

# V2X Roadside Unit

## RSU-352EC

C-V2X roadside unit, V2Xcast® ETSI C-ITS stack and SDK

## RSU-352ED

DSRC-V2X roadside unit, V2Xcast® ITS-G5 stack and SDK

## RSU-352UC

C-V2X roadside unit, V2Xcast® IEEE 1609/SAE J2735 stack and SDK

## RSU-352UD

DSRC-V2X roadside unit, V2Xcast® IEEE 1609/SAE J2735 stack and SDK



RSU-352 is the most advanced V2X roadside unit featuring a global V2X solution; the hardware supports either C-V2X or DSRC-V2X communication standards with appropriate V2X stack embedded, reducing the cost and complexity for cooperative intelligent transportation systems (C-ITS) deployments.

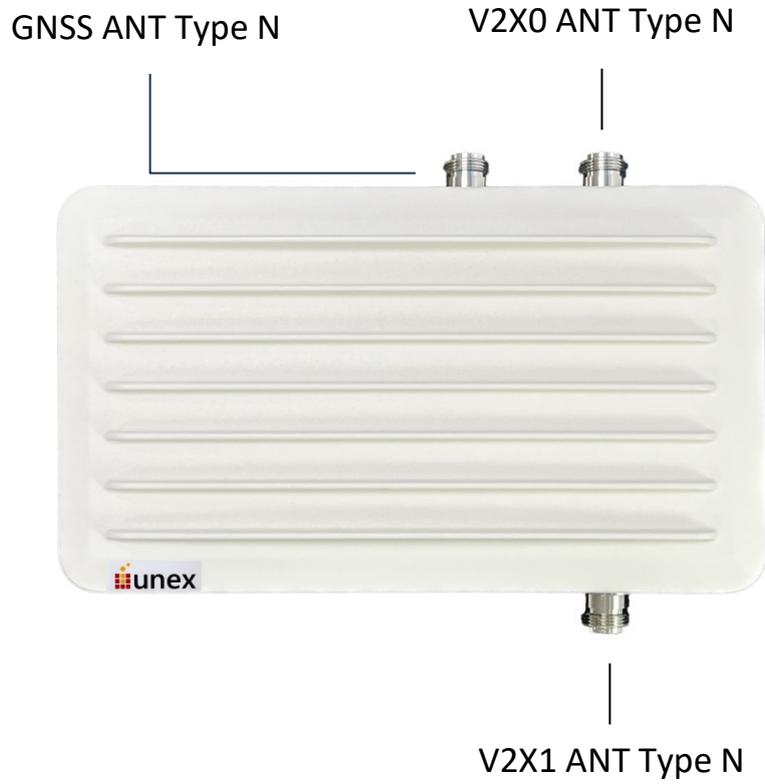
The rugged waterproof IP67 aluminum enclosure protects against water and dust ingress. A GORE® vent balances the air pressure to increase the RSU service life. Additionally, surge protectors are affixed to both the antenna and PoE ports, increasing the level of protection.

With embedded ITS-G5 or IEEE 1609 V2X stack for either DSRC-V2X or C-V2X (PC5), users can directly use the RSU for secondary software development, without the hassle of handling the V2X protocol details from scratch.

- ❖ Complete V2X system, containing CRATON2/PLUTON2 V2X chipsets, GNSS, eHSM, 256MB DDR3 RAM, and 512MB NAND, and V2Xcast® software.
- ❖ A user-friendly V2Xcast® software contains:
  - ◆ Standard compliant V2X stacks embedded.
  - ◆ Consistent V2Xcast® APIs for Service, Tx/Rx, PoTi, J2735 or ITS-G5 compliant Messages encode/code for secondary development of your own applications.
  - ◆ Application example codes, including Event Detector to detect remote vehicle and roadside events, Traffic Signal Detector to detect current position's signal phase, RTK Sample Application to improve GNSS accuracy.
- ❖ Secured V2X communication supports SCMS or CCMS including the V2X PKI certificate management and the private key operation on the embedded Hardware Security Module (eHSM).
- ❖ IP67 aluminum enclosure, -40°C ~ +85°C operating temperature, PoE Surge Protector, GORE® Vent, and stainless steel mounting bracket ensure performance reliability in harsh outdoor environments.
- ❖ Innovative software-defined, RSU can flexibly shift between DSRC-V2X or C-V2X with one V2X stack (IEEE 1609 or ITS-G5 V2X standard) through local/remote firmware update.
- ❖ Lowest entry and total ownership cost: bundle license right to use the software on the hardware (per MAC address) at one fixed price, no extra license fee or royalty required.

