



U.S. Department of  
Transportation



## Intelligent Transportation Systems Standards Fact Sheet

August 2002

### NTCIP 1102 (Draft)

## National Transportation Communications for ITS Protocol (NTCIP) – Octet Encoding Rules

### Overview

The National Transportation Communications for Intelligent Transportation System (ITS) Protocol (NTCIP) is a family of standards that provides both the rules for communicating (called protocols) and the vocabulary (called objects) necessary to allow electronic traffic control equipment from different manufacturers to operate with each other as a system. The NTCIP is the first set of standards for the transportation industry that allows traffic control systems to be built using a “mix and match” approach with equipment from different manufacturers. Therefore, NTCIP standards reduce the need for reliance on specific equipment vendors and customized one-of-a-kind software. To assure both manufacturer and user community support, NTCIP is a joint product of the National Electronics Manufacturers Association (NEMA), the American Association of State Highway and Transportation Officials (AASHTO), and the Institute of Transportation Engineers (ITE).

The NTCIP family of standards is a joint project of the following standards development organizations:

**American Association of State Highway and  
Transportation Officials (AASHTO)**

**Institute of Transportation Engineers (ITE)**

**National Electrical Manufacturers Association  
(NEMA)**

(Contact information is shown at the end of this fact  
sheet)

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For current information on the status of this  
standard, check the Web site at the bottom of this  
page.

Prior to the establishment of the NTCIP, traffic management centers used a number of proprietary protocols to exchange information with field devices such as traffic signal controllers and dynamic message signs. The goal of all NTCIP standards is to identify a common set of non-proprietary communications protocols that address requirements for center-to-center and center-to-field communications and promote interoperability.

### What is this standard for?

This standard, **NTCIP 1102 – Octet Encoding Rules (OER)**, is a presentation layer standard that defines how NTCIP objects are encoded (i.e., the exact digital representation of the value of an object that is to be transmitted over a communications path). It is used in conjunction with application layer protocols defined in other standards. This standard is applicable to both center-to-roadside and center-to-center communications. Unlike the other types of encoding rules used in standards-based implementations, such as ASN.1 basic encoding rules (BER) and packed encoding rules (PER), OER addresses the specific needs of certain application layer protocols used by the transportation community.

Originally, a subset of the encoding rules defined in this standard was specified in the NTCIP 1101 – Simple Transportation Management Framework (STMF) standard. However, in order to address extended ASN.1 functionality needed for center-to-center communications, the necessity to develop a stand-alone document became apparent. The result is this standard, which replaces section 5.1.2.2 of the NTCIP 1101 standard (along with its Amendment 1 of 1998). However, this document defines many additional features.

### Who uses it?

This standard should be used by software engineers, system designers, and system integrators that implement certain center-to-roadside (i.e., NTCIP 1101 – Simple Transportation Management Protocol [STMP]), or center-to-center (i.e., NTCIP 2304 – Application Profile - Data Exchange [DATEX]) profiles. Additionally, transportation and traffic engineers involved with the design, specification, procurement, and testing of systems should be familiar with this standard.

Annex A organizes the requirements of OER into a list of specific capabilities and options. The list can be especially useful for:

- a. Users of an implementation as a basis for verifying compatibility with other implementations;

- b. Protocol implementers as a checklist to reduce the risk of failure to conform to all requirements;
- c. Suppliers or purchasers of standardized systems as a detailed indication of the capabilities of an implementation; or
- d. Protocol testers as the basis for selecting appropriate tests to ensure conformance of an implementation.

**How is it used?**

This standard is being used within certain NTCIP communications profiles (NTCIP 1101 – STMP or NTCIP 2304 – DATEX). Both application layer protocols specified in these profiles rely on this standard for encoding the data that is to be transmitted. It defines the methodology for formatting and preparing data (objects) for transmission between two entities (e.g., between field devices and centers, among centers, etc.). In contrast with other sets of encoding rules, OER delimits data elements on octet (byte-level) boundaries at the cost of additional bandwidth.

Within the NTCIP data dictionaries, every data element (object definition) is based on one or multiple one-byte values. These definitions are the basis for the encoding rules defined in this standard. The main reason for defining a new set of encoding rules (in addition to those defined by ASN.1 used elsewhere in the information technology industry) is the desire of the transportation industry to preserve byte-level and word-level boundaries and ease the testing of their systems.

**Scope**

The formatting of information based on octet boundaries for transmission between a transportation management center and field devices or other centers are defined in this standard. It is essential that the encoding rules in this standard be implemented by the devices and/or centers at both ends of a communications channel.

**Related documents**

To accommodate the broad scope of this standardization effort, the NTCIP standard has been divided into numerous individual standards. A detailed list of related documents is available on the [NTCIP 9001 – NTCIP Guide](#) fact sheet. (The NTCIP Guide is also available on-line at [www.ntcip.org](http://www.ntcip.org)).

ISO/IEC 8825-1:1999, ITU -T X-690 (12/97) -- Information Technology-ASN.1 Encoding Rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER), and Distinguished Encoding Rules (DER)

[NTCIP 1101 – Simple Transportation Management Framework \(STMF\)](#)

[NTCIP 2304 – Application Profile - Data Exchange \(DATEX\)](#)

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