

# Technical and Performance Standardization of Electronic ID

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A successful national livestock identification system is one that is permanent, low cost, capable of being automated, safe - for animals, meat, milk, the environment and people, is reliable and is compatible with international standards for ID. Electronic identification has shown that promise. My task is to discuss the purposes and current status of electronic identification standards as they pertain to the possibility of adoption of electronic ID as a national system for livestock. This presentation will have two major sections: performance standards and technical standards. Performance standards are those that are of specific interest to user groups; technical standards concern compatibility among products from different manufacturers, and are under the primary control of the International Standards Organization (ISO).

Technical standards for EID are very important to regulatory agencies and other users to minimize the cost of the systems by being able to read any manufacturer's transponder with a single reader system, and to have a standard protocol for transmission of the data from any manufacturer's reader to a computer system. Likewise, users should have some assurance of minimum performance standards that are expected.

## **Performance Standards**

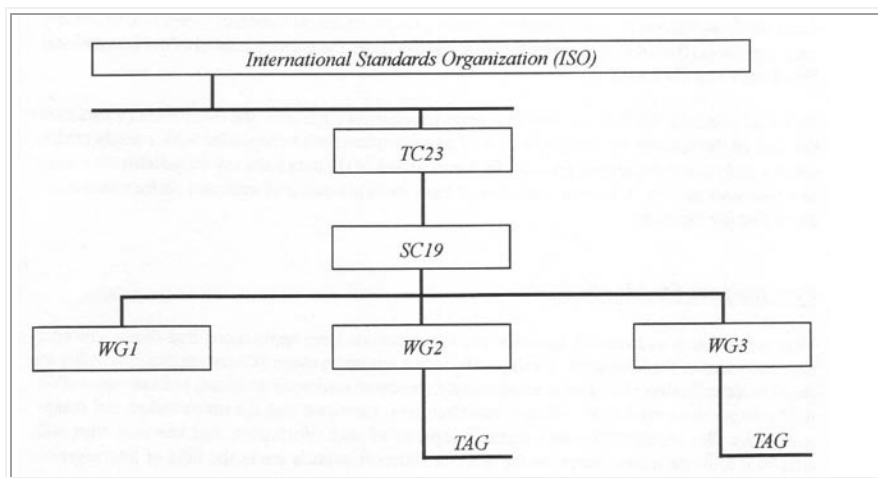
User groups such as livestock agencies and organizations have applications that require specific characteristics of the ID system. Examples include a minimum range of interrogation, the ability to read the identification of an animal automatically, the use of stationary antennae, and assurance of no duplicate numbers even from different manufacturers, assurance that the transponders and equipment meet ISO standards for such items as capacity of chip information, and knowing what will happen if multiple transponders on the same or different animals are in the field of interrogation simultaneously. A standard attachment site or insertion site is desirable. The earliest age that an animal may have a transponder attached or inserted needs to be standardized. Is it desirable for the transponder to be reusable? How important is it for the transponder to be secure? Is tamper resistant sufficient? These items may need to be standardized differently for different species and different applications, but they do need to be standardized.

One of the specifications that appears to be very important for routine use of electronic ID in livestock management is a stationary antenna system. Some of the manufacturers have made substantial progress in this area. My contention has been that a portal (walk through) configuration was needed, although an antenna mounted on one side of a closed area may be sufficient in some situations.

We at Illinois have worked with the Holstein Association and National DHIA to specify the characteristics of electronic ID systems that would be suitable for the dairy industry. I suggest that other livestock agencies and organizations would benefit from developing their own specifications and conducting some tests to help bring this technology to the market place. The specifications that we developed have been used as a model for international performance standards in the dairy industry by the International Committee on Animal Recording (ICAR), the main international group concerned with milk recording.

## **Technical Standards**

The development of technical standards for electronic ID is through the International Standards Organization (ISO)



*TC23* = Tractors and Machinery for Agriculture and Forestry

*SC19* = Agricultural Electronics

*WG1* = Mobile Equipment

*WG2* = Stationary Equipment

*WG3* = Identification

Figure 1. Committee structure within International Standards Organization for setting standards on agricultural electronic identification equipment

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Technical standards for manufactured products are developed by this group through its over 170 committees that cover products as diverse as power takeoffs on tractors and medical devices. EID systems for livestock are covered through ISO's technical committee, TC23, Tractors and Machinery for Agriculture and Forestry, subcommittee SC19, Agricultural Electronics, and Working Groups WG2, Stationary Equipment, and WG3, Identification.

These working groups have been very active during about the last three years as the technology has evolved from laboratory development to on farm testing. Three ISO standards that are in various stages of approval have evolved.

