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MANUAL

STEREOCODER
GC 003
230.8518

Table of Contents

Data sheet

2. Preparation for Use and Operating Instructions

2.1 Legend for Fig. 1

Item	Panel engravings	Function
1	⊙ L, R ◯ • R L L = -R L = R — 6 dBm, f = 500 Hz	Input selector with the following positions: inputs L and R switched through inputs switched off the built-in generator feeds the two inputs in the selected mode; the frequency can be adjusted internally. LED 12 is on for ◯•(off) and R, L, L = -R and L = R.
2	+6 +3 0 -3	Attenuator switches for common level adjustment of the L and R channels in steps of 3 dB (2), 0.5 dB (3) and 0.1 dB (4)
3	▲+1 ▲0 ▲-1	
4	▲+0,4 ▲+0,2 ▲0 — L/R INP. LEVEL (dBm)	
5	PRE-EMPH.	Pushbutton for switching on and off the preemphasis (change soldered links for 50 or 75 µs). LED 12 signals when preemphasis is switched off.
6	-	Panel meter with the following two scales (0 dBm = 0.775 V_{rms}): -15 to +8 dBm (for L, R and MPX signals) (nominal level marked at +6 dBm) -17 to -8 dBm PILOT (nominal levels marked at -9.5 dBm and -15 dBm) sensitivity (+10 dB) can be changed with switch 8

Item	Panel engravings	Function
7	MPX2 MPX1 PILOT R L L+R	Selector for type of indication on meter 6
8	0 +10 dB	Sensitivity switch for meter 6 Position "0": direct reading Position "+10 dB": 10 dB must be added to reading
9	ΔU--- PILOT	Level control for pilot tone
10	Δφ---	Phase control for pilot tone
11	◯• – ⊙	Mode selector for pilot tone with the following positions: ◯• : no pilot tone in the MPX signal (LED 12 signals) — : pilot tone is adjustable with 9 (amplitude) and 10 (phase) (LED 12 signals) ⊙ : pilot tone with standard level and standard phase available in the MPX signal
12	! ◯•	LED; lights when pilot tone is missing or not to specification, when the inputs or the preemphasis are switched off.
13	MONO	Pushbuttons with pilot lamps for mode selection: MONO = both channels linked and driven from the input internally set with link BR103

Item	Panel engravings	Function
14	STEREO	STEREO = normal operation These functions can be remote-controlled and are maintained even in the case of AC supply failure
15		Power switch with pilot lamp
16	115 V/125 V T 0.16 B 220 V/235 V T 0.08 B Si1	Power fuse, must match with AC supply voltage as shown
17	ST10 47 - 63 Hz	Power connector with label indicating the selected AC supply voltage
18	MPX2 Bu50	Multiplex outputs, fed by separate amplifiers
19	MPX1 Bu40	
20	M $\frac{L+R}{2}$ Bu30	Mono-(centre) signal output
21	R Bu20	Left-channel input
22	L Bu10	Right-channel input
23	ST101 0 - 9, a, b, c	Male connector strip with pin assignment according to Fig. 3 Terminals 18 to 22 are in parallel with those on the male connector strip

2.2 Preparation for Use

See Fig. 2.

2.2.1 Adjusting to Local AC Supply

The GC 003 is factory-adjusted for 220 V. When switching over to another AC supply voltage, change the soldering connections of the corresponding

terminal on the soldering-lug strip of the power transformer. This soldering-lug strip is located below the cover, on which a diagram of the wiring is printed, and is accessible from above after having removed the stereocoder from the rack. Check the value of the fuse Si1 (16) and, if necessary, insert the correct value. Change the voltage value on the label below the power connector (17) accordingly.

2.2.2 Adjusting the Preemphasis (L and R) and Deemphasis ($M = \frac{L + R}{2}$)

The capacitors C101, C115 and C141, which determine the time constant, are fitted on solder terminals. Their value for 50 µs is 10 nF (±1%) and for 75 µs 15 nF (±1%); the value set in the factory is 50 µs.

2.2.3 Input Resistance

By changing the resistors R138 and R139 (solder terminals) the input resistance R_{in} can be adjusted up to 4 kΩ. For R_{in} = 600 Ω, R138 = R139 = 700 Ω.

2.2.4 Changing to Operating Mode MONO

For the transmission of monaural signals, the stereocoder can drive both channels from one input. Either the left or the right channel must be set by a link; the channel will then feed both multiplex outputs in the mode "linked" (≙ MONO).

Insert the link BR103 into L for the left channel and into R for the right channel according to the silk-screening on the printed wiring board.

2.2.5 Synchronization to External Pilot Tone

The pilot-tone circuit can be adjusted to synchronization with an external pilot tone.

Apply the pilot signal to St101.3a (3c = ⊥) with a level of $V_{pp} \approx 1$ V.
Insert the link BR104 into E (external).

In normal operation, BR104 must be set to I (internal).

2.2.6 Fitting the SCA Modulator (option)

See separate manual and specified codings.

Fit the modulator into St110. Remove the link BR107 to enable the output, and insert BR106. The AF input St101.5c (6c = ⊥) is at the rear of the set.

2.3 Brief Operating Instructions

The following switch positions are required for generating a standard coded signal:

- o Input selector 1 to ⊙ (on).
- o Common level adjustment for L and R channels with 2, 3 and 4.
- o PRE-EMPH. button 5 pushed, i.e. preemphasis switched on.
- o PILOT switch 11 to ⊙ (on), i.e. standard pilot level.
- o STEREO button 13 pushed.

2.4 Operation

2.4.1 L and R Inputs

Connections

The sound sources are applied to the female connectors or, if the stereocoder is rack-mounted, to the connector strip 23 (contacts L = 0abc, R = 9abc; see Fig. 3). The inputs may be balanced or unbalanced. The input voltages must be free from any DC component to avoid DC magnetization of the transformers.

Channel L	Bu10 (22)	St101.0ab-c	(23)
Channel R	Bu20 (21)	St101.9ab-c	

Input selection

Switch 1 permits the above inputs to be switched on and off as well as the signal from the built-in AF generator to be applied for checks and measurements.

Level adjustment

The attenuator switches 2, 3 and 4 adjustable in steps of 3 dB, 0.5 dB and 0.1 dB are effective on both the left and the right channels. The labelling on the switches refers to the nominal input level.

Nominal levels	2	3	4
e.g. +6 dBm	+6	0	0
e.g. 0 dBm	0	0	0

The nominal levels are adjustable between -4 and +8 dBm, resulting in a value

of +6 dBm without pilot tone at the MPX outputs.

AF generator

In the positions L, R, L = R and L = -R of switch 1, the built-in AF generator is connected to the inputs corresponding to the switch labelling. The amplitude is +6 dBm.

Preemphasis

The preemphasis can be switched on and off with pushbutton 5. In normal operation the button is pushed in, i.e. the preemphasis is switched on. It can also be changed over between 75 µs and 50 µs by changing capacitors. The mono output ($M = \frac{L + R}{2}$ has always a flat frequency response, since a deemphasis section cancels the preemphasis switched into circuit.

Note for measurements with discrete frequencies

A preemphasis of 50 µs increases the voltage by 13.6 dB at 15 kHz. Thus the maximum input voltage (AF) should be no more than -1 dBm, in order not to exceed the overdrive limit of +12.5 dBm. In the case of 75 µs preemphasis, the maximum input voltage is -4.5 dBm.

Signal indication

The level of the left or right channel can be observed on the upper scale of meter 6 with switch 7 in position "L" or "R". The measurement range can be extended by +10 dB with slide switch 8.

2.4.2 MPX 1 and MPX 2 Outputs

Connections

The coded signal (MPX or multiplex signal) is available in unbalanced form at two parallel-connected outputs via two buffers.

MPX 1	Bu40	(19)	St101.7b-c	(23)
MPX 2	Bu50	(18)	St101.7a-c	

Level adjustment

The output voltage is fixed to a nominal level of +6 dBm referred to the nominal input level and the corresponding position of attenuator switches 2, 3 and 4. The pilot component is added during level measurement.

Signal indication

In positions "MPX 1" and "MPX 2" of the indication selector switch 7, it is possible to observe the output level on the upper scale of meter 6. The measurement range can be extended by +10 dB with slide switch 8. The meter indication represents the peak value of the complete signal (MPX + pilot + SCA + additional signals).

2.4.3 M Output

Connections

The signal $M = \frac{L + R}{2}$ (mono or centre signal) is floating and available at the parallel-connected outputs Bu30 (20) and St101.8ab-c (23). The nominal output level is fixed to +6 dBm; there is no preemphasis.

Signal indication

In position "L + R" of indication selector 7, the level may be observed on the upper scale of meter 6.

Note for measurements with discrete frequencies

The output voltage is obtained by adding the L and R signals after the preemphasis sections. This causes an increase of 13.6 dB at 15 kHz when the preemphasis is switched to 50 µs and of about 17 dB with 75 µs. A deemphasis section compensates for this increase so that a flat frequency response is obtained. The overload limits, such as mentioned in section 2.4.1, have to be taken into account.

2.4.4 Stereo/Mono Switchover

For monaural transmissions, the signal on the left or right channel, depending on the setting of link BR103, can be directly taken to the MPX outputs. The changeover can be carried out either on the front panel or via remote-control lines. All switch positions are stored and unaffected by AC supply failure. For pin assignment of St101 see Fig. 3.

