HB*flex*™

mmWave and sub-6 GHz Network Testing

Scanning Receiver | 10 MHz – 6 GHz | 24 – 40 GHz

The PCTEL® HB*flex* is a highly flexible scanner designed for testing 5G NR, LTE, 2G/3G cellular across mmWave (FR2) and sub-6 GHz (FR1) bands. It features Dynamic Spectrum Sharing (DSS) and simultaneous mmWave and sub-6 GHz measurements to help operators efficiently utilize all their spectrum and make a smooth transition to 5G.

Bands

- 5G: 3GPP FR1
- mmWave 3GPP FR2
- All existing 2G, 3G, and 4G
- CBRS
- Public safety
- WiFi (2.4 and 5 GHz)
- Other bands currently deployed around the world

Technologies

- 5G NR
- LTE FDD
- TD-LTE
- NB-IoT
- UMTS
- GSM
- CDMA
- EV-DO
- WiFi
- LAA
- P25
- DMR
- TETRA

Custom Channel Power Measurements for additional technologies

Features

- 4G/5G Dynamic Spectrum Sharing (DSS)
- Dual polarization beamforming measurements
- 2x2 and 4x2 LTE MIMO measurements
- Hot-swap battery system
- Windows® laptop and Android™ tablet support
- Connect with Bluetooth® or USB
- Blind Scan for automatic channel detection

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HB*flex*™ Specifications

5G New Radio (NR)

Measurement modes		NR TopN Signal: Synchronization channels (P-SS/S-SS) & PBCH; Layer 3 Reporting: MIB (FR1 and FR2), SIB1 (FR1); Dual polarization beamforming measurements (FR1); Blind Scan
Data modes		PCI, PSS-RP [dBm], SSS-RP [dBm], PSS-RQ [dB], SSS-RQ [dB], PSS-CINR [dB], SSS-CINR [dB], RSPBCH-RP [dBm], RSPBCH-RQ [dB], RSPBCH-CINR [dB], SSB-RP [dBm], SSB-RQ [dB], SSB-CINR [dB], SSB-idx, SSB-RSSI, SSS-Delay-Spread, Time Offset
Sub carrier spacing		15/30/120/240 kHz
Max. number of channels		12 (sub-6 GHz), 8 (mmWave)
Max. number of PCIs		16 (sub-6 GHz), 8 (mmWave)
Max. number of beams/PCI		8 (sub-6 GHz), 64 (mmWave)
Measurement rate (typical)		30/sec (sub-6 GHz), 20/sec (mmWave, 2 RF ports), 6/sec (mmWave, 1 RF port)
Dynamic range (CINR)		PSS/SSS CINR: -10 to +33 dB (sub-6 GHz), -10 to +23 dB (mmWave) PBCH DMRS CINR: -8 to + 40 dB
Min. detection level	RP	SCS @15 kHz: -135 dBm, SCS @30 kHz: -132 dBm, SCS @120 kHz: -128 dBm, SCS @240 kHz: -128 dBm
Accuracy (CINR)	PSS/SSS, PBCH DMRS	±2 dB

LTE FDD and TD-LTE

Measurement modes		Top N Synchronization Channel Reference Signal (P-SCH/S-SCH) and Resource Block (Wideband, Subband), Dynamic Spectrum Sharing (DSS), Layer 3 Reporting, Blind Scan, Mobile Blind Scan
Data modes		RP, RQ, CINR, Cyclic Prefix, Time Offsets, Delay Spread; RF Path Measurements (4x1, 4x2); MIMO: Condition Number, ECQI, EPUT
Channel bandwidths		1.4 / 3 / 5 / 10 / 15 / 20 MHz
Max. number of channels		24
Receive modes		SISO; MIMO (2x2, 4x2)
Transmit antenna configurations		1, 2, 4 (with path measurement)
Measurement rates	Sync Channel RS	LTE FDD: 50/sec; TD-LTE: 25/sec
Dynamic range (CINR) @ 10/15/20 MHz	RS P-SCH/S-SCH	-26 to + 40 dB -10 to +18 dB
Min. detection level	P-SCH/S-SCH & RS	-140 dBm (RSRP @ 15 kHz)
Accuracy (CINR)	P-SCH/S-SCH & RS	±1 dB
Max. number of PCIs		16