# RSU I/O Interfaces

## Front view



## Side view

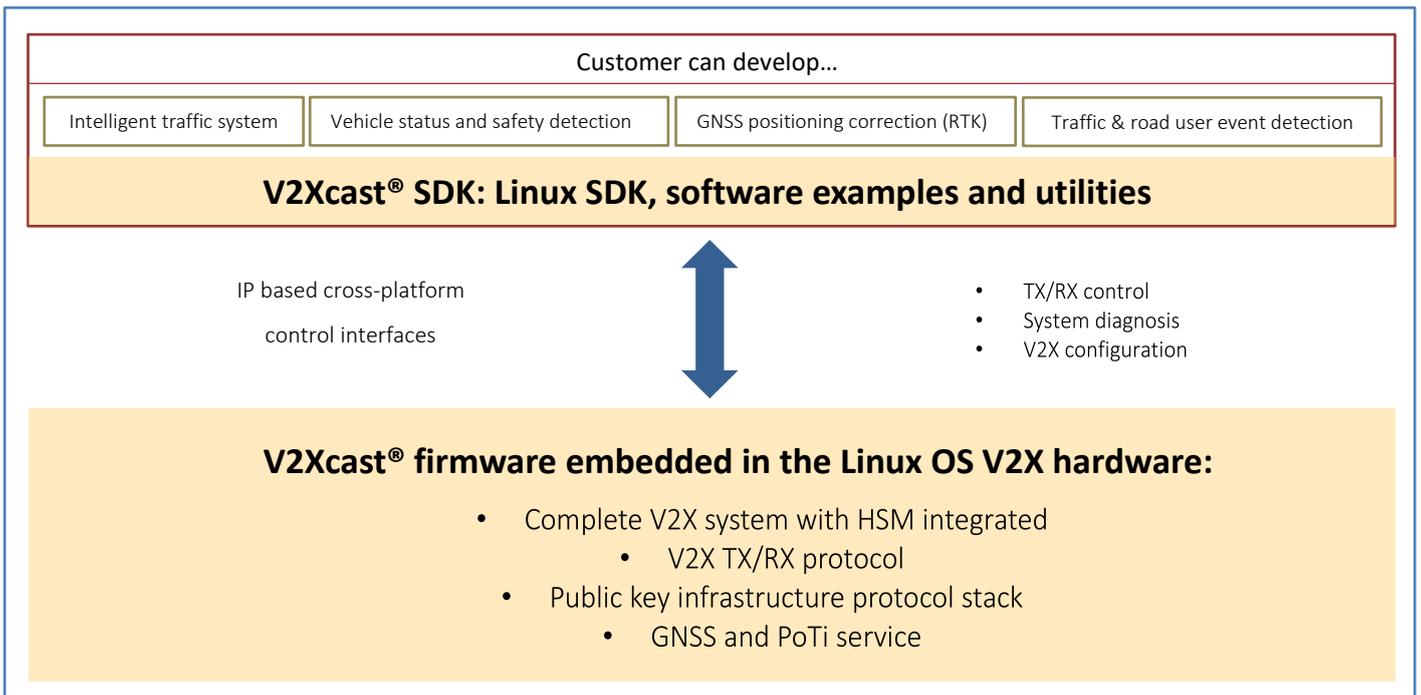
**PoE port**



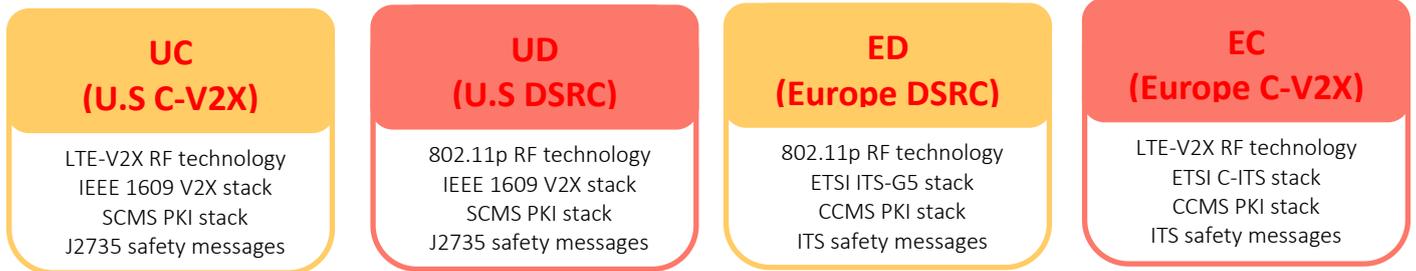
**LED status**



# V2Xcast® Firmware



\*4 versions existed. Firmware update fee required.



Unex V2X platform SOM, OBU, RSU

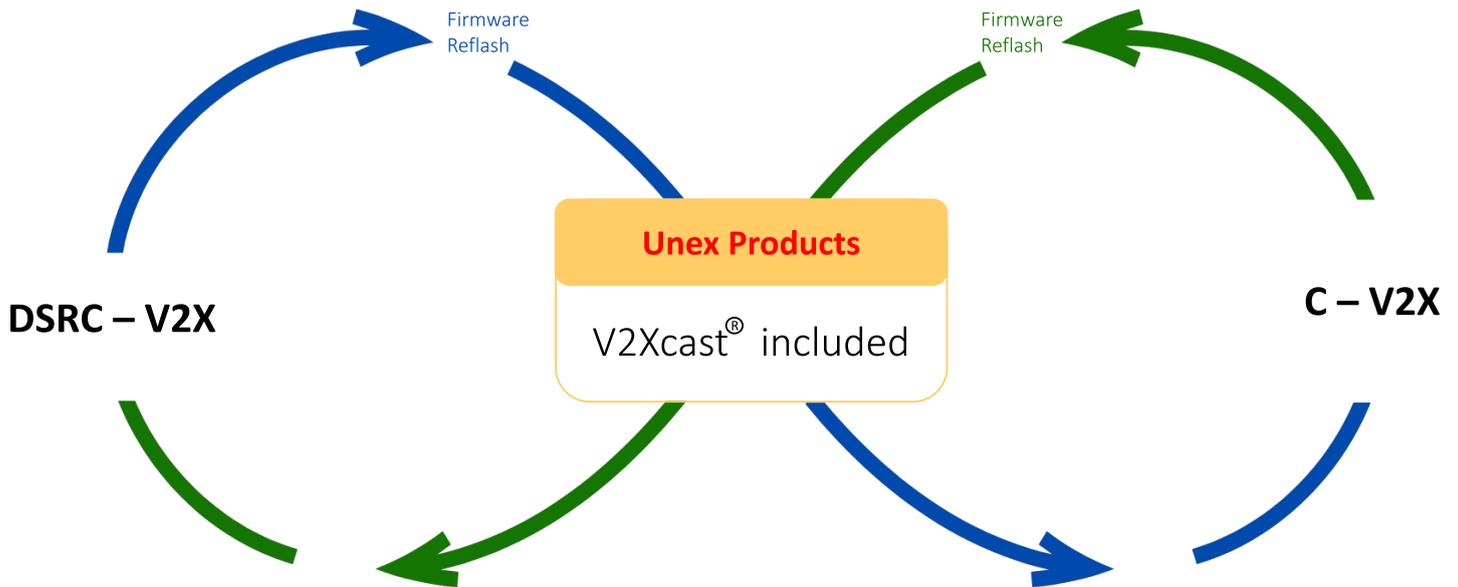
Unex's Software & SDK (V2Xcast®)

Custom's Add-on Software

## Software-defined Global V2X

Innovative software-defined design lowers the total ownership cost in field application, the same RSU can flexibly shift between DSRC-V2X or C-V2X with one V2X stack (IEEE 1609 or ITS-G5 V2X standard) through local/remote firmware update.

Remarks: For shifting requirements from DSRC-V2X to C-V2X on the same MAC address (vice-versa)V2X hardware, extra license fee would be required.



