

Technomad Military Audio Systems

Abstract

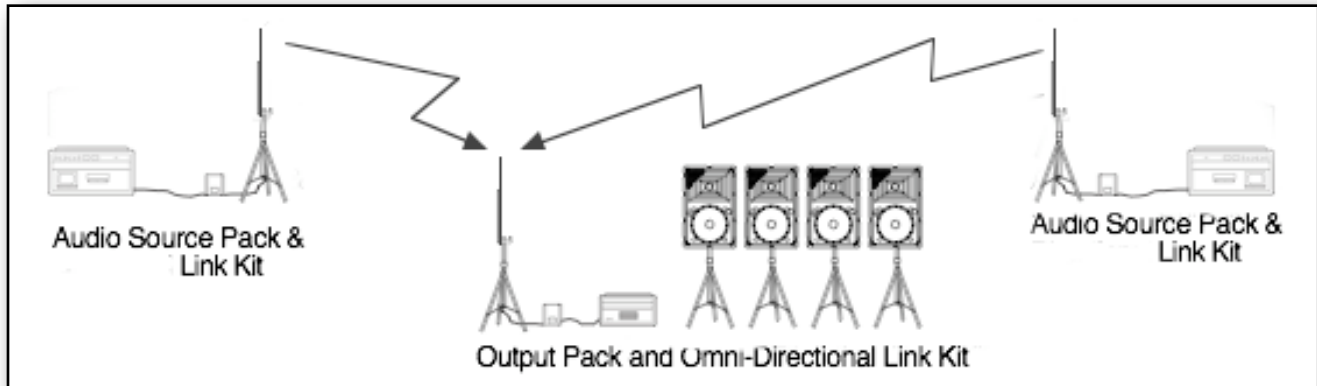
Technomad Inc is a Massachusetts USA based manufacturer of high-performance Commercial-Off-The-Shelf (“COTS”) weatherproof networked military audio systems. Using combinations of standard Technomad PA system elements, deployed base-wide PA systems can be created that offer many advantages over traditional military audio systems. These advantages include: vastly better audio quality and speech clarity, integral flight-case design, rapid deployment, weatherproof construction, an extensible mesh-network digital radio ‘backbone’, inherent redundancy, and more. Technomad is the de-Facto standard for high performance tactical audio systems for the US military, and has delivered many PA systems in support of US, UK, and Canadian operations in Iraq and Afghanistan. Technomad military audio systems have a 10-year history of reliable, effective operation in deployed and fixed installation applications.

Technomad has recently introduced highly mobile, 'man-pack' micro PA systems ideal for PSYOPS and tactical applications.

The firm has also created a simple to use flash-RAM audio player recorder offering instant playback of sounds (i.e. sirens, music, speech, etc.) and also allows scheduling of sounds for automatic playback (i.e. Reveille daily at 0600).

Technomad Military PA System Overview

Technomad deployed military PA systems are comprised of two or more Technomad Audio Source Packs, connected to one or more Technomad Output Packs by digital audio Link Kits.



NOTE: Some W.A.A.C.C. systems have two or more Output Packs.

The Audio Source Packs allow an operator to speak into a microphone, play a tape or CD, or play pre-recorded sirens and songs from a Flash RAM playback device. Link Kits convert the audio into IP data, automatically create a "mesh network", and send the audio as needed from the Audio Source Packs to the Output Pack(s). Two types of Output Packs PA Systems are used - OutputPack 4 for large areas (circular coverage up to 1.66 KM in radius), and the OutputPack 1 for point-source areas.

This system is designed to be quick to setup with no operator experience, to be reliable, simple to use, and to provide unmatched "live" speech clarity, siren playback, and music / sound effects playback in deployed environments. All elements can be hand carried by two operators, and setup time per system element is 15 minutes or less. No specialized training is required.

Audio Source Pack



Technomad Audio Source Packs' are the command center of the PA system. Each ASP includes a 6-input mixer, hand-held microphone, CD/Tape player, and optionally a Flash RAM Audio Player and Zone Controller

A.S.P.s allow a user to:

- Hail a target using a 'live' microphone
- Play CDs / cassette tapes
- Play pre-recorded audio clips (i.e. sirens, warning tones, local language speech messages, music, etc) from a Flash-RAM audio player/recorder

