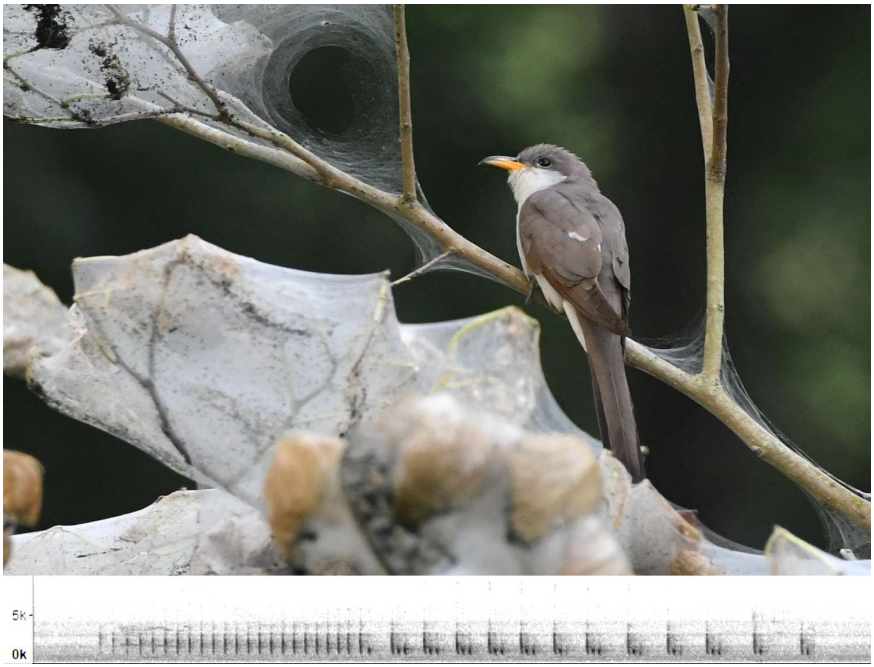
Field Recording Sourcebook



Kevin J Smith ed.

2025

Avant propos

These pages present a source of advice, and savoir-faire concerning recorders and microphones useful for ambient field / bird recording. Based on my personal research and experience, I have crafted what I feel are useful and otherwise unavailable charts on microphone sensitivity. These make comparison between microphones direct and unbiased.

A DISCLAIMER before I get started: Everything on this page is NON-COMMERCIAL and I receive absolutely no compensation of any kind from the manufactures of the gear being reviewed. These are my own observations based on my own research. My recommendations you may take as you wish.

Some background first. I started recording with just a simple Evistr V508 dictating recorder with the simple requirement of capturing audio at CD quality, 44.1 KHz, or 1536 kbps. In this regard the V508 served me well for over a year. Eventually I began seeking a more directional microphone. My worry was, and remains, that a 22 inch parabolic dish is overly directional and therefore "high maintenance". With the Evistr I could just set it up in a tree and record as I watched my patch with my principal documentary gear, a good DSLR. I eventually chose a Wildtronics 11" parabolic (Pro Mini) as a compromise. Not too much directionality and of course, not much off-axis rejection. Overall it worked well for over a year.

Finally when I was ready to up my game I was faced with the question of "off-axis" sounds. A narrowly-focused 22" dish will reject/supress bird calls from the side or behind the dish. My worry was that an interesting bird would call once or twice outside the field of view and before I could swing the dish in its direction the bird would be gone. This is not an unusual circumstance. Thus using a big dish would sacrifice a certain quantity of important records.

The solution for me was to use the unused second channel of my stereo recorder with input from a second omnidirectional microphone. An important additional constraint was to power things with a big USB battery pack. I abhor changing batteries constantly and the more devices present the more batteries to change. My first foray was with a Tascam DR-05X recorder coupled to the 22" Wildtronics mic and a secondary Behringer B-5 omnidirectional condenser mic. Both mics require 48V phantom power not supplied by the recorder so I was obligated to add two pre-amp/phantom power supplies between the mics and the recorder. This worked but the entire setup was overly noisy and my recordings were not stellar.

Eventually I swapped the Behringer B-5 small diaphragm mic with a B-2 large diaphragm mic and then a Røde NT1 with lower self-noise and greater sensitivity. Additionally I swapped the Tascam for a Zoom H5 recorder. The

Zoom has significantly lower self-noise and importantly it provides phantom power to the mics so I could dispose of the noisy pre-amps. Also important, the unit allows independent channel input levelling with up to 55dB internal preamplification. This is important because of the very different nature of the two mics being employed. The omni picks up the most variety naturally while the parabolic, when pointed well, has noise-free gain. I need to note here that most of the above gear changes were made with a minimum of research, mostly just looking at the specs. This is a mistake! My recorder is quite good, but I could have done much better, gear is expensive and a trial and error approach is more so.

If you wish to craft a setup to record in the field you need to know what is available and what specs actually count. Just looking at spec sheets with a zillion parameters is confusing. So, what is actually important for field recording? You will be wanting a setup that is SENSITIVE and LOW NOISE. Bird calls can be hard to hear and you will probably be amplifying your recordings, you do not want to amplify much noise along with it.

For recorders look first at the EIN (equivalent input noise), a small EIN, -120 dB or lower if you can find it. Your condenser microphone (because that is what you should be using) will want Phantom power, try to find a recorder that provides this as external power supplies / pre-amps are overly noisy. Getting a recorder with 32 bit A/D will also eliminate the need for pesky leveling. I use a Zoom H5 with EIN of -120 dB and two XLR ports providing phantom power. For just $87 more the Zoom F3 has 32bit and -127 EIN.

For microphones look at the Self Noise and Sensitivity specs. Self noise ranges from 4 or 5 dB to over 20 dB, get as low as you can. Sensitivity is also important for soft sounds. Look for high sensitivity measured mV/Pa 20 or higher, measured in dB -35 or higher (note negative numbers, -28 is higher than -32). Signal to Noise ratio 85 dB or higher is also important. I use a 22" dish microphone with self noise (at the focus) of -8 dB and sensitivity of -4 dB! Røde makes an excellent condenser mic called RT-1. This mic has a self noise of just 4 dB (inaudible) and sensitivity of -32 dB (25 mV/Pa). Signal to noise is 90 dB. For the price you will probably never do better.

Because of the very different nature of the two microphone types, I also desire that my recorder allows independant channel leveling. If you are just using the recorders' built-in mics and walking along, then indepant leveling is not an issue. Note that 32bit A/D recorders can handle all inputs without the need for leveling, this is the way to go.

So:
1) Use condencer microphones.

Get a dish (for stationary work), or a shotgun (for walking) if you can afford it, their directional properties reduce off-axis interference, a dish gives gain as well. Or, just use the mics included with the recorder, they work too.
2) Use a low noise recorder that:
    a) provides phantom power for your mics and
    b) has 32 bit A/D or allows independant channel leveling (if you use more than one mic).
3) Use XLR cables between mic and recorder, they are low noise and allow phantom powering.
4) Finally, go look at the Zazu Recommendation at the end of the book!

I mount the whole shebang on a sturdy tripod and add a beefy USB Li ion battery to power the recorder for long runs. I hate frequently changing batteries!

Finally, it is critically important here to SET YOUR EXPECTATIONS. You are likely not going to be submitting your recordings for inclusion is a National Geographic documentary. Even if you have put together a zazu noise-free setup, it will NOT prevent your neighbors from fireing up their gasoline-powered leaf blower right when that rare bird is calling. You live in a noisy environment, deal with it!

KJS 04/2025

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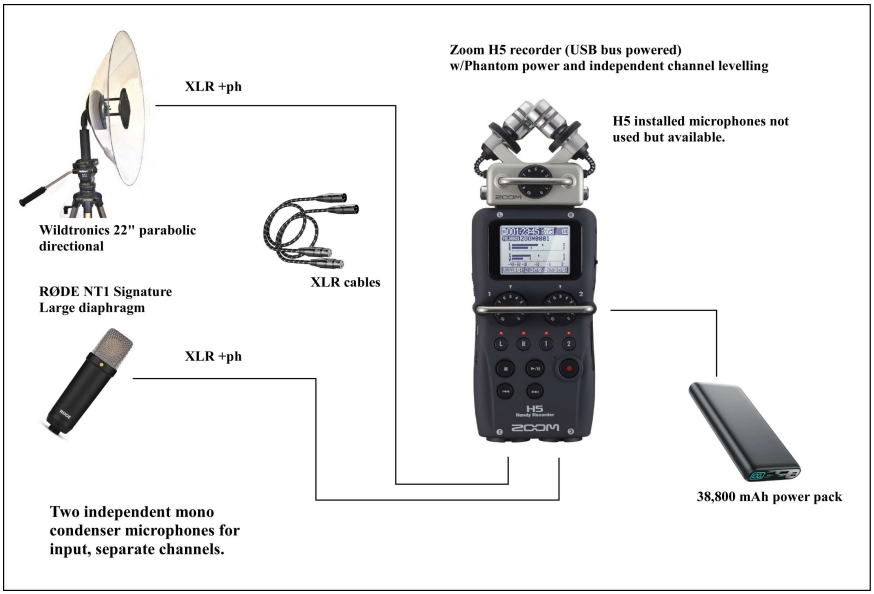
My field setup

The graphic below illustrates my recording setup. It is rather overboard, but suits my needs. The parabolic microphone is highly directional, this makes it, in my opinion, high maintenence. The need to frequently re-point the dish at whoever is calling at the moment is always there. One additional agnst for me is the frequent situation where an "important" bird flys in at 90 degrees or more away from where the dish is pointed, calls loudly once or twice and then before I can pan the dish in its direction it flys off, show over.

You will also notice that I do not include headphones for monitoring while recording. I do NOT want to be tethered to the recorder when an interesting bird shows up and I need to reposition myself to get a better look/photo, often in a hurry. All listening takes place at the computer after the field session is over.

So the setup includes a sensitive omni-directional microphone to record the ambient background along with the occasional ringers. Power the whole shebang off a beefy 38,800 mAh USB battery pack and its time to go record.



Note that this setup is suited for my patch style of birding where setting a microphone on a tripod is appropriate. For mobile recording I expect a recorder with or without shotgun microphone is the better way to go so I include background on such microphones later on as well.


RØDE
wildtronics.com

My Experiences with Suburban Background Noise

Having been recording in my "patch" for some time now, I have experience with the nature of the urban background noise environment. What follows is a summary of the main sources of noise I have to contend with daily. There are two principal types of noise to describe, "Man-made" rumble and "Natural" ambient noise.

Man-Made noise sources (at my suburban patch) include:

1) Garden machinery.
   Gasoline-powered lawn mowers, edger's, and leaf blowers (don't get me started) can be heard at any time, seven days a week, 12 hours a day, and often are! I have been bothered by lawns being mowed late into evening dusk when night is near.
   Tree trim services with their chain saws, shouting, and chipping machines.
2) Road rumble.
   From Interstate 10 to the north or Fry Rd to the west and south.
   I bird mornings so I contend with rush-hour road roar generally from before I start to around 9:30 ish at least although loud rumble can float in anytime.
3) Aircraft.
   Commercial jets approaching IAH pass sometimes every few minutes, business jets approaching Hobby can pass low and loud on occasion, and private / small aircraft linger low and loud at anytime, and often do.
4) Lawn watering system.
5) Air conditioners/heat pumps.
   My own especially!
6) Shooting range.
   Across Barker Reservoir is a shooting range that is active more or less most days, and very active Friday through Sunday. Percussive reports occasionally sound like a war-zone!
7) Dogs.
   Barking is heard from just about anywhere, but especially our neighbors' little Rødent, Mr. Yappy.
8) Nearby construction projects.
   Houses get built in the area and roofs get rebuilt. The hammering, sawing, shouting can be heard for miles.
9) Something new in the neighborhood.. outdoor drum practice! Merde!

Natural noise sources include:

1) Rain and Thunder.
   I record most days rain or shine so this can be a problem for which there is no mitigation. There is the sound of the rain itself as well as the sound of it dripping off the roof (I stay under cover!). The sound is across the frequency spectrum and cannot be edited away. Thunder is percussive and loud, but not frequent.
2) Wind.
   Windy days can also have heavy noise across the audio spectrum making recording difficult, but there are "openings" so get out and record!
3) Bugs.
   Bugs in summer, including Katydids, Cicadas, Crickets, etc. are loud and cover same frequencies as many/most birds. Sucs for the recordist.
4) Frogs.
   Frogs croak/call at low frequencies, often more or less continuously in the morning, evening or night.
5) Birds.
   Yes you hear that correctly. With a sensitive mike and a busy environment there can be so many birds calling away that it is very difficult to isolate a single bird to record without interference from other birds.

Recorder Specification Table

Recorder avisoft.com/recorder-tests	Price	EIN dBu A-weighted	Clipping level dBu	Dynamic Range A-weighted	Bit depth			XLR	PH	#Ch
CEntrance MixerFace R4R	$450	-129	-46	82	16	24		Y	48V	4
SoundDevices MixPre-3M	$950	-129			16	24	32	Y	48V	3
Zoom F6	$575	-128	-58	70	16	24	32	Y	24/48V	6
Zoom F3	**$289**	**-128**					**32**	**Y**	**24/48V**	**2**
SONY PCM-D100	NA	-127	-27	100		24				
TASCAM Portacapture X6	$259	-127	-54	73			32	Y	24/48V	4
TASCAM FR-AV2	**$399**	-127		132		24	32		24/48V	4
Tascam DR-70D	*$279*	-126	-51	75	16	24		Y	24/48V	4
Olympus LS-5	$250	-122	-54	68		24				2
Zoom H5	**$202**	**-120**	**-53**	**68**	**16**	**24**		**Y**	**24/48V**	**4**
Tascam DR-60DMKII	*$179*	-120	-50	70	16	24		Y	24/48V	4
Zoom H4essential	$200	-120					32	Y	48V	3
SONY PCM-D10	$500	-119	-58	61	16	24				2
Roland R-07	$206	-117	-48	69		24				2
SONY PCM-A10	$230	-116	-54	62	16	24				2
Tascam DR-07X	$119	-113	-46	67	16	24				1
Tascam DR-05X	$79	**-109**	**-42**	**67**	**16**	**24**			**PIP**	**2**
Tascam DR-40X	$179	-107	-43	63	16	24		Y	24/48V	4
Zoom H2n	$124	-99	-43			24	32			2

[Ed note: there really just are not a lot of good portable recorders "out there" to choose from. This list is my best shot. Seems that Zoom and Tascam are the leading names.]