Control	Stereo	Mono
Pushbutton on front panel Momentary connection to ground	STEREO St101.2a-2c	MONO St101.2b-2c

Signalling	Stereo	Mono
Lamps on front panel	STEREO	MONO
External lamps (24 V/50 mA)	St101.1a-1c	St101.1b-1c
Floating contacts	St101.6a-6b	St101.5a-5b

2.4.5 Pilot Tone

Operating modes

Switch 11 selects the following operating modes:

"On" = ⊙ : 19-kHz pilot tone with standard amplitude and phase added to the multiplex signal

"Off" = ◯• : pilot tone switched off (available at sync output St105.3bc with adjustable phase)

ΔU - Δφ : pilot tone with adjustable amplitude (control 9 "ΔU") and adjustable phase (control 10 "Δφ") added to the multiplex signal. Pilot amplitude adjustable in the range -16 dBm to -5 dBm relative to the +6 dBm level of the multiplex signal. Pilot phase adjustable in the range -5° to $+5^{\circ}$ compared with the standard phase with respect to the 38-kHz subcarrier.

Indication

If the indication selector 7 is in position PILOT, the pilot level can be read on the lower scale of meter 6. The indicated value applies to an output level of +6 dBm of the MPX signal (nominal value: -9.5 dBm).

Trigger output

A constant 19-kHz squarewave voltage of approx. 1 V peak-to-peak ($Z_{out} < 100\ \Omega$) is available at the rear connector 23 (contact St101.3b-c), the phase being equal to that of the pilot tone in the multiplex signal.

With the pilot-mode selector 11 set to "on", the phase is internally coupled to the 38-kHz subcarrier, whereas in the positions "off" and "$\Delta\varphi$ ΔU" the phase of the squarewave voltage is adjustable with control 10 in position "$\Delta\varphi$".

Synchronization of pilot tone

The entire pilot-tone processing of the coder can be synchronized to an external 19-kHz signal at the rear connector 23 (contact St101.3a-c), if link BR104 is set to E (external).

Voltage requirement: approx. 1 V peak-to-peak; pull-in range: approx. $\pm$2 Hz

2.4.6 Auxiliary Inputs

The three auxiliary inputs can be used as follows:

Signal	Input	Nominal level
SCA signal	St101.5c-6c 30 Hz to 7.5 kHz	-10 to +12 dBm
Traffic radio signal	St101.4a-4c 53 to 100 kHz	-14 dBm
Additional signal	St101.4b-4c 53 to 100 kHz	-10 dBm

Contacts 4c and 6c = chassis (screen).

The SCA channel can only be used when the SCA modulator is built in. For this purpose, BR107 must be removed and BR106 fitted (see separate manual).

The inputs for the traffic radio signal and the additional signal can be used without taking any particular measures. The gain between the input used and the MPX output is 0 dB $\pm$1 dB.

3. Maintenance

3.1 Routine Maintenance

Regular maintenance is not required. However, it is recommended that the unit be checked occasionally against the specifications according to section 3.2.

3.2 Checking the Rated Specifications

3.2.1 Required Measuring Equipment

DC voltmeter		
AF voltmeter	10 Hz to 100 kHz -70 to +12.5 dBm $R_{in} > 1$ kΩ	SUN 2/U
AF generator	10 Hz to 100 kHz +12.5 dBm, max. $R_{out} < 30$ Ω	
Oscilloscope	bandwidth > 10 MHz high overload capability for measurements of cross-talk in multiplex signal	TEKTRONIX
AF analyzer or selective AF voltmeter	bandwidth < 100 Hz sensitivity better than -70 dBm	FAT 2
Stereodecoder		MSDC 2
Psophometer	(contained in SUN 2/U)	
Distortion meter		e.g. LEA or HP

3.2.2 Measurements

Refer to the data sheet for the required results.

Checking the amplifier characteristics

Apply a signal to the L and R inputs (Bu10 and Bu20) at f = 30 Hz to 15 kHz and with the specified input levels. Measure at the decoder outputs (DEC.), the MPX output (Bu40) and the M output (Bu30) by means of an AF voltmeter and the panel meter (J10).

Input	Measure at	Measured value	Remarks
Coder circuit			
500 Hz/+6 dBm			
L = R	DEC. "L"	+6 dBm	Pilot "on"
L = R	DEC. "R"	+6 dBm	
L = -R	DEC. "L"	+6 dBm	
L = -R	DEC. "R"	+6 dBm	
L (R = 0)	DEC. "L"	+6 dBm	
L (R = 0)	DEC. "R"	(< -54 dBm)	Value with
R (L = 0)	DEC. "L"	(< -54 dBm)	ideal decoder!
R (L = 0)	DEC. "R"	+6 dBm	
Frequency response			Referred to 500 Hz
30 Hz to 15 kHz/+6 dBm			
L = R	Bu40 "MPX1"	< ±0.15 dB	
L = R	DEC. "L"	< ±0.15 dB	Preemph. "off"
L = R	DEC. "R"	< ±0.15 dB	(Deemph. in
L = R	Bu30 "M"	< ±0.2 dB	decoder "off")
Preemphasis			Referred to 500 Hz
500 Hz/15 kHz/-6 dBm			
L = R	DEC. "L" and "R"	+13.66 dB (50µs) +17.07 dB (75µs) (±0.2 dB)	Preemph. "on" (Deemph. in decoder "off"
Pilot level			
L = 0, R = 0	Bu40 "MPX"	-9.5 dBm	Pilot "on" or "ΔφΔU"
	J10 "MPX"	-9.5 dBm	(upper scale)
Indication			
500 Hz/+6 dBm			*) Pilot "off"
L = R	J10 "L"	+6 dBm	
L = R	J10 "R"	+6 dBm	
L = R	J10 "L + R"	+6 dBm	
L = R	J10 "MPX1"	+6 dBm *)	upper scale
L = R	J10 "MPX"	+6 dBm *)	
L = R	J10 "Pilot"	+9.5 dBm	lower scale

Checking the crosstalk

Measure at the MPX output with an oscilloscope with high overload capability (for L/R crosstalk checks) and with a selective AF voltmeter (for M/S) according to sections 5.3.7 and 5.3.8.

Checking the distortion

Apply a signal to the L or R input with a level of +6 dBm or +12.5 dBm at frequencies of 30 Hz, 500 Hz and 5 kHz. Measure the harmonics at the corresponding output of the decoder.

Checking the intermodulation distortion to DIN 45403

Apply a signal to the L or R input via two identical decoupling resistors of about 18 kΩ using two generators. Frequencies f1 = 13 kHz and f2 = 14 kHz. Adjust the same level on both generators to that the meter J1 indicates "+6 dBm" or "+12.5 dBm". Measure the amplitudes at the corresponding decoder outputs:

f1:	V1 (13 kHz)	f2:	V2 (14 kHz)
2f1 - f2:	S1 (12 kHz)	2f2 - f1:	S2 (15 kHz)
f2 - f1:	D (1 kHz)		

If the distortion is < 10%, the intermodulation distortion components may be calculated in accordance with DIN 45403 as follows:

$$d_2 = \frac{D}{V1 + V2} \qquad d_3 = \frac{S1 + S2}{V1 + V2}$$

Checking the carrier suppression

Apply a signal to both inputs: L = R = +6 dBm at 500 Hz. Measure at the MPX1 output (Bu40) at 38 kHz.

Checking the weighted and unweighted noise voltages

Measure at the decoder output with the psophometer, the L and R inputs of the GC 003 being short-circuited and with the preemphasis in the coder and deemphasis in the decoder switched on.

4. Circuit Description

4.1 L and R Channels

See circuit diagram 230.8518 S, sheet 1.

The signals on the left and right channels are taken to two identical signal paths either via Bu10 and Bu11 or via St101.0abc and .9abc. Switch S101 permits the inputs to be switched off or the internal sinewave generator to be cut into circuit.

Each channel consists of the input transformer Tr101 (Tr102) and the attenuators switchable in steps of 3 dB and 0.5 dB and decoupled by buffer stages. The preemphasis sections R122/C101 (R162/C115) are followed by further buffers B101 (B103) whose feedback paths include attenuator sections switchable in 0.1-dB steps.

The Cauer-type lowpass filter L101 to L104 (L105 to L108) suppresses frequencies in the range above 15 kHz; it has notches at 38.8, 19.2, 18.1 and 23.1 kHz.

After inversion in B102 (B104), the signals are passed on to the resistor chain of the coder (lines D and G in circuit diagram). Correction signals for improving the crosstalk are also required (lines A, B, E, F).

Link BR103 selects the channel associated with mono operation.

The amplifier T111 to T116, which has a two-stage feedback circuit, feeds the sum outputs M ($= \frac{L + R}{2}$) at Bu30 and St101.8abc by means of transformer Tr103. The deemphasis section R206/C141 in the feedback path is switched with S105 and cancels the preemphasis in the left and right channels.

4.2 Coder

See circuit diagram 230.8518 S, sheet 2, and oscillograms Fig. 6a.

The coder operates on a principle which is based on the switching technique. The "hard-switching" procedure at 38 kHz is replaced by graded switching in 14 steps. In this way unwanted sidebands only occur at the 13th harmonic and can be filtered out by a simple lowpass filter.
"Soft-switching" is performed by the resistor chain R231 to R262 between the signal lines "-L" (line D in circuit diagram) and "-R" (line G) and by the field-effect transistors T121 to T128 that are switched in one after another. The correction signals "-L'" and "-R'" (lines E and F) improve the coding at the moment of subcarrier zero crossing. The switching pulses for the field-effect transistors are generated in the shift register B108/B109 and delivered in the correct

sequence by the AND gates B106/B107 (see oscillograms Fig. 6a). The switching sequence of the 38-kHz subcarrier frequency within each cycle starts with T124 towards T121, is reversed to T128 via T124 and terminates with T125.

4.3 Summing Amplifier, MPX Lowpass Filter and Output Amplifier

See circuit diagram 230.8518, sheets 2 and 3.

