Jcast Vehicle Detection System

ORSN(On Road Sensor Node) **SC-100**

User Manual/Operation Guide

P/N SC-100 Rev A
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Introduction

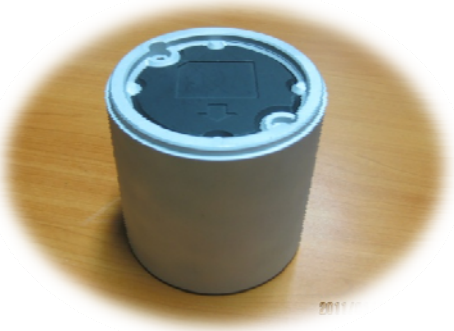
This guide provides information and procedures for installing Jcast Vehicle Detection Sensor Node(ORSN) SC-100 in conjunction with the Jcast Vehicle Detection System and ORSN Specifications.

Overview

In this section explains a Jcast Vehicle Detection Sensor, the contents of a Sensor Information and Sensor Specifications

On Road Sensor Node (ORSN) SC-100

A Jcast On Road Sensor Node (ORSN) is a magnetometer capable of low-power radio communications packaged in a small, hardened plastic case suitable for in-pavement mounting.



ORSN detect canges in the earth's magnetic field to determine the presence or absence of vehicles relative to the detection zone of the ORSN. Detection "events" are transmitted via Wireless Communications to a Jcast Road Side GateWay(RSGW) where they processed, stored and forwarded to other systems(SUS).

ORSN utilizes multifunctional sensors which consist of three-axis AMR, physical and pressure sensors listed in Tables I and II. The three-axis AMR is used for vehicle detection, classification and speed measurement while other sensors are used for calibration and enhancement of measurements.

Table 1

Sensor Measurement Approaches

Property	Specification	
	Measure	Principle
Physical	Pressure Temperature Humidity Flow	Piezoresistive Capacitive Capacitive, resistive Pressure change, thermistor
Motion	Position Velocity Angular velocity Acceleration	E-mag, GPS, contact sensor Doppler, Hall effect, optoelectronic Optical encoder Piezoresistive, piezoelectric, optical fiber
Contact	Strain Force Torque Slip Vibration	Piezoresistive Piezoresistive, piezoelectric Piezoresistive, optoelectronic Dual torque Piezoresistive, piezoelectric, optical fiber, sound, ultrasound
Pressure	Tactile/contact Proximity Distance/range Motion	Contact switch, capacitive Hall effect, capacitive, magnetic, seismic, acoustic, RF E-mag(sonar, radar, lidar), magnetic, tunneling E-mag, IR, acoustic, seismic(vibration)
Vehicle Traffic	Detection Classification Speed	AMR, inductive loop coil AMR, inductive loop coil AMR, inductive loop coil

Table 2

Magnetic Sensor Technology Field Ranges

Magnetic Sensor Technology	Detectable Field Range (gauss) *		Remark
	Min	Max	
Squid	10^{-10}	10^{5}	
Fiber-Optic	10^{-6}	10^{1}	
Optically Pumped	10^{-8}	10^{0}	
Nuclear Procession	10^{-7}	10^{2}	
Search-Coil	10^{-8}	10^{10}	
Earth's Field	10^{-4}	10^{0}	
Anisotropic Magnetoresistive	10^{-6}	10^{1}	ORSN uses this sensor.
Flux-Gate	10^{-6}	10^{2}	
Magnetotransistor	10^{-1}	10^{4}	
Magnetodiode	10^{-1}	10^{4}	
Magneto-Optical Sensor	10^{0}	10^{10}	
Giant Magnetoresistive	10^{-1}	10^{8}	
Hall-Effect Sensor	10^{2}	10^{6}	

