

# ANTENNA SOURCEBOOK®

## OVERVIEW

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The Antenna SourceBook® is organized by antenna type – Portable/Terminal, Mobile, Base Station, etc. – followed by mounts, replacement whips, cable and coaxial connectors, then parts/accessories/tools. A picture represents the models listed in each section, showing you exactly what you can expect to receive. No guesswork.

The Portable/Terminal sections covers the **SPOTS!** molded line, the Kulduckie® ExacTune™ PVC dipped line and stealth blade line of antennas.

The Mobile section covers models from 27 MHz to 1.5 GHz, starting with low band and working up the frequency spectrum. Within each frequency section, antenna models are listed in alpha-numeric order by series (KG, LM, LP, NMO, etc.). Antennas are shown in all modular configurations.

The Broadband Mobile section covers models from 2.4 to 5.8 GHz. It includes transit style, NMO whips, stealth blades and magnetic mounts.

The Broadband section covers 802.11a and 802.11b frequencies. Products featured in this section include planar arrays, sectors and omni antennas. This section differentiates between single and multi band antennas.

Base Station Antennas are organized by series in alpha-numeric order (BSA, FB, etc.). Within each series, the models are listed by frequency.

Finally, what makes the Antenna SourceBook® a valuable resource is the technical resource section - Antenna Basic Concepts and the Antenna Glossary. These sections are provided to assist users in understanding the basics of antenna system design, theories and terminology.

The Larsen Antenna SourceBook® is your source for antennas and accessories.



## MULTI BAND VHF/UHF

MODEL	FREQUENCY (MHz)	CONN
NMO2/70BK	144 - 148 / 440 - 450	PL-259

### SPECIFICATIONS

GAIN	VHF: 3.8 dBi UHF: 5.2 dBi
TYPE	VHF: center loaded 1/2 wave UHF: collinear
VSWR (see bandwidth)	2:1
BANDWIDTH @ 1.5	VHF: 2% / UHF: 3%
BANDWIDTH @ 2.0	VHF: 4% / UHF: 6%
COIL	VHF: 146 MHz / UHF: 445 MHz
POWER RATING	VHF: 100 Watts / UHF: 100 Watts
WHIP	W2/70 B, .100 enclosed coil
COAX	17' RG-58A/U
MAX HEIGHT	34 3/4"

Complete factory tuned dual band antenna and mounting kit for 2m/70cm amateur radio frequencies. Black coil and whip.



MODEL	FREQUENCY (MHz)
NMO2/70SH	144 - 148 / 440 - 450

### SPECIFICATIONS

GAIN	VHF: 2.14 dBi UHF: 4 dBi
TYPE	VHF: center loaded 1/4 wave UHF: center loaded 3/4 wave
VSWR (see bandwidth)	1.5:1
BANDWIDTH @ 1.5	VHF: 10% / UHF: 10%
BANDWIDTH @ 2.0	VHF: 15% / UHF: 17%
COIL	VHF: 146 MHz / UHF: 445 MHz
POWER RATING	200 Watts
COLOR	Black/Stainless
WHIP	.100 enclosed coil
COAX	Order separately
MAX HEIGHT	19"

Factory tuned NMO 2m/70cm "short" antenna with Stainless spring and whip.



MULTI BAND  
VHF / UHF



MODEL	FREQUENCY (MHz)
NMO150/450C	150 - 154 / 450 - 460

### SPECIFICATIONS

GAIN	VHF: 3.8 dBi UHF: 5.2 dBi
TYPE	VHF: center loaded 1/2 wave UHF: collinear
VSWR (see bandwidth)	2:1
BANDWIDTH @ 1.5	VHF: 2% / UHF: 3%
BANDWIDTH @ 2.0	VHF: 4% / UHF: 6%
COIL	VHF: 150 MHz / UHF: 450 MHz
POWER RATING	100 Watts
COLOR	Black/Stainless
WHIP	W150/450, .100 enclosed coil
COAX	Order separately
MAX HEIGHT	37 1/4"

Commercial dual band coil and factory tuned Stainless whip for 150 - 154 / 450 - 460 MHz radio frequencies.