The summing amplifier consists of the input stage designed as a differential amplifier comprising T131 and T132, and of the driver stage T133 whose collector resistor is the constant current source T135 to increase the open-loop gain. The operating point of the complementary output stage T134/T135 is determined by the emitter resistors R293 and R294 together with the diodes Gl 121 and Gl 122. The negative feedback is adjustable with R288. The following signals are summed at the amplifier input with the correct relative levels:

a) Sum signal $M = \frac{L + R}{2}$ and difference signal $S = \frac{L - R}{2}$ superimposed on a carrier and delivered by the coder (see section 4.2).

b) Pilot tone P (19 kHz) obtained from the pilot generator circuit (see section 4.4).

c) Correction signals for reducing the crosstalk via R263 + C146 and R264 + C147 (lines A and B).

Interfering switching spikes (532 kHz) from the coder are eliminated by the sample & hold circuit T137/C155. The emitter follower T138, whose resistor is designed as a constant current source comprising T139, feeds the MPX lowpass filter (via line J).

The MPX lowpass filter using L111 and L112 is a Cauer-type filter with two attenuation peaks at 768 kHz and 498 kHz. The harmonics of the subcarrier - which theoretically may be present - are sufficiently suppressed without deteriorating the phase and amplitude response up to 53 kHz.
A contact of the bipolar relay Rs101 selects the MPX signal or the mono signal (from ER103).

The output amplifier is made up of the summing circuit T151 to T154 and the two output stages MPX1, T155 to T157 and MPX2, T158 to T160. The first stage adds the following signals with the correct relative levels:

a) MPX signal (coded signal including the pilot tone).

b) SCA signal, if the option "SCA modulator" is used.
This signal from the input ST101.5c (.6c =) is frequency-modulated and has a carrier in the range 60 to 74 kHz whose centre frequency is referenced

to the pilot tone.

c) Additional signal on input St101.4b (c).

d) Radio traffic signal on input St101.4a (c).

For the MPX signal the stage gain is +6 dB (R337 : R325); the other signals are not amplified.

The two output stages MPX1 and MPX2 are of identical design. The emitter followers T155 (T158) are equipped with the controlled current sources T156/T157 (T159/T160) acting as emitter resistors. The capacitors C195/C196 (C198/C199), which are connected back to back, couple out the MPX signal without the DC component and feed the parallel-connected outputs Bu40 and St101.7bc (Bu50 and St101.7ac) at the rear of the unit. The source impedance is basically the resistance of R347 (R355).

4.4 Pilot-frequency Processing

See circuit diagram 230.8518 S, sheet 2, and oscillograms in Fig. 6b.

The crystal oscillator Q101/B111 III delivers the 4.256-MHz reference frequency (= 2 x 8 x 14 x 38 kHz) via the inverters B111 II and I. After a division of 8 : 1 in B113 I, the 532-kHz clock frequency is available for the shift register. From this frequency the monostable circuit consisting of T141/T142 obtains the slightly delayed sampling pulses for the sample & hold circuit T137 in the summing amplifier.

The stages 1 to 14 in the 16-digit shift register B108/B109 are connected via B109.12 - Gl 107 - B108.7 so as to form a ring. One bit continuously cycles with the clock frequency and thus causes a "high" level at the output assigned to the corresponding digit. All other outputs that are not activated are at "low". If there is no bit circulating, it is fed in by Gl 111 to Gl 118 via B111 IV and Gl 106. The reset line B109.13 (13th digit) which is run to B108.6 + .14 and B109.6 erases the contents of the stages 1 to 12 before the bit is transferred to the first stage, thus avoiding the circulation of two or more bits.

Pilot-tone generation is carried out in two different ways, depending on the pilot mode selected with switch S107; the shift register acts as a 14 : 1 divider.

The signal from the 8th shift register stage (B108.2) is used for the pilot tone with fixed phase. It is applied to the 2 : 1 divider B113 II which produces a symmetrical squarewave at 19 kHz.

For the pilot tone with adjustable phase, the signal from the 6th shift register stage (B108.12) triggers the monostable B112. Its delay can be adjusted between 2 µs and 4 µs, approximately, by means of R316 "Δf", corresponding to a phase shift of about 14° ($> 10^{\circ}$) referred to the pilot tone. The divider B113 II is again used to generate the 19-kHz squarewave signal.

The squarewave signal performs several functions. It synchronizes the phase control loop in the SCA modulator option (see separate manual) via C170. After limiting with G1 125/G1 126, the emitter follower T147 feeds the pilot output St101.3b (c) at the rear of the stereocoder. The differential amplifier T145/T146 delivers the sinewave pilot tone to the summing amplifier via the 19-kHz bandpass filter (L113 to L114) and the emitter follower T144. The pilot amplitude is determined by the current flowing through T145/T146, depending on the pilot mode selected with S107. It is preset with R314 in the pilot mode "on" and adjustable by means of R312 "ΔU" on the front panel in the variable pilot-tone mode; there is no output in the pilot mode "off".

The PLL IC B114 provides external synchronization of the pilot tone via the input St101.3a. It compares the offset between the internal pilot frequency at pin 3 and the external pilot frequency at pin 14 and then delivers a DC voltage which is proportional to the phase difference. With appropriate setting of link BR104, this DC voltage is taken to the tuning circuit T143/C163/C164 of the crystal oscillator instead of the internally generated DC voltage (R317/R318).

4.5 AF Generator

See circuit diagram 230.8518 S, sheet 1.

The AF generator is designed as a Wien bridge oscillator and operates when input selector S101 is in the positions L, R, L = R and L = -R.
The frequency-determining section is formed by the series-connected RC high-pass and lowpass filters. The capacitors C132 and C133 are fixed, whilst the resistors R181 and R182 can be changed to set the desired frequency (see section 5.3.2). The output voltage is +6 dBm.

The following operating modes can be obtained by turning input selector S101:

L: a signal is only applied to the left channel, whereas the input of the right channel is connected to 0 V (chassis).

R: a signal is only applied to the right channel.

L = R: both channels are driven in phase with the same level.

L = -R: both channels are driven out of phase with the same level.

The amplitude is stabilized with the control loop B105 II and T107. After peak rectification with Gl 101, R191 feeds amplifier B105 II. The reference is a constant current flowing in the opposite direction via R192. Gl 102 temperature-compensates Gl 101. The field-effect transistor T109 in series with R185 is connected in parallel with R184. The output voltage of B105 II acts on the feedback circuit R183/R184 until the nominal value of the oscillator voltage is achieved.

4.6 Indication

See circuit diagram 230.8518, sheet 1.

The checkpoint selector S106 selects the signal to be indicated and can be set to the positions L and R for the AF input signal, L + R for the sum signal, MPX1 and MPX2 for the multiplex signal and PILOT for indication of the pilot component in the multiplex signal. The indication sensitivity can be increased by disconnecting the 10-dB attenuator R225/R226 with S20.

The halfwave peak rectifier circuit using T117 to T120 evaluates the negative halfwaves of the input signals L or R. The differential amplifier T119/T120 delivers the signal for the transistor T118 which operates as a rectifier. Capacitor C143 is charged to the peak value. The FET impedance transformer T117 delivers the indicating voltage for meter J10 while offering a minimal load for the charging circuit. The feedback via R216 adjusts the operating point of the differential amplifier so that only the peaks exceed the adjusted level (for a constant-level input it is exceeded for only short periods) and recharge the capacitor immediately.The discharge time constant is fixed by R219 and is around 10 seconds.

4.7 Selection of L or R Channel for Mono

See circuit diagram 230.8518 S, sheet 3.

For monaural transmissions the signal on the left or right channel, depending on the setting of link BR103, is switched through to the outputs instead of the coded signal.

The selected mode is stored- irrespective of power failure - in the bipolar relays Rs101 and Rs102 whose windings are connected in parallel. A contact of relay Rs101 switches the signal path. A contact of relay Rs102 feeds the

pilot lamps R1 30 and R1 40 on the front panel, the signal outputs St101.1a and .1b for external lamps (24 V) as well as the two relays Rs103 and Rs104 which provide floating signalling contacts at St101.5ab and .6ab. The operating mode is selected with the pushbuttons S108 and S109 on the front panel or via the inputs St101.2a and .2b which are controlled by momentary connection to earth.

4.8 Power Supply

See circuit diagrams 230.8518 S, sheet 3, and 230.8918 S.

The AC supply voltage passes from the rear connector ST10 through the noise filter X10, the power switch S10 and the fuse Si1 to the power transformer. The two secondary windings feed the control circuit Y10. Lamp R1 10 indicates that the unit is switched on.

The board Y10 is made up of two identical regulator circuits for the +12 V and -12 V output voltages. The feedback amplifier B401 (B402) controls the series transistor T401 (T402); resistor R401 (R402) limits the short-circuit current under fault conditions. B401 compares the reference voltage of G1 404 (+6.2 V, approx.) with that portion of the +12-V output voltage which is tapped off at R406. The diode G1 403 delivers the supply voltage for B401. The second feedback amplifier B402 is fed with +12 V and -12 V.

5. Repairs

5.1 Required Measuring Equipment

See section 3.2.1.

5.2 Trouble-shooting

Prior to electrical testing, the boards and the components should be checked for visible defects. Then trace the faults through the following stages (see signal level diagram):

- power supply
- AF generator, input amplifier, L/R indication
- generation and processing of pilot tone
- coder circuitry, output amplifier
- SCA modulator (see separate manual)

5.2.1 Power Supply

Check the supply voltages +12 V at K70.6/7, -12 V at K70.1/2 and +21 V (unstabilized) at K70.8.

