Streetline

Embedded Vehicle

Sensors

Installation Overview

Rev. 1.0

STREETLINE
CONNECTING THE REAL WORLD

What you need to get started..

MATERIALS:

- One Streetline Embedded Vehicle Sensor

- About 4 ounces of pavement epoxy

EQUIPMENT:

- Portable core drill with 5-inch diameter core drill bit

- Hammer drill with chisel bit

- Wet / Dry Vacuum

- Propane torch

- Epoxy mixing equipment

- Proper safety equipment and attire

Installation overview

Installation of the Streetline embedded vehicle sensor is done in 2 general steps:

- Hole preparation
- Deployment

Unlike typical electronic devices, the Streetline embedded vehicle sensor is an ultra-low-power device that does not require a power switch. The unit ships pre-powered and ready to go as-is. Shortly after you deploy the device to the designated area, the sensor will automatically search and join a preinstalled network around it and begin operating immediately.

Equipment and Preparation

EQUIPMENT REQUIREMENTS PER CREW:

- A flat bed truck large enough to carry all equipment plus a substantial water tank for refilling pump tanks

- Measuring equipment and chalk

- Electric core drill and stand capable of handling a 5" diameter core bit, such as Hilti DD130

- 5" diameter core drill bit

- Small portable water tank with pump (refilled from truck bed tank)

- An electric hammer drill and chisel bit

- Two gas powered generators on a low dollies

- Shop vac and plenty of rags

- Propane torch (200-500 btu)

- An epoxy mixing/metering machine -**OR-** manual mixing equipment:
  - plastic cups
  - mixing sticks
  - paint stirrers (for transferring resin and hardener into the cup).
  - rapid cure epoxy (SL uses epoplex MA-50) many brands are available, but *rapid cure is critical*)

SOME NOTES ON EQUIPMENT AND PREP:

- Gas powered core drills are available, but hard to rent.
  They save the need for one generator and can be used effectively without a stand.

- Electric core drill and all drilling equipment is OTS and rentable if not owned by the city.
  Check with renting agency to ensure bearings are good to reduce "chatter" during drilling.

- Epoxy mixing can be done manually, but a machine improves efficiency substantially.

- A diamond core drill bit is good for about 200 cuts before retooling/sharpening.

- Crewmembers should be provided with:
  - heavy gloves for cleaning divots of debris
  - plenty of latex gloves for handling epoxy
  - rubber boots are advisable for the drilling team, as water is used liberally during the drilling process and will soak ordinary work boots

How to install a Streetline Embedded Vehicle Sensor in five easy steps..

1. Drill the core

2. Remove the core

3. Prepare the hole

4. Pour the Epoxy

5. Position the Sensor

Step 1: Drill the Core

A core drill creates a hole by making a circular cut around the material to be removed,
instead of breaking up all the material from the hole. Core drills are commonly available for rental
from Hertz and other equipment rental companies.

- **GET THE RIGHT SIZE BIT**
Remember to specify a 5-inch diameter bit for the job.
This is a common bit size, so it should be easy to get.

- **BRING WATER**
Be sure to supply the drill with water.
The core drill uses water to lubricate the cut and contain dust created by the drilling process.
Water is fed to the drill with a standard garden hose.
Most models will come with small water tanks that can be pressurized with a hand pump.
For larger jobs, you may want to bring a truck with a water tank on board.
If water runs out, the core can get stuck inside the drill bit, which will put an early end to your work day.

- **GET THE DEPTH RIGHT**
Getting the depth right is important for a good fit and to make sure you're using only as much epoxy as you need.
You can see how deep you're going by looking at markings on the bit.
Drill to a depth of 1.25 inches. It's better to be a little bit to deep than a little bit to shallow.

AFTER EVERYTHING IS SET UP, GETTING TO THE CORRECT DEPTH TAKES ABOUT A MINUTE.

RIGHT: A clean, completed cut.
The core is still attached on the bottom,
and will be removed by chipping in the next step.

ABOVE: Operators set up the core drill,
with a full tank of water and proper safety attire.

Step 2: Remove the Core

Now that you have a circular cut in the pavement to a depth of 1.25 inches,
you can remove the core material to create a space for the sensor.

The best way to get this done is with a hammer drill. Like the core drill used in the last step,
hammer drills are commonly available at commercial rental companies.

- **START FOR THE TOP**

You'll get a cleaner, faster result if you start by drilling straight down the center of the core
to get the process started.