NOTE: Antennas are not to scale

1 800 ANTENNA

To convert to Gain (dBd):  
Gain (dBi) - 2.14

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Just watch for the icon to locate the type of product you desire!

# ORDERING SERVICE & SUPPORT

## STOCK OPTION MODULAR INVENTORY

Larsen offers the “Stock Option” Modular Inventory System. This system allows you to order complete antenna kits (a), the antenna base coil and whip (b), or the components individually (c). And, for many mobile products, there is no price difference. The result is lower inventory costs with the flexibility to satisfy a broad variety of applications.

- a) NMO150CK
- b) NMO150C
- c) NMO150BCO, W490 , NMOK

## DISTRIBUTION

Larsen has partnered with the industry’s leading wireless products distributors throughout North America and around the world. Larsen antennas are as close as your phone or fax. (For a list of Larsen Stocking Distributors please see Pages 212-216 of the Antenna SourceBook®.)

## ORDERING

At Larsen we understand managing your business in today’s rapidly changing wireless communications market can be complicated. We want to make the process of doing business with us as easy as possible.

Whether it’s your first order or you’ve been doing business with us for a while, each and every customer is equally important to us. From our “no hassle credit” policy and experienced customer service associates to the latest in communications technologies, Larsen strives to exceed your expectations with every transaction.

To assist you in ordering products, Larsen has partnered with industry-leading distributors. For a list of fully stocked distributors, please see Pages 212-216 of the Antenna SourceBook®.

## 1-800-ANTENNA (268-3662)

When you need an antenna, what better way than to remember 1-800-ANTENNA (268-3662). Our knowledgeable Customer Support staff is available to assist you from 7:00 am – 5:00 pm Pacific Time.

In addition, our toll free FaxDirect is available for your convenience 24 hours every day. Simply fax your order to 1-800-525-6749.

For our international customers (outside North America):

Phone: 360-944-7551  
 Fax: 360-944-7556

Our dedicated, professional staff is waiting to exceed your expectations!

## LARSEN NO-NONSENSE™ WARRANTY



Every effort is made to assure the integrity and long life of each Pulse product. In the unfortunate event a problem does occur, you will find us ready to make it right!

Duration of warranty is specific to the product type:  
 Active Products: One year from date of purchase  
 All Other Antenna Products: Two years from date of purchase

Pulse will repair or replace without charge any Larsen antenna product which fails for any reason during the warranty period. Pulse is not responsible for any incidental or consequential damages due to failure of the antenna under this warranty or any implied warranty. This exclusion may not apply to all areas of the USA or Canada.

For service under warranty, contact the Larsen Customer Support Department at 1-800-ANTENNA (268-3662) for a Return Product Tracker number and complete instructions.

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**CHANGES / CONDITIONS: Continual research and development make it necessary for Pulse to reserve the right to make exceptions to or changes in policies, specifications and prices without notice.**

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Founded in 1965 as Larsen Electronics, Inc., the company experienced rapid growth with the advent of cellular expansions and new wireless markets. Acquired in 1999 by RADIALL SA, the company became known as Radiall/Larsen Antenna Technologies. In 2006 Larsen joined Pulse, the electronic components segment of Technitrol (NYSE:TNL, www.technitrol.com). The Larsen business has integrated into Pulse's Antenna Division while maintaining the highly respected Larsen brand name.

Headquartered in San Diego, California, Pulse is a worldwide leader in electronic component and subassembly design and manufacturing. Pulse is also a leading provider of antennas and antenna modules for mobile handsets and wireless devices. Through its automotive division, Pulse also supplies components for automotive ignition, monitoring and control systems.

The Larsen facility is located in Vancouver, Washington. Larsen is an ISO 9001:2000 certified production operation, with the capacity to produce over two million antennas annually.

With over 2000 standard antennas deliverable from stock or used as a design basis for special customer modifications, Larsen can quickly satisfy many antenna requirements. Full custom design is a ready option when the design parameters are highly specific or have proprietary intent.

Pulse has worldwide production operations located in Asia, Europe and North Africa. As a result of worldwide relationships, advanced supply chain management and close cooperation with our customers, we are able to explore broader value-added projects. This activity is particularly interesting for embedded antenna designs where the package is part of the antenna itself. In this case, Larsen can deliver a complete embedded antenna, plastic enclosure and cable harness subsystem.

