	
Mode 3	running bit patterns
Mode 4	stationary bit patterns, can be shifted left and right
Mode 5	same as mode 4, inverted
Code line superimposition	
Mode 6	current superimposition of 16 periods of continuously varying bit sequence; can be shifted left and right
Period length	2 to 255 bits selectable per line
Mode 7	same as mode 6, inverted
Mode 8	stationary superimposition of 16 periods of stored bit sequence (max. 8192 bits); can be shifted left and right
Period length	2 to 255 bits selectable per line
Mode 9	same as mode 8, inverted

## Inputs and outputs

FSK signal input (grounded)	for demodulated signals to V.28 (RS-232-C) as well as TTL levels and single current 10 to 60 mA
Input voltage range, mark	+2.4 to +30 V
space	-30 to +0.8 V
Input impedance	2 kΩ
Connector	BNC female

FSK signal input (floating via optocoupler)	for two channels with demodulated signals (F7B) with CHAN 1/2 key
Switchover	10 to 60 mA; positive or negative single or double current
Input current range	100 Ω
Input impedance	7-way female (Tuchel)
Connector	

### IF/AF input

Frequency range AF	1.2 to 8 kHz
IF	30 to 1400 kHz (programmable)
Input voltage range	50 mV to 1 V
Input impedance	50 Ω
Connector	BNC female
Demodulator adjustment for F1B or F7B signals	automatic
Evaluation of channels	can be selected with CHAN 1/2 key

Indication of momentary frequency or of demodulator tuning	32 LED bars
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Switchover between FSK signal inputs and IF/AF input	by means of DEMOD key (either of the FSK signal inputs can be selected)
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### Standard-frequency input

Input voltage	1/5/10 MHz (programmable)
Input impedance	0.3 to 1 V <sub>rms</sub> approx. 1 kΩ
Connector	BNC female

### Output for regenerated signal and bit clock

for recording or display of demodulated signal	
Levels	TTL
Operating range	2 to 600 baud
Bit clock duration	approx. 100 µs
Output impedance	500 Ω
Connector	7-way female (Tuchel) connector of floating input

## Interfaces

CCITT interface	to CCITT V.24/V.28 and EIA RS-232-C (built in)
Signals	DTR, TXD, DSR, RXD, RTS, CTS
Baud rate	75 to 2400 baud (switch-selected)
Connector	25-way male (Cannon)
IEC-bus interface	to IEC 625-1 and IEEE 488
Functions	SH1, AH1, T5, L3, SR1, PP1
Connector	24-way male (Amphenol)

## General data

Operating temperature range	0 to +40 °C
Storage temperature range	-40 to +70 °C
Power supply	100/120/220/240 V ± 10 %, 47 to 440 Hz (50 VA)
Overall dimensions (W × H × D)	
Bench model	470 mm × 118 mm × 349 mm
19" rackmount	483 mm × 88 mm × 392 mm
Weight of bench model	5 kg

## Ordering information

Order designation	► FSK Analyzer GA 082
Bench model	624.0512.02
19" rackmount	624.0512.03

Accessories supplied	manual
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### Recommended extras

Program Unit GA 082 A1 (lockable plug-in unit)	
without program	628.6715.02
with program GA 082 P1	628.6715.03
Program for additional transmission codes (user10 program package)	
GA 082 P1	640.4660.02
Printers	
PUD 2, 359.5018.02, or PUD 3, 359.5501.02 (with RS-232 Interface PUD 2-B5, 373.3019.02, and Data Cable PUD 2-Z3, 373.3119.02)	
RX 80 (Epson) with V.24 (RS-232-C) interface/20 mA	