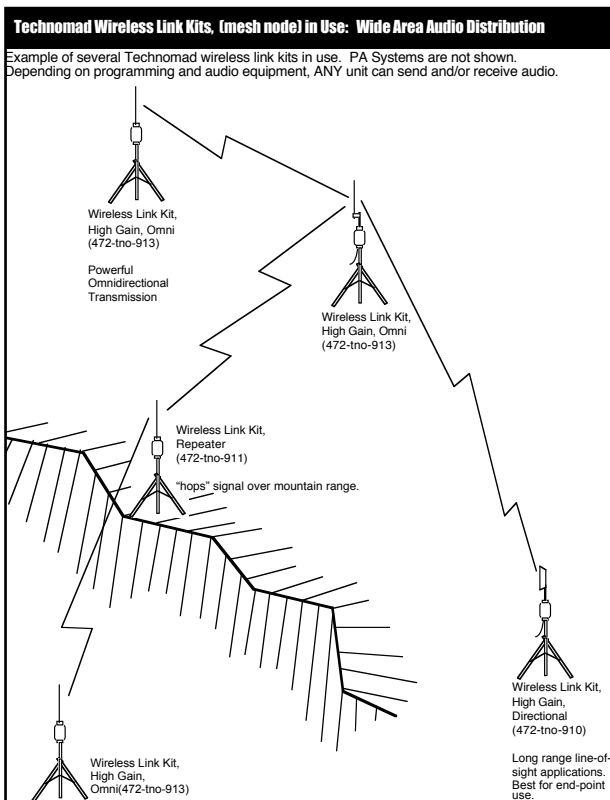


The mixer allows the user to connect 3d-party audio devices such as computers, iPods, and military / commercial radios without difficulty. Technomad uses industry-standard audio connectors, unlike proprietary 'closed' systems from other vendors.

No computer is required for audio playback or scheduling, increasing system reliability.

Dimensions: .9M X .6M X .4M, Weight: 31 Kg.

Link Kits

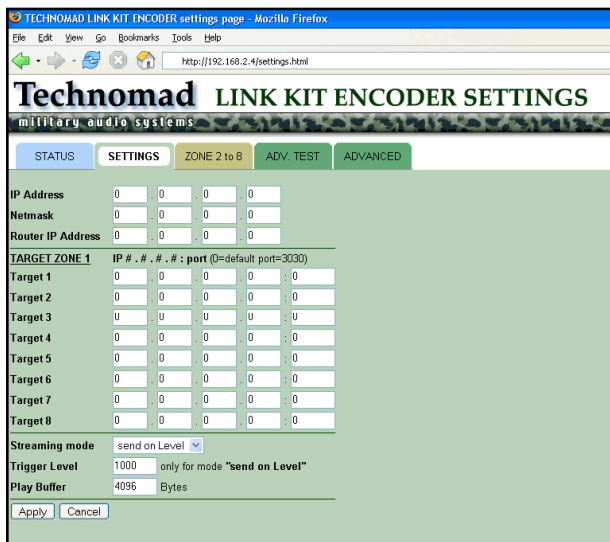


Technomad Link Kits are self-configuring, ad-hoc mesh network Internet-Protocol radios with integral audio-to-IP conversion. Unlike a traditional ‘transmitter/receiver’ structure, Technomad Link Kits create a co-operative network for data transport. This means that an Audio Source Pack can send streaming audio as IP data through multiple ‘hops’, using intermediate Link Kits to relay data to remote PA systems. Distances between any two Link Kits can be up to 12 miles (with supplied RF Amplifiers). Link Kit radios are fully weatherproof.



Link Kits operate in world-wide unlicensed bands (2.4 and 5.6 GHz) using spread-spectrum, frequency-hopping microwave transceivers. No user programming is required – users can simply power-on additional Link Kits in the field as needed, and they intelligently join an existing Technomad network, or create a new one if no network exists.

Certifications: ETSI-European Telecommunication Standards ETS 300328 and ETS 300339.



Each Link Kit can be configured as a transmitter, receiver, or both using a simple, standards-based web interface. Any ethernet-equipped computer can be used to make system settings / adjustments, but a computer is not needed for routine operation of the system. Transmitters can broadcast to all devices on the network, or just to specific target devices. With the Zone Control option, users can instantly send audio to any of eight pre-defined zones (each of which can be a broadcast or eight-target-device group). Radiated power is

200 mW, or 1W with optional RF booster amplifier.

Dimensions: .2M x .2M x 2M, Weight: 10Kg

Photos: illustration of multiple Link Kits in deployed applications, screen shot of web-interface for programming Link Kit behavior.

Output Pack



Technomad Output Packs are rugged, high-output PA systems with fully weatherproof loudspeakers. All elements of the Output Pack are built into Military Specification 810F flight cases.

When in “Transport Mode”, the flight-case elements have the following features:

Ergonomic:

- Handles usable with gloved hand / cold weather dress
- Latches usable with gloved hand / cold weather dress
- Manpack 2-person lift (Omaha, Audio Source Pack)
- Safety 1.5” radius corners, all metal parts edges broken

Logistical:

- Packing efficiency: 100% space utility / 0% waste
- Aircraft Carry / Palletizable: Yes
- Vehicle Carry / Palletizable: Yes
- Other: Stacking Interlock Feature
- Hardware: Field-Replaceable

Photos show Output Pack 4 (with only 2 loudspeakers shown) in deployed mode, and below in ‘transport’ mode.

Technomad systems are highly serviceable. A fuse (which protects the unit from most over-power situations) is replaceable without disassembling the unit. The loudspeakers can be easily disassembled with hand tools. Bass driver / High frequency drivers / diaphragms can be replaced in approximately 25 minutes. Control Rack: amplifiers / mixers etc can be swapped out of the control rack with hand tools. Note that entire loudspeakers / control racks can be swapped out virtually instantly in case of a failure.