Since 1965, the Larsen name has been synonymous with high performance in professional antennas. The company was founded on a passion for innovation and excellence. The passion remains today.

It is on this solid foundation Larsen will continue to build. Our focus is clear: to design, develop and manufacture innovative antenna products of the highest quality for emerging wireless markets.



Larsen's facility located in Vancouver, WA, USA

## OUR QUALITY PRINCIPLES:

- Customer Satisfaction
- Continuous Improvements
- Quality Performance
- Defect-free Products



# QUALITY

Pulse Wireless Devices and Automotive Division radiates QUALITY! Our resonance for this fundamental business basic has powered our company to gain its exceptional reputation and be a leader in the market. Committed to bringing the highest possible level of compliance to international standards, all sites are ISO 9000 Registered. Pulse takes a leadership role in defining industry applications standards with active participation in IEEE, ANSI, ADSL Forum and other committees, ensuring the customer will have full standards compliance when Pulse products are on board!

## PULSE CORPORATE POLICY

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- The corporate goal is to achieve the highest level of customer satisfaction through continuous improvements in quality, delivery and service.
- Pulse is committed to and expects quality performance from every employee.
- The company standard is defect-free products and services.

## PULSE ENVIRONMENTAL POLICY

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Pulse shall strive through planning and continual process improvement to protect and preserve the environment through prevention of pollution, reduced consumption of natural resource elements and materials and compliance with all relevant legal and other requirements

## ISO 9001

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Pulse stands for just one thing – quality! This fundamental business basic has helped our antenna products stand out from the pack since 1965. Larsen quality is seen in our innovative designs, superior materials and benchmark customer service. As part of our commitment to quality, Larsen proudly achieved ISO certification in 1996 and upgraded to ISO 9001:2000 standard. ISO certification has been preserved through continual improvement and honest commitment to total customer satisfaction.

## ISO/TS 16949

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In 2003 the automotive antenna products facility in Vancouver, Washington, was assessed by Underwriters Laboratories (UL) to upgrade its certification from QS9000 to the more stringent ISO/TS 16949:2002 standard. Like the ISO 9001 standard which it incorporates, ISO/TS 16949 is a set of quality system requirements internationally recognized by the automotive industry.

ISO/TS 16949 was developed in 1999 through the collaboration of major North American and European automotive manufacturers in an effort to harmonize the various national industry standards. The standard was revised in 2002 with the participation of Asian automotive manufacturers to make it fully compatible with ISO9001:2000.

In 2006, Pulse acquired Larsen and combined synergies to further enhance the quality and reliability of antenna products and relentlessly increase customer satisfaction through comprehensive quality programs and the appropriate use of quality tools.

## COMPLIANCE WITH RoHS

The antenna products in this catalog are compliant with the RoHS requirements to the best of our knowledge. They do not contain any banned substances with respect to the EU Technical Adaptation Committee (TAC) recommendations and exceptions regarding maximum concentration values for substances.



Availability of lead free products:

Larsen has converted all products in this SourceBook to lead free and has been 100% compliant with the RoHS directive since July 1, 2006.

- Tin-lead plating was replaced with pure tin. Larsen R&D has investigated many possibilities in order to be able to propose to our customers the best alternative plating solution.
- Our products are compatible with lead-free processes (eg. compatibility with higher soldering temperature), as well as continuing to remain compatible with former processes.

Meeting specific customer requirements:

Exemptions: Customers with specific needs for tin-lead products are invited to contact Larsen at 1-800-ANT-ENNA. Larsen will continue to support products with tin-lead plating for specific applications where exemptions to the EU directives are applicable.

For more specific information on a particular antenna product, please contact your Larsen representative (see Pages 210-211 for a list of Larsen representatives).



# CUSTOM OEM DEVELOPMENT

## DESIGN PROCESS

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Years of experience give Larsen a special ability to work with customers to determine configuration needs quickly. Through close communication with our customers, we bring projects to completion on target and often within compressed time schedules. Each new antenna design begins with careful development of the mechanical and electrical performance objectives. A proposal is prepared detailing feasibility, timing and unique costs.

