

VF PCM Tester

- For measurements on digital exchanges, PCM multiplexers and analog transmission equipment
- Compact VF generator and receiver
- Performs all measurements stipulated in ITU-T Rec. O.133 for analog interfaces
- D.C. loop holding circuits in input and output
- Memory for 100 instrument setups and results
- Worldwide instrument of reference



Line-up, maintenance and fault-finding Operators of VF transmission equipment as well as 10, 24 and 30 channel PCM systems must make frequent measurements on the analog interfaces of these systems. Typical requirements involve VF measurements and recording of specific PCM parameters such as the quantizing noise and gain response. Data communications (X.25 or group 3 facsimile) using high-speed modems places significant demands on analog or PCM channels. The analog interfaces of primary multiplex equipment are found in the analog exchanges; line cards in digital exchanges also have analog interfaces on the subscriber side.

End-to-end measurements are used to check the quality of the line between multiplexers ("full channel" measurements, ITU-T G.712). A pair of PCM-23s are used, one acting as generator and the other as receiver. Tests can be carried out on the system without having to interrupt any existing connections or to wait for the clear-down signal on all the other telephone channels.

Summary of measurement modes

- Level
- Loss
- Stability
- Frequency response
- Gain/level response
- Crosstalk
- Idle channel noise
- Total distortion

Out-of-service measurements can be made using a single PCM-23 between the analog inputs and outputs via the digital loop of the multiplex equipment under test.

Accurate yet easy to use The PCM-23 was especially designed for field applications. The instrument is battery operated and runs for approximately 8 hours on a set of batteries. The MK-1 equipment case has space for the PCM-23, test cables, batteries, a.c. adapter/charger and instrument manual. Built-in loop holding circuits can be separately switched in parallel to the input and output to maintain the loop. The memory facilities for results and instrument setups make for quick and reliable measurements. A self-test is executed each time the instrument is powered up. When a new setting is made, an autocal routine is run prior to the first measurements. Despite its compact size, the PCM-23 has a stable synthesizer which allows frequency settings in 1 Hz steps.

The specifications are valid under the nominal operating conditions, unless otherwise stated.

Generator

Output

BN 2035/01 balanced, floating, 3 pole CF socket
 BN 2035/02 balanced socket, matches WECO 310 plug
 BN 2035/03 balanced socket, matches I 214 APS plug
 Output impedance, switchable approx. 0 Ω, 600 Ω, OPT
 (OPT = user-specified;
 standard value = 220 Ω + 115 nF || 820 Ω)
 Signal balance ratio (ITU-T O.121) > 46 dB
 Return loss, Z_{out} = 600 Ω > 36 dB
 Max. levels at output
 A.C. +24 dBm
 D.C. 60 V from Z_{out} ≥ 600 Ω

Output signals

Sinewave
 Frequency range 200 Hz to 4 kHz
 Resolution 1 Hz
 Digital or stepwise frequency setting
 Step width, selectable 1 Hz to 1 kHz
 Level range -55 to +5 dBm0
 at relative levels between -20 to +4 dBr
 Resolution 0.1 dB

Intrinsic error and level response, +20 to +26 °C, f = 1 kHz:



Output level frequency response, referred to 1 kHz ± 0.1 dB
 Overall error limits ± 0.3 dB

Noise signals

Band-limited noise (ITU-T O.131)
 Frequency band 350 to 550 Hz
 Frequency spacing 3.91 Hz
 Crest factor 10.5 dB

Level range -55 to 0 dBm0
 at relative levels between -20 and +4 dBr
 Resolution 0.1 dB

Conventional telephone signal (ITU-T G.227)

Frequency spacing 7.8 Hz
 Crest factor 9.5 dB

Level 0 dBm0
 at relative levels between -20 and +4 dBr
 Resolution 0.1 dB

Intrinsic error and level response, +20 to +26 °C



Overall error limits ± 0.3 dB

Receiver

Input

Connectors same pattern as generator output connectors
 Output impedance, switchable > 30 kΩ, 600 Ω, OPT
 (OPT = user-specified;
 standard value = 220 Ω + 115 nF || 820 Ω)
 Signal balance ratio at 50 Hz > 110 dB
 reducing by 20 dB/decade up to 5 kHz (ITU-T O.41)
 Reflexionsdämpfung bei R_i = 600 Ω > 36 dB
 Max. input levels
 A.C. + 32 dBm
 D.C. 60 V from Z_{out} ≥ 600 Ω

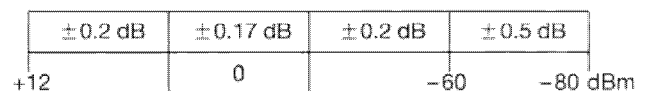
Input filters

Band pass 0.2 to 4 kHz; 1 kHz;
 350 to 550 Hz (ITU-T O.131)¹⁾
 800 to 3400 Hz (ITU-T O.131)¹⁾
 Band stop 1 kHz (ITU-T O.132 and IEEE 743)
 Psophometer filter to ITU-T O.41¹⁾
 C-message filter to IEEE 743²⁾

Input level

Digital result display up to ± 99.99 dB(m)
 Resolution 0.1 dB (normal)
 0.01 dB (AVRG)
 Relative level setting range -20 to +10 dBr

Intrinsic error and level response, +20 to +26 °C, f = 1 kHz, with 0.2 to 4 kHz bandpass filter and AVR on:

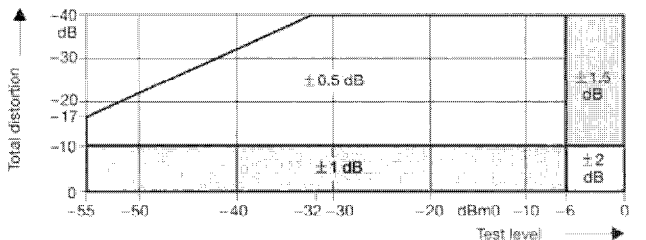


Frequency response with 0.2 to 4 kHz bandpass filter, referred to 1 kHz ± 0.25 dB
 Overall error limits with 0.2 to 4 kHz bandpass filter, for levels between +12 and -80 dBm, generator level below -40 dBm ± 0.35 dB

Error limits

with Z_{in} = Z_{out} = 600 Ω, relative levels between 0 and -16 dBr (generator), -5 and +7 dBr (receiver).