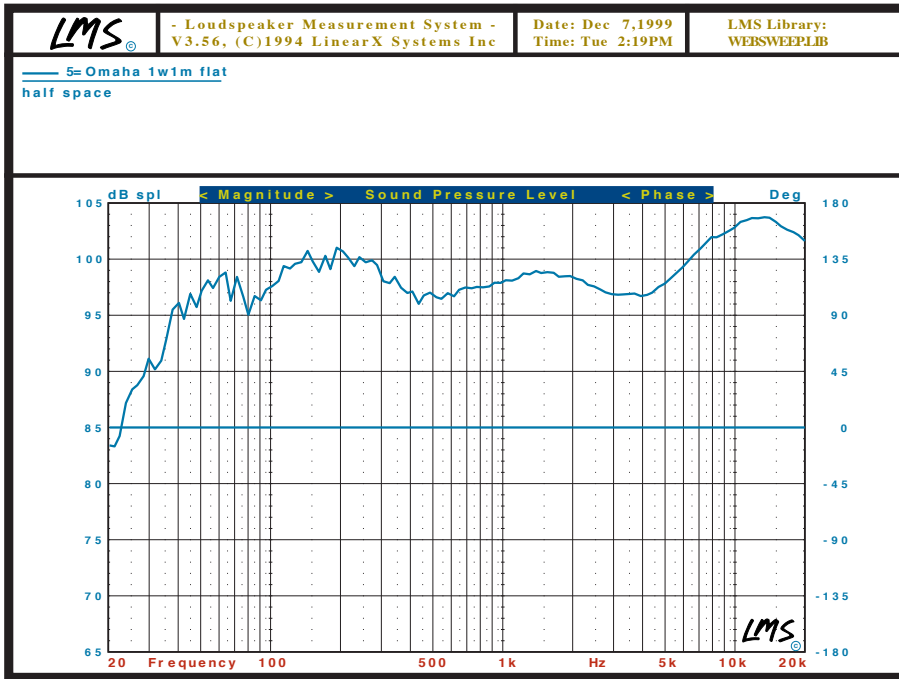
High Lift Tripod Upgrade option replaces standard 6’ tripods (show above) with 4-meter ‘crank-up’ tripods with included guying system for stability in high winds.

Audio Features:

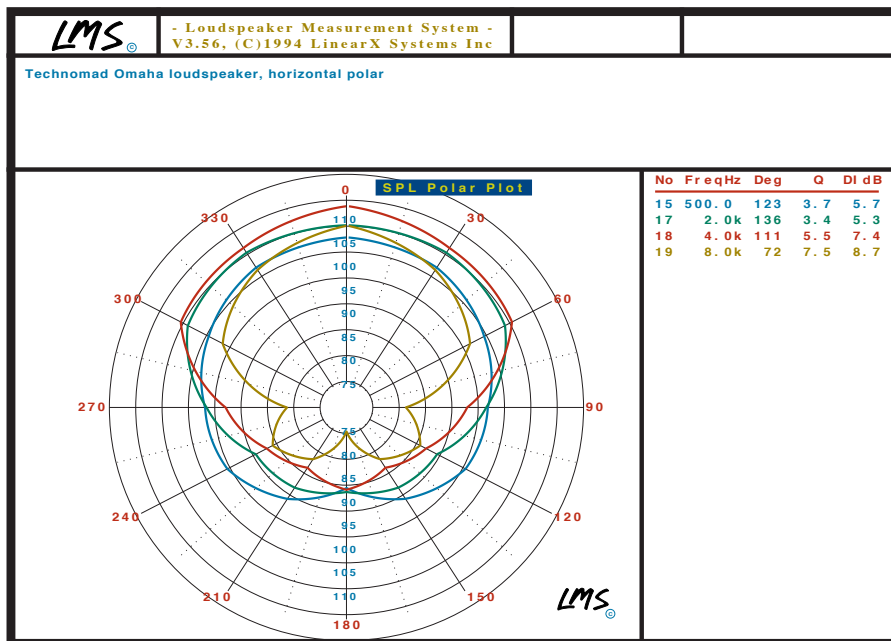
- Loudspeaker cluster produces 127 dB at 1M
- Frequency Response: +/- 3 dB, 100Hz to 16KHz (functionally ‘flat’ frequency response).
- Systems deliver highly intelligible speech, due to a lack of ‘horn-throat’ distortion common in high-Q, directional systems.
- Speech is clear, natural, and easily understood. Music is played with full fidelity. Sound effects (i.e. combat simulation playback) are extremely realistic

Control Rack (1)	Dimensions: .9M X .6M X .4M,	Weight: 41 Kg.
Omaha Loudspeaker (4)	Dimensions: .8M X .5M X .3M,	Weight: 41 Kg.