The ZOOM H5 Handy Recorder: Features

zoomcorp.com/en/us/handheld-recorders/handheld-recorders/h5/

[Ed note: This is my principal recorder, not because it is the best choice (that would be the F3) but because it is what I bought before I did sufficient research and it works quite well. Hard to justify the cost of replacing it myself and impossible to justify it to my wife!.]

Up to 24-bit/96 kHz audio in BWF-compliant WAV or a variety of MP3 formats
Two mic/line inputs with XLR/TRS combo connectors, each with selectable phantom power and -20 dB pad
Built-in effects, including low-cut filtering, compression, and limiting
Auto-record, Pre-record, and Backup-record functions mean that you'll never miss that perfect take
Multichannel and stereo USB audio interface for PC/Mac/iPad with Loop Back function
Powered by two AA batteries or via USB
About 10 hours of operation with alkaline batteries

$202

THE H5 HANDY RECORDER

Ideal for documentaries, podcasting, audio for video, and professional sound design, the Zoom H5 portable handheld recorder lets you quickly record up to four input signals regardless of your audio experience.

Specifications:
General

Recording media:	SD card: 16MB to 2GB , SDHC card: 4GB to 32GB
Display:	Backlit LCD (128 x 64 pixels)
Inputs	
INPUTS L/R [XYH-5 X/Y mic]:	Mic type: Unidirectional
Sensitivity:	**-45 dB, 1 kHz at 1 Pa**
Input gain:	-∞ to 55 dB (in 1/2)
Max sound pressure input:	140 dB SPL
Equivalent input noise (EIN)	**-120 dBu or less**
PHONE OUT :	Connector: 1/8" stereo mini jack
Output Level:	20 mW +20 mW into 32 Ω load
Built-in speaker:	400mw 8 Ω mono

Recording Formats:

STEREO MODE:	WAV (BWF-compliant)
Sampling frequency:	44.1/48/96 kHz
Bit rate:	16/24 (Stereo)
	Maximum simultaneous recording tracks: 2
	MP3
	Sampling frequency: 44.1kHz
	Bit rate: 48/56/64/80/96/112/32/ 60/192/224/256/320kbps
MULTITRACK MODE:	WAV (BWF-compliant)
	Sampling frequency: 44.1/48 kHz
	Bit rate: 16/24 (Mono/Stereo)
	Maximum simultaneous recording tracks: 6 (L/R + INPUT 1/2 + L/R backup)

USB

Mass Storage Class operation:	Class: USB 2.0 High Speed
Audio Interface operation:	
Multitrack mode:	Class: USB 2.0 High Speed
	Sampling frequency: 44.1/48kHz
	Bit rate: 16/24 bit
	Inputs / Outputs: 4 / 2
Audio Interface operation:	
Stereo mode:	Class: USB 2.0 Full Speed
	Sampling frequency: 44.1/48kHz
	Bit rate: 16 bit
	Inputs / Outputs: 2 / 2
	USB bus powered operation possible (iPad operation supported in Stereo mode only)

Power Requirements

AA size (LR6) battery x 2
AC adapter: AD-17 (DC5V/1A/USB-type) (optional)
USB bus power


ZOOM
L
R
001:23:45
XY5
FOLDER01
ZOOM0001
1
2
L
R
1
2
H5
Handy Recorder
ZOOM


ZOOM
Designed by ZOOM in Japan.
Assembled in China
LINE IN
XYH-5
XY STEREO MIC
OPEN
BATTERY


LINE OUT
+ VOLUME –
DC5V
USB
HOLD
REMOTE
MENU

Zoom H5 Microphone accessories:

EXH-6

XYH-6

XYH-5

EXH-6 Dual XLR/TRS Input Capsule $ 90
XYH-6 Adjustable Stereo Microphone Capsule
XYH-5 Shock Mounted Stereo Microphone Capsule $ 80

MSH-6

SGH-6

SSH-6

MSH-6 Mid-Side Microphone Capsule
SGH-6 Shotgun Microphone Capsule $150
SSH-6 Stereo Shotgun Microphone Capsule $110

Recording media		16MB–2GB SD cards, 4GB–32GB SDHC cards	
Inputs	L/R inputs	**XY mic (XYH-5)**	
		Mic type	Directional
		Sensitivity	–45 dB, 1 kHz at 1 Pa
		Input gain	–∞ to 52 dB
		Maximum sound pressure input	140 dBSPL
		MIC/LINE IN stereo mini jack	Input gain: –∞ to 52 dB
			Input impedance: 2 kΩ or more
			Plug-in power supported
		Backup input	Set L/R input gain –12 dB
	1/2 INPUTS	Connectors	XLR/TRS combo jacks (XLR: 2 hot, TRS: TIP hot)
		Input gain (PAD OFF)	–∞ to 55 dB
		Input gain (PAD ON)	–∞ to 35 dB
		Input impedance	1.8 kΩ or more
		Maximum allowable input level	+22 dBu (PAD ON)
		Phantom power	+12/+24/+48 V (can be turned ON/OFF independently for INPUTS 1/2)
		Equivalent input noise (EIN)	–120 dBu or less
Outputs	Output jacks	LINE OUT stereo mini jack (rated output level –10 dBm when output load impedance is 10 kΩ or more)	
		PHONE OUT stereo mini jack (20 mW + 20 mW into 32Ω load)	
	Built-in speaker	400mW/8Ω mono speaker	
Recording formats		**STEREO FILE mode**	
		Supported WAV formats:	44.1/48/96kHz, 16/24-bit, stereo, BWF format supported
		Supported MP3 formats:	48–320 kbps, 44.1kHz sampling frequency
		Maximum simultaneous recording tracks	4 tracks (L/R + backup recording)
		MULTI FILE mode	
		Supported formats:	44.1/48kHz, 16/24-bit, mono/stereo, BWF format supported
		Maximum simultaneous recording tracks	6tracks (L/R + 1/2 +backup recording)
Display		LCD (128 x 64) with backlight	

USB	**Mass storage class operation**
	Class: USB 2.0 High Speed
	Audio interface operation: MULTI TRACK mode (Note: Use with Windows requires a driver, but Mac OS does not)
	Class: USB 2.0 High Speed
	Specifications: 4 in/2 out, 44.1/48kHz sampling rate, 16/24-bit bit rate
	Audio interface operation: STEREO mode (no driver required)
	Class: USB 2.0 Full Speed
	Specifications: 2 in/2 out, 44.1/48kHz sampling rate, 16-bit bit rate
	Note: Use as an iPad audio interface supported (STEREO mode only)
	Note: USB bus power operation possible
Approximate continuous operation times when recording using battery power (using alkaline batteries)	**STEREO FILE mode** XY mic, 44.1kHz/16-bit (stereo x 1): about 10 hours **MULTI FILE mode** XY mic, Inputs 1 and 2, 48kHz/24-bit (stereo × 2): about 5.2 hours Note: The above times are estimates. Note: Approximate continuous recording times when using battery power were calculated using our own testing method. They may differ greatly depending on operating conditions.
Power	Operates using 2 AA batteries
	AC adapter : DC5V 1A AD-17
	USB bus power
Dimensions	Main unit: 66.8 mm (W) × 135.2 mm (D) × 42.1 mm (H), 176 g
	XYH-5: 65.5 mm (W) × 62.2 mm (D) × 41.0 mm (H) 94 g

The ZOOM F3 Field Recorder:

[Ed note: From all that I have read, specifications to reviews, in addition to my experience with various recorders, THIS recorder is my recommendation, the BEST CHOICE for field recording.]

Forget about clipping, forget about gain, and forget about hassle; just power on the Zoom F3 portable 2-track field recorder and press record to capture clear, distortion-free sound from your external XLR mics in an instant for your next video shoot, interview, or sound design excursion. With two premium mic preamps and 32-bit float technology, the F3 handles the softest and loudest sounds you can throw at it while avoiding distortion, maintaining low-noise performance, and freeing you from the responsibility of adjusting gain. Recordings ruined by clipped converters and poorly set preamps are things of the past.

$289

Automatic Distortion-Free Audio
The F3 utilizes dual A/D converters and 32-bit float recording technology to capture intensely loud signals without clipping the converters and bring in extremely quiet sounds without overwhelming noise, all without requiring any gain adjustment from you. Record with confidence, knowing that you can just connect your microphones and start recording to attain crisp, clear audio.

Dual XLR Mic/Line Inputs
Two balanced mic/line inputs with locking XLR jacks and switchable +48V phantom power make the F3 an ideal match for professional microphones such as handheld dynamics and shotgun condensers as well as line-level feeds from a dedicated field mixer.

EIN	-128
Bit Depth	32
Inputs	2 XLR (24/48V)

Specifications

Input and output channels	Inputs	MIC/LINE (mono)	2
	Outputs	LINE OUT	1
		PHONE OUT	1
Inputs	MIC/LINE (mono)	Connectors	2 XLR (2: HOT)
		Input gain	Adjustment unnecessary (dual AD converter circuits used)
		Input impedance	MIC: 3 kΩ or more LINE: 3 kΩ or more
		Maximum input level	MIC: +4 dBu LINE: +24 dBu
		Phantom power	+24/48 V Combined channel total of 10 mA or less
		Equivalent input noise	−127 dBu or less (IHF-A) when waveform magnification is ×1024 with 150 Ω input
Outputs	LINE OUT	Connector	1 stereo mini jack
		Maximum output level	+1 dBu
		Output impedance	100 Ω or less
	PHONE OUT	Connector	1 stereo mini jack
		Maximum output level	50 mW + 50 mW (into 32 Ω load)
		Output impedance	15 Ω or less
Recorder		Maximum simultaneous recording tracks	2
		Maximum simultaneous playback tracks	2
		Recording format	WAV 44.1/48/ 88.2/96/192 kHz, 32-bit float mono/stereo BWF and iXML formats supported
		Recording media	4 – 32 GB cards compatible with the microSDHC specification 64 GB – 1 TB cards compatible with the microSDXC specification
Display			LCD with backlight (96×64 resolution)

USB	Connector		USB Type-C • Use a USB cable that supports data transfer. USB bus power is supported.
	Audio interface operation		USB2.0 High Speed 44.1/48/88.2/96 kHz 24-bit linear/32-bit float • 32-bit float format is supported for firmware version 2.0 or later. 2-in/2-out
	Mass storage operation		USB 2.0 High Speed
REMOTE			Dedicated wireless adapter (ZOOM BTA-1)
Power			2 AA batteries (alkaline, NiMH or lithium) AC adapter (ZOOM AD-17): DC 5 V/1 A • USB bus power is supported.
Estimated continuous operation time using batteries • The values are approximate. • Continuous battery operation times were determined using in-house testing methods. They will vary greatly according to use conditions.		48 kHz/32-bit float, 2ch recording to microSDHC card (without headphones, PHANTOM off, LCD Backlight off)	Alkaline batteries: about 8 hours NiMH batteries (1900 mAh): about 8.5 hours Lithium batteries: about 18 hours
		48 kHz/32-bit float, 2ch recording to microSDHC card (headphones into 32Ω load, PHANTOM at 48 V (5 mA), LCD Backlight off)	Alkaline batteries: about 2 hours NiMH batteries (1900 mAh): about 3 hours Lithium batteries: about 7.5 hours
Power consumption			5 W maximum
Dimensions			75.0 mm (W) × 77.3 mm (D) × 47.8 mm (H)
Weight (including batteries)			242 g

Note: 0 dBu = 0.775 Vrms

EVISTR V508 User Manual *

PART 1

Thank you for purchasing a recorder from EVISTR. Customer satisfaction is our priority. If you have questions or problems, please feel free to contact to us.

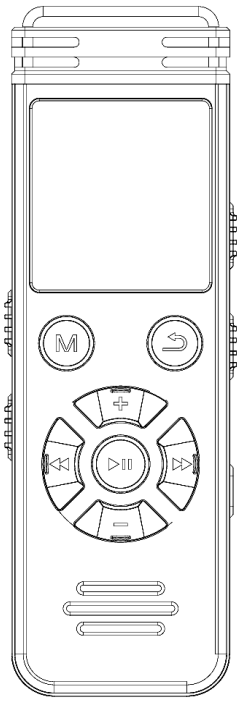
- Our customer support email: support@evistr.com

- Keep this booklet for future reference. The Booklet Compiled by 7 main parts: Package Information, Warranty, Product Sketch, Quick Operation Guide, Basic Operation Guide, Menu Option, Frequently Asked Question

At Quick Operation Guide and Basic Operation Guide, we can learn how to use the devices function in short time

At the Menu Options Parts, we can find all functions for the devices

Notice: The device built-in 16GB, no TF card include. Device can directly use without TF card



Package Information

- ✔ 1 x V508 Device
- ✔ 1 x USB Cable (for charging and data transfer)
- ✔ 1 x Earphone

* [Ed. Note: I include this document because I still use the recorder while on travel. It is small and easily transportable. It captures 1536 bps sound quality with internal memory (expandable) and Li-ion rechargeable battery. It can record .wav files at maximum sampling for up to 12 hours on a single charge. It does a fine job for hand-held recording while walking.]

Technical Parameter

Product Dimension	4.3 X 1.3 X 0.55inch (110 x 32 x 14mm)
Product Weight	73g (2.57z)
Screen Size	1.4inch, 128 x 64 LCD
USB Socket	USB 2.0 High Speed (Charging and Data Transfer)
Charging	Input < 1A 5V
Record Bit Rate	1536kpbs, 1024kpbs, 512kpbs, 128kpbs, 64kpbs, 32kpbs
Support System	Windows98 and later version, XP, Windows 7 /8 /10
Earphone Output	Max 10mW+ (30Ohm), Freq 20Hz - 20KHz, S/N ratio > 90db, Distortion factor 0.05%
Memory	8G / 16G / 32G (Subject to the device)
Battery	3.7V 550mAH Lion Polymer
Music Playback Battery Time	12 hours (single full charged with earbud, screensaver)
Max Recording Battery Time	Full charged, recording at 32kpbs could work 15 hours
Support Music Format	MP3 / WAV / FLAC / APE / OGG / WMA

EIN, Self Noise, and Sensitivity of the microphones not provided.