Overall error limits for S/Q measurement using noise signal to ITU-T O.131



1) BN 2035/01 and BN 2035/03 only
 2) BN 2035/02 only

Measurement modes

Mode	Output signal	Output level	Input filter	Range	Error limits
LEVEL	0.2 to 4 kHz or ITU-T O.131 noise ²⁾	-55 to +5 dBm0 -55 to 0 dBm0	0.2 to 4 kHz bandpass 350 to 550 Hz bandpass	+5 to -60 dBm0 +5 to -60 dBm0	± 0.5 dB ± 0.5 dB overall error, generator and receiver
LOSS	1014 or 1004 Hz ¹⁾ or 813 Hz	0 or -10 dBm0	0.2 to 4 kHz bandpass	+20 to -20 dB	± 0.25 dB
STAB	1014 or 1004 Hz ¹⁾	0 or -10 dBm0	0.2 to 4 kHz bandpass	+2 to -2 dB	± 0.05 dB
ΔLOSS vs. F	reference frequency 1014 or 1004 Hz ¹⁾ or 813 Hz	0 or -10 dBm0	0.2 to 4 kHz bandpass	+20 to -20 dB	± 0.25 dB
Δ GAIN vs. LEV	1014 or 1004 Hz ¹⁾ ITU-T O.131 noise	-55 to +5 dBm0 -55 to -10 dBm0	1 kHz bandpass 350 to 550 Hz bandpass	+20 to -20 dBm	± 0.2 dB
CROSSTALK	1014 or 1004 Hz ¹⁾ or conventional telephone signal	0 dBm0 0 dBm0	1 kHz bandpass ITU-T O.41 psophometer filter	+5 to -75 dBm0	± 1 dB between +5 and -65 dBm0
IDLE CH NOISE	no signal or 1014 or 1004 Hz ¹⁾	— -40 dBm0	psophometer or C- message, or psopho- meter-notch or C-notch ¹⁾	+5 to -80 dBm0p or +95 to +10 dBmrc0 ¹⁾	± 0.5 dB between +5 and -75 dBm0p +95 and +15 dBmrc0 ¹⁾
S/Q	1014 or 1004 Hz ¹⁾ or ITU-T O.131 noise ²⁾	-55 to +5 dBm0 -55 to 0 dBm0	1 kHz bandpass + psoph.- or C-notch ¹⁾ , or 350 to 550 Hz ²⁾ + 0.8 to 3.4 kHz bandpass filters	10 to 40 dB	± 1 dB, or see diagram
VDC	—	—	4 kHz lowpass	0 to 20 V	± 50 mV ± 3 %

Special functions

D.C. loop-holding circuit

separately switchable for generator and receiver
 Dynamic impedance > 100 kΩ
 Voltage drop at 60 mA approx. 15 V
 Permitted loop-holding current ≤ 80 mA

Memory

Stores up to 100 freely programmable device settings.
 Store and recall using keyboard, clear by overwriting.

General specifications

Power supply
 Battery or a.c. line operation
 Built-in dry batteries 2 pcs. 9 V IEC 6 F 22
 NiMH batteries (on request) 2 pcs. 9 V V7/8H
 Separate a.c. adapter/charger available,
 trickle-charging possible with PCM-23 switched on.

Operating times

on dry batteries approx. 8 h
 on NiMH batteries approx. 2 h
 EMI/RFI suppression to Deutsche Bundespost
 Reg. 1046/1984

Ambient temperature

Nominal range, use 0 to +50 °C
 Limits operating range -10 to +55 °C
 Storage and transport -40 to +70 °C
 Dimensions (w × h × d) in mm 110 × 200 × 60
 Weight (including batteries) approx. 1 kg

1) BN 2035/02 with 1004 Hz and C-notch filter
 2) BN 2035/02 without noise signal

Ordering information

PCM-23 VF PCM tester with CF connectors	BN 2035/01	Accessories (charged extra)	
PCM-23 VF PCM tester with WECO 310 compatible connectors	BN 2035/02	LNT-2 AC adapter/charger	BN 2071/90.02
PCM-23 VF PCM tester with I 214 APS compatible connectors	BN 2035/03	Powers the PCM-23 and charges the NiMHs. Specify plug when ordering:	
PCM-23 VF PCM tester Eurocom version with CF connectors (on request)	BN 2035/04	European plug	K 490
		US plug	K 491
		U.K. plug	K 492
		Australian plug	K 493
Accessories (included in price) 2 dry batteries and shoulder strap		NiMH rechargeable battery (2 required)	BN 820/00.50
Option (charged extra)		MK-1 Equipment Case for PCM-23, LNT-2, batteries, test cables and operating manual	BN 2090/02
User-specified impedance (instead of 220 Ω + 115 nF 820 Ω)	BN 2035/00.60	Leather carrying case (black)	BN 926/22
		WG PenBERT mini PCM monitor (E1) (see WG PenBERT data sheet for details)	BN 4555/11