5.2.2 AF Generator, Input Amplifier, L/R and L + R Indication

Set the input selector S101 to position R = L and check the level with the indication selector S106 in positions R/L and R + L.
The indication must be +6 dBm in both channels. In case of an error, carry out further checks according to the level diagram in Fig. 5 (test points MP101 to 108, MP111, links BR101 to 103).

5.2.3 Generation and Processing of Pilot Tone

Set the indication selector to PILOT and check for the correct pilot level on the lower scale. The nominal level is indicated with the pilot mode selector (S107) set to "on" and "Δ ΔU"; there is no indication when the pilot mode selector is in position "off". If there is a problem, check with an oscilloscope according to Fig. 6 (test points MP114, MP115 and specified pins of the ICs). Check the frequency with a counter (test point MP114 or St101.3b).

5.2.4 Coding and Output Amplifier

Set the input selector to position "MPX" (1 or 2) and the pilot mode selector (S107) to "off": no SCA or auxiliary signal.

Input selector (S101)	Indication (with S106 set to "MPX")
L	+6 dBm
R	
L = R	
L = -R	

Oscillogram as in Fig. 7a (triggering with pilot tone).

5.3 Adjustments

5.3.1 Supply Voltages

Adjust R406 for +12 V ±50 mV at St402.6/7.
Adjust R411 for -12 V ±50 mV at St402.1/2
(chassis: St402.4/5).

5.3.2 AF Generator

Fit the resistors R181 and R182 (on solder terminals) according to the desired frequency (set in factory to 500 Hz).

Frequency	500 Hz	800 Hz	1 kHz
R181	97.6 kΩ	60.4 kΩ	48.7 kΩ
R182	31.6 kΩ	19.6 kΩ	15.8 kΩ

Set the input selector (S101) to position "L" or "R".
Measure at test point MP109 with distortion meter, voltmeter and frequency counter.
Adjust R187 for minimum distortion ($\leq$ 0.1%).
Adjust R194 for a level of +6 dBm.
Check the frequency: permissible deviation: < 2% from nominal value.

5.3.3 Indication

Adjust the mechanical zero of the meter with the GC 003 switched off.
Adjust the electrical zero (without AF signal) by means of R221.
Adjust R218 with a 500-Hz AF signal in the left channel.
Set the sensitivity switch (S20) to "0 dB" and the indication selector to "L".
Check the level at test point MP104: should be +6 dBm ±0.05 dB.
Adjust for +6-dBm indication on the upper scale.
Check the sensitivity switch: when switching from "0 dB" to "+10 dB", the indication must drop from +6 dBm to -4 dBm.

5.3.4 Channels L and R

15-kHz lowpass filters

Apply a signal to the L and R inputs (BU10 and BU20) with a level of about +6 dBm at the specified pole frequencies (±0.5%) and adjust for minimum at test point MP...

Pole frequency	Left channel		Right channel	
38.8 kHz	L101	MP104	L105	MP108
19.2 kHz	L102		L106	
18.1 kHz	L103		L107	
23.1 kHz	L104		L108	

Carrier suppression

Measure the DC voltage (offset on B103 and B104).
Set link BR101 to "L" and BR102 to "R"; do not apply an AF signal.
Adjust R135 for 0 V ±0.5 mV at test point MP104.
Adjust R175 for 0 V ±0.5 mV at test point MP108.

5.3.5 MPX Lowpass Filter and Output Amplifier

MPX lowpass filter

Open the link BR105 and apply a signal to BR105.M at the specified frequencies (±0.5%). Measure at the MPX output (BU40). Mode: STEREO
Adjust L111 for minimum at 768 kHz (approx. 20 x 38 kHz).
Adjust L112 for minimum at 498 kHz (approx. 13 x 38 kHz).

Auxiliary inputs

Apply a signal to the specified points at approximately 60 kHz and +6 dBm. Measure at the MPX output BU40.

St110.7 (BR107 removed and BR106 inserted).
St101.4a (c)
St101.4b (c)

In all three cases the output voltage must be +6 dBm ±0.5 dB.

Level adjustment

Apply L = R = +6 dBm at 500 Hz. Switch the pilot off with S107.
Measure at BU40 with a load of 600 Ω.
Adjust to +6 dBm (±0.1 dB) with R288.
Check for matching in the modes MONO and STEREO.
Check the indication in switch positions "MPX1", "MPX2" and "L + R".

5.3.6 Pilot-tone Generation

Crystal oscillator

Measure the frequency at test point MP109, link BR104 being set to "J" (as set in factory).
Adjust to 4.256 MHz $\pm 1 \times 10^{-5}$ with R317.

Pilot indication

Set the indication selector (S106) to PILOT and the pilot mode selector (S107) to "on". Adjust for "9.5"-dBm indication on the lower scale using R314.

Pilot amplitude

Set the indication selector (S106) to PILOT, do not apply an AF signal.
Measure at the multiplex output (BU40). Adjust pilot indication by means of R314.
Set the pilot mode selector (S107) to "on".
Adjust for a pilot amplitude of -9.5 dBm ±0.05 dB with R300.
Set the pilot mode selector (S107) to "$\Delta\varphi$ ΔU".
Check the setting range available: should be about -4 dBm to -17 dBm.
Check the indication on the meter.

Pilot phase

Set the indication selector (S106) to "L" or "R" and the input selector (S101) to "on". Apply a signal to the L and R channels in antiphase at f = 500 Hz and with about -16 dBm.

Measure at the multiplex output with an oscilloscope; trigger externally with pilot from St101.3b. See Figs 7b and 7c which show the oscillograms for the pure pilot tone and for the pilot tone with difference signal, the sensitivity setting being the same for both pilot tones. The voltage V_{PH} referred to the pilot amplitude V_{19} has the following relationship with the phase angle φ in degrees:

$$\varphi^{\circ} = \frac{V_{PH}}{V_{19}} \times \frac{180}{\pi}$$ (φ in degrees with respect to the 19-kHz pilot frequency)

Set the pilot mode selector (S107) to "on".
Measure the voltage V_{PH}.
Adjust for minimum phase with R341. $V_{PH} < 3$ mV ($\triangleq \leq 0.2^{\circ}$).
Set the pilot mode selector (S107) to "$\Delta\varphi$ ΔU".
Measure the voltage V_{PH}.
Check the setting range available when using R316 "$\Delta\varphi$ ". V_{PH} should be varied symmetrically by $\pm$80 mV. This corresponds to a phase setting range of approximately $\pm 5^{\circ}$ referred to the above-mentioned levels (AF voltage -16 dBm, pilot level -9.5 dBm). If the setting range is extremely asymmetrical, vary R315 so that $V_{PH} < 10$ mV when R316 is at its mid-position.

Distortion of 38-kHz subcarrier

Plug links BR101 and BR102 into T; do not apply an AF signal; set the pilot mode selector (S107) to "off".
During this measurement the signals -L and -R are replaced by DC voltages at the resistor chain (approx. -4.3 V at test point MP104, approx. +4.3 V at test point MP108). The sequential switching followed by the sampling and filtering process generates a 38-kHz voltage with a sine-shaped characteristic in the ideal case. Any errors which may occur in the resistor network or the switching transistors will result in distortion.
Measure the distortion at the multiplex output: $k \leq 0.5\%$.

5.3.7 Crosstalk L/R

Set the pilot mode selector (S107) to "off". Switch off the preemphasis (S105). Measure at the multiplex output (BU40) using an oscilloscope with high overload capability.
Drive one channel with +6 dBm and at the specified frequency; measure the deviation from the zero line, i.e. the crosstalk (see Fig. 7d). Sequence of adjustments: R264, R263, C147, C146. Trigger the oscilloscope with an AF signal.
Connect BU10.2 and BU10.3 (transformer screening) to chassis.

Input	100 Hz	15 kHz
Channel L (BU10)	R264	C146
Channel R (BU20)	R263	C147
Crosstalk	< -70 dB	< -64 dB

5.3.8 Crosstalk M/S

Switch off the pilot mode (S107) and the preemphasis (S105).
Measure at the multiplex output (BU40) with a selective AF voltmeter.
Drive both channels simultaneously with +6 dBm. The attenuation referred to the input level must be attained at the specified test frequency.
Connect BU10.2 and BU20.2 (transformer screening) to chassis while measuring.

Input		Test frequency	Adjustment	Attenuation
L = R	1 kHz	37 kHz, 39 kHz	R137	> 60 dB
L = R	15 kHz	23 kHz, 53 kHz	L101, L105, alternately	> 52 dB
L = -R+)	15 kHz	15 kHz	check only	> 48 dB