SC-100 Specifications

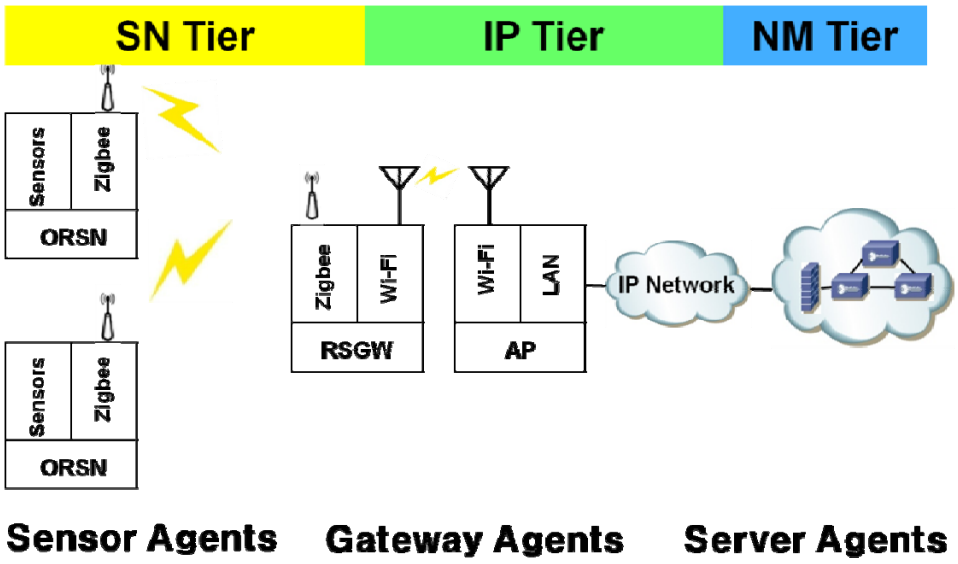
SC-100 Sensor Node

Detection tech	3-axis magnetic field sensing
Sampling rate	128Hz
Protocol	IEEE 802.15.4
Modulation	DSSS OQPSK
TX/RX bit rate	250kbps
Frequency band	2400 ~ 2483.5Mhz
Frequency channels	16
Channel bandwidth	5Mhz
Nominal output power	0dBm
Typical receive sensitivity	-95dBm
Power supply	8.5Ah(nominal capacity)
Weight	300g
Environmental	IP67
Operating Temp.	-40°C ~ +85°C
Supporting Models	SC-100Z, SC-100B, SC-100T

Jcast Vehicle Detection System Architecture

Jcast Vehicle Detection System

Communication Between Agents



Communication Between Agents

Installation Procedures

This section discusses installation requirements and provides step-by-step installation procedures.

Required Equipment

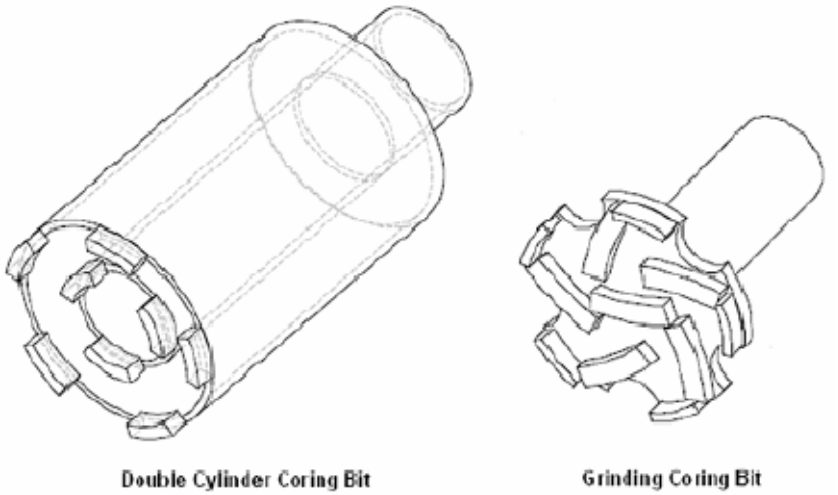
Before installing a ORSN, ensure that the following components are available :

- Jcast On Road Sensor Node(ORSN)(s)
- A minimum of one tube of FJS epoxy for each ORSN

A 2:1 ratio pack of Fablck Joint Seal(FJS), a two-component 100% solid silicone polyurea-based joint sealant is recommende. This self-leveling joint sealant displays fast cure times and excellent adhesion to concrete. In ambient temperatures from 20°F (-6.6°C) to 180°F (82.2°C) the epoxy cures in approximately five minutes.

- Coring bit suitable for creating a hole (4” diameter, 2 ¼” depth [10.2 cm, 5.7 cm]) in the target surface

Two types of 4-inch drill bits, each with 1¼” standard machine threaded sleeves, are recommended as shown in the following diagram.



Coring bits

For soft road surface, a 4” *double cylinder coring bit* is recommended. Once a 2” (5cm) deep hole is drilled, chisel any remaining material so that the result is a flat bottomed hole. For harder surfaces, a 4” *grinding coring bit* is recommended.

Use a shop vacuum or other implement to ensure that the hole is free of all dust, debris and loose impediments.

- Coring drill and frame
- Cold chisel and club hammer or a power chisel
- A shop vacunm, brush of other implement suitable for removing dust and debris from a hole cored in the oave ment
- Heat gun propane torch (helpful in environments with significant roadway moisture)

Step-by-Step Procedures

Installing the Sensor/Shell Assembly into the Pavement

1. Find and mark the center of the desired ORSN location.
2. Core a hole approximately 4”(10cm) in diameter, and 2¼” (6 cm) deep into the pavement Check depth as your drill, remove debris periodically.

Coring Sensor Hole

3. Vacuum or brush the hole clear of dust and debris

Clearing Sensor Hole

Ensure that the hole is dry as moisture may impede the curing of the epoxy. If moisture is observed, use the heat-gun or torch to dry the inside of the hole completely.

4. Apply epoxy to the bottom of the hole to a depth approximately 1/3 of the hole's total depth.

First Epoxy Application

5. Place Sensor in hole. Verify the following

   - Label is visible
   - Arrow on label points in the direction of traffic flow

6. Fille the hole with epoxy, empletely covering the ORSN

Filling Hole With Epoxy

Installed Sensor

FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference. and
(2) This device must accept any interference received, including interference that may cause undesired operation.

Caution

Any changes or modifications (including the antenna) made to this device that are not expressly approved by the manufacturer may void the user's authority to operate the equipment.