Microphone Specification Table

Microphone	Length in	Price ($)	Sensitivity (mV/Pa)	Sensitivity (dB)	Self Noise (dB)	SNR 94dB ref	Max SPL (dB)
Wildtronics Pro Mono		**$790**	**630**	**-4**	**-8**	102	100
Sennheiser MKH 8070	18.3	$1,699	112	-19	8	94	124
Rode NTG-8	**22.0**	**$999**	**97.5**	**-20**	**8**	**81**	**124**
Sanken CS-3e	10.6	$1,450	100	-20	15		120
Rode NTG-5	**8.0**	**$499**	**67**	**-23.5**	**10**	**84**	**130**
Wildtronics Micro PIP		**$260**	**63**	**-24**	**14**	**80**	**110**
Rycote HC-35	13.8	$499	55	-25.2	7.5	87	133
Lewitt LCT 540 Subzero		**$699**	**41**	**-28**	**4**	**90**	**136**
Azden SGM-3500L	9.7	$549	40	-28	12	82	130
Sony ECM678/9X	9.8	$559	40	-28	16	78	127
Rode NT1 Original		NA	**35**	**-29**	**4.5**	**89.5**	**132**
Rode TF-5 pair		$1,499	35	**-29**	14	80	135
Blue Blackout Spark SL		$185	35	-29	16	78	136
Rode NTG-3	10.0	$699	32	-30	13	81	130
Audio Technica AT875R	6.9	$129	32	-30	20	74	127
Neumann U 87		$3,600	28	-31	12	82	127
Schoeps SuperCMIT		$4,291	28	-31	13		125
AKG Pro P420		$175	28	-31	15	79	155
AKG P420 Omnidirectional		$199	28	-31.1	15	79	135
Lewitt LCT 440		**$270**	**27.4**	**-31.2**	**7**	**87**	**140**
Rode NT1 Signature / 5th		**$159**	**25**	**-32**	**4**	**90**	**142**
Rode NT1 A/5th Gen		$250	25	-32	4	90	142
sE Electronics sE2300		$399	25	-32	9	85	125
Sennheiser MK 4		$300	25	-32	10	84	140
DPA 2017	7.2	$995	25	-32	10	84	140
AT 4040		$250	25	-32	12	82	155
Deity S-Mic 2	9.8	$359	25	-32	12	82	130
Sennheiser MKH 416	9.8	$999	25	-32	13	81	130
sE Electronics T2		$499	25	-32	13	81	137
Sennheiser MKH 418-S	11.0	$1,699	25	-32	14	80	130
Rode NTG-4+	10.9	$249	25	-32	16	78	135
Sony ECM-680S	9.8	$1,092	25	-32	18	76	124
Aston Spirit		$449	23.7	-32.5	14	80	138
Aston Spirit multi pattern		$379	23.7	-32.5			138
AKG Pro C414		$1,110	23	-33	6	88	158
Neumann TLM 103		$1,195	23	-33	7	87	138
Lewitt LCT 940		$1,700	23	-33	8	86	143
Neumann KMR 82	15.6	$1,995	21	-33	12	82	128
Marantz Audio Scope SG-17P	21.3	$299	22.4	-33	18	76	130
Sure VP89L	19.2	$1,154	21	-33.5	15		132
AKG Pro C214		$335	20	-34	13	81	156
AT4022		$349	20	-34	13	81	146
Sennheiser MKH8040		$1,399	20	-34	13	81	142
Rode Broadcaster		$419	20	-34	14	80	128
Sennheiser MKE 600	10.1	$330	21	-34	15	79	132
AKG P220		$145	20	-34	16	78	155

…Plus so many more, but these are the highest sensitivity I could find.

Wildtronics, LLC
Professional Parabolic Microphone

[Ed. note: This is my principal field microphone since receiving it in May, 2024. I record with it 2 to 3 hours a day, up to 5 or 6 days a week. It is rugged, extremely sensitive and highly directional. Because of its sensitivity it still picks up a lot of side sounds, but when someone chirps in the "sweet zone" its fantastic.]

The Wildtronics Parabolic Microphone is engineered to the be the most advanced and best performing parabolic microphone on the market. The microphone was developed by Bruce Rutkoski, who has professionally recorded nature sounds for over a dozen years, originated new recording techniques, and has designed many specialized recording devices. This microphone offers the professional a vastly improved parabolic microphone, with multiple connectivity without special cables, an integral tripod mount, accessory mounting provisions, and costs a fraction of competing microphones. The new, original design combines multiple techniques to increase audio gain, broaden the frequency response, reduce mic self-noise, improve isolation of the subject, and minimize handling noise. Use this parabolic microphone for sound reinforcement on football and baseball fields, recording birds and nature sounds, wildlife research, law enforcement, paranormal investigation, or anytime sounds need to amplified and isolated beyond the performance of other microphones.

The large, 22-inch, parabolic dish is optimally sized to balance portability and low frequency response. The dish is clear so you may accurately sight your target. Parabolic curves can be calculated to select the depth and focal point. The Wildtronics' parabolic shape was optimized for a focal point to match the microphone's polar response, shield undesired sound pickup, and offer a compact package. The paraboloid was then accurately CNC machined to create a master mold. This accuracy is necessary for precision focus at higher frequencies. The

microphone assembly is easily removed and reinstalled without altering it's precisely located, factory set focal point. The molded plastic dish is 0.080-inch thick for best all around durability, critical shape retention, and some bending to fit into larger airline luggage.

Integral booster discs are designed into the microphone assembly to increase the audio gain, boost low frequency response to that of a 30-inch parabolic dish, and help isolate the sound pickup to only the focused target and avoid other stray sounds. This amazing booster disc technology further sets the Wildtronics Parabolic Microphone apart from all others.

Not just one, but an array of low noise microphone elements are used at the focal point of the parabola. Array technology not only increases the audio gain, but reduces self noise to that of the lowest noise microphones on the market. Combined with the parabolic dish and booster discs, the signal to noise ratio is far higher than any other microphone. A military grade foam windscreen is built-in.

$790

Widltronics Pro Mono Specifications:

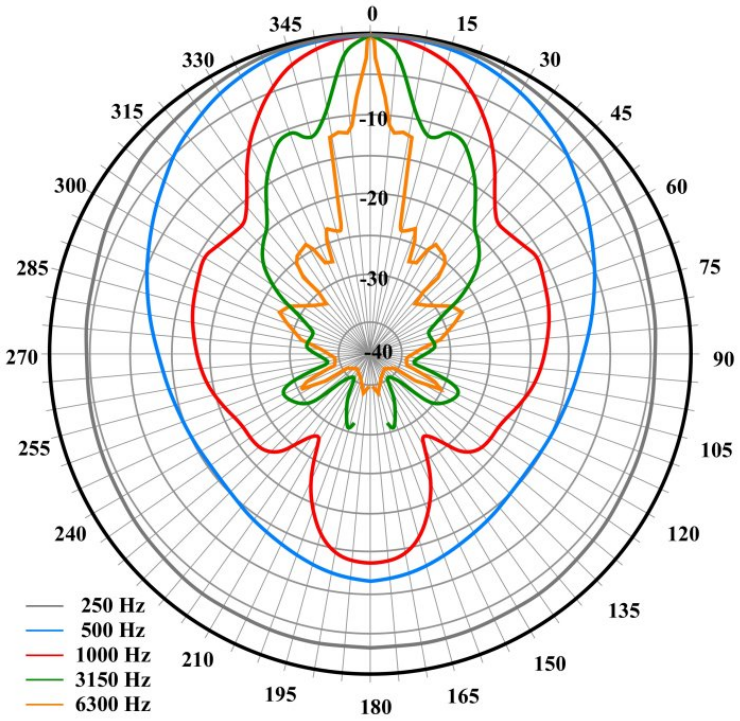
Sensitivity
Mono XLR: -4dB (630mV) / Pascal @1kHz
Mono XLR: +6dB (2V) / Pascal @3kHz
Mono XLR: +14dB (5V) / Pascal ®10kHz

[Cabling the microphone with 3.5mm connectors will reduce the sensitivity by 6dB at all frequencies.]

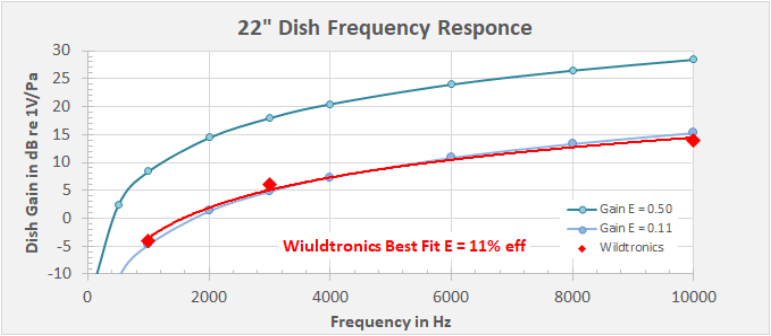
Max input sound level
Mono: +100dB @ 1kHz
Mono: +90dB @ 3kHz
Mono: +80dB @ 10kHz

Equivalent Self-noise
Mono: -8dBA @ IkHz
Mono: -18dBA ® 3kHz
Mono: -26dBA @ 10kHz

S/N Ratio
Mono: 102dB @ 1kHz



The following Frequency Responce chart was cobbled together with Wildtronics Sensitivity values overlain on the Dish Gain Equation. The three sensitivity values allowed me to calculate a relationship of gain vs frequency defined thus: Wildtronics Dish Gain = 7.7986ln(frequency Hz) - 57.379. This relation most closely matches the Gain Equation for a 22 inch dish with 11% efficiency.



Gain dB = 20LOG(3.25DE/W) Where: D = diameter inches
W = wavelength inches
E = efficiency (0 to 1)

Does this actually mean the 22” dish has only 11% efficiency? NOT necessarily so. The Pro Mono Sensitivity is the Sensitivity of the Array microphone boosted by the 22” dish with a 6" boundary booster disk. The three components we need to know for the system sensitivity are: 1) dish gain, 2) booster gain, and 3) array microphone sensitivity.

We know the system sensitivity is -4 dB. Wildtronics publishes the microphone plus booster sensitivity as 10 dB!! This is incredible as the best condenser mike "out there" (Sennheiser MKH 8070) has -19 dB. I cannot get everything to ADD UP using 10 dB so I must go out on a limb here and ASSUME the actual value is -10 dB. Since the mic plus booster = -10 dB, take away the 6 dB boost and the microphone must have a fantastic but still credible -16 dB sensitivity.

The dish gain equation allows calculating the dish gain but you now need another parameter, dish efficiency. Referring to published literature: "*Practically, the dish efficiency η is in the range of 45% to 70% depending on the material, shape and construction. Here, we have calculated the gain by assuming efficiency as 50%.*" Sawant, O. and Bhowmick, IEEE, Jan 2022. Sounds good to me, lets assume 50% efficiency and start guessing!

A) Total Sensitivity (-4 dB) = Dish 50% gain (8.46 dB) plus booster gain (6 dB) plus Microphone sensitivity (-16 dB) = -1.5 dB. does NOT add up.
B) Total Sensitivity (-4 dB) = Dish 40% gain (6.52 dB) plus booster gain (6 dB) plus Microphone sensitivity (-16 dB) = -3.5 dB. Close enough, so 40% dish efficiency is needed for things to add up. This seems at the low end of published suggestions. Here I must assume that the 6 inch booster plate is blocking a portion of the dish thus lowering the efficiency.

I feel that the system Mr. Rutkoski has designed with integrated dish, booster, and array microphone is as good as any on the market, likely better than most.

RØDE NT1 Sig/5th

The Røde NT1 is a large-diaphragm condenser microphone suitable for a wide range of studio applications.

[Ed. Note: Røde The NT1 is a side-address mic with a cardioid pickup pattern. It is my "secondary" microphone needed to pick up calls from outside the focus zone of the parabolic. It is extremely low noise (4 dBA) and quite sensitive at -32 dB. It is an excellent choice for the price.]

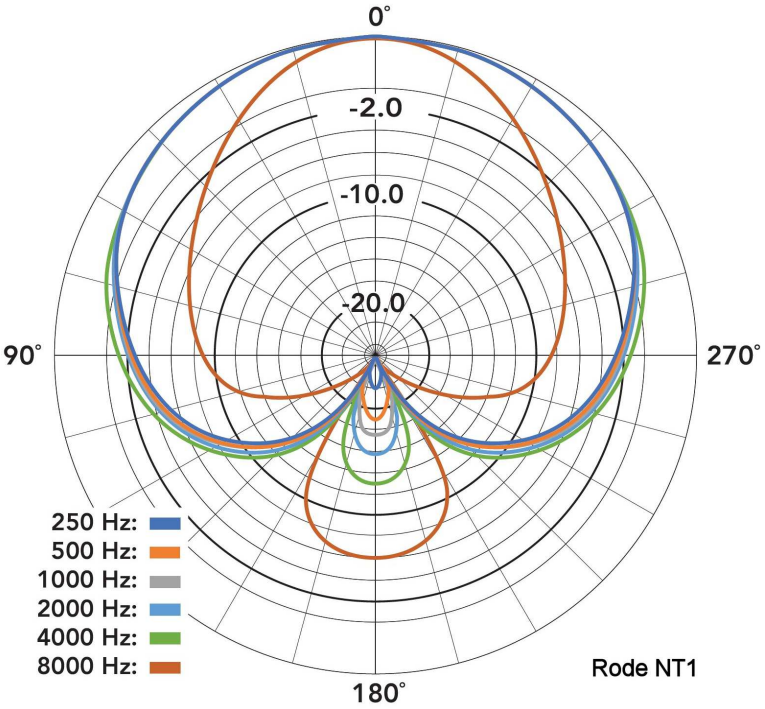
- Large 1" gold-sputtered capsule
- **Exceptionally low noise** (4.5dBA)
- Smooth frequency response (20Hz – 20kHz)
- True condenser operation with **cardioid polar pattern**
- **$159**

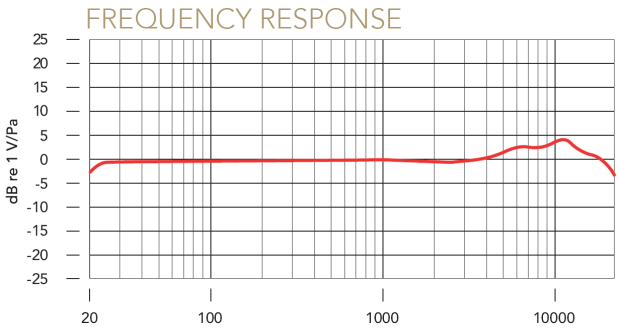
ACOUSTIC & ELECTRICAL SPECIFICATIONS

Acoustic Principle:	Pressure gradient
Active Electronics:	JFET impedance converter with bipolar output buffer
Capsule:	1.00"
Polar Pattern:	Cardioid
Address Type:	Side
Frequency Range:	20Hz - 20kHz
Output Impedance:	100Ω
Maximum SPL:	**142dB SPL**
Maximum Output Level:	8.0mV (@ 1kHz, 1% THD into 1KΩ load)
Sensitivity:	**-32.0dB** re 1 Volt/Pascal (25.00mV @ 94 dB SPL) +/- 2 dB @ 1kHz
Equivalent Noise:	**4 dBA** (A-weighted)
Signal-to-noise ratio:	**90 dBA** (according to IEC651)
Power Requirements:	P24 and P48
Output Connection:	XLR

MECHANICAL SPECIFICATIONS

Weight (grams):	440
Dimensions (millimetres):	H 187 mm, W 50 mmm, D 50 mm
Compatible RØDE Accessories:	SM6, SMR, Stereo Bar, WS2, PSA1+, PSA1





What is the difference between the NT1 Signature and the 5th Generation?
The NT1 5th Generation offers a dual USB and XLR output that allows you to record 32-bit floating point audio, whereas the NT1 Signature Series has a single XLR output and is well-suited to musicians and producers, as well as content creators. The 5th Gen prevents clipping, has a built-in preamp, and has DSP effects. While the Signature Series doesn't include these frills, it sounds identical and is priced more affordably.