- **GET A LOW ANGLE ON THE JOB**

You can see this in the main picture on the next slide.
You're trying to create a flat bottom that comes just to the edge you created with the core drill,
without going any deeper. So after you punch the center hole, keep the bit closer to level with the roadway,
to avoid punching a deeper hole than you need.

- **WORK OUT FROM THE CENTER**

Once you've got the center hole punched, work from the center to the edges.
Large chunks of asphalt will pop out intact this way, and you'll be left with a rough bottom to finish.

- **FINISH AROUND THE EDGES**

To finish the bottom, work in a circle around the edges of the cut.
Be careful not to chip outside the circle.

THIS STEP TAKES A FEW TRIES TO GET GOOD AT IF YOU HAVEN'T DONE IT BEFORE, SO TAKE YOUR TIME ON THE FIRST FEW.
ONCE YOU GET THE HANG OF IT, YOU CAN GET RELIABLE, HIGH QUALITY RESULTS IN ABOUT 5 MINUTES PER HOLE.

Step 3: Prepare the Hole

Now you've got a freshly cut circular hole in the pavement, with a flat bottom.
You want to put a sensor in it and have the sensor stay for years to come, secured with a layer of tough pavement epoxy.

To get the best performance from your epoxy, you've got to make sure the inside of the hole is cleared of loose material and reasonably dry. This is a critical step – and a quick simple job.

- **VACUUM IT OUT**

Use a wet / dry vacuum (for example, a Shop Vac) to remove any water left over from the core drill, and any loose gravel left over from the hammer drill.

- **DRY IT OUT**

Next, dry the remaining moisture with a propane torch.
Don't overdo it – if you heat the asphalt too much, it will soften and crumble. Just dry it off quickly.

- **CHECK THE FIT**

Drop the sensor into the hole.
Each sensor has three tabs extending from the top of the surface.
All three tabs should be in contact with the surrounding pavement surface.

NOW YOU'RE READY TO INSTALL THE SENSOR..

Clean

Dry

Check the Fit

Step 4: Pour the Epoxy

Pouring epoxy is easy. It sets up quickly, but is a mess to clean.
So, make sure you use only as much as you need, and it's ready to use before you mix it.

- **MEASURE**

Each sensor will require about 4 ounces of mixed epoxy.
If you're mixing manually, you can generally mix enough for three or four sensors at a time.

- **MIX**

Mix thoroughly and quickly, just before you pour.

- **POUR**

Add just enough epoxy to each hole so that it will fill uniformly around the sensor,
and reach the pavement without overflowing.

With the sensor ready and waiting, add just enough epoxy so it will fill the gaps when you press the sensor into the hole.

Step 5: Install the Sensor

As you push the sensor into the epoxy..

- **POSITION THE INDICATOR**

Before the sensor is placed in the epoxy, pay close attention to the positioning in which it goes in.
The device MUST have the indicator (a small circle on the top of the sensor) oriented towards the curb.
(see picture on next slide)

- **CENTER THE SENSOR**

The best result has a uniform layer of epoxy all the way around the sensor.
This will happen on it's own for the most part, but you will want to keep it in mind
as you're pressing the sensor into the epoxy. You'll have a minute or so after the sensor is seated
to move it slightly away from the sides, if needed

- **KEEP IT CLEAN**

It's important to keep the top of the sensor free of epoxy.
The best way to avoid smudges is to avoid overfilling the hole with epoxy in the first place,
and keep your gloves free of epoxy during the install process.
If needed, clean excess epoxy from the edges.

Prepare the hole   Position the indicator facing the curb   Pour the right amount   Push the sensor in

Equipment Rental Options

HERTZ RENTAL EQUIPMENT

1-888-777-2700

www.hertzequip.com

UNITED RENTALS

1-800-877-3687

www.ur.com

CHECK IN YOUR AREA FOR LOCAL AND REGIONAL EQUIPMENT RENTAL COMPANIES.

Regulatory information

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

Please do not modify the product without first contacting Streetline for approval. Modification of the product may result in violation of FCC regulations.

Streetline SL-EPS Vehicle Sensor
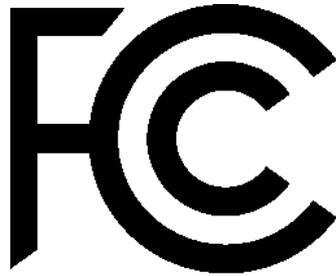
FCC ID: V21SL-EPS

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.