## MECHANICAL DESIGN EXPERTISE

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Each commercial antenna design represents a marriage of electrical and mechanical technologies. Our effort is to meet both of these objectives for the customer.

Harsh-use environments, severe drop test requirements and other special needs are within our experience. Mechanical design also represents the important opportunity to meet cost targets. By utilizing a team approach to product design, our electrical, mechanical and manufacturing engineers design the best overall solution. Special mechanical capabilities involve the use of plastics in antenna design, including insert and overmold applications. Advanced mechanical form and application experience exist for terminal, vehicle and small/mid base antenna design.

All mechanical design output is documented in Solidworks® three-dimensional modeling software. This output can also be translated into most popular design formats. The impact of the mechanical design objective is determined through a rigorous testing and validation process.

## ELECTRICAL DESIGN EXPERTISE

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Advanced electrical antenna design represents the heart of our business. The electrical performance goals of each antenna design are paramount in meeting the total design objective. Electrical design progresses from the theoretical to the practical through the use of early computer simulation, prototype and verification.

## TECHNOLOGIES & SOLUTIONS

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Larsen offers solutions for applications using different technologies and frequencies ranging from 136 - 5800 MHz.

Technologies include:

- Embedded and External Wire Patch and PIFA
- Printed and Sleeve Dipoles
- Bi-Directional Printed circuit board
- Patch Array
- Omni Collinear Array and Yagis
- Ceramic Patch
- Multiband Active
- Helical monopoles

These technologies cover a very wide variety of applications to fit an array of needs for any OEM customer.

These include solutions for:

- Embedded Handsets, Terminal Devices, Access Points and Routers
- Wi-Fi, WiMax, WLAN
- PCMCIA Cards
- In-building coverage
- Portable Radios
- Telemetry, Telematics, Tracking

# CUSTOM OEM DEVELOPMENT

In December 2006, Larsen became a part of Pulse, the electronic components segment of Technitrol. Pulse is a worldwide leader in electronic component and subassembly design and manufacturing. The merger of Larsen and Pulse creates a powerful synergy and new opportunities for our customers who will be able to source a diverse range of antennas from our combined product lines. Larsen will also benefit from Pulse's substantial engineering resources, including test equipment and anechoic chambers.

## PIONEER OF MOBILE ANTENNA SOLUTIONS

Pulse offers a broad range of antenna solutions for mobile phones and other wireless devices. Pulse has often been the first to introduce new technologies that have subsequently earned a dominating position in their field. A good example is the internal handset antenna, originally introduced by Pulse, which is now ubiquitous in several major mobile terminal categories.



## OPTIMAL MANUFACTURING SOLUTION FOR EACH SCALE

Pulse has an impressive track record in building and offering cost-optimized manufacturing solutions that support different economies of scale of different products. Our capabilities include solutions for very high-volume manufacturing, for high-volume flexibility, and for manual assembly. Available manufacturing options economically cover production volumes from thousands to tens of millions of units.

## CAREFULLY DEVELOPED COOPERATION ACROSS THE WHOLE VALUE CHAIN

Pulse has put into effect several individual projects and actions to enhance cooperation with its supplier network. The aim is to improve quality, manage costs, diminish risks, enhance logistics and offer better service for the end customers. Practically without exception, these actions are also very much appreciated by our supplier companies. Every company gains by better understanding the needs of the end customer.

## GLOBAL PARTNERS FOR GLOBAL CUSTOMERS

Pulse serves global customers on a global scale. This requires similar capabilities from our suppliers, and that is why our supplier network is characterized by a global scope. Our site in China has built an impressive network of high-quality supplier companies operating inside the fast-growing market area, thus offering substantial logistic and cost benefits to customers.

## GLOBAL CAPABILITIES FOR GOOD SERVICE

In our line of business markets are global, customers are global and successful operations demand global capabilities. Our main sites are in Asia, Europe and North America. In addition to this, we utilize Pulse's worldwide network of customer service sites and authorized distributors and representatives.

Call our OEM Development team for more information or to begin selecting or designing the best antenna for your project.