Lewitt LCT 540 Subzero

[Ed. Note: Lewitt LCT 540 S is a side-address mic with a cardioid pickup pattern. It has extreme low noise (4 dBA) and extreme high sensitivity at -28 dB. The polar pattern is sufficiently wide to cover an entire hemisphere without notable drop in sensitivity. It is the BEST CHOICE for a general coverage microphone even if pricy.]

1" true condenser studio microphone
Ultra-low noise microphone circuit
Fit for extreme processing
Low-cut filters and attenuation
The ultimate low noise / high sensitivity mic if you wish to afford it!
$699

SPECIFICATIONS

Type	Condenser, externally polarized
Transducer Ø	25.4 mm, 1 in
Diaphragm	3 micron gold sputtered Mylar
Polar pattern	Cardioid
Frequency range	20 ... 20,000 Hz
Sensitivity	**-28 dBV/Pa** , 41 mV/Pa
Self-noise	**4 dB (A)**
Max. SPL for 0.5 % THD	136 dBSPL, 0 dB attenuation
Signal / noise ratio	**90 dB (A)**
Dynamic range	132 dB (A)
Attenuation	0 dB, -6 dB, -12 dB
Low-cut filter	linear, 80 Hz (6 dB/oct), 160 Hz (6 dB/oct)
Internal impedance	68 Ω
Supply voltage	48 V ± 4 V
Current consumption	3.6 mA
Microphone enclosure	Zinc die cast
Connector	Gold-plated 3-pin XLR
Microphone dimensions	158 x 52 x 36 mm, 6.22 x 2.04 x 1.42 in
Microphone net weight	371 g, 13.1 oz

Polar patterns of the LCT 540 S

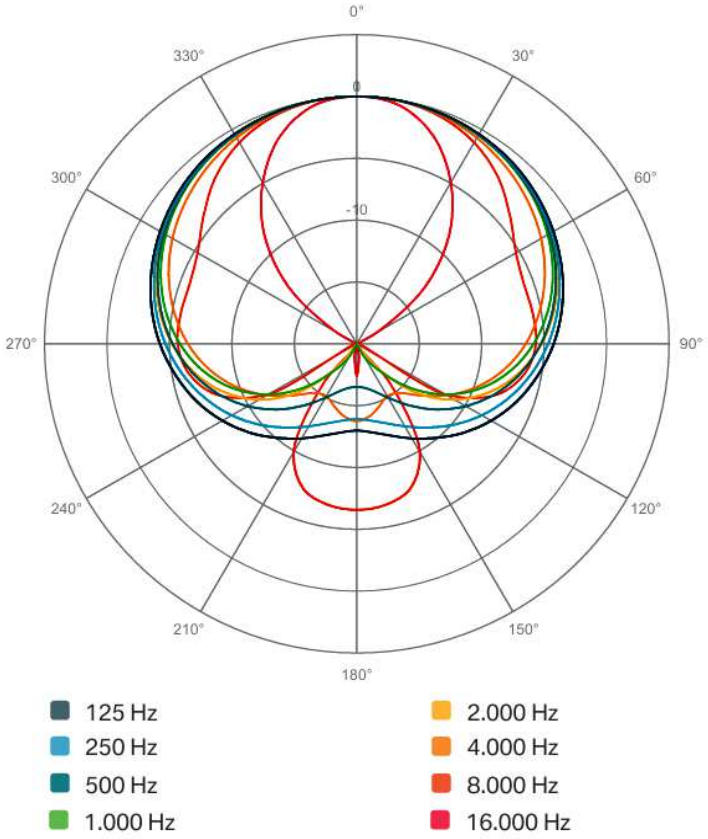
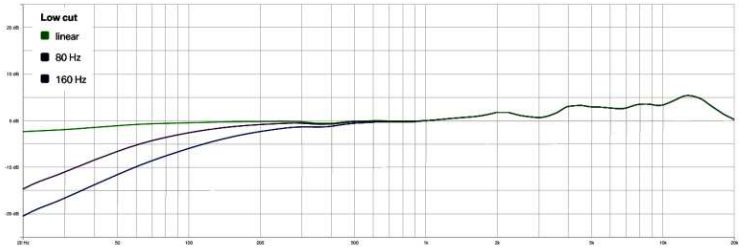


Figure 9.1 - Frequency response of the LCT 540 S



Røde NT1 versus Lewitt LCT 540 S

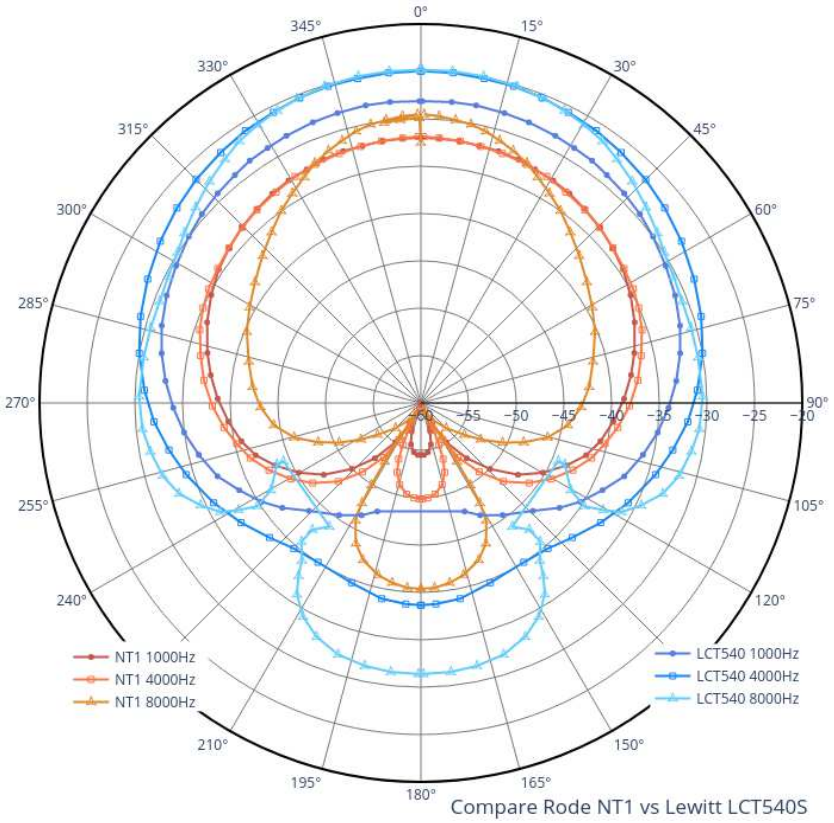
When I look at the microphone spec table for condenser microphones, that are non-shotgun, non-parabolic, the Lewitt LCT 540 S ($699) and the Røde NT1 ($159) stand out with the lowest noise (4 dB) and highest sensitivity, (LCT 540 S -28 dB, NT1 -32 dB). Looking at the prices though, you must wonder if those extra 4 dB are worth $540. Here is where all the additional data and charts are wanted. How do these two microphones really stack up against each other?

To start with, to properly compare the charts you need to take into account that the microphones have different sensitivities (which is why you are doing this in the first place). Also, the sensitivities are not flat at higher frequencies so you need to consult the Frequency Response charts as well.

To fix all these deficiencies I have digitized the charts for 1000 Hz, 4000 Hz, and 8000 Hz. With digital data I have first "normalized" the Røde data to 0 dB at 0 degrees. Then I have added the sensitivity of each microphone at the correct frequencies. (That is, the curves do not start at 0 dB and 0 deg but rather start at the measured sensitivity at 0 deg). NOW I have comparable data at the correct relative magnitudes for the two microphones. Take a look at the 0 degree crossings for the two microphones at 1000 Hz and you will find they correspond to the spec sheet sensitivities (which were measured at 1000 Hz). The higher 0 degree crossings for higher frequencies are due to the frequency response data where sensitivity is higher for higher frequencies. Theory meets practice, this is working.

In order to make this comparison chart I had to massage things somewhat. Just looking at the published polar charts is not very helpful in fact. Røde commits some slight-of-hand by plotting their curves at a +5 dB crossing of the 0 degree axis, most unconventional but readily mitigated. Lewitt commits their slight-of-hand by plotting with a Y-axis scale of just 20 dB, (0 to -20). That cuts off all measured data below -20 dB, which should be considerable. No mitigation here, you just do not get to see it.

On the following plot the Røde curves are in warm colors red/orange and Lewitt curves in cool blues. You should immediately see that at all frequencies and polar directions the Lewitt LCT 540S microphone is more sensitive. Interestingly the NT1 becomes more directional at high frequencies whereas the LCT does not. As the function of the secondary mic in my setup is to catch near-omnidirectional sounds (away from the directional parabolic) the LCT is the superior choice. But is that choice really worth the extra $540 ? Can you honestly hear the difference from a 4 dB boost in sensitivity? For $540 ? For the time being I think the NT1 is the right choice for me. Should I become dissatisfied with it later on I have not sacrificed too much and the LCT ought still to be available.



[For those who may have noticed, I do not consider the Lewitt LCT 440. Compared to the Røde NT1 it has only marginally better sensitivity and has higher self-noise yet still costs more than the NT1. It is off the table.
Note also that the original NT1 had a sensitivity of -29 dB wheras the current NT1 signature / 5th Gen both have a sensitivity of -32. What a pity.]

Directional microphone Comparison and Analysis

When it comes to highly directional microphones the bird recorder has two basic choices, a long shotgun microphone or a parabolic microphone. Each have their respective good points. The long gun is more portable and easier to carry about in the field, easier still when one goes to shorter guns (at the sacrifice of off-axis rejection). Parabolic microphones are quite bulky and are best suited to stationary setups. They become less bulky if one goes for smaller dishes but again at the sacrifice of directionality. Be aware that both parabolic and long gun microphones are high maintenance, very good when you can see the bird singing and wish to record only that.

For directional microphone work I have identified three excellent microphones that seem both very sensitive and very low noise as well as highly directional (See Microphone Specification Table p51). The Wildtronics Pro Mono 22" parabolic dish, and the Røde NTG8 (22 in) and Røde NTG5 (8 in).

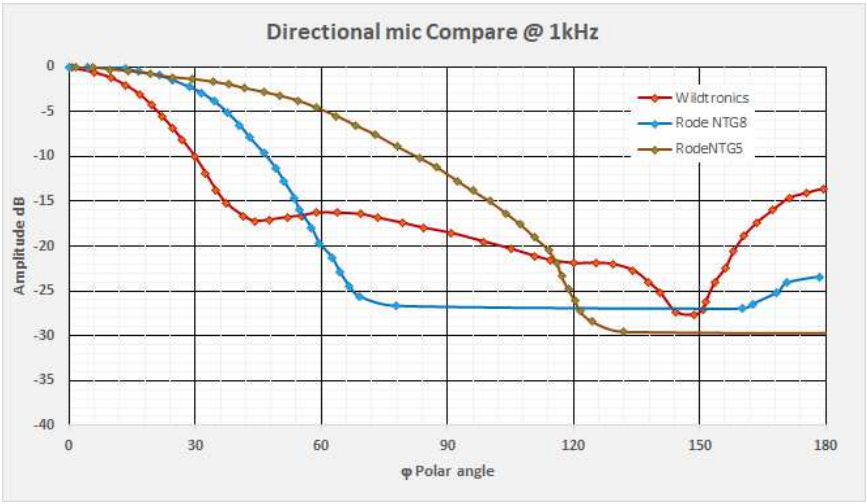
Mic	Sensitivity	EIN	SNR	(all in dB)
Wildtronics	- 4	-8	103	
Røde NTG8	-20	8	81	
Røde NTG5	-23.5	10	84	

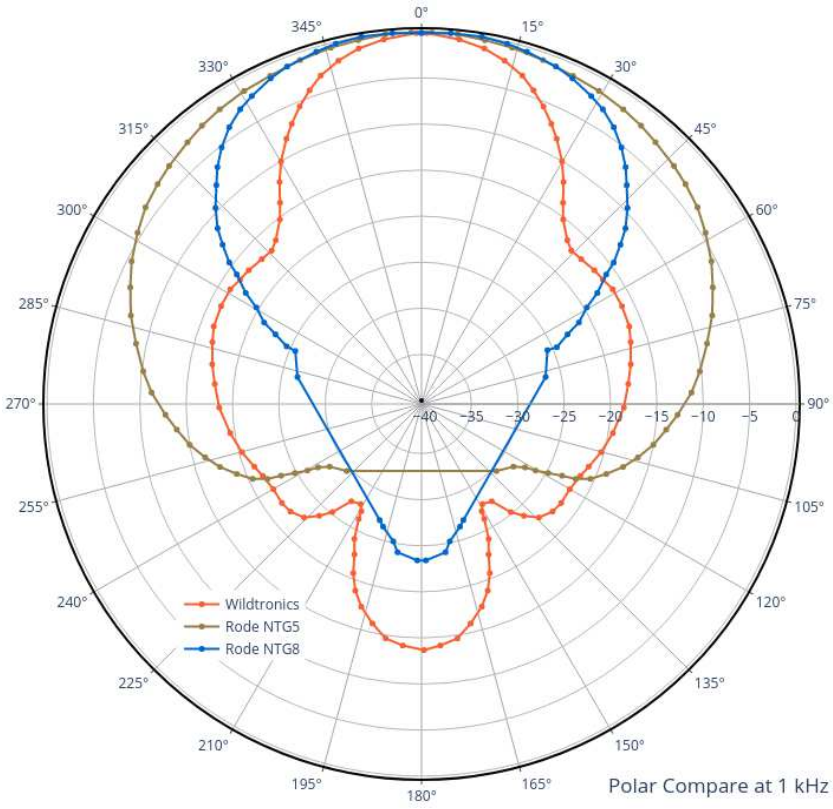
I try to look at and compare the polar plots of the three mics but find it difficult as Wildtronics and Røde have chosen different dB scales. Where Wildtronics places the origin at -40dB and maximum gain at 0dB, Røde places the origin at -25dB with maximum gains of +2 to +5dB depending on the mic. I made graphic for the Wildtronics for 1kHz and traced the Røde mic plots simply scaled so all max at 0dB, at least you can compare the plot shape this way.