NB-IoT

Measurement modes		Top N NRS (Narrowband Reference Signal), NPSS (Narrowband Primary Synchronization Signal), and NSSS (Narrowband Secondary Synchronization Signal), Layer 3 Reporting, Blind Scan
Data modes		NRS: RP, RQ, RSSI, CINR, Time Offset; NPSS: RP, RQ, RSSI, CINR; NSSS: RP, RQ, RSSI, CINR, Time Offset
Operation mode		In-Band, Guard Band, Stand-alone
Channel bandwidths		180 kHz
Measurement rates		5/sec
Dynamic range (CINR)	NRS	-10 to + 40 dB
Min. detection level	NRS RP	-138 dBm
Accuracy (CINR)	NRS	±2 dB
Max. number of PCIs		16

UMTS [WCDMA/HSPA(+)]

Measurement modes		Top N Pilot, Layer 3 Reporting, Blind Scan, Mobile Blind Scan
Data modes		Io, Ec/Io, Aggregate Ec/Io, SIR, Rake Finger Count, Time Offset, Delay Spread
Channel bandwidths		200 kHz / 3.84 MHz
Max. number of channels		24
Measurement rate		100/sec (high speed mode); 50/sec (high dynamic range mode)
Top N CPICH dynamic range (Ec/Io)		-26 dB
Min. detection level		-120 dBm (high dynamic range mode)
Accuracy		±1 dB
Max. number of Pilots		32

GSM

Measurement modes		Color Code, Layer 3 Reporting, Blind Scan, Mobile Blind Scan
Data modes		BSIC, C/I, RSSI
Channel bandwidths		30 kHz / 200 kHz
Measurement rates		Up to 200 BSIC Decodes/sec
Dynamic range		+2 dB C/I
Min. basic detection level		-110 dBm
Accuracy		±1 dB

HB*flex*™ Specifications

CDMA and EV-DO

Measurement modes	Top N PN, CDMA Layer 3 Reporting, Blind Scan, Mobile Blind Scan
Data modes	Ec, Io, Ec/Io, Aggregate Ec/Io, Pilot Delay, Delay Spread
Channel bandwidths	30 kHz / 1.25 MHz
Max. number of channels	24
Measurement rates	CDMA: 25/sec; EV-DO: 18/sec
Top N PN dynamic range, Ec/Io	CDMA: -28 dB; EV-DO: -18.5 dB
Min. PN detection level	CDMA: -130 dBm; EV-DO: -120 dBm
Accuracy (CINR)	±1 dB
Max. number of Pilots	32

WiFi

Wireless adapter	ORiNOCO® USB-9100 (US), Asus USB-AC56 (world) or equivalent
Radio configuration	802.11a/b/g/n/ac
Data modes	Signal Strength, Noise Level, SNR, Channel Number, Channel Bandwidth, BSSID, Device Name, SSID, Security Protocol, 802.11 Media, Beacon Interval, Channel Utilization, Throughput
Frequency range	2.4 - 2.483 GHz; 5.15 - 5.85 GHz (subject to country regulations)
Measurement rates	9/sec (typical); 5/sec (typical) for 802.11ac

LAA

Measurement modes		QTopN
Data modes		RSRP, RSRQ, RS-CINR, PSS-RQ, PSS- RP, PSS-CINR, SSS-RP, SSS-RQ, SSS-CINR
Channel bandwidth		20 MHz
Max. number of channels		24
Measurement rate (20MHz, 1 Sig)		6.25/sec
Dynamic range (CINR)		-12 dB
Minimum detection level	RSRP	-130 dBm
Accuracy (CINR)	RS-CINR	±1 dB (Input CINR 0 dB to +15 dB)

P25 (Phase 1 and Phase 2)

Measurement modes		DL (Phase 1 and Phase 2), UL (Phase 1), RSSI
Data modes	DL UL	SINR, RSSI, OOS-BER, Frame BER, Network ID, Auto Classification of Phase and Modulation Type SINR, RSSI, Frame BER, Network ID, Mobile ID, Auto Classification of Phase and Modulation Type
Channel bandwidths	DL & UL	12.5 kHz
Measurement rate	DL UL	5.4 Decodes/sec (maximum); 2.7 Decodes/sec (typical); 100 RSSI/sec 2.4 Decodes/sec (typical), 100 RSSI/sec
Dynamic range (SINR)	DL & UL	+1 dB minimum detection
RSSI Accuracy	DL (Phase 1 C4FM & Phase 2 HDQPSK) UL	±1 dB over -105 to -10 dBm ±1 dB over -105 to -10 dBm
SINR Accuracy	DL (Phase 1 C4FM & Phase 2 HDQPSK) UL	±1 dB over +10 to +25 dB; ±2 dB over +7 to +10 dB, 25 to 30dB ±1 dB over +10 to +25 dB; ±2 dB over +7 to +10 dB, 25 to 30dB
Adjacent channel rejection	DL & UL	49 dB