+) Input in antiphase

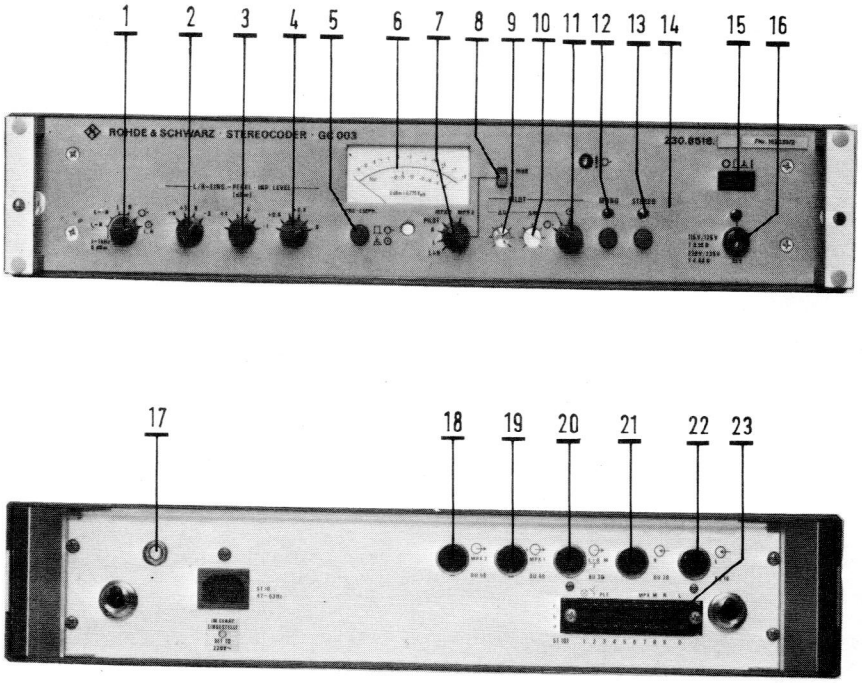


Fig. 1 FRONT- and rear-panel controls

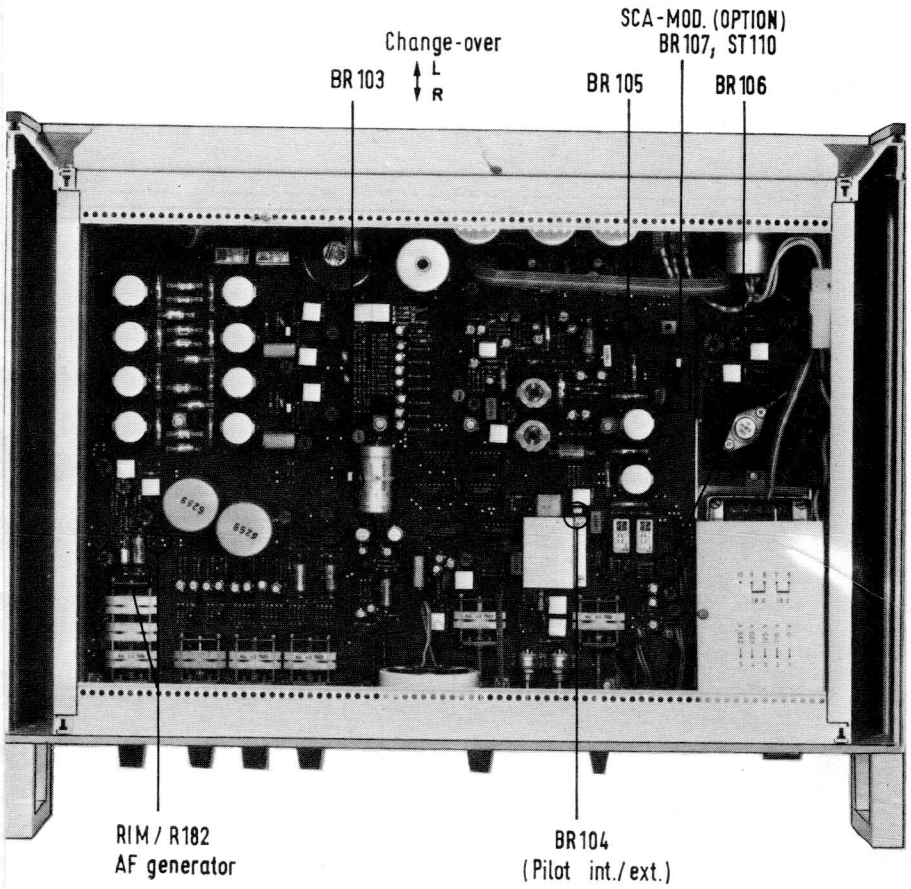


Fig. 2 Interior view

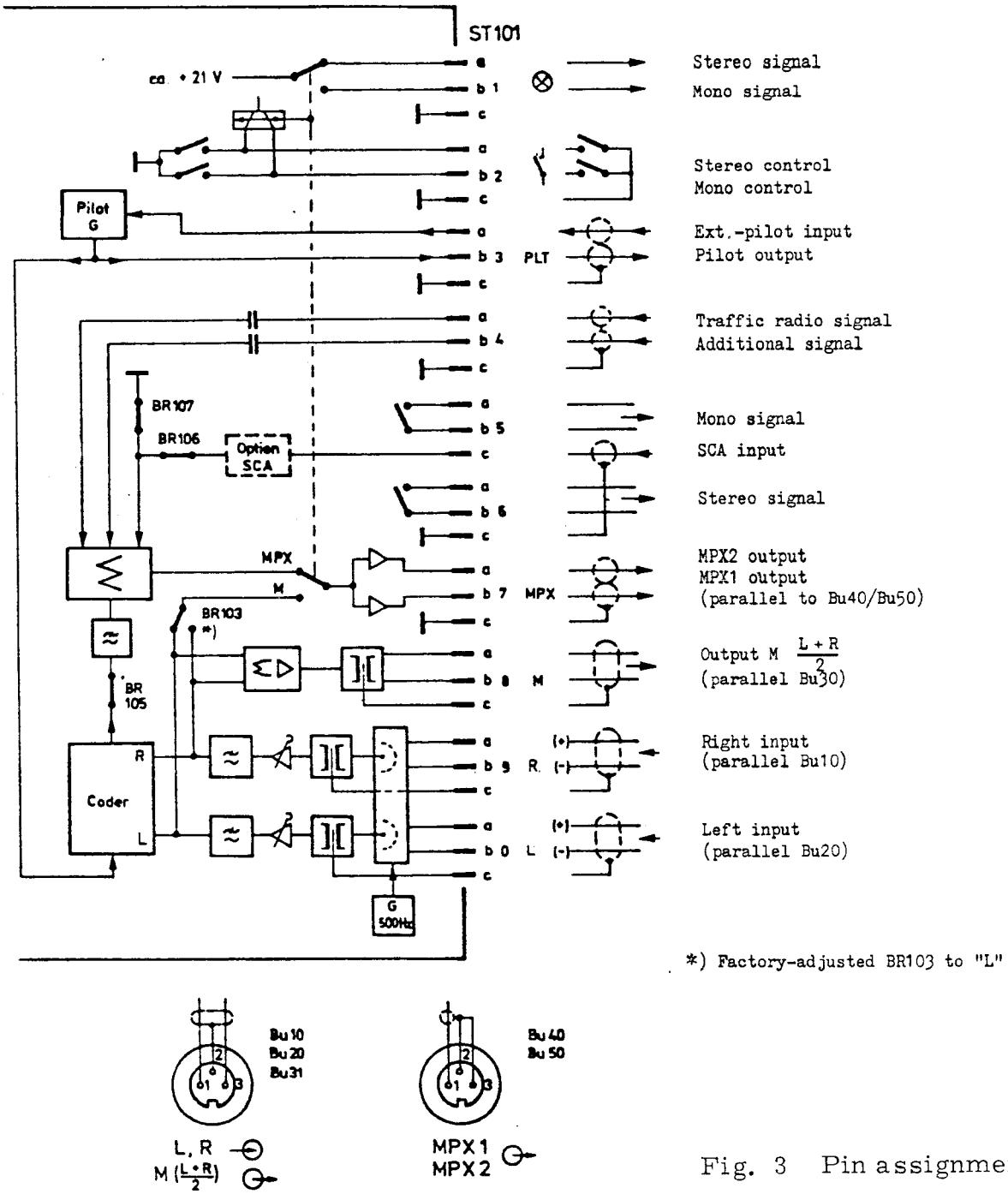


Fig. 3 Pin assignment

Frequenz / Frequency		0,3	0,5	1	1,5	2	3	4	6	8	10	12	14	15	kHz
Preemphasis	50 µs	0.04	0,11	0,41	0,87	1,45	2,76	4,11	6,58	8,64	10,36	11,82	13,08	13,66	dB
	75 µs	0,086	0,23	0,87	1,76	2,76	4,77	6,58	9,54	11,82	13,66	15,18	16,49	17,07	dB