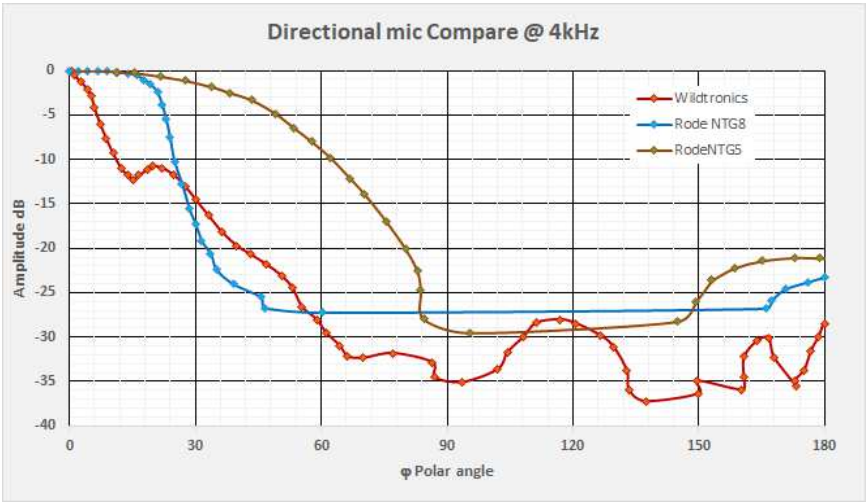
To do this I digitized the data and first plotted it on cartesian coordinates. This way I can review the actual data. I again scaled the amplitudes such that all three max at 0dB at 0 degrees (center axis). Eventually I learned how to plot the data on polar coordinate charts which are tricky.

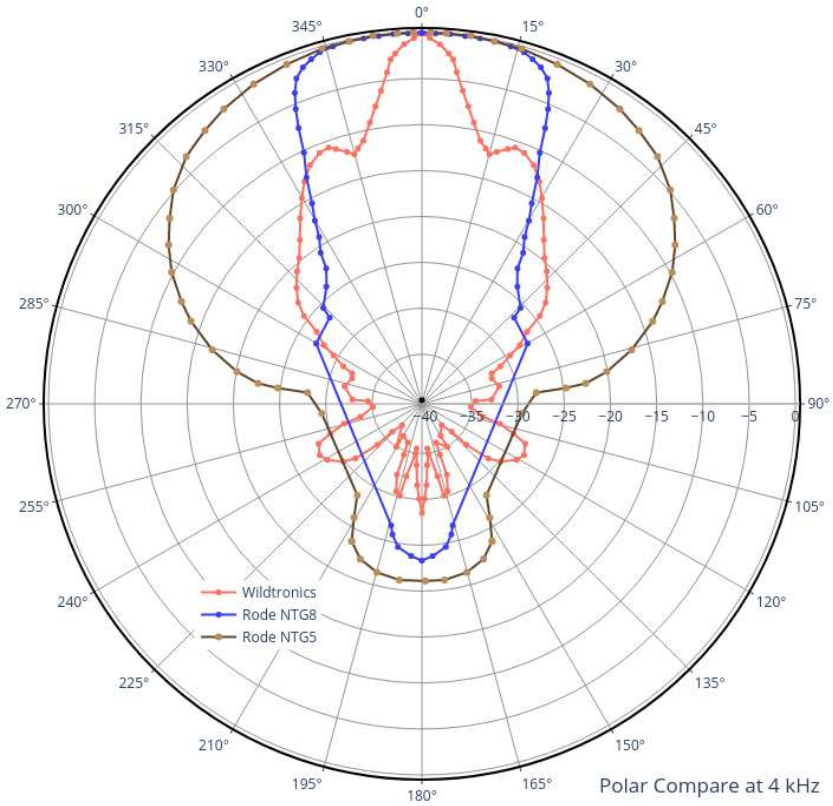
From the following chart comparisons I must seriously question the directionality for the Røde NTG5, better than a simple cardioid, but by how much? The Røde NT1 is a side-address cardioid that is more sensitive and has lower self noise and should be easier to carry about in the field, but is not really directional.

The Wildtronics comes out as a clear winner in terms of directionality, sensitivity, and self noise. It is also less expensive than the NTG8.


Directional mic Compare @ 1kHz
Amplitude dB
0
-5
-10
-15
-20
-25
-30
-35
-40
0
30
60
90
120
150
180
φ Polar angle
Wildtronics
Rode NTG8
RodeNTG5


0°
15°
30°
45°
60°
75°
90°
105°
120°
135°
150°
165°
180°
195°
210°
225°
240°
255°
270°
285°
300°
315°
330°
345°
-40
-35
-30
-25
-20
-15
-10
-5
0
Wildtronics
Rode NTG5
Rode NTG8
Polar Compare at 1 kHz


Directional mic Compare @ 4kHz
Wildtronics
Rode NTG8
RodeNTG5
Amplitude dB
0
-5
-10
-15
-20
-25
-30
-35
-40
0
30
60
90
120
150
180
φ Polar angle


0°
15°
30°
45°
60°
75°
90°
105°
120°
135°
150°
165°
180°
195°
210°
225°
240°
255°
270°
285°
300°
315°
330°
345°
-40
-35
-30
-25
-20
-15
-10
-5
0
Wildtronics
Rode NTG8
Rode NTG5
Polar Compare at 4 kHz

For the previous plots comparing the Wildtronics Pro Mono with Røde NTG5 and NTG8 I have had to manage things digitally as the Røde polar plots contain much deceptive mischief. If you look at the published Røde polars, you should note some oddities. First for the NTG8 they include data for three frequencies only, and none below 500 hZ. This gives the impression of near total side and rear sound rejection. Secondly, both plots at zero azimuth have the curves in positive values instead of a standard maximum of 0 dB. This gives the false impression of forward gain which is most certainly NOT the case. Finally, the Røde plots have an origin of -25 dB, (slightly more given the positive forward). This chops out all measured data below that amplitude, especially on the sides and rear and so further giving the false impression of near total rejection of side/rear sound.

To mitigate these slights of hand I had to digitize the data in order to manipulate it for a standard presentation comparable with the honest Wildtronics presentation. In order to digitize the curves I utilized "PlotDigitizer" (plotdigitizer.com/app). It is a very nice app that allows digitizing values from various types of charts, I highly recommend it! With the data in digital format, it was straightforward to shift the Røde data back to 0 dB forward. Plotting polar data is another thing. I eventually found "Plotly" (chart-studio.plotly.com/create/) that does an excellent job.

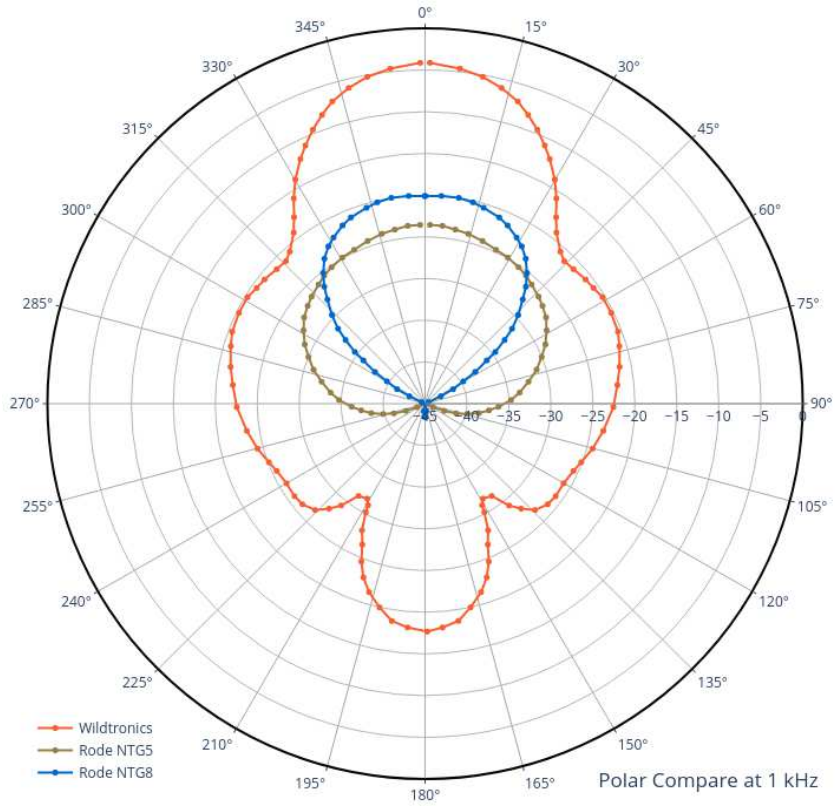
The plots I show (for 1 kHz and 4 kHz) include a standard X/Y chart and one polar chart. Note that the Wildtronics data is for 3150 Hz so it is quite pessimistic withy respect to the Røde data. [Note: in the next post I suggest that the Wildtronics at 4000 Hz will look much the same as the Telinga at 4000 Hz. If so then the Wildtronics is significantly more directional than the NTG8]. For all data plotted I have scaled the origin to -40 dB and the Røde data to 0 dB forward. These charts give a direct comparison of the three microphones considered, Wildtronics Pro Mono, Røde NTG8 and Røde NTG5. With the X/Y charts it becomes obvious where Røde cuts off the data, their curves "flatline". There is almost certainly missing data that was removed with this technique. Its less obvious on the polar charts but noticeable once you know what to look for. Røde has wiped out all the smaller side lobes.

Finally, it is apparent that the NTG5 looks fairly Cardioid rather than highly directional. The Wildtronics and NTG8 appear fairly similar overall. One thing to note though, unlike the long Røde NTG8, the Wildtronics 22" dish DOES give noise-free gain. From the gain equation (G = 20Log(3.25DE/W) where G = dish gain dB, D = Diameter in inches, W = wavelength in inches, and E = Efficiency from 0 to l). Efficient dish gain is: @ 1000 Hz = 14 dB dish gain, and @ 4000 Hz = 27 dB dish gain. As you will see, the dish is NOT 100% efficient.

Lets therefore take another look at the 1 kHz comparison plot between the Wildtronics 22” dish, the Røde NTG5 and NTG8. This time I have made an

important modification to the polar chart data. The normal polar presentation starts with 0 dB at the 0 degree central axis. Then all points around the plot represent decreased sensitivity in the off-axis directions. BUT, not all microphones have the same sensitivity at the 0 degree location. The reported sensitivity in the spec sheets is just this, the sensitivity at 0 degrees.

For this plot then, I added the spec sensitivity to the data, shifting the curves to their true relative positions. Thus you can see that each curve intersects the 0 degree line at its respective sensitivity and things go downhill as you get increasingly off-axis. Visually the Wildtronics dish ballons out somewhat although I tried to compensate by plotting the chart origin at -45 dB.

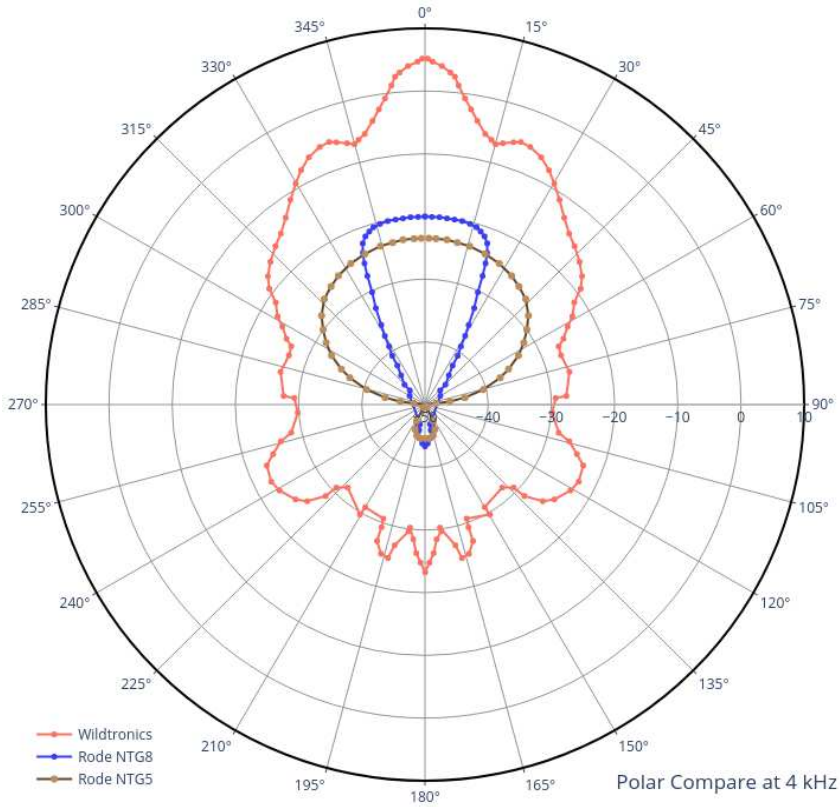


Here I assume the data was taken with microphone array and dish combined. This should thus reflect the dish gain at the three frequencies reported. The reported sensitivity values when plotted on the dish gain chart (see p 85) are well below that predicted for a perfectly efficient dish. My best match for the data to theory is with a dish efficiency of just 11%.
Wildtronics sensitivity: -4 dB @ 1kHz, +6 dB @ 3k Hz, +14 dB @ 10kHz

Gain equation @ E = 0.11 -4.7 dB, +4.85 dB, and +15.3 dB

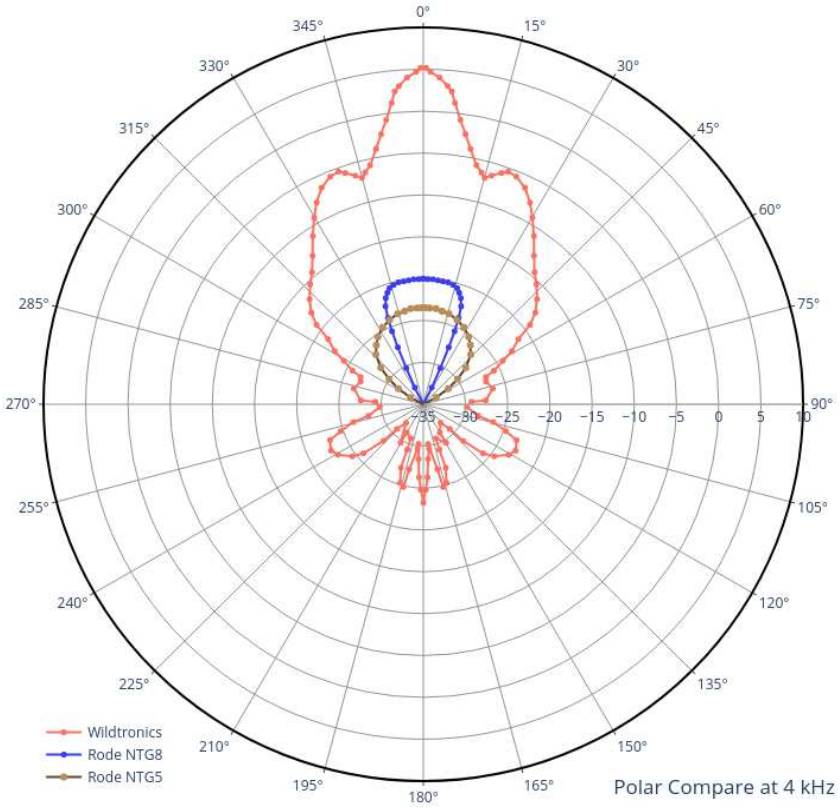
OK, to finish the comparison I did the same slight of hand to the comparison at 4 kHz. Here the dish gain overwhelms the two Røde microphones. Its all about the dish! For the Wildtronics I used a sensitivity of +5.27 dB from the Gain equation at 3.15 kHz and an efficiency of 11%. It would be 7.35 dB 4 kHz. The two Røde microphones retain their same sensitivity as they have a flat response with no forward dish gain.