DMR

Measurement modes		Decode, RSSI
Data modes		SINR, RSSI, Frame BER
Channel bandwidths		12.5 kHz
Measurement rate		5.4 Decodes/sec (maximum); 2.7 Decodes/sec (typical); 100 RSSI/sec
Dynamic range (SINR)		-1 dB minimum detection
Accuracy	SINR RSSI	±1 dB over 6 to 40 dB; ±2 dB over 3 to 6 dB ±1 dB over -118 to -10 dBm
Adjacent channel rejection		49 dB

TETRA

Measurement modes		Decode, RSSI
Data modes		SINR, RSSI, Frame BER, Color Code, MCC, MNC
Channel bandwidths		25 kHz
Measurement rate		6.5 Decodes/sec (maximum); 3.5 Decodes/sec (typical); 100 RSSI/sec
Dynamic range (SINR)		+2 dB minimum detection
Accuracy	SINR RSSI	±2 dB over +8 to +20 dB; ±3 dB over +4 to +8 dB ±1 dB over -118 to -10 dBm
Adjacent channel rejection		20 dB

GPS

Type	56 channel internal receiver
Position accuracy	2.5 meters
Acquisition time	Cold start: <30 sec; Hot start: <2 sec
Sensitivity (tracking)	>-150 dBm

HB*flex*™ Specifications

Power Measurements

Accuracy		±1 dB (across basic RF input power range)
Dynamic range		-120 to -20 dBm @ 30 kHz
RSSI	5G NR, LTE NB-IoT, UMTS, GSM CDMA, EV-DO	11,050 ch/sec (maximum, continguous channels) 4,250 ch/sec (maximum, continguous channels) 8,500 ch/sec (maximum, continguous channels)
Custom channel power (examples)	12.5 kHz (P25, DMR, EDACS, Analog LMR) 25 kHz (TETRA, EDACS, Analog LMR) 125 kHz (LoRa) 250 kHz (LoRa) 500 kHz (LoRa)	25,500 ch/sec (maximum, continguous channels) 14,025 ch/sec (maximum, continguous channels) 10,710 ch/sec (maximum, continguous channels) 8,925 ch/sec (maximum, continguous channels) 6,885 ch/sec (maximum, continguous channels)
Enhanced Power Scan (EPS)	5 kHz to 20 MHz in 2.5 kHz increments	1,000 MHz/sec @ 5 MHz (typical)
Spectrum analysis	Range: >90 dB	>270 MHz/sec (single sweep)
LTE power analysis	1.3 / 3/ 5 / 10 / 15 / 20 MHz TD-LTE only	20 msec @ 5 MHz

Physical

Maximum power (+9 to +17 VDC)	25W max.
Size	10.10" D x 6.50" W x 4.40" H (255.3 mm D x 165.1 mm W x 111.5 mm H)
Weight	7.26 lbs (3.3kg)
Temperature range	Operating: 0°C to +50°C; Storage: - 30°C to +80°C
Humidity	5% to 95% relative humidity, non-condensing
Host data communications interface	USB 2.0, Ethernet, Bluetooth®
Data storage	SD (32 GB)
Antenna ports	RF (sub 6 GHz, Bluetooth): SMA Female (50 Ω); GPS: Male (50 Ω) SMB, RF (mmWave): 2.92 mm Female
Safety	EN 62368-1
EMC	EN 301 489 -1
Shock and vibration	MIL-STD-810G, SAE J1455
RoHS	Directive 2011/65/EU and amendment 2015/863 (RoHS 3)

RF Characteristics

Frequency range		Sub 6 GHz: 10 MHz – 6 GHz mmWave: N257 (26.5-29.5 GHz), N258 (24.25-27.5 GHz), N260 (37-40 GHz), N261 (27.5-28.35 GHz)
Internally generated spurious response		-105 dBm (typical)
RF operating range	In-Band	- 20 dBm max.
Desensitization	Adjacent channel	>50 dB (20MHz RBW)
Safe RF input range		≤ +0 dBm
Frequency accuracy		±0.05 ppm (GPS Locked); ± 0.1 ppm (GPS unlocked)
Conducted local oscillator		-55 dBm (typical)

Supported bands, technologies, data modes, software features, and frequency ranges vary by scanning receiver configuration. Upgrades may be available for previously purchased scanning receivers. Please contact a sales representative for more information.

Solving Complex Wireless Challenges

PCTEL is a leading global provider of wireless technology, including purpose-built Industrial IoT devices, antenna systems, and test and measurement solutions. Trusted by our customers for over 25 years, we solve complex wireless challenges to help organizations stay connected, transform, and grow.

For more information about the HB*flex* scanning receiver, contact your sales representative or visit
> pctel.com/scanning-receivers

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