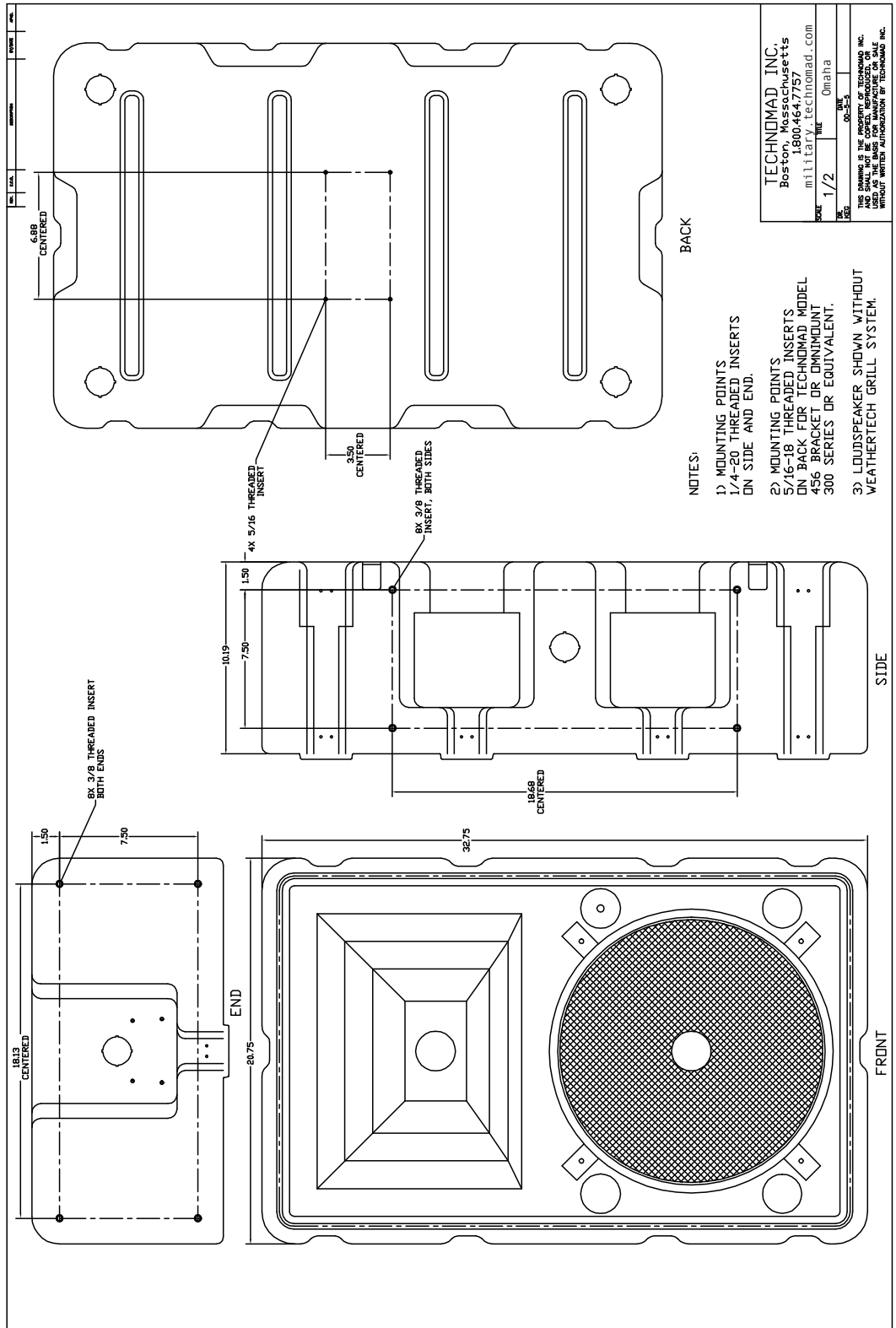
Omaha Frequency Response



Omaha Polar Response



Omaha Technical Drawing (no lid shown)



BACK

NOTES:

- 1) MOUNTING POINTS
1/4-20 THREADED INSERTS
ON SIDE AND END.
- 2) MOUNTING POINTS
5/16-18 THREADED INSERTS
ON BACK FOR TECHNOMAD MODEL
456 BRACKET OR EQUIVALENT
300 SERIES OR EQUIVALENT.
- 3) LOUSPEAKER SHOWN WITHOUT
WEATHERTECH GRILL SYSTEM.

TECHNOMAD, INC. Boston, Massachusetts 1.800.464.7757 military.technomad.com	
SCALE	1/2
TITLE	Omaha
DATE	06-23-05
DESIGNER	
<small>THIS DRAWING IS THE PROPERTY OF TECHNOMAD, INC. IT IS TO BE USED AS THE BASIS FOR MANUFACTURE OR SALE WITHOUT WRITING AUTHORIZATION BY TECHNOMAD, INC.</small>	