Interpreting polar chart may not be for the faint of heart. I make two presentations with the EXACT same data but with different scales to demonstrate. Below is the plot scaled for all the data, +10 to -50 dB. The Wildtronics data for 3150 Hz now appears rather distorted, but this is not the case.



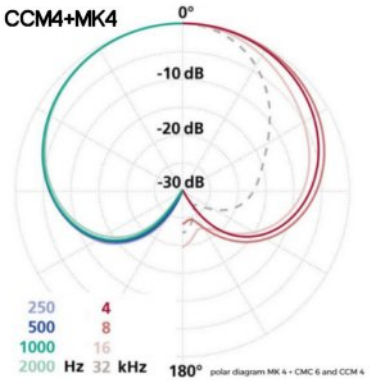
Even though the Wildtronics curve “looks” puffed out and distorted, it is unchanged and should be interpreted the same way as before. To prove the point, I plotted the data (below) with the scale at +10 to -35 dB so that it is clear the Wildtronics curve has the same “look” as in the original published report. It should be more straightforward to interpret and compare the off-axis rejection now.

Of course in plotting the true sensitivities with this scale, the Røde curves look itty bitty and some of their data has been lost in the singularity at the center of the chart. Which microphone do you want to own?



Wildtronics Pro Mono versus Telinga w/Schoeps CCM 4

Schoeps CCM4 LG



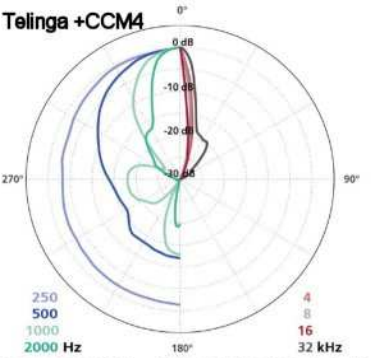
The Schoeps CCM4 is a small diaphragm cardioid microphone featuring a detachable cable and designed for use on singing and speaking voices as well as a wide variety of instruments.
At -37.7 dB it most clearly was never intended for low-volume ambient and bird recording!

Sensitivity: 13 mV/Pa or -37.7 dB
Self Noise: 15 dB

$1858

The image above is the polar plot for the Schoeps CCM 4 + MK 4 microphone. Clearly a cardioid pickup pattern, it becomes transformed to that below when facing a 22" Telinga dish.

Telinga Modular



POLAR DIAGRAM with. cardioid SCHOEPS CCM 4 facing the dish.

Telinga Modular a 22" foldable professional parabolic dish set offering your microphones to be used in mono or PZM stereo configurations.

Please note: the Telinga Modular does not include microphone or cable/connectors. It is designed for professionals wishing to use a favorite configuration of own mics in the parabolic dish.

$1099

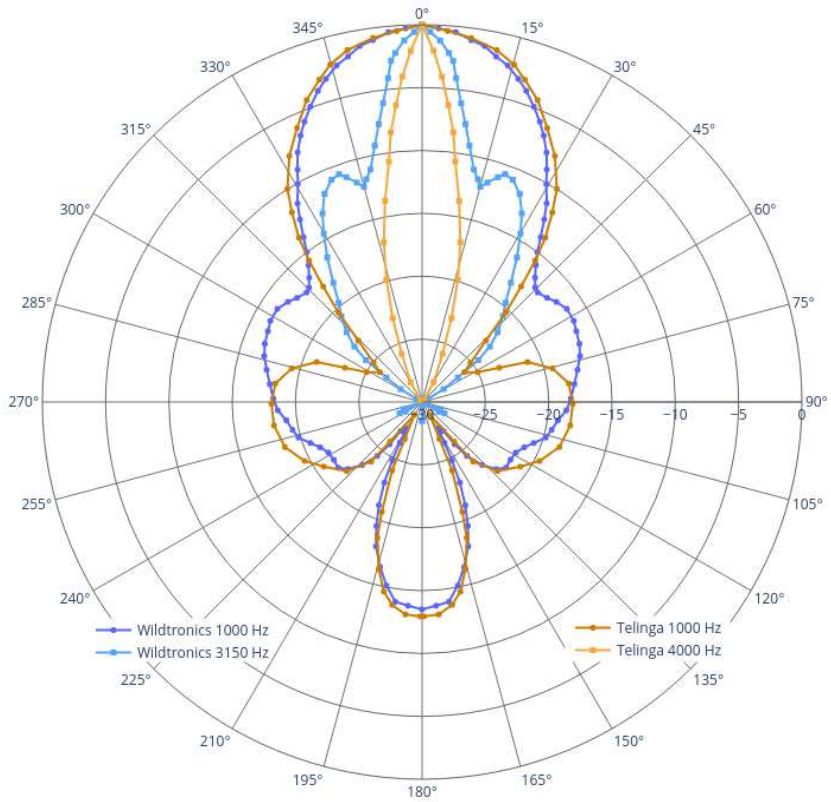
The image above is a polar plot of the Telinga 22" coupled with the Schoeps CCM 4 + MK 4 capsule. It is included in the User Manual of the Telinga Modular microphone. I digitized this plot in order to compare it to the Wildtronics.

The Telinga Modular 22” parabolic dish microphone is a principal competitor / alternative to Wildtronics, therefor I think it best to do a bit of comparison. This

is rather difficult as the Telinga is a modular design with a Choose-Your-Own-Microphone concept. As the polar response may be as much microphone specific as it is dish specific, it is non-unique. Still, the Telinga Modular manual does publish a polar response chart for the dish coupled with a Schoeps CCM 4 microphone facing the dish. A setup that will put you back some $2957, (B&H kindly offers you the combo at a cool $3308) a lot of coin!

The following polar chart compares the Wildtronics Pro Mono to the Telinga Modular. I retain the standard zero dB at zero degree polar. While Wildtronics does give data to allow me to calculate the absolute sensitivity vs polar angle, this was not available for the Telings/Schoeps configuration. (as they published a polar plot, the actual sensitivity ought to be somewhere unpublished).

Note also that the Schoeps CCM 4 sensitivity is not that great at -37.7 dB. It does not even make it onto my microphone spec list. (The Røde NT1 S has -32 dB and the Lewitt LCT 540 S has -28 dB). I presume it was chosen because it is an end-address mic suitable for use with the Telinga dish.



Wildtronics Pro Mono versus Telinga Modular w/Schoeps CCM4

On the above plot I give the curves for 1000 Hz on both dishes, and the Wildtronics at 3150 Hz and the Telinga at 4000 Hz. The two curves at 1000 Hz are pretty much identical in the forward high-gain portion. The difference between 3150 Hz and 4000 Hz is significant (21%) which should explain the somewhat wider field on the Wildtronics curve. I strongly suspect that the two dishes at 4000 Hz would also be nearly the same, and so on up the frequency scale.

It is a pity that so little technical data is available for the Telinga Modular. No frequency response and no dish gain curves are published. Given the very close similarity of the curves above I imagine the two dishes are the same in other aspects as well, ie: gain and efficiency.

Can we ever hope to even guess the relative sensitivities of the two dishes?. Quite possibly. Total system sensitivity is the sensitivity of the microphone boosted by the gain of the dish (times some efficiency factor). Note that everything after this is based on numbers at 1000 Hz.

Telinga/Schoeps:
For the Telinga/Schoeps setop we know the microphone sensitivity and dish gain equation. We need only guess on the Telinga dish efficiency. IEEE provides for us a range of efficiency between 40 and 70% and suggests 50% as a starting place. Sounds good to me, lets assume 50% efficiency and start guessing!

A) Total Sensitivity = Dish 50% gain (8.46 dB) plus Microphone sensitivity (-37.7 dB) = -29.3 dB.
B) Total Sensitivity = Dish 65% gain (10.7 dB) plus Microphone sensitivity (-37.7 dB) = -27.0 dB. (about as generous as I can imagine)

If the Schoeps microphone really has only -37.7 dB sensitivity then the Telinga/Schoeps combo is going to suffer significantly. Use the -23.5 dB capsule off a Rode NTG5 and you may increase the Telinga sensitivity to -15 dB.

Wildtronics:
For the Wildtronics system we know the answer, the sensitivity is -4 dB. All that follows is just showing off. Wildtronics publishes the microphone plus booster sensitivity as 10 dB!! This is incredible as the best condenser mike "out there" (Sennheiser MKH 8070) has -19 dB. I must go out on a limb here and ASSUME the actual value is -10 dB. Since the mic plus booster = -10 dB, take away the 6 dB boundary boost and the microphone must have a fantastic but still credible -16 dB sensitivity.

Total Sensitivity (-4 dB) = Dish 40% gain (6.52 dB) plus booster gain (6 dB) plus Microphone sensitivity (-16 dB) =~ -4 dB.

I use only 40% efficiency because that makes the numbers add up and I assume the 6" booster disk blocks enough of the dish to lower its efficiency. Its my best educated guess.

My analysis strongly suggests that the Wildtronics setup easily has greater than 20 dB sensitivity than the Telinga/Schoeps setup while retaining the same directionality.

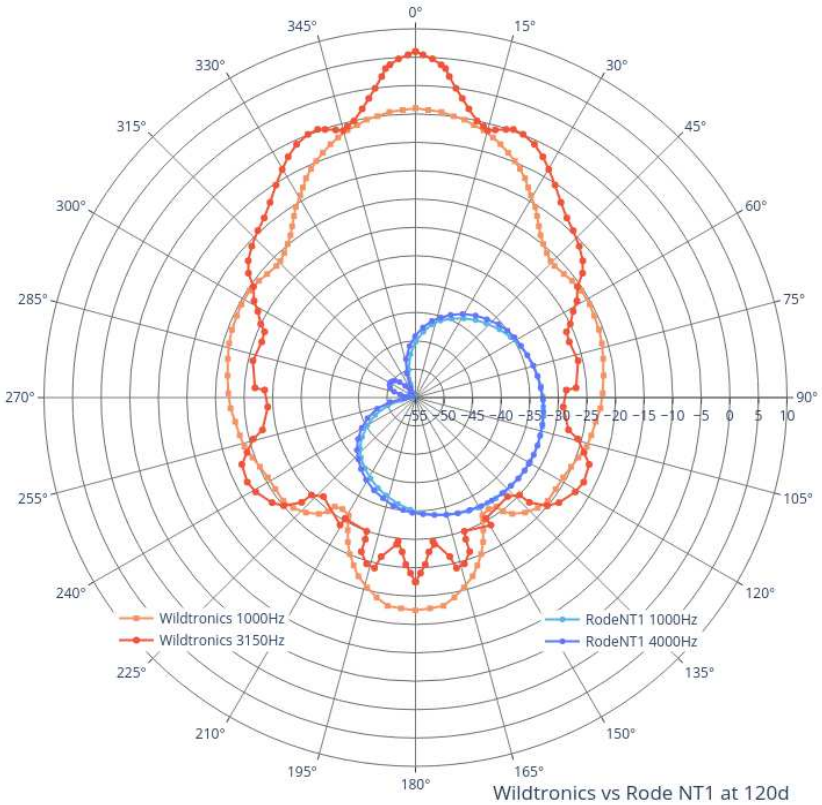
$790 versus $2957, you be the judge.

Wildtronics Pro Mono versus Røde NT1

I have been recording for some time now with a dual-channel Wildtronics / Røde NT1 setup. It was my intention to have the Røde cover the space above, behind, and to the sides of the highly directional dish, zones “rejected”. On my recordings it always seems surprising to me that the "chatter" on the two tracks are pretty much the same. That is, the dish is recording all the same sounds as the NT1 and at similar amplitudes. Yes, sometimes the dish brought in the sound at superb strength and I know I was in good focus (I do not, can not reposition the dish with every chirp I hear). From many articles I have read I had been led to think of directionality as off-axis rejection. That is NOT happening. Now I understand why.

Having constructed polar plots scaled to absolute sensitives when comparing directional microphones, I am struck by the incredible sensitivity of the Wildtronics dish at all polar angles. This should remind the reader that "Directional" in microphones is defined as a ratio between the sensitivity at zero polar angle to that at some large angle, say at 60 or 90 degrees. It is NOT "off axis rejection" although it is often presented as such.

The following plot shows the Wildtronics polar responce for 1000 and 3150 Hz along with the Røde NT1 responce at 1000 and 4000 Hz. All curves are plotted with their correct sensitivities relative to each other. On the chart I have rotated the NT1 120 degrees off the dish zero axis. This reflects my actual setup where the angle between the two microphone zero axes is about 120 degrees. Think of the chart as representing a vertical cut with the NT1 directed up and behind the dish. Note that the Wildtronics data appears “puffed out” due to the scale chosen in this plot. I assure you the data is unchanged and the plot correctly shows the relative amplitudes of the original.

