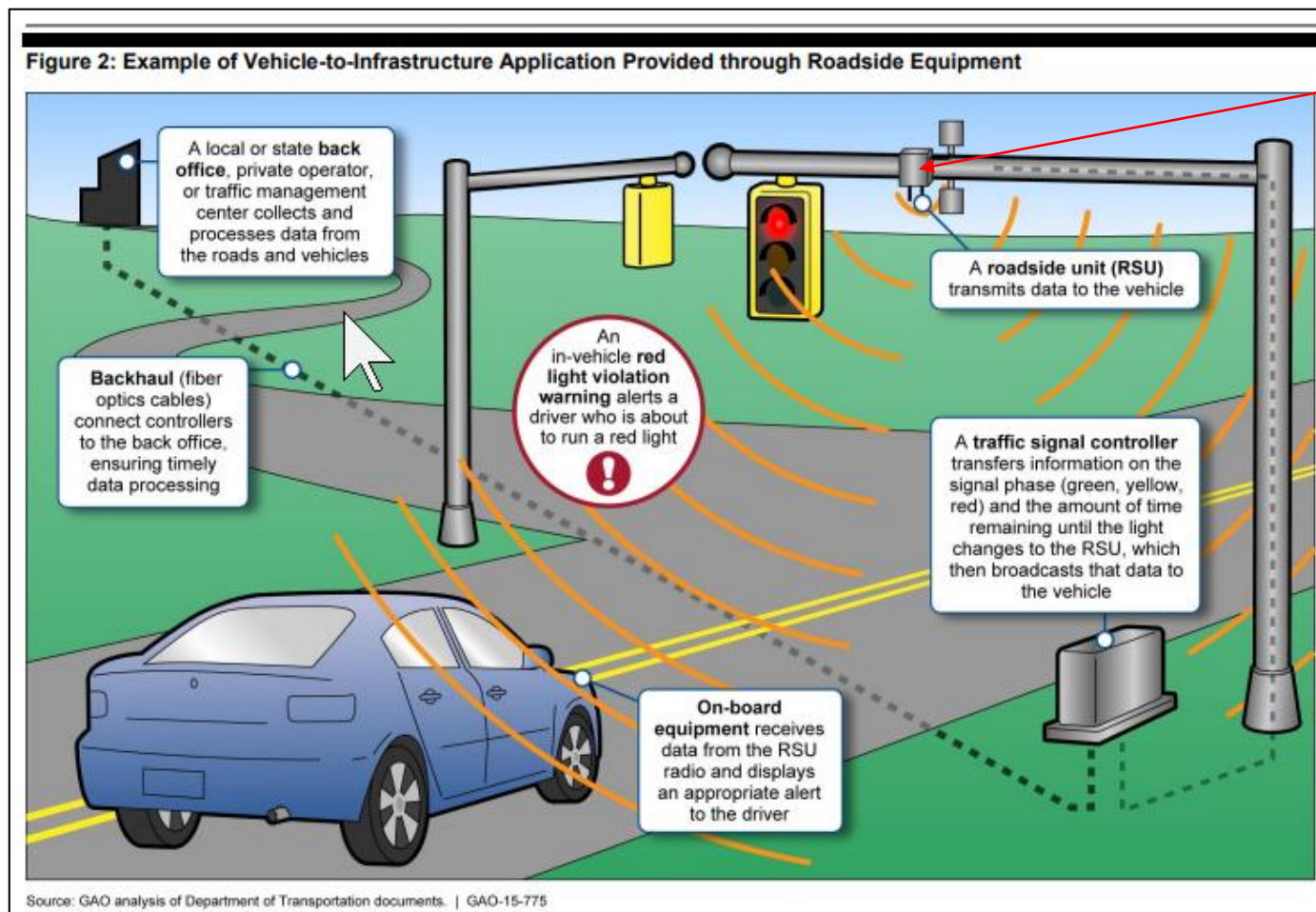


V2X Roadside Unit (RSU-5941)

FCC ID: LXC-V2X-RSU-5941

The RSU is typically mounted on a traffic arm or vertical pole, connected to traffic signal controller to transmit signal phase and timing, and connects with 5.9 GHz links to vehicles near the intersection.