Equipment Physical Overview

- **Weather Resistance:** Technomad military PA gear is designed to function reliably under all conditions - snow, sleet, salt spray, etc. The loudspeakers have a ten year history of dependable performance under extreme conditions. The loudspeakers are weatherproof - not weather-resistant. They incorporate anti-fungal treatments, treated drivers, sealed cross-overs, three-layer stainless/foam/mesh grill systems, and integral cabinet self-draining ports. The loudspeaker cabinets are molded of heavy gauge (3/8" to 3/4") medium density polyethylene, with UV-stable pigments. All metal elements are stainless steel. Technomad loudspeakers are routinely installed in unprotected marine environments. Note that Technomad recommends use of the clamp-on hurricane lid when extreme weather is expected. This reduces the possibility of mechanical damage to the loudspeaker from 100MPH+ winds.
- **Shock and Vibration:** Technomad military PA systems are routinely shipped by military transport to deployed locations, are mounted on wheeled and tracked vehicles, and are hand-carried for field operations without failure. The loudspeakers can withstand a 2.5' drop onto concrete without damage. The 'control rack' (amplifier/audio source device) internal cabling is cable-tied, and heavy items such as amplifiers are front-and-rear mounted for maximum shock resistance. Flight cases in the W.A.A.C.C. system have been upgraded to 'shock mount' types (with an internal floating frame suspended by rubber isolation mounts from the outer case shell).
- **Mean Time Between Failures:** Technomad systems are routinely used in environments that destroy other COTS systems, and are difficult to recreate in a lab setting. The firm has seen a very low failure rate in the field (estimated sub 3% of all systems sold since 1995), and 75%+ of these failures were determined to be caused by obvious operator error (i.e. driving the loudspeakers with highly distorted signal for hours, mounting the loudspeakers pointed directly at the sky so the self-draining ports could not work, etc). Current-model fielded systems have been operating for 5+ years without failure. It is difficult to calculate a meaningful MTBF figure for the systems, but a low estimate would be 3-5 years. If a failure occurs, the likely failure points (HF Driver, LF Driver, Fuse) are easily field-serviced without special tools.
- **Field Serviceability:** Technomad systems are highly serviceable. Loudspeakers: A fuse (which protects the unit from most over-power situations) is replaceable without disassembling the unit. The loudspeakers can be easily disassembled with hand tools. Bass driver / High frequency drivers / diaphragms can be replaced in approximately 25 minutes. Control Rack: amplifiers / mixers etc can be swapped out of the control rack with hand tools. Note that entire loudspeakers / control racks can be swapped out virtually instantly in case of a failure.
- **Inherent Redundancy:** Because the system uses multiple loudspeakers simultaneously, the loss of any one unit only reduces the total projected volume - it does not totally compromise the PA system's ability to function as is the case with the single / directional loudspeaker approach.

Critical Features Summary

Critical Features Summary / Vendor: Technomad (MilPA and Output Pack Military PA Systems)

Rev. 6.233 Website: <http://military.technomad.com>

Key Advantages of a Technomad Military Audio System Include:

Audio – for detail, see separate document “Audio_Performance.doc”

- Bass driver / Treble driver design – **NOT** a one-driver “horn” based system.
- High quality audio reproduction – wide, low distortion frequency response.
- Audible range: 1/2 mile or 1 mile depending on model.
- Coverage: semi-circle or circle depending on model.
- Integrated CD/Tape player + microphone
- No audio experience required for setup / operation

Physical – for detail see separate document “MilSpec_810F_Summary.doc”

- Typical Setup Time: 15 minutes or less
- Self-Casing design: speaker and control rack are built into rotationally molded Mil-Spec 810F flight cases with lids and handles (see http://military.technomad.com/products/self_casing_mil.html) - not separate loose cases.
- Totally weatherproof loudspeaker
- System can operate in rain, snow, blowing sand, salt fog, and jungle environments.
- Loudspeakers include integral anti-fungal chemical treatment
- Loudspeakers are self-draining
- PA Systems are palletizable
- All items in PA are 2-person lift (or lighter).
- Can be used for deployed OR permanent installation use
- Systems arrive pre-wired and ready to use
- Systems can be setup in rough terrain without the use of tools, lifts, forklifts, etc.
- Systems include tripods – no poles or structure required to deploy.

Options / Expandability

- Systems can be networked by optional audio-over-IP digital Link Kits. Unlimited control / output nodes
- Networked PA systems can cover multiple square miles.
- Available audio-over-IP digital Link Kits provide open 10-BaseT Ethernet ports for accessories (chemical sensors, access control, web cams, etc).
- Systems operate from 120V AC power – 240-220 AC 50Hz or 24V DC power systems available
- Optional integrated 5-tone siren generator
- Optional wireless microphone

TECHKEYFEAT Specifications subject to change without notice.



Technomad Inc Partial Client List

White House Communications Agency

http://military.technomad.com/articles/whca_mil.html

Zussman Urban Combat Training Center

http://military.technomad.com/articles/zussman_mil.html

United Kingdom Ministry of Defense

Forces Canada

US Marine Corps, Guantanamo Bay

US Marine Corps, Parris Island

Offutt Air Force Base

Seymour Johnson Air Force Base

US Army, Ft Irwin

US Emory S. Land (Small craft standoff-warning system)

Camp Pendleton

Polk Air Force Base

Sembach Air Force Base, Germany

US Army, , 1st Armored Division Wiesbaden Germany

Beale Air Force Base

US Naval Air Station, Corpus Christi

Camp Slayer, Iraq

Camp Julien, Afghanistan

...and over 100 deployed and permanently installed locations around the globe.

Technomad Inc.

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<http://military.technomad.com>

Technomad Firefly™ Tactical Micro PA System

Preliminary Spec

Features & Specifications



- Dimensions: 16" high, 7.25" wide, 10.5" deep
- Weight: 18 lbs.
- Max SPL: 120 dB, measured at 1M
- Max Range: 1000 meters (.6 miles)
- Dispersion (1K): 120° x 90°
- Power: internal rechargeable battery with external 12V/ AC power adapters. Operates for hours from a single charge.
- **Weatherproof** (can be operated in rain, snow, etc) without damage.
- Includes **wireless headset microphone** system (typical operating range up to 200M).
Wireless mic frequency: 169 to 172 MHz
- Includes integral **digital audio player / recorder**. User can transfer MP3-format audio to the device using included USB cable, or record audio without a computer using the included wireless microphone or line-in jack. Audio storage is 512 Mb SD ram card. Sounds can be of any length, limited by available storage. User can play files in order, or loop one audio file indefinitely, or loop a user selected segment of an audio file.
- Line out / Line in connections
- Speak-On connector for driving external Technomad loudspeakers. Power provided to output: 30W RMS into 8-ohm load.