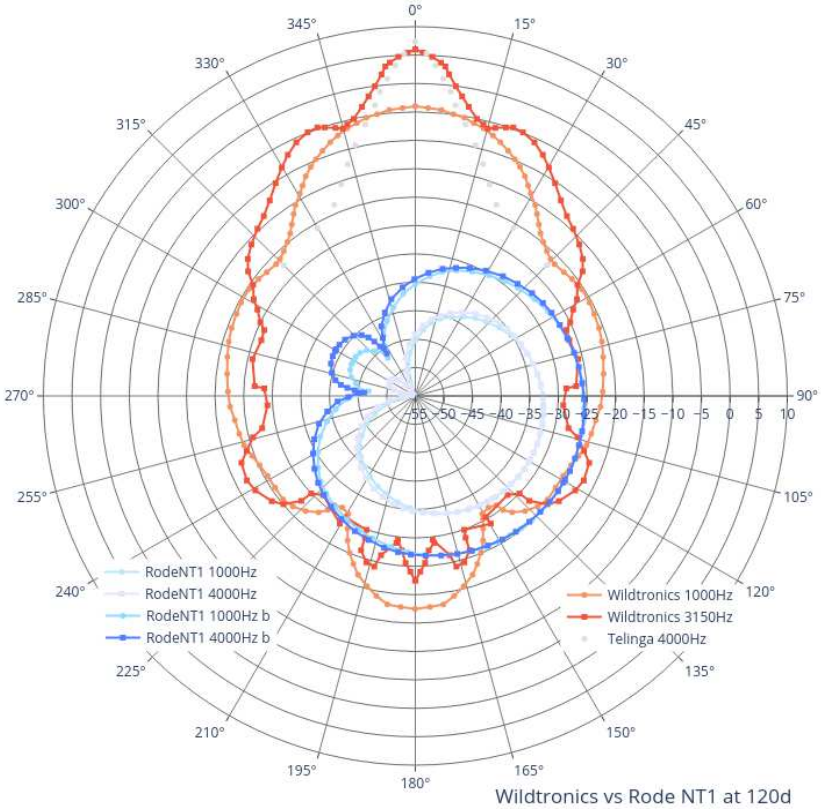


The first and immediate imnpression is just how much lower the Røde NT1 sensitivity (blue curves) is with respect to the dish (red curves) with its "free gain". The Lewitt LCT 540 S would only be four dB better, still well below the dish sensitivity. My angst about missing the off-axis rarities was misplaced!

Or was it? These plots are theoritical and while based on actual measurements, may not be an exact representation of the sensitivity in the field, nor does Wildtronics publish sensitivity measurements at 4000 and 8000 Hz. I do occasionally record higher amplitudes with the NT1, especially from birds flying above and behind my setup, Whistling ducks and Swifts come readily to mind. Note also that thes polar region 60d to 180d is characterized by several side lobes which come and go with frequency.

Finally, leveling must be taken into account. With the H5 I generally level the Wildtronics at 7 while leveling the Røde NT1 at 9. That is a 21% increase in "sensitivity" for the NT1. The following plot is a total fake where I have simply "boosted" the NT1 amplitudes by 21% with respect to the Wildtronics. Here you begin to see the utility of the second microphone in the setup. Additionally,

looking closely I have added points where the Telenga 4000 Hz data plots. It also suggests the need for better coverage in the side and rear position of the big parabola. It is a close call



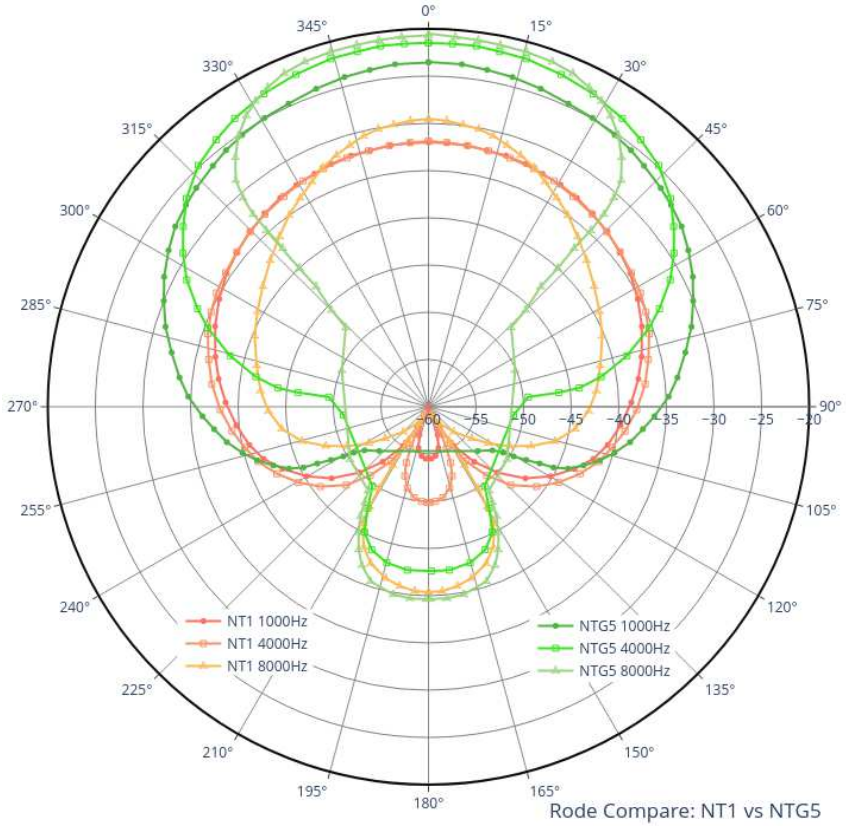
With an otherwise unused second channel available, why not use it? Plunking down $700 for the Lewitt may improve things even more.

Røde NT1 versus NTG5

I mentioned earlier that the NTG5 polar chart appears cardioid. Lets take a closer look.

Mic	Sensitivity	EIN	SNR	(all in dB)
Røde NT1	-32	4	90	
Røde NTG5	-23.5	10	84	

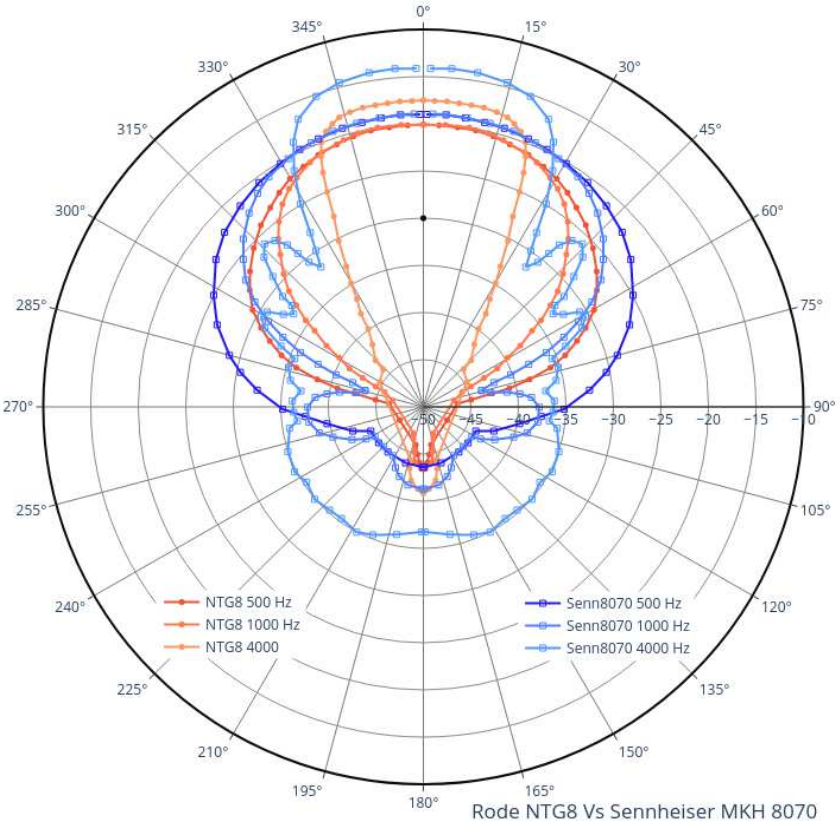
The following polar chart compares the Røde NT1 to the NTG5. Here you see that the NTG5 provides a narrower field of view compared to the NT1 and is significantly more sensitive. How they get a small-diaphragm mic to be more sensitive than a large-diaphragm is a mystery to me, something about a Mr. Tony Faulkner engineering some magic. This should justify the difference in price ($159 vs $499) for field recording while walking, and it comes with a nifty pistol grip. Having the microphone in hand may help you quickly change the aim when desired.



Røde NT8 versus Sennheiser MKH 8070

I have a little bone to pic with a review / recommendation that was presented on the Acoustic Nature website for 2023. Titled "Best Shotgun Mic for Field Recording in 2023" they compare the long shotguns Røde NTG8 with the Sennheiser MKH 8070. They declare the Sennheiser "Best Overall" while giving the Røde NTG8 a lower score of "Best Value". Given the difference in price (NTG8 $999 vs MKH 8070 $1599) I was hoping to understand what the extra $700 was getting you.

Things boil down to two factors: The MKH 8070 is "Slightly more sensitive" than the NTG8 and has "significantly better off-axis rejection". Oh come on! The sensitivity values of -20 dB vs -19 dB are virtually identical. For off-axis rejection the following plot compares the two microphones at 500 Hz, 1000 Hz, and 4000 Hz. It should be very clear that the NTG8 shows superior off-axis rejection at all frequencies.



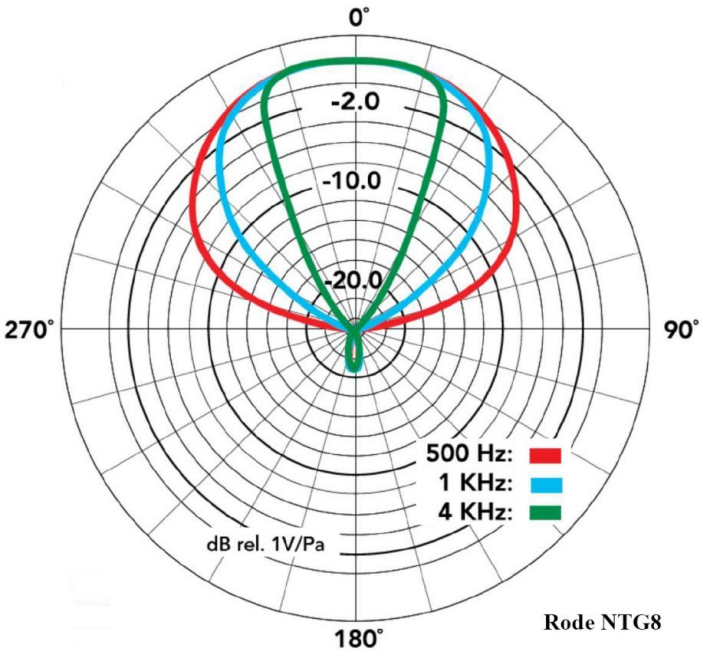
The NTG8 is 22” long and the MKH 8070 is 18”, physics tells you the NTG8 will have a narrower FOV. The Acoustic Nature conclusion is simply false.

Røde NTG8 RF-BIAS LONG SHOTGUN MICROPHONE

ACOUSTIC & ELECTRICAL SPECIFICATIONS

Acoustic Principle:	Line gradient
Active Electronics:	RF Bias
Capsule:	0.50”
Polar Pattern:	Supercardioid
Address Type:	End
Frequency Range:	20Hz - 20kHz
Output Impedance:	25Ω
Maximum SPL:	124dB SPL
Maximum Output Level:	8.2mV (@ 1kHz)
Sensitivity:	**-20.0dB** re 1 Volt/Pascal
Equivalent Noise Level:	**8dBA** (A-weighted)
Power Requirements:	P48
Output Connection:	XLR

$ 999



Røde NTG5 BROADCAST SHOTGUN MICROPHONE

The NTG5 is a short shotgun mic designed for the most demanding recording applications. Tailored frequency response, tight polar pattern and smooth off-axis response deliver superb audio. Lightweight aluminium construction makes it perfect for location recording with a boom pole, and RF-bias circuitry and conformal coating ensure high resistance to adverse environmental conditions.

$499

ACOUSTICS & ELECTRICAL SPECIFICATIONS

Acoustic Principle:	RF-bias condenser
Active Electronics:	RF-bias demodulation
Polar Pattern:	Supercardioid shotgun
Frequency Range:	20 Hz – 20 kHz
Frequency Response:	80 Hz - 20 kHz ±3 dB
Output Impedance:	25 Ω
Signal to Noise Ratio:	**84 dB**
Equivalent Noise:	**10 dB SPL (A-weighted, as per IEC651)**
Input SPL @ 1%THD:	130 dB SPL (1kHz @ 1% THD, 600 Ω load)
Power Requirements:	2 mA @ 48V phantom power
Sensitivity:	**-23.5 dB** re. 1 Volt/Pascal or Better

Dimensions (LxWxH):	NTG5	203 x 19
	PG2-R	117 x 60 x 240
Weight:	NTG5	76g
	PG2-R	224g

Tripod and accessory hardware.

68" Camera Tripod & Monopod with **360° Ball Head** • Lightweight Aluminum Travel Tripod with Bag • Extra 1/4" QR Plate and Phone Holder • Compatible with Canon Nikon Sony and iPhone
$60.00


Carrying Bag × 1

Manual ×1


Alen Wrench× 2


Quick Release Plate× 1


Tripod (with built-in one plate for arca)x 1


Smartphone Holder × 1


Original Rubber Foot Pad X1

About this item
The multifunctional camera tripod is universally compatible with all cameras and equipment with 1/4"-20 and 3/8"-16 threaded holes , such as DSLR cameras, sports cameras, telescopes and projectors, etc. The carry bag have a multifunction phone holder can used for most cellphone.

The aluminum tripod can be easily turned into a monopod or walking stick alone to make your photography more diverse, It is a good companion for you hiking or traveling, And the center column can be inverted to used for low angle shooting and macro photography.

4-section column legs with quick release flip-locks allows you to adjust the working height flexibly from 16.5” to 68” in seconds. 3-position leg angle adjustment system helps you get support for level shots in any condition. 16.5" folded size with professional storage bag is very convenient for carrying and outdoor photography.

The camera tripod offers high level of stability using great quality level of magnesium aluminum alloy. It can withstand up to 33 lbs (15 kg). You can focus on taking photos or recording videos without worrying your hand may be shaky.

My rant against ball-heads for camera tripods.

In the "Good Old Days" not so long ago when industry was your "friend" and worked to manufacture products both efficient and useful, virtually ALL camera tripods came with Tilt-Pan heads. Its not hard to see why, that is the most efficient and preferred way to use a tripod. Somewhere along the way a marketer (I presume) asked an engineer to design a solution for a non-existent problem, thus the detestable Ball-Head.