Fig. 4 PREEMPHASIS

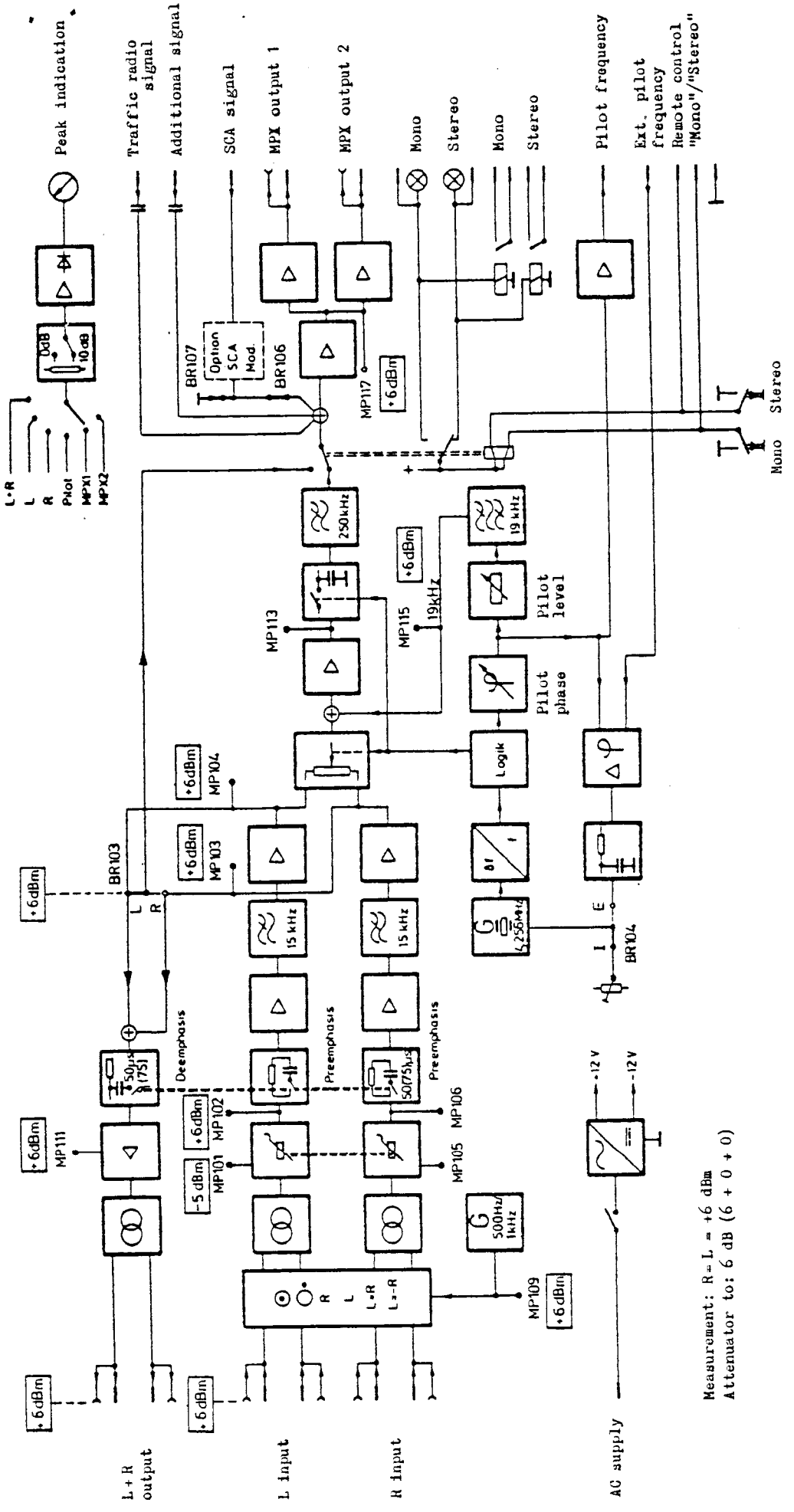
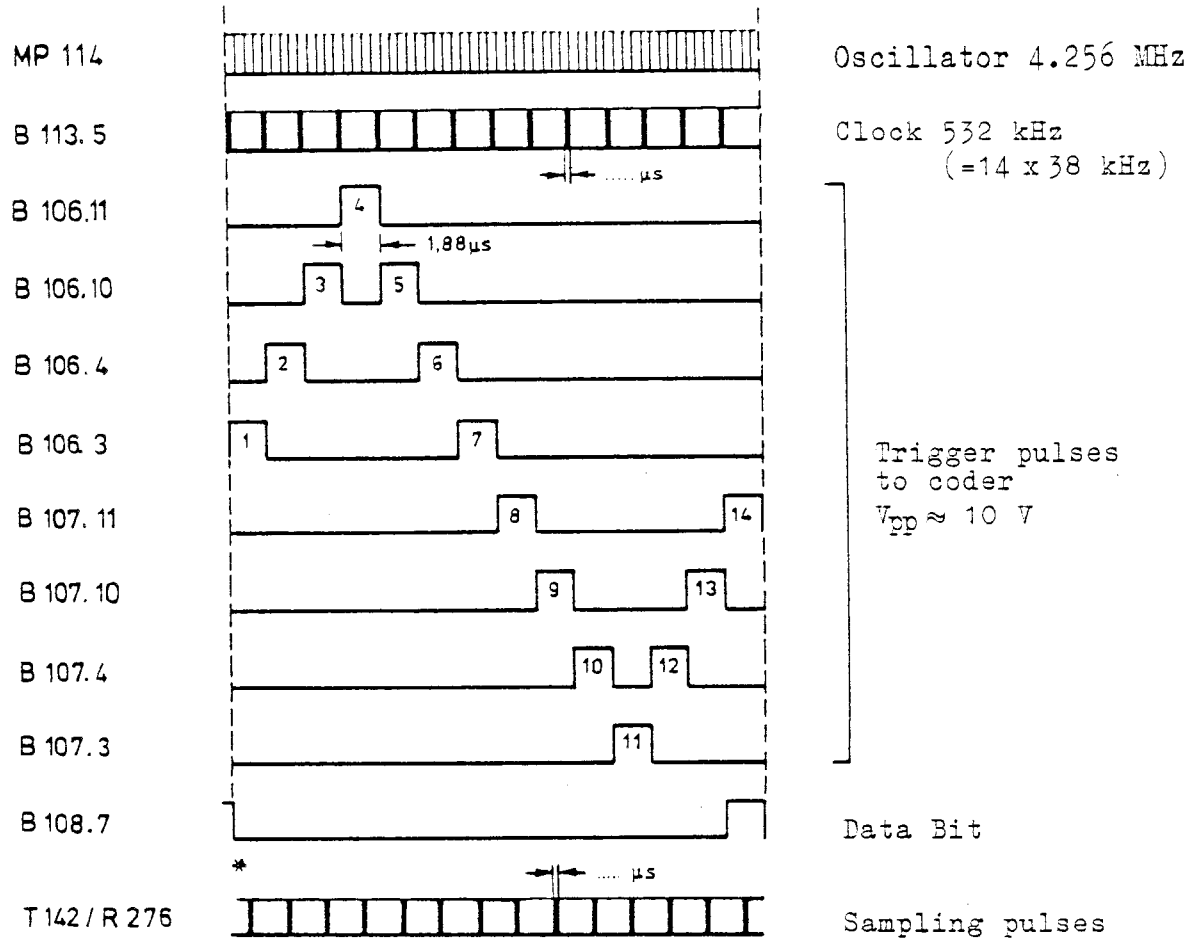
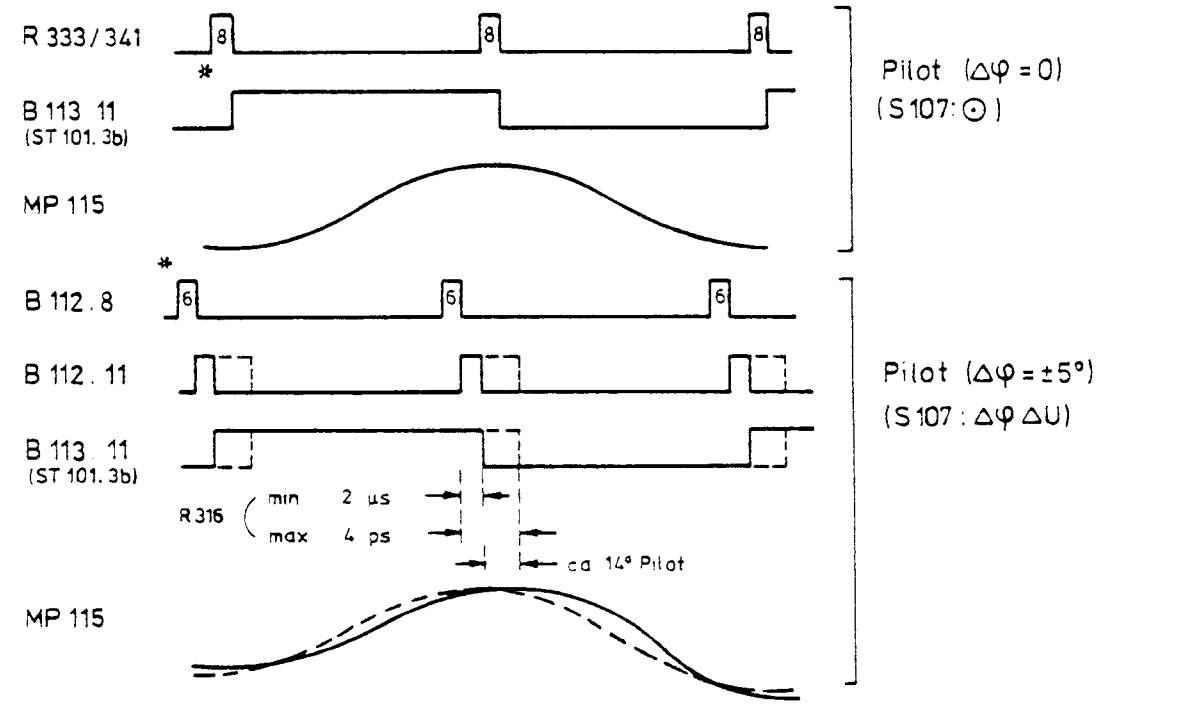


Fig. 5 Level diagram

6 a



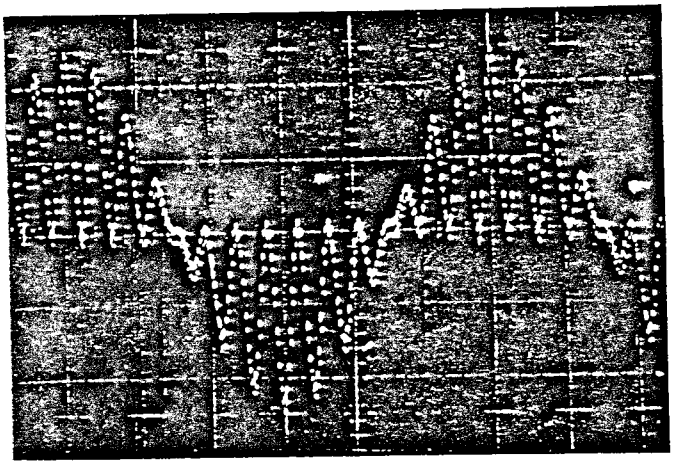
6 b



* Edge of trigger pulse for oscilloscope

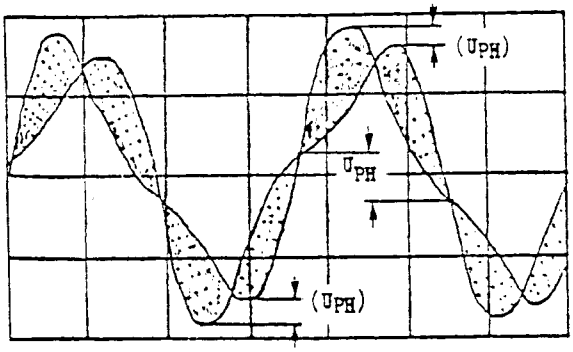
Fig. 6
Oscillograms Pilot-tone generation