Description

The Technomad **Firefly™** delivers high-performance audio for highly mobile applications where compact size and light weight are a priority. The unit is a compact, all-in-one system with integral amplifier, battery / charging system, wireless microphone, and digital audio recorder / player, all in a package you can carry in one hand or in a rucksack. Fully weatherproof, the Firefly can be used in harsh weather conditions without fear of damage. The integral digital audio recorder is shipped pre-loaded with siren sounds and standard US audio files (National Anthem, etc), but you can upload any MP3 format audio from your computer using the included USB cable. Audio files can be looped, or played in sequence. The wireless mic and digital recorder/player can be used simultaneously - for example, playing sound effects while an instructor gives voice commands.

Applications

The Firefly is ideal for PSYOPS & deception applications, because it can be placed near a target and an operator can 'speak through' the PA system from a safe distance away. Also, the operator can pre-load a series of sound files and play them to create confusion. A 'silent' MP3 - an MP3 recording of silence - can be played first in a sequence of sounds allowing the operator time to move away from the Firefly before it begins playing.

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(Applications, continued) The Firefly is also well-suited to general audio and paging applications (i.e. crowd control, safety announcing, training applications, paging, etc) where a larger Technomad PA system is impractical due to size and weight constraints. The Firefly can be easily carried in a backpack / rucksack.

Note: Technomad recommends using our **MilPA** product line (MilPA1, 2, 3, 4) for military audio applications where size and weight are not the primary concern. These full-range high-power systems deliver unmatched frequency-response, clarity, and accuracy for wide-area speech, music, siren, and sound effect application. For compact / portable use, the Firefly is an excellent solution.

Options

- Hardigg StormCase™ transport case (with foam insert for Firefly)
- Backpack (lightweight nylon with foam insert for Firefly)

Additional Photos



Left Side

Front

Back

Right Side

For Pricing or to Order:

Contact Hardigg military sales (USA 413.665.2163)

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Technomad SuperConductor™ Recorder / Player

Preliminary Spec



Features & Specifications

- Dimensions: 1.75" high, 19.5" wide, 10.5" deep (1U Rackmount)
- Weight: 4 lbs.
- Storage: 1Gb Standard - up to 1500 minutes of audio at highest quality. Unlimited tracks.
- File Transfer: Ethernet cable connects to PC, OR by removing USB Flash drive and connecting to PC
- Scheduling: Unlimited scheduled events - sounds can be **automatically** played at any time of day on specific days of the week / weekdays / weekends, or at specific days. Sounds can be repeated and looped as part of a schedule. Audio files played from the front knob interrupt scheduled audio (for emergency warnings, etc), but scheduled audio resumes.
- **Instant Access:** Audio files can be assigned to any of 99 Knob positions - these audio files can be selected from the knob on the front of the unit, and played **instantly**. Sounds can be set to loop indefinitely, play once through, or play only while the knob is pressed in.
- Power: 110V AC power
- Inputs: 1/4" mono jack, XRL mic input, integral panel-mount microphone.
- Outputs: 1/4" mono jack

Description

The Technomad **SuperConductor™** combines two critical audio functions in a compact package: virtually unlimited recording / on-demand playback AND scheduling of sounds for automatic, unattended playback. In military applications, a SuperConductor can be used for 'on-the-fly' playback of pre-recorded warnings or sirens from the instant access knob, but also used for scheduling base operations (Reveille at 0600, safety warning every 20 minutes, etc).

Advantages

- No moving parts
- Uses widely available USB flash drive storage (1GB drive included)
- No PC required for unattended audio playback
- No risk of PC hardware failure, or virus infection

Applications

The SuperConductor is ideal for forward operating base use - a simple all-in-one device, it allows an operator to trigger instant warnings in case of attack, and plays audio cues for base activity scheduling. Larger facilities also benefit from the **SuperConductor™** for scheduling and instant playback. PSYOPS and combat simulation are also ideal uses for the SuperConductor.

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Preliminary Spec

Audio Formats / Quality

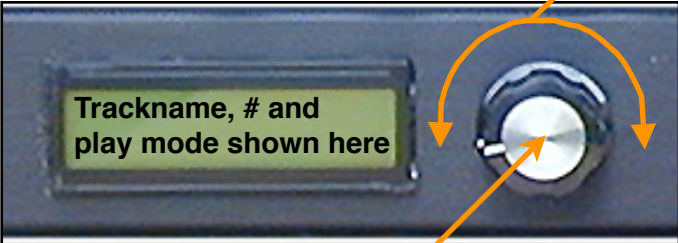
The SuperConductor plays MP3 format audio only (other audio formats can be easily converted to MP3 using free tools such as iTunes). The unit plays MP3s of ANY quality / bitrate (24Kb/Sec to 300+ Kb/Sec). The SuperConductor™ records audio at 192Kb/Sec – virtually indistinguishable from CD.