# Specifications

## Chipset

- ❖ Autotalks® CRATON2 V2X communication processor
- ❖ Autotalks® PLUTON2 V2X RF Transceiver
- ❖ Embedded Hardware Secure Module (eHSM)
  - ◆ Dedicated ARM Cortex-M0 CPU
- ❖ GNSS module

## Operation System

Linux Yocto

## Antenna Detection/Diagnose

Supported

## System Memory

512MB NAND, 256MB DDR3

## Preloaded Firmware

- ❖ RSU-352EC: V2Xcast® ETSI C-ITS stack including LTE-V2X (PC5), CAM/DENM, GN/BTP, Security, PoTi, \*ETSI C-ITS standard over LTE-V2X is still draft only.
- ❖ RSU-352ED: V2Xcast® ITS-G5 stack including IEEE802.11p, Facility Message, GN/BTP, DCC, Security, PoTi, C2C-BSP
- ❖ RSU-352UC: V2Xcast® C-V2X stack including 1609.2, 1609.3, IEEE1609.2.1, SAE J2735, PoTi
- ❖ RSU-352UD: V2Xcast® IEEE1609/SAE J2735 stack for 802.11p WAVE including 1609.2, 1609.3, 1609.4, IEEE1609.2.1, SAE J2735, PoTi

## Development Tool

V2Xcast® SDK, including Service, Tx/Rx, PoTi, J2735 or ITS-G5 compliant Message/Service and application example codes

## Hardware Security

- ❖ Dedicated ROM containing certified secure V2X signing firmware
- ❖ Secure encrypted off-chip storage of private keys
- ❖ Private material is inaccessible outside HSM
- ❖ Capable of >110 signatures / second, with <9ms signing latency for ECDSA NIST P256 or ECDSA Brainpool P256R1
- ❖ Line-rate ECDSA verification engine (>2500 ECDSA NIST P256 verifications / second)
- ❖ Tamper detection\*

(\* . Support by project)

## V2X

- ❖ Supported frequency band:
  - ◆ C-V2X: 5.895 ~ 5.925 GHz
  - ◆ DSRC-V2X: 5.850 ~ 5.925GHz
- ❖ DSRC-V2X radio mode: 802.11p
- ❖ C-V2X radio mode: 3GPP LTE-V2X Rel.14/15 PC5 sidelink
- ❖ RF transmit power: max. +20dBm on antenna port, Class C RF spectrum mask compliant with margins
- ❖ RF sensitivity: typ. < -92dBm

### Remarks:

For legacy DSRC WAVE applications, (1) channel switch in 1609.4, (2) WSA broadcast, and (3) dual channel are not supported.

---

## GNSS

- ❖ Update rate: max. 10Hz
  - ❖ Sensitivity:
    - ◆ Acquisition: -146dBm
    - ◆ Navigation: -158dBm
    - ◆ Tracking: -162dBm
  - ❖ NMEA Standard: NMEA 0183
  - ❖ Accuracy: 1.5m (CEP50 with SBAS)
  - ❖ supports GPS/GLONASS constellations
- \*. SBAS like WAAS (US), is also supported.

---

## I/O Interface

- ❖ 3 color status LED for start-up, operational, FW upgrade, fault
- ❖ One 802.3af power over Ethernet port: supports both mode A and mode B PSE (power sourcing equipment)
- ❖ Two V2X type-N antenna connectors, surge protected and built-in antenna detection function.
- ❖ One GNSS type-N antenna connector, surge protected and built-in antenna detection function.
- ❖ One GORE® Vent

---

## Antenna

- ❖ Two type-N V2X 7.6dBi omni-directional detachable antennas, 5.9GHz
- ❖ One type-N GNSS active detachable antenna

---

## Operation Voltage

IEEE 802.3af (DC 44-57V, typical 48V)

---

## Power Consumption

- ❖ 802.3af PoE PSE: typical 0.06A/3.26W at 25°C
- ❖ 802.3af PoE PSE: typical 0.07A/3.80W at 85°C

## ESD Protection

IEC/EN 61000-4-2 level 4

---

## Surge Protection

IEC/EN 61000-4-5 level 4 (1.2/50  $\mu$ s and 10/700  $\mu$ s)

---

## RF Regulation

CE, FCC Class B (Q2/2024)

---

## Operation Temperature Range

ambient: -40°C ~ +85°C

---

## Operating Humidity

10% ~ 95%, non-condensing

---

## Storage Humidity

max. 95%, non-condensing

---

## Housing