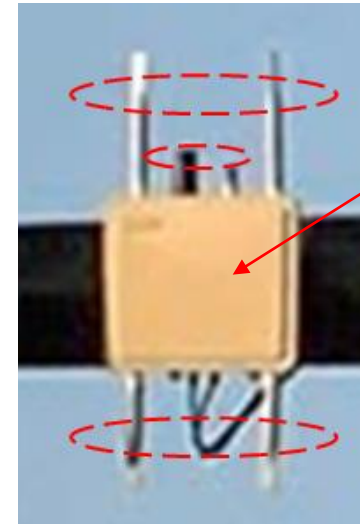
RSU mounted on Traffic arm

RSU Installation On Traffic Arm (examples)

Since the RSU device is installed on transportation infrastructure by professional installers or City or County staff members, as shown in views below, the device is not sold to the general public, consumers, or end-users directly.



CALTRANS, 2023



Sample RSU mounted on horizontal traffic arm. Preference is that horizontal arms and poles be used if possible

Installation: RSU mounts on Utility poles, Traffic arms, and other roadside structures

Since the RSU device is installed on transportation infrastructure by professional installers or City or County staff members, as shown in views below, the device is not sold to the general public, consumers, or end-users directly.

Sample mounted on vertical utility pole. Dual V2X antennas help to see around large vertical poles.



Sample mounted on horizontal utility pole

RSU Radio Features

This device mainly consists of an ITS band LTE-V2X (CV2X) transceiver and a GNSS positioning receiver for internal timing and positional awareness. The device is installed along the roadside on utility poles or at traffic intersections above the intersection and connected to a traffic signal controller. The RSU uses 5.9 GHz V2X communication with Connected Vehicles (CVs) to perform use cases such as emergency traffic light preemption, in-vehicle display of traffic signal countdown, red-light violation warning, and emergency vehicle alerts. Last, public buses may transmit V2X signals to traffic lights to preempt the light durations to maintain transit schedules.

This RSU device also receives information transmitted from other vehicles and nearby vulnerable road users (VRUs) and may calculate the possibility of collision between a vehicle and VRU such as a pedestrian or cyclist. Some vehicles may also receive messages identifying the existence of nearby vulnerable road work zones.

FCC Part (CV2X):	FCC Part 2 and FCC Part 90M
Frequency:	5895-5925 MHz
Channel #, bandwidth	Ch183; 20 MHz bandwidth
CV2X Device Class:	UE Power Class 3
RSU Antenna mount:	Direct mount on RSU housing
Maximum Gain:	9 dBi max (7.6 dBi is baseline value)
Max EIRP	33dBm (FCC regulation)
Measured max EIRP	28.86 dBm

GNSS Receiver	U-Blox M8030
Frequency, pol.	L1 frequency, RHCP
GNSS Ant gain:	5dBic
LNA gain	28 dB

FCC ID: LXC-V2X-RSU-5941 (Pg 1 of 3)

This device is authorized for use with specified antenna maximum gain values. Refer to tables on the previous page.

1) Regulatory Compliance Information:

- Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- Replacement of any transmitter component (crystal, semiconductor, etc.) could result in a violation of FCC rules.
- The RSU should not be operated concurrently with any other wireless transmitter or antenna.

2) Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm from all persons.

3) Locked firmware settings:

All firmware settings, including power level and frequency tuning parameters are stored in firmware by DENSO at the time of manufacture. The max output setting cannot be set to exceed the FCC-certified value. Also, no hardware components are adjustable after the product is manufactured.

4) Part numbers:

Software version: Firmware **g0ace21b13805**; Hardware: **RSU-5941 Rev. DV1.2**

FCC ID: LXC-V2X-RSU-5941 (Pg 2 of 3)**6) RSU Antenna Height/TX Output Restrictions (EIRP reduction)**

- The radiation center of an RSU antenna shall not exceed 8 meters above the roadway surface bed.
- An RSU may employ an antenna with a height exceeding 8 meters but not exceeding 15 meters, provided the EIRP is reduced accordingly, as outlined in the equation below:
 - $\text{Reduced EIRP (dB)} = \text{Original EIRP (dB)} - 20 \cdot \log_{10}(\mathbf{Ht}/8)$
 - The term, **Ht**, refers to antenna height above road surface in meters.
- If an RSU transmit antenna operates between 8 and 15 meters, the reduced EIRP will be realized by the professional installer by either reducing the conducted power to meet the reduced EIRP, reduces the RSU gain, or some combination of both.
- With the dB-by-dB reduction in EIRP due to the factor above ($-20 \cdot \log_{10}(\mathbf{Ht}/8)$), the installer can input the correct power based on the installation height.

7) Part 15B Class A Caution statements

- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
- Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
- Any changes or modifications made to this device that are not expressly approved by DENSO International America, Inc, may void the user's authority to operate the equipment.
- 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.
- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must be at least 20 cm from the user and must not be co-located or operating in conjunction with any other antenna or transmitter.