

NanoCART (NCART) Series Transmitters

**Monitor smolts, juveniles and sub-adult species
as they move through multiple environments**

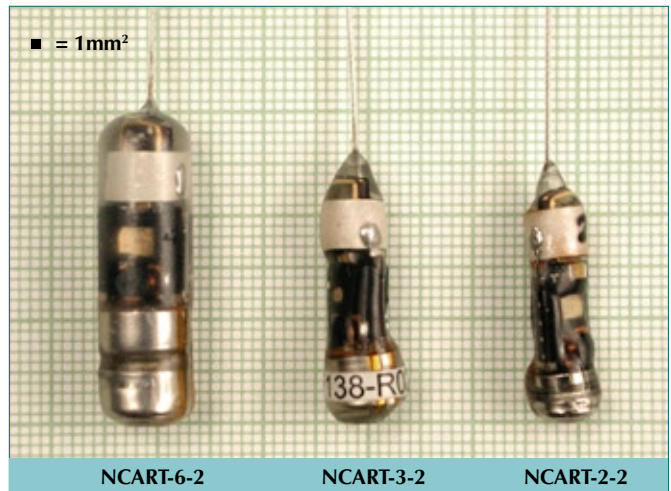
Research often advances when a new tool is applied to an unanswered question. In fisheries and wildlife research, these questions arise from our inability to study the life stages of certain animals, or to monitor their movement throughout their natural environments.

Fish that migrate to and from different environments – for example, through riverine, estuarine and marine environments, or from fast flowing rivers in the spring to deep lakes and reservoirs during the summer – pose distinct monitoring challenges.

This is especially true of the smolts, juveniles and sub-adults of such species. Until now, no technology has been available that would allow researchers to collect continuous data on such small specimens as they move through multiple environments.

LOTEK NCART Series transmitters provide researchers with a new tool to elucidate fish behaviour in all of these environments. They combine acoustic and radio technology (CART) in a single miniaturized transmitter that is suitable for use in research involving juveniles, sub-adults and small fish species.

NCART transmitters employ field-proven designs that have made our NanoTag and MiniMAP Series transmitters so effective. They possess the attributes long sought by the fisheries research community: small size and long life with reliable, stable performance throughout their operational lives.



Key Features

- Small size and multi-mode operation make NCART particularly suitable for use on small anadromous fish species
- Compatible with all LOTEK SRX and DRX radio receivers
- Compatible with all LOTEK MAP 200kHz acoustic receivers
- Acoustic CDMA coding for virtually collision-free operation
- Radio frequency tolerance to $\pm 100\text{Hz}$ means stable signal throughout life
- Available radio frequency ranges from 147MHz to 168MHz
- Infrared activation to simplify field deployment
- Standard or extended life options
- Programmable on/off features to extend operational life

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The Acoustic Advantage

Acoustic transmitters can be detected in deep, brackish and saline water environments that may limit or preclude the use of radio telemetry. The acoustic mode of NCART Series transmitters employs CDMA coding and is designed for use with LOTEK MAP acoustic products, including mobile tracking and submersible datalogging receivers, as well as MAP positioning systems. Among MAP system benefits are high capacity and collision-free operation, even in projects that demand fine spatial

resolution or where large numbers¹ of fish congregate in the study area. With their compatibility with multi-architecture MAP receiver systems, NCART transmitters provide researchers with considerable versatility when designing a system to meet project objectives.

¹ The number of available acoustic codes may vary depending upon system-specific parameters configured to address application requirements. Please consult with your Lotek representative for details.

The Radio Advantage

Radio transmitters can be detected using a variety of tracking modes including aircraft and ground, while both boat tracking and autonomous datalogging also afford the use of aerial antennas to facilitate data collection opportunities. Radio telemetry can also operate in freshwater environments that limit or preclude the use of acoustic telemetry, including shallow water applications, spillways, tailraces and areas with high air entrainment. The radio mode of NCART Series transmitters is designed for use with LOTEK digitally encoded SRX and DRX

receivers which use a proprietary coding scheme that allows over 500 transmitters to be assigned on a single radio frequency while retaining the ability to identify individual animals. The need for multiple frequencies is thereby significantly reduced with a corresponding reduction in overall scan time. As scan time is reduced, spatial and temporal resolution are enhanced, which in turn improves overall detection probability as fish move through the reception zone.

Tag Life Options

Model	Size (mm)	Wt (g)		Standard / Extended Life			
		Air	Water	Burst Interval (CDMA / PPM)			
				2.5s	5s	10s	15s
NCART-2-2	6.9 x 22	1.9	1.2	4 / 10	7 / 17	14 / 26	18 / 32
NCART-3-2	7.8 x 25	2.3	1.5	5 / 13	9 / 21	17 / 32	22 / 39
NCART-6-2	9.0 x 29	4.5	2.8	30 / 73	53 / 116	93 / 179	124 / 218

Burst interval with corresponding operational life specified for the transmitters are provided for comparative purposes. Various burst intervals are available, based upon application specific considerations and operational life requirements.

Above specifications are based on internal implantation. Weight includes battery pack and antenna. Use of alternative antenna material or encapsulants may alter the above specifications. Trimming antenna may void warranty.

Typical operational life values are stated based on component specifications and transmitter measurements, with warranty life expressed as 80% of the typical value effective from date of shipment.

Further detail regarding MiniMAP Series and NanoTag Series transmitters is available from Lotek's web site at www.lotek.com.