7a



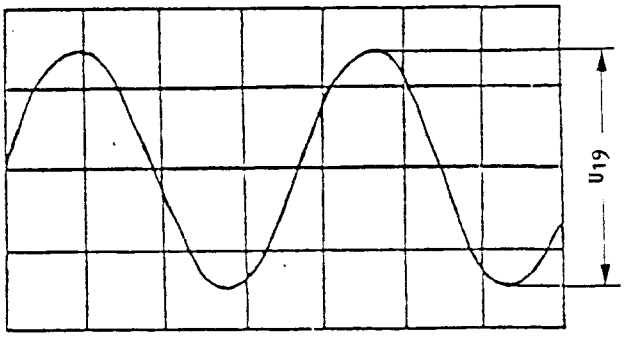
MP 113

7b



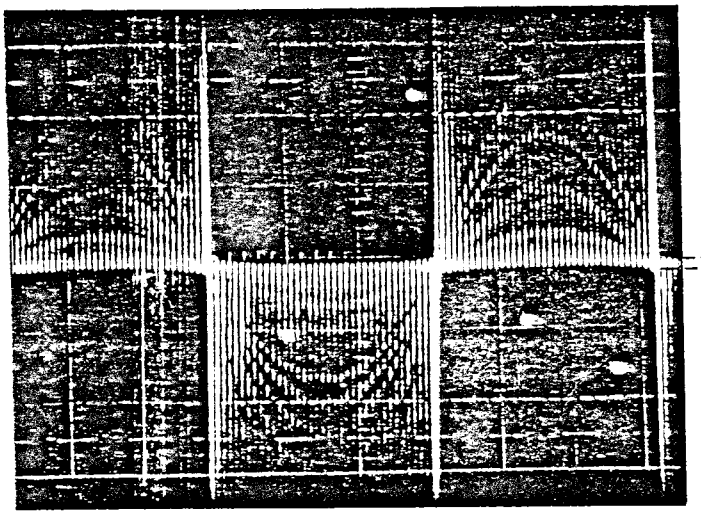
Difference signal + pilot tone

7c



Pilot tone

7d



Input level +6 dBm
(V_{pp} = 2,8 x 1,55V = 4,34V)

> 64 dB (= < 2,73 mVss)
> 72 dB (= < 1,08 mVss)

100 times overload, i.e.
one division approx. 7 mV

Fig. 7 Oscillograms Coder circuitry

Translations for Drawings and Diagrams

Ausgangsverstärker	Output amplifier
Codierung	Coding pin
Eingang L	L input
Eingang R	R input
L - Eingang	L input
L + R Ausgang	L + R output
Monomeldung	Mono signal
Monorelais	Mono relay
MPX - Tiefpass	MPX lowpass filter
Netzfilter	Line filter
Pilotamplitude	Pilot amplitude
Pilotphase	Pilot phase
Pilotton	Pilot tone
Pilottonausgang	Pilot-tone output
Pilottonerzeugung	Pilot-tone generation
Quarzoszillator	Crystal oscillator
R 138 und 139 nur bei Bedarf	R 138 and 139 only used if necessary
R - Eingang	R input
Regelteil	Power supply
Spitzenwertanzeige	Peak indication
Spitzenwertgleichrichter	Peak rectifier
Stereomeldung	Stereo signal
Stereorelais	Stereo relay
Stromversorgung $\pm$12 V	Power supply $\pm$12 V
Summierverstärker	Summing amplifier
Umsch.	Change-over
Verkehrsfunk	Traffic radio signal

Zusatzeingang	Additional-signal input
Zusatzsignal	Additional signal
15 kHz Tiefpasse	15-kHz lowpass filters

ROHDE&SCHWARZ

GC 003

STEREOCODER GC 003

for the most exacting requirements (channel separation ≧ 60 dB);
generates a stereo multiplex signal according to CCIR, EBU and FCC recommendations (pilot-tone system) to modulate transmitters

Data sheet
N 3 – 297
E – 1

STEREOCODER GC 003

- Very high channel separation: crosstalk attenuation between left and right channels better than 60 dB
- Low intrinsic distortion
- Built-in AF test oscillator and peak voltmeter
- Inputs for traffic radio and subsidiary signals Plug-in SCA generator (option)

Characteristics and Uses

The Stereocoder GC 003 combines the "left" and "right" information and forms a **coded stereo signal** (multiplex signal, MPX signal) for transmitter modulation according to the pilot-tone method (CCIR Recommendation 450, Section 2). The pilot tone required for the multiplex signal is generated in the Stereocoder with crystal accuracy. The GC 003 was developed in particular for use in FM transmitters and complies with the standard specifications 5/3.2 of the ARD.

Extremely high crosstalk attenuation, very low harmonic distortion and **high S/N ratio** are the outstanding features of the new coding method used (see also Description).

In addition to **stereo** signals, **mono** information can be transmitted. The respective mode of operation can be selected locally or by **remote control** and is maintained even in case of AC supply failure.

Two isolated multiplex outputs are provided on the Stereocoder GC 003 to meet the requirements of use with transmitters.

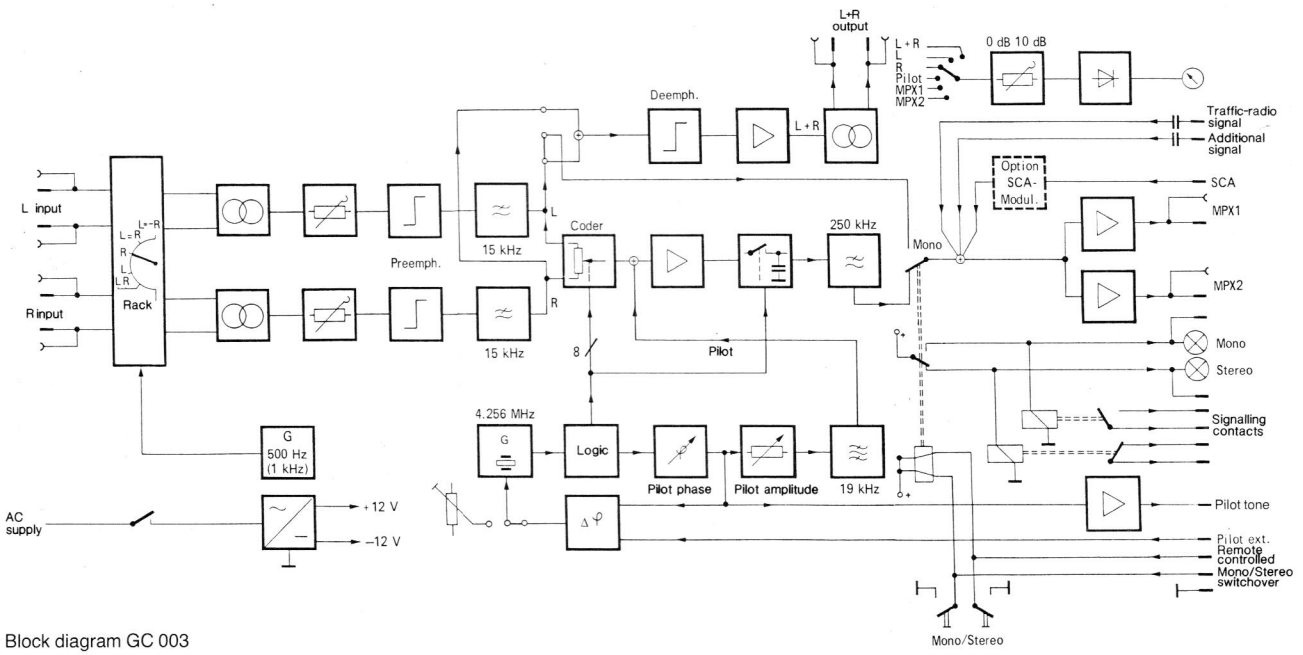
For checking purposes, the GC 003 is equipped with a high-grade floating output for the M signal ($\frac{L+R}{2}$).

The sensitivity of the AF inputs can be accurately matched to the input levels by means of step switches over a wide range.

The built-in AF oscillator produces a 500-Hz signal of **high amplitude stability** and **low harmonic distortion** for measurements and checks. This oscillator can be used for modulation in the following operating modes:

L
R
L = R (M signal)
L = −R (S, difference signal)

If any of the switches for preemphasis, pilot tone or operating mode is not in the normal operating position, a signal lamp on the front panel lights up. Modulation of the coder and its functions are indicated on a built-in **peak voltmeter.**



Block diagram GC 003

Description

In conventional stereocoders, encoding is performed either by the frequency-division multiplex method (matrix method) or the time-division multiplex method (switching method) using a switching frequency of 38 kHz. Both methods entail the disadvantage that it is difficult to filter out system-inherent unwanted frequencies in order to achieve high channel separation.

The Stereocoder GC 003 operates in the **time-division multiplex** mode with **"soft" switching over 14 stages.** This technique produces spurious signals only above 500 kHz, which can easily be suppressed.

