



TACTICAL
RADIOS

ML-91 NVIS Roof Rack Antenna System

product summary



CONTINUOUS COVERAGE

Q-MAC Electronics has pioneered the world's first folding roof rack HF SSB antenna. The Q-MAC ML-91 NVIS Roof Rack Antenna is a technological breakthrough in vehicle-based HF radio communications. The ML-91 is without doubt the best type of antenna for vehicular NVIS (Near Vertical Incidence Skywave) operations and is effective in overcoming the skip zone common in whip based antenna systems.

The ML-91 is a magnetic half loop antenna which predominantly radiates RF energy towards the ionosphere, making it ideal for NVIS propagation. Skip zones are eliminated and coverage, with the correct selection of frequency, is virtually continuous from 0 to 1000km or more.

HIGH PERFORMANCE

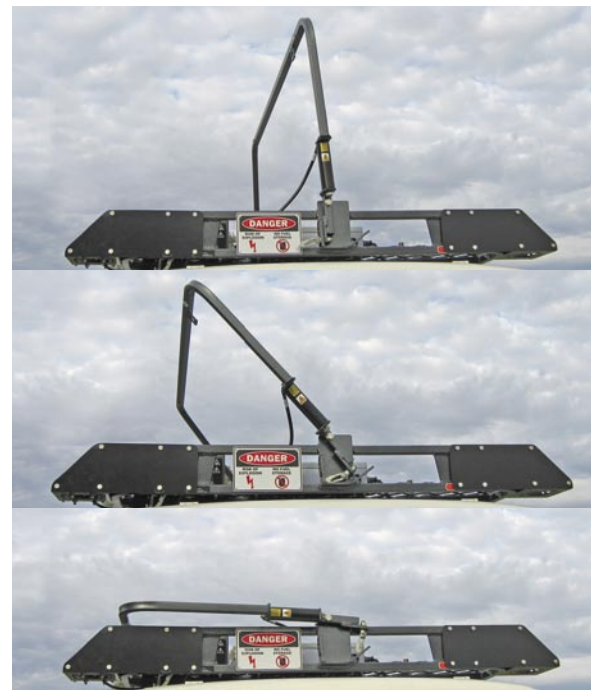
Q-MAC's ML-91 is significantly more efficient than any whip-type vehicle antenna, producing considerably more transmit and receive power. The received signal relative to whip antenna systems varies between +10dB and +14dB. Antenna current in a typical whip system at the base is 1.5 Amperes, whereas the antenna current in the ML-91 loop element approaches 15 Amperes.

The radiation pattern of the ML-91 has low angle nulls toward each side of the vehicle, effectively reducing noise from adjacent power lines which commonly affect vehicles driving on remote roads that have high voltage distribution lines in close proximity. Q-MAC's ML-91 also magnifies the received signal strength, giving a higher overall performance than any vehicle whip antenna system. The receive bandwidth is narrow (Hi Q) which helps to eliminate noise from adjacent channels common on conventional systems.

Q-MAC Electronics Pty Ltd is the holder of Australian Innovation Patent No 2001100423 protecting the intellectual property comprising the ML-91 Vehicle Roof Rack Magnetic Loop Antenna System.

INTEGRATED ROOF RACK

The ML-91 roof rack has been designed by Q-MAC as an integral part of the antenna system. The ground plane for the antenna is a heavy-duty aluminium mesh floor, which is welded to the frame bars, maximising current within the radiating loop. Using a closed magnetic loop antenna design, the ML-91 effectively shields and isolates vehicle ignition noise thus providing greater clarity in communications. Whip based systems rely on the vehicle chassis for ground and as a result commonly suffer from induced electrical noise.



Q-MAC's Folding Antenna Element

secure • simple to use • low cost

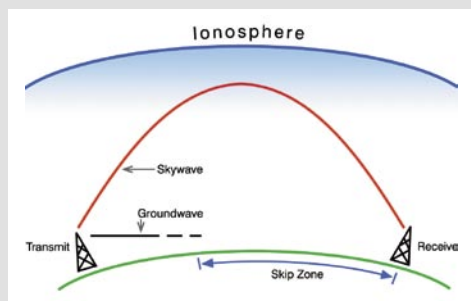
SPECIFICATIONS

Frequency Range	3.7-13MHz	Drive Method	Microprocessor controlled precision stepper motor
Power Rating	Up to 125W PEP	Tune Point	Peak antenna current
Power Supply	12V DC (24V option)	Receive Bandwidth	Variable from 40kHz at 3.7MHz to 280kHz at 13MHz
Radiation Pattern	Omni directional at high radiation angles	Dimensions	<ul style="list-style-type: none"> • Standard rack 1800 x 1250mm • Compact rack 1500 x 1250mm
Input Impedance	50 Ohm	Weight	Physical weight 45kg (excluding mounting brackets)
Tune Control	Control signal from transceiver; Customisable to suit 3rd party transceivers	Environmental	IP68
Tune Time	Approximately 3 seconds	Temperature	Operating -20°C to +60°C
Tuning Method	Continuously variable tuning capacitor		

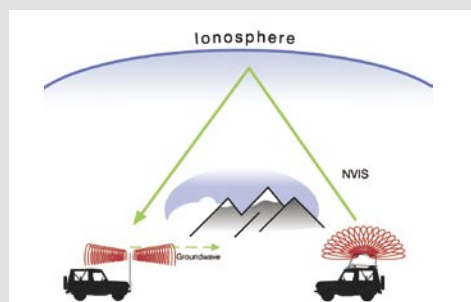
NVIS PROPAGATION

Propagation refers to the path a radio frequency signal travels when radiated from an antenna. There are three main types of propagation commonly used in vehicle HF SSB systems:

- Skywave - the signal radiates at a low angle towards the horizon and is refracted by the ionosphere to return back to earth at a long distance away from the source
- Groundwave - the signal radiates along the ground directly from the radiating antenna following the contour of the earth
- NVIS - the signal radiates at a high angle towards the ionosphere and is refracted to return at a close to medium distance from the source



Typical HF Propagation



Propagation using whip antenna system and ML-91 NVIS Roof Rack Antenna

ALL TERRAIN COVERAGE

The ML-91 uses NVIS propagation which is highly effective for communication in mountainous areas. Vehicle whip systems used in close proximity to mountains and hills suffer from most of the groundwave signal being blocked. However, with Q-MAC's ML-91 antenna, a large amount of RF energy is propagated vertically so the signal effectively bounces straight over the mountainous terrain.

NO SKIP ZONE

Q-MAC's ML-91 antenna system also provides highly effective medium range communications, reducing the skip zone traditionally found between 30-150km. The skip zone refers to the area where groundwave propagation ends and skywave propagation begins. Between these two points, HF coverage using a whip antenna is very limited or non-existent. Q-MAC's ML-91 overcomes this by using NVIS propagation, providing continuous coverage for up to 1000km or more. Whip antenna systems, which are usually vertically polarised, radiate most of their RF signal towards the horizon. As a result, very little signal radiates towards the zenith, which is required to facilitate NVIS propagation.

OPTIMISED PERFORMANCE

Frequency selection is also important in NVIS propagation. The wrong frequency selection will cause the RF signal to pass in to space with no refraction back to earth. Ideal NVIS frequencies are typically below 12Mhz. Q-MAC has designed the ML-91 Automatic Antenna Tuning Unit (ATU) to tune frequencies in the range 3.7-13MHz. This range includes the frequencies commonly used in military and industrial applications, as well as the NVIS band.

The ATU is a highly efficient, continuously variable capacitor unit which is driven by a stepper motor to precisely peak the antenna current. Maximising the antenna current correlates exactly with maximum radiated signal. This is preferred to minimising VSWR, which seldom coincides exactly with peak signal.



RUGGED CONSTRUCTION

The ML-91 is constructed from high conductivity, light weight, all welded aluminium components. The design of the complete system, including the rack and tuner, caters to users operating in extreme conditions. The roof rack is field proven in some of the world's worst remote area conditions and is designed to withstand rough corrugated, pot holed and unsealed roads. The rigid antenna design enables communications whilst driving. Often whip based systems suffer from fading signals when the whip is flexing during motion.

FLEXIBLE MOUNTING OPTIONS

The roof rack comes in two sizes and with a range of mounting bracket options. Solutions are available that will allow clamping to the roofs of 4WDs, sedans, buses, trucks and troop carriers. The roof rack is designed for minimum wind noise and includes a wind deflector to improve fuel economy. The high roof mounting also protects the antenna system from accidental damage and vandalism common with whip systems mounted on the front bull (nudge) bar or rear bumper.

COMPATIBILITY

Q-MAC's ML-91 is available in versions compatible with other manufacturer's transceivers up to 125W, including:

- Codan NGT™
- Barrett Communications 950™ and 2050™ series
- Icom ICF 7000™

Other transceivers can be provided on request. Complete packages including the ML-91 and Q-MAC's HF-90 transceiver are also available as integrated systems.

The ML-91 also includes a built in broadband scan amplifier which allows it to be used with systems containing Automatic Link Establishment (ALE) and multi-frequency networks operating in a selective calling scan group.

Mounting hardware sets are available to suit most types of vehicles, including Land Rover Discovery, Toyota LandCruiser, Toyota Prado, Nissan Patrol and Mitsubishi Pajero. Custom brackets can be made for all types of military vehicles.

FEATURES

Highly Efficient

- Radiates 10dB to 14dB more than a whip antenna
- Equivalent to a 500W transmitter with a whip antenna

Simple Installation

- Does not require welding or mounting plates
- No separate antenna tuner to install
- Fast & inexpensive installation
- Easily moved between vehicles

Integrated Roof Rack

- Conventional roof rack for storing tents, boxes & luggage
- Additional storage without compromising performance

No Skip Zone

- Eliminates or minimises skip zones
- Virtually continuous HF coverage from 0-1000km +

Noise Reduction

- Increased immunity to ignition & power line noise

Simple Design

- Mechanically simple & robust folding mechanism
- Low risk of failure compared with electromechanical designs

Covert

- Easily disguised for covert applications
- Not immediately recognisable as an antenna
- No unwanted attention in areas of conflict

Flexible

- Designed for the Q-MAC HF-90 transceiver
- Accommodates other manufacturer's transceivers up to 125W

APPLICATIONS

- | | |
|-----------------|----------------------|
| ■ Border Patrol | ■ Paramilitary |
| ■ Aid & Relief | ■ Police |
| ■ Customs | ■ Emergency Services |
| ■ Peace Keeping | ■ Mining, Oil & Gas |
| ■ Military | ■ Conservation |



TACTICAL
RADIOS

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Q-MAC is a wholly owned Australian company.

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