The ball head is difficult to operate, and it makes leveling the camera very difficult as the head swivels in any direction. Additionally, it supports much less weight than a tilt-pan setup. It is something no photographer would ever want to purchase, much less use. Do not take my word on this. You need only look at the detachable-head tripods for sale on Amazon. Virtually ALL the tripods come with the ball-head. Why? Because there is NO OTHER way to sell the accursed heads. It merely adds to the tripod cost because you must buy a Tilt-Pan head separately. Industry no longer even trys to be your friend. It all aggravates me.

By the way, before you toss the ball-head in the dustbin, remove the plate, it could be useful.

Jan 2025 addendum:
I have discovered a use for the otherwise worthless ball head mount. Remove it from the tripod where it serves no purpose and instead mount it on your tripod accessory bar (3/8” to 1/4” female adapter needed). Then you can attach the quick-remove plate to the back of your sound recorder. This allows you to adjust the recorder angle and easily dismount it from the accessory bar for downloading your recordings into the computer.

NEEWER Video Camera Tripod Pan Tilt Head
$60.00

About this item
NEEWER TH03 all metal tripod head features a tilt and pan handle, and effortlessly rotates the camera 360° or tilt it +90°/-60°, ensuring seamless transitions from horizontal to vertical compositions, and stably supports cameras up to 11lb/5kg.

A bowl shaped leveling base enables you to pivot the camera 360° and slightly tilt it between -15° and +15° when precise adjustment is needed. After achieving an ideal angle, tighten the screw knob to keep the camera stationary.

Use the professional pan base to smoothly swivel the camera for panorama photography and videography. 360° scale markings help you revolve the camera with high accuracy and a dial knob can securely lock the camera in place

Arca type quick release system.

[Ed Note: With this tripod head one locks the tilt via a simple rotation of the tilt handle. This is very important as it allows one-handed operation for tilt adjustment. Many/most tripod heads these days feature a "bent" tilt handle that cannot be rotated. Tilt adjustment requires two hands, one to loosen a clamp and the other to change the tilt before then re-tightening the clamp. This is obnoxious and unnecessary and therefore to be avoided in your tripod head choice.]

PU-300 300mm Universal Lengthened Quick Release Plate Slide Rail
with D-Ring Screw for Tripod Ball Head DSLR Camera, Arca-Swiss Compatible
$26.99

Fotasy 50 mm Arca Swiss Type Clamp
Quick Release Plate Clamp, QR Clamp, Arca Tripod Mount for Tripod Head Monohead, fits Arca Style Plate
$9.29

[Ed Note: Arca rail plates come mounted parallel to the tripod pan handle. As I need my accessory rail mounted sideways (normal) to the handle, this clamp allows a 90d rotation of the Arca mount.]

Short XLR Cables, Microphone Cable 2ft Feet 2 Pack
Mic Cord Braided Balanced 3 Pin Connector Male to Female XLR for Mixer, XLR Speaker Systems ect
$12.99

ChromLives Furry Windscreen Muff
Mic Cover Wind Muff, Outdoor Microphone Wind Cover Compatible with Zoom H5 H6 and More, Grey
$11.99

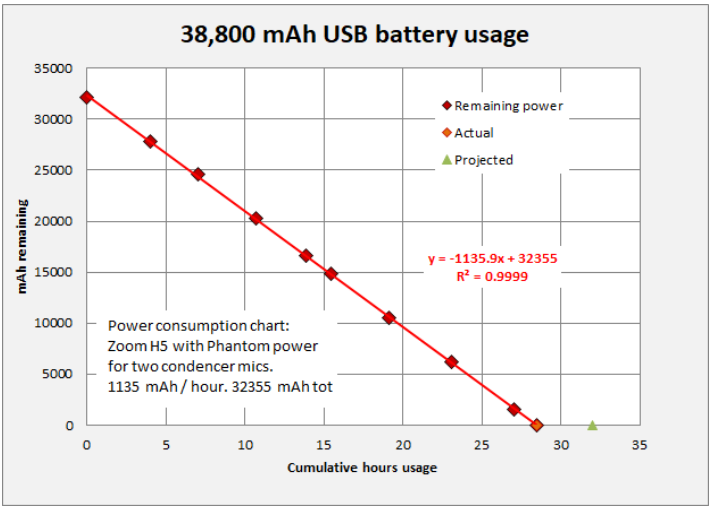
The wind muff not only prevents wind noise but importantly protects the microphone capsule from Houston humidity.

Portable Charger 38800mAh Battery Pack Backup

LCD Display Power Bank, 4USB Outputs, USB-C in & out Dual Input Phone Charging

$28 Amazon
Brand:RGVOTA

USB Battery discharge versus time used with my actual setup:



The above usage plot indicates a 32 hour potential, but it rapidly dropped at the end giving 28.5 hours service (suggesting 32355 mAh total). Still quite respectable.

Premium Smartphone Holder/Vertical and Horizontal Tripod Mount Adapter
Rotatable Bracket with 1/4 inch Screw/Adjustable Clip
$7.99

Note, I use this to mount the USB Battery to the tripod accessory bar.

BILIONE 1pcs Large Microphone Clip
Adjustable Mic Holder for Microphones with Outer Diameter Range 1.26" from 2.3", with 5/8" Male to 3/8" Female Screw Adapter [3/8 male to 1/4 female adapter needed to mount to tripod accessory bar]
$7.99

1Mii B0305 $27

Transmit Mode:

1. Connect ML300 to a TV or another device with a 3.5mm audio cable.
2. Slide the mode button to the “TX’ side.
3. Please press and hold the 1Mii B0305 2 In 1 Wireless Transmitter and Receiver - icon 1button for about 2 seconds to enter pairing mode,(LED lights flashing red and blue).
4. Set your device (Bluetooth headphone or Bluetooth speaker) to pairing mode, and wait for the pairing to succeed. (LED stays blue) 4

X14 Bone Conduction Headphones $34

Turn On The Headphones:

Press and hold the power button for 3 seconds or until the LED indicator light flashes red and blue, it will prompt “Power On” and “Bluetooth mode”.

Pairing:

1. Start with X14 turned off.
2. Press and hold the power button until the LED indicator light flashes red and blue. It will prompt “Power on” and “Bluetooth mode.
3. Open your first device’ s Bluetooth settings and select “X14”. It will prompt “Connected”.

Peterson Field Guide To Bird Sounds Of Eastern North America

Nathan Pieplow, (Peterson Field Guides) Hardcover – March 7, 2017
$28.00

The first item in your recording kit should be a good guidebook to bird songs and sonograms/spectrograms. The Peterson series offers an excellent choice here, a "**Must-Have**" for the bird recordist.

Audio preparation and eBird upload guidelines

Modified on: Wed, 3 May, 2023 at 2:30 PM

[Ed. Note: The eBird audio tutorial presents the purist "keep it natural" approach where editing is strongly discouraged. In my audio clips I typically will do a good deal more low-frequency suppression than is here recommended. This is because of the very noisy suburban environment wherein I make my recordings. Road rumble, aircraft, shooting range, lawnmowers etc introduce a horrendous amount of manmade "unnatural" noise. You include that in a bird recording, normalize it to -3 dB and the bird is lost in the roar.]

[Ed note: eBird quality ratings, in my experience, are subjective and worthless (to me). I would MUCH rather see “Views” given as it is both objective and interesting.]

Making A Quick And Effective Boundary Microphone

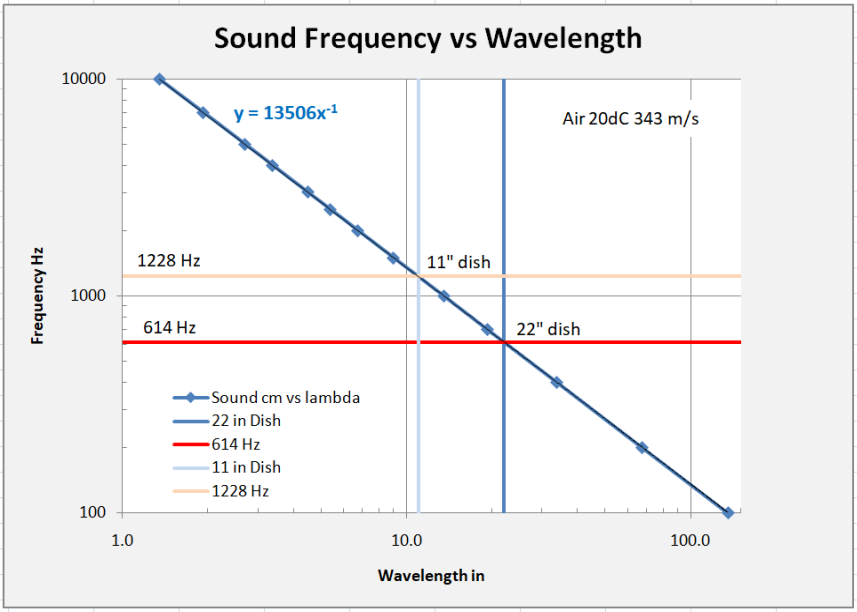
If a mic is placed in the pressure zone, then **it’s voltage output will be roughly doubled over what it would be in free space, resulting in a 6 dB increase in output level from the mic**. If multiple boundaries are used, the increase will be even greater.

The boundary size must be large enough to reflect the lowest frequency of interest. Wavelengths that are large relative to the boundary size will simply diffract around it rather than be reflected.

A method of obtaining free accoustic gain is a pressure zone of boundary plate. This essentially means placing a microphone within 0.035 inches from a flat surface. Each flat surface can provide 6dB of accoustic gain. So, if you have two plates 90 degrees perpendicluar to each other, you can get l2dB of gain.

Sound frequency vs wavelength (in)

Sound frequency vs wavelength plot					
		Dish parabola		Dish parabola	
Air 20dC or 68dF		22	100	11	100
343	m/s	22	10000	11	10000
1125	Ft/s				
		F = 13506 * in^-1			
		614	Hz	1228	Hz
		614	1	1228	1
		614	150	1228	150



The above little plot illustrates the correspondance between sound wavelength in inches and frequency in Hertz. It assumes conditions of 20 dC or 68 dF. Speed of sound at these conditions is 343 m/s or 1125 ft/s.

This may give a good idea of the frequency responce versus the dish diameter. A 22" dish corresponds to a frequency of 614 Hz, below that frequency there will be no "gain".

Bit Rate calculation

(Uncompressed Format) bit rate=bitspersample (16-bit or 24-bit)*samplespersec(44.1KHz-48KHz)*no.of channels. Example 16-bit 48Khz strereo contains bitrate of 1.5Mb/sec. File size calculation For Uncompressed Format file size=((bitspersample(16-bit or 24-bit)*samplespersec(44.1KHz-48KHz)*no.of channels*duration(no.of sec the music played))/8. Example 16-bit 44.1Khz stereo for 60 min the file size is 630MB. For Compressed Format File size=((bit rate in kbps)*(length of the audio in sec))/8 Example 16 bit 44.1Khz stereo for 60min at 128Kbps the file size is 10.8MB

For live streaming the bandwidth required can be calculated using the formula: bandwidth=listeners*bit rate*length(audio length per day)*no. of days. The bandwidth required for bit rate of 128Kbps is 57.6MB/hr. Table Representing the bandwidth for various Bitrates The length of the file is taken as 60min(180 sec)

Bit rate calculation					1000
uncompressed					
	bit size	sample rate		bit rate	
	b/samp	smp/s	#chan	Hz	kbps
Zoom H5	16	44100	1	705600	706
	24	48000	1	1152000	1152
	16	96000	1	1536000	1536
Zoom F3	32	44100	1	1411200	1411
	32	48000	1	1536000	1536
	32	88200	1	2822400	2822
	32	96000	1	3072000	3072
	32	192000	1	6144000	6144
Evistr V508	16	96000	1	1536000	1536
	8	96000	1	768000	768
	8	64000	1	512000	512
	8	128000	1	1024000	1024
	8	**192000**	**1**	**1536000**	**1536**
	8	192000	1	1536000	1536
Tascam DR-05X	16	44100	1	705600	706
	16	48000	1	768000	768
	16	96000	1	1536000	1536
	24	44100	1	1058400	1058
	24	48000	1	1152000	1152
	24	96000	1	2304000	2304
RCA VR5220	8	8000	1	64000	64
Formula:					
Mono	bits/samp * samp/sec = bits/sec				
Stereo	bits/samp * samp/sec = bits/sec * 2 ch = bits/sec stereo				

Technical links:

Unit Converter: Convert units of measurement easily!
by Anatoly Zolotkov
https://www.translatorscafe.com/unit-converter/en-US/microphone-sensitivity

Microphone sensitivity and conversion
https://sengpielaudio.com/calculator-transferfactor.htm

Zazu Field Recording Setup

Here I present a short recommendation for the potential recordist who has yet to invest in much gear and would like the lowest self-noise and most sensitive setup possible without breaking the budget.

Recorder:
Get the **Zoom F3 Field Recorder**, $300.
This recorder has extreme low self-noise with an EIN of -127 dB.
It uses 32 bit floating point A/D so good riddance to pesky level-setting. It has 2 XLR ports that provide phantom power for your condenser mics. As 32 bit is the future of recording, time to go all-in, this is the BEST CHOICE recorder.

Microphone(s):
For one desiring highly directional recording I recommend:
1) **Wildtronics Pro Mono**, $790.
This is a 22" parabolic dish mic with extreme low noise (-8 dB) and extreme sensitivity, (-4dB with dish boost). It is rather bulky and you will want a tripod, not for walking in the field unless you are a total masochist.
Or 2) **Røde NTG8**, $999.
This is a long (22") shotgun mic with similar directionality to the dish above, but more self noise (8 dB) and high sensitivity (-20), 16 dB less than the dish above. At 2ft long with the XLR cable attached it is bulky for walking.

Depending on your budget there are two wide-view choices:
3) **Røde NT1 Signature**, $159.
This microphone has a very low EIN of 4 dB and Sensitivity of -32 dB. You will not do better for the price. It is a side-address studio mic, not too large and easily carriable in the field. Cardioid pickup.
Or 4) **Lewitt LCT 540 S**, $699.
Very low EIN of 4 dB and very high sensitivity at -28 dB. Wider pattern than the NT1, this is the TOP CHOICE but rather pricy.

For the indecisive who require a compromise:
5) **Røde NTG5 shotgun**, $499.
A shorter shotgun (8"), it provides some directionality, has low EIN (10dB) and very high sensitivity (-23.5 dB). Easily portable while walking.

OK, there is your gear. You will also want a tripod and associated mounting gadgets, cables, headphones, and a beefy USB battery. For walking ditch the tripod and just get a small waist pouch to hold the recorder and battery.

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