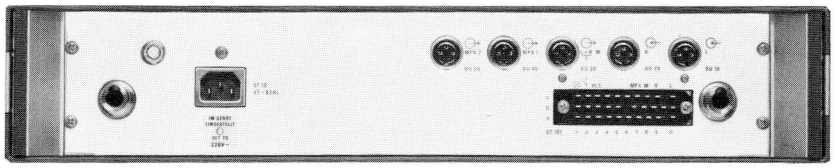
The incoming L and R signals are applied to the modulator via two identical channels. An input transformer, an 18.5-kHz lowpass filter and a preemphasis network (which can be switched off) are provided in each channel as well as a switchable level attenuator. Further signals in the range between 53 kHz and about 100 kHz (e.g. traffic radio, SCA channels) can be added without affecting the multiplex signal. An optional SCA modulator can be fitted in the Stereocoder by removing a shorting plug.

The modulator consists of eight electronic switches. After adding the pilot tone, the multiplex signal (MPX) from the modulator is taken to both output amplifiers via a lowpass filter. It is then available without any DC bias at two identical, non-interactive outputs.

The pilot and carrier frequencies are derived from a 4.256-MHz crystal. They can also be synchronized to an external 19-kHz frequency by means of a built-in phase control circuit.

For mono transmission, the signal is selected from the L or R channel ahead of the modulator and then directly applied to the output amplifiers.

Except for the power supply, the entire circuitry of the GC 003 is contained on a single PC board which is easily accessible from both sides.



Rear view
GC 003

Specifications

Inputs for L and R channels

Frequency range	30 to 15 000 Hz
Input impedance (balanced, floating)	≧4 kΩ (soldered connection can be changed for 600 Ω ±2%)
Connectors	female, 3-pole receptacle, similar to DIN 41524 (lockable) and 30-pin male connector strip acc. to DIN 41622
Input level at 1000 Hz and L = R (or L = −R) for +6 dBm output level of M signal or of S signal modulated onto subcarrier	−4 to +8 dBm
Stepping of level control	
coarse	4 x 3 dB
fine	6 x 0.5 dB
	6 x 0.1 dB
Overdrive limit	≧6.5 dB
Gain difference between the two channels after adjustment to any level	≦0.2 dB
Time constant of preemphasis in L and R channels	(50 ±1) μs; soldered connections changeable to (75 ±1.5) μs; preemphasis disconnectible
Attenuation of lowpass filters above 18.5 kHz (relative to 500 Hz)	≧54 dB

Inputs for subsidiary signals

Frequency range of subsidiary signals	53 to 100 kHz
Input impedance	≧ 2 kΩ (unbalanced)
Input level for −10 dBm ±1 dB at stereo outputs	−10 dBm
Connector	30-pin male connector strip (DIN 41622)
Frequency range of traffic-radio signal	53 to 100 kHz
Input impedance	≧2 kΩ (unbalanced)
Input level of unmodulated traffic-radio signal (57 kHz) for an output level of −14 dBm ±0.25 dB	−14 dBm
Connector	30-pin male connector strip (DIN 41622)

Auxiliary frequencies

Frequency of pilot tone	19 kHz ± ≦1 Hz
Subcarrier frequency	38 kHz
Phase difference between positive zero crossings and pilot-tone zero crossings	
in fixed position	≦±0.3°
in variable position	≦±5°
Input for external synchronization of pilot frequency	
Input voltage	≧1 V_{pp}
Input impedance	≧1 kΩ
Frequency	19 kHz ±2 Hz

Outputs

Outputs for multiplex signal with subsidiary signal (free from DC)	2
Level variation at one of the outputs M, MULTIPLEX I and MULTIPLEX II with load varying between short and open circuit at the other output	≦0.1 dB
Connectors	female, 3-pole receptacle similar to DIN 41524 (lockable) and 30-pin male connector strip acc. to DIN 41622
Nominal output level of M or of S signal modulated on subcarrier (L = R or L = −R, 500 Hz, Z_1 = 300 Ω shunted by 5000 pF)	+6 dBm ±0.1 dB

SPECIFICATIONS

Nominal output level of pilot tone (Z_l = 300 Ω shunted by 5000 pF)	
in fixed position	−9.5 dBm ±0.2 dB
in variable position	−16 to −5 dBm
Source impedance of stereo outputs	≦20 Ω
Output level at stereo outputs after switching to mono operation	+6 dBm ±0.25 dB
Attenuation of subcarrier (referred to output level of +6 dBm)	≧60 dB
Suppression of all frequencies above 53 kHz without subsidiary signals (referred to output level of +6 dBm)	≧52 dB
M signal output	floating, balanced (Z_{out} ≦ 20 Ω)
Nominal output level (500 Hz, stereo or mono operation, Z_l ≧ 200 Ω)	+6 dBm ±0.3 dB
Connector	female, 3-pole receptacle similar to DIN 41524 and 30-pin male connector strip acc. to DIN 41622
Suppression of all frequencies above 18.5 kHz	≧54 dB
Pilot frequency output	
Output voltage into ≦100 Ω	(1 ± 0.1) V_{pp}
Waveform	squarewave; mark-to-space ratio 2 : 1
Connector	30-pin male connector strip acc. to DIN 41622

Amplitude-frequency response

Amplitude variations at stereo outputs in frequency range 30 Hz to 15 kHz (relative to 500 Hz; preemphasis off), measured via decoder	≦ ±0.15 dB
Amplitude variations in frequency range 53 to 100 kHz	≦ ±0.1 dB

Crosstalk

Crosstalk attenuation between M and S channels (L = R or L = −R; 30 Hz to 15 kHz)	≧46 dB (typ. 50 dB)
Crosstalk attenuation between L and R channels	
100 to 5000 Hz	≧60 dB (typ. 64 dB)
30 to 15 000 Hz	≧58 dB (typ. 60 dB)

Nonlinear distortion

Harmonic distortion (30 Hz to 5 kHz), without preemphasis, at R, L and M outputs, measured via decoder at output levels of	
up to +6 dBm	≦0.1%
up to +12.5 dBm (f >60 Hz)	≦0.1%
up to +12.5 dBm (f = 30 to 60 Hz)	≦0.2%
Intermodulation distortion (Δf = 1 kHz in range 5 to 15 kHz) in R, L and M channels at output levels of up to 12.5 dBm	d_2 ≦0.05%[1]) d_3 ≦0.1%[1])
Suppression of all nonlinear crosstalk products with preemphasis at output levels of up to +12.5 dBm	≧60 dB

Weighted and unweighted noise

measured with 50 μs preemphasis and deemphasis via stereocoder or M output of coder:

Unweighted S/N ratio, ref. to +6 dBm, peak-value measurement to DIN 45405 and CCIR Rec. 468-2	≧80 dB
Weighted S/N ratio, ref. to +6 dBm, peak-value measurement to DIN 45405 and CCIR Rec. 468-2	≧76 dB

[1]) $d_2 = \frac{U_{(f_2-f_1)}}{U_{out} \cdot \sqrt{2}}$ $\quad d_3 = \frac{U_{(2f_2-f_1)} + U_{(2f_1-f_2)}}{U_{out} \cdot \sqrt{2}}$

AF test oscillator

Frequency	500 Hz (1 kHz on request)
Level	+6 dBm ±0.2 dB
Distortion	<0.1%

Indication

	built-in moving-coil meter (peak-value measurement) indicating pilot tone, MPX I, MPX II, L, R or L+R, selectable
Indicating error	≦0.2 dB +1.5%
Measurement range	
Pilot-tone indication	−17 to +2.5 dBm
MPX, L, R	−16 to +18 dBm

Stereo/mono selection

Local	by two pushbuttons
Remote	by momentary external contact closure
Signalling of operating state	by 2 lamps (24 V/20 mA) and 2 relay contacts (60 V/0.2 A max.)

SCA modulator (option)

Input voltage[2])	−10 to +12 dBm
Amplitude-frequency response between 30 Hz and 7.5 kHz	±0.5 dB
Preemphasis[2])	50/75 μs ±5%
Modulation frequency deviation	±2 to ±8 kHz
Centre frequency (crystal-controlled)	67 kHz
Harmonic distortion (30 Hz to 7.5 kHz, deviation ≦7.5 kHz)	≦1%
Output level[2])	−20 to 0 dBm

General data

Nominal temperature range	+5 to +45 °C
Operating temperature range	−5 to +55 °C
Storage temperature range	−40 to +70 °C
Power supply	110/125/220/235 V +10/−15 %, 47 to 63 Hz (10 VA)
Overall dimensions (W×H×D) and weight	
19'' cabinet model (rackmount with panelling)	492 mm x 116 mm x 392 mm; 6.9 kg
19'' rackmount	483 mm x 88 mm x 384 mm, seated depth d: 305 mm; 4.7 kg
Colour	front panel: grey RAL 7001 panelling: blue-grey
Panel markings	German + English
Order designation	▶ Stereocoder GC 003
19'' rackmount	230.8518.03

Accessories supplied

Power cable	025.2365.00

Recommended extras

Panelling	085.1313.00
SCA modulator	230.9014.00
3-pin connector (mating with chassis inputs and outputs; required quantity: 5, max.)	018.5340.00
Standard Stereocoder MSDC 2	281.0514.03
Parts required for rack adaptation to DIN 41490:	
Connector bar GC 003-Z (DIN 41490)	281.1604.00
Front-panel adapter (for adapting to front-panel dimensions to DIN 41490)	034.0990.00
Adapter bars for adapting the 19'' rackmount to guide-rail spacing to DIN 41490 (2 required)	085.6373.00
Parts required for rack adaptation to DIN 41494:	
Connector bar GC 003-Z (DIN 41494)	281.1591.00
Adapter bar for left side (DIN 41494)	043.6875.00
and	
Adapter bar for right side (DIN 41494)	043.6969.00

[2]) can be varied to suit requirements within specified limits

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