Additional Photos

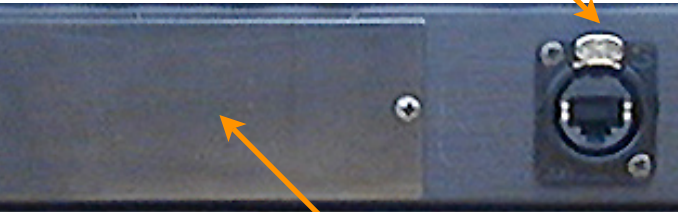
SuperConductor in A.S.P.



Rotate to Select Audio



Push to Play / Stop



Hatch covering removable USB Drive

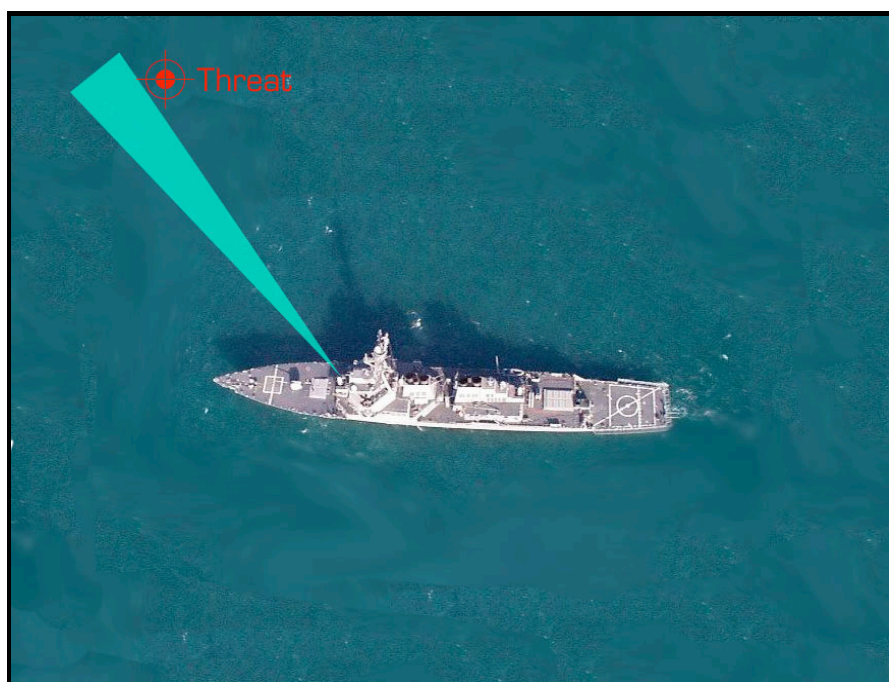
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Disadvantages of Hyper-Directional Audio Systems for Force Protection

A number of new acoustic devices have been developed that generate high sound pressure levels (146+ dB) and deliver extremely directional output - with left-to-right coverage angles of 5 degrees or less. This combination of features allows the devices to be used for interesting applications such as 'acoustic weapons' or long-range addressing of specific targets for hailing and Force Protection applications. However, there are significant downsides to hyper-directional transducers for general-purpose force protection audio. These disadvantages are: aiming requirements, 'one-target only' addressing, low quality audio, and cost.

Disadvantage #1: Aiming Requirements.



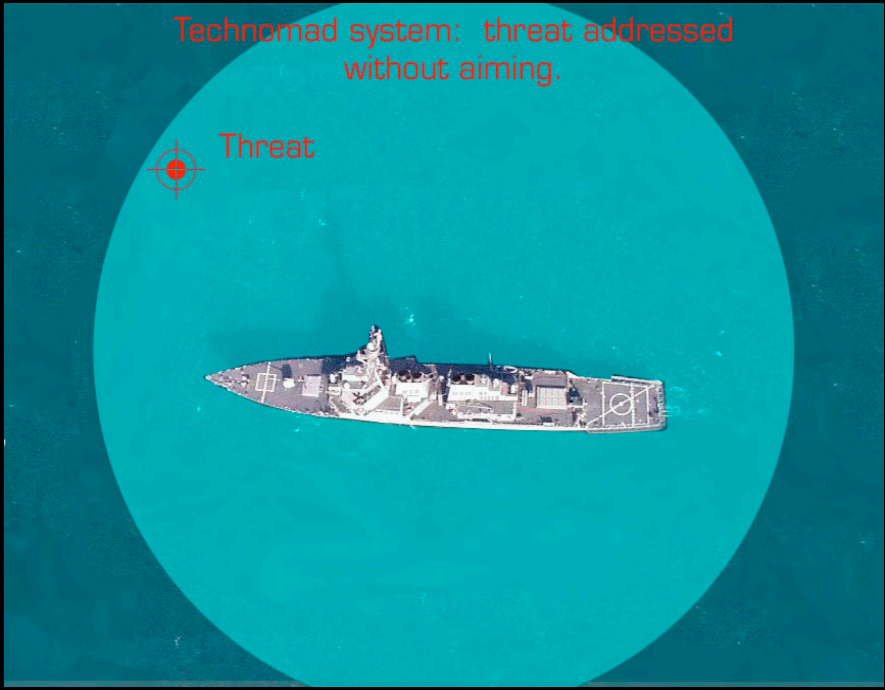
Target missed.