**Figure 2. ISO Progress Toward RFID Standards**

Item	Action
ADIS - file format	Approved by ISO
Data dictionary	Being developed
Transponder code	Approved by SC19
RFID transponder-reader specifications	Voting underway
Include non-livestock?	Proposal being considered
Include farm code?	Proposal being considered

A standard file format for transmitting information from an ID reader to a computer or other data collection device has been approved. A data dictionary or standard livestock terms are being developed to go with this standard. The data dictionary is most developed for dairy due to extensive existing computerized dairy record systems in Europe and North America. Data dictionaries for other species will be added as an addendum to the standard as they evolve.

The transponder code was agreed upon in January 1993 by WG3, and is proceeding toward approval in ISO, perhaps as early as their meeting in February, 1995. Voting is currently underway on ID reader specification (votes are due Dec 15). ISO standards for reader specifications could be published as final as early as a year from now if the proposed standards are approved without modification or comment. If significant comments are received (a likely scenario), final approval probably would not be before October 1996. In the meantime, there is nothing to stop manufacturers from building and selling readers that would conform to the current ISO proposal for readers.

Two proposals under consideration at the WG3 meeting, being held in Braunschweig, Germany, simultaneously with this meeting, are potentially important. Both deal with modifications in the previously approved code structure for the transponders. One proposal would require that the capability for a national farm code be included in the code structure. A second proposal would require the capability to mark electronically the transponders that are to be placed in animals of endangered species.

Another important question that has not been resolved is whether the currently proposed code structure and reader standards will include all species of animals. The main problem is that there is a large installed database of transponders that do not meet the proposed ISO standard that have been implanted in non-agricultural animals, mainly companion animals and exotics, and great expense would be incurred in the conversion to the proposed ISO standard. However, to maintain a dual standard would result in an investment of two types of readers instead of one for each regulatory agent or veterinarian in order to monitor all species of animals.

One of the important achievements of the ISO for implementing electronic animal ID is the approval of a code structure for transponders.

**Figure 3. Code Structure Proposed for Standardized International Animal Identification**

Bits	Information	Combinations
1	Flag for animal (1) or non-animal (0) application	2
2-15	Reserved Code	16,384
16	Flag for trailing information	2
17-26	ISO country code (3 digits)	1024
27-64	National ID Code	274,877,906,944

The ISO standard chip has a minimum capacity of 64 bits. Transponders are marked for animal or non-animal use. A section of the chip is reserved for future use. The transponders are coded to indicate if more than 64 bits of data are on the chip (future use, write only and read-write data). The country of origin is coded, and there is a large part of the code that is for identification of the animal. The transponders are coded with their number during the manufacturing process.

The proposed ISO standards for the electronic details of the transponder and the reader are well along toward approval if no changes are made. Several compromises were made to accommodate equipment from as many companies as possible while maintaining specifications that were known to result in a read range that would allow automated reading of transponders attached to, or implanted in cattle.

Three standard sizes are proposed for injectable transponders. Different size transponders are appropriate for various animals. Read ranges are limited by the size of the antenna in the transponder, so smaller transponders result in shorter read ranges.

Standards for readers also have been developed.

**Figure 4. Proposed ISO Standards for Electronic Animal ID**

Parameter	Proposed Standard
Transmission System	Full or Half Duplex
Activation Frequency	134.2 kHz
Modulation	Phase shift or frequency shift keying
ID Code Bits	64

Full duplex means that the transponder receives electromagnetic energy from the reader and sends its encoded ID signal back simultaneously. Half duplex transponders have a small capacitor that becomes charged with the energy from the reader; the half duplex reader stops sending energy while the

transponder sends its encoded ID signal. Two methods of modulation also were approved. Approval of this flexibility in the standard allows different companies to manufacture the transponders, the readers, and the antennae with only a slight increase in the cost of the reader relative to readers designed for a specific transponder.

Finally, I am announcing that, as a result of advances in antenna design and shielding, we have documented 100% reads from about 50 cows as they walked through the milking parlor twice a day at milking time on our dairy farm during the period between November 15 and November 23. Shielding prevents unwanted reads from transponders that are attached to cows in the adjacent area, and the portal antenna system is automatically reading every cow as they pass through the portal antenna.

**For more information about ISO standards, the ISO process and how to become involved in the U.S. Technical Advisory Groups (TAG), contact:**

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**To obtain copies of 11784, 11785, 11789, and other ISO standards, contact:**

American National Standards Institute (ANSI)  
11 West 42nd Street  
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(212) 642-4900

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