The narrow beam width of a hyper-directional device requires extremely accurate aiming, particularly at medium and long distances, to ensure that the hailed target actually **hears** the hyper-directional device. For hailing applications - for example, sentries attempting to warn a vehicle to slow down approaching a checkpoint - it is easy for an operator to miss the intended hailing target with a hyper-directional device. If the hyper-directional device is not aimed precisely at the approaching vehicle, the vehicle occupants will not hear the sentries' warning, and might drive onward obliviously. The result could be the loss of life if the sentries respond to the 'duly warned yet non-compliant' vehicle with deadly force. Tracking issues are compounded if the approaching target moves erratically or at high speed, or the hyper-directional device is hand-held. At short range, a hyper-directional design is unnecessary, yet at medium and long range acoustic devices

like this are often ineffective due to aiming difficulty.

Technomad Solution:

Technomad wide-dispersion **military PA systems** offer high levels of speech clarity in a 120 degree vertical and horizontal coverage pattern, with clusters of loudspeakers offering full 180 or 360-degree coverage. This means that for guard post, shipboard hailing, or other Force Protection applications, the target is CERTAIN to have been addressed by a wide 'no-aiming needed' sound field.



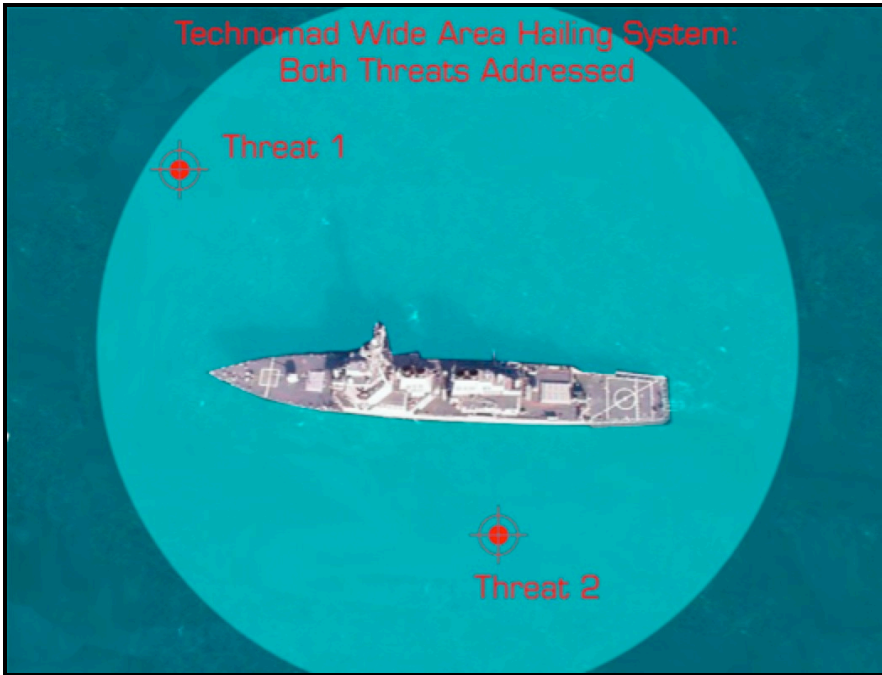
Target Addressed!

Disadvantage #2: One Target Only



Target missed.

The narrow beam width of a hyper-directional device means that it is difficult or impossible to address more than one acoustic target with the hyper-directional device simultaneously. While a hyper-directional device can be effective in addressing one target, multiple targets cannot be addressed. A multiple-target threat, such as a number of speedboats or jet-skis approaching a ship, or motorcycles approaching a tent city, is poorly met by the highly directional hyper-directional device.



Target Addressed!

Technomad Solution:

Technomad wide-dispersion **military PA systems** flood a large area with clear, articulate speech and sirens. Result: multiple targets can be addressed with confidence, without requiring any operator effort to aim or track multiple potential threats.

Disadvantage #3: Different Volumes for Speech vs. Tones

The typical max SPL specifications of hyper-directional devices show a max continuous 'tone' SPL output of @ 145 dB, but max continuous 'voice' SPL outputs are generally 25 dB less (120 dB or lower). Further, most hyper-directional device designs have very poor frequency response and phase response, which significantly degrade speech clarity. The limited mid-band frequency response of hyper-directional devices is particularly destructive to male voices. Generally, hyper-directional devices are a poor fit to applications requiring live speech commands.



Technomad Solution: Technomad full-range, high efficiency **military PA systems** offer high-efficiency output in both speech and siren frequency ranges, and do so WITHOUT high levels of phase shift, harmonic distortion, group delay, or other destructive audio artifacts. Male and female voices are delivered with outstanding clarity, and sirens and sound effects are accurate, detailed, and compelling.

Disadvantage #4: Cost

Hyper-directional force protection systems are extremely costly - a recent survey of GSA Advantage showed a typical system priced at \$33,000. **In contrast**, a Technomad MilPA4 system - which covers a full 360-degree area, requires no aiming, and reproduces speech, music, and sirens accurately and without distortion - costs less than half of that price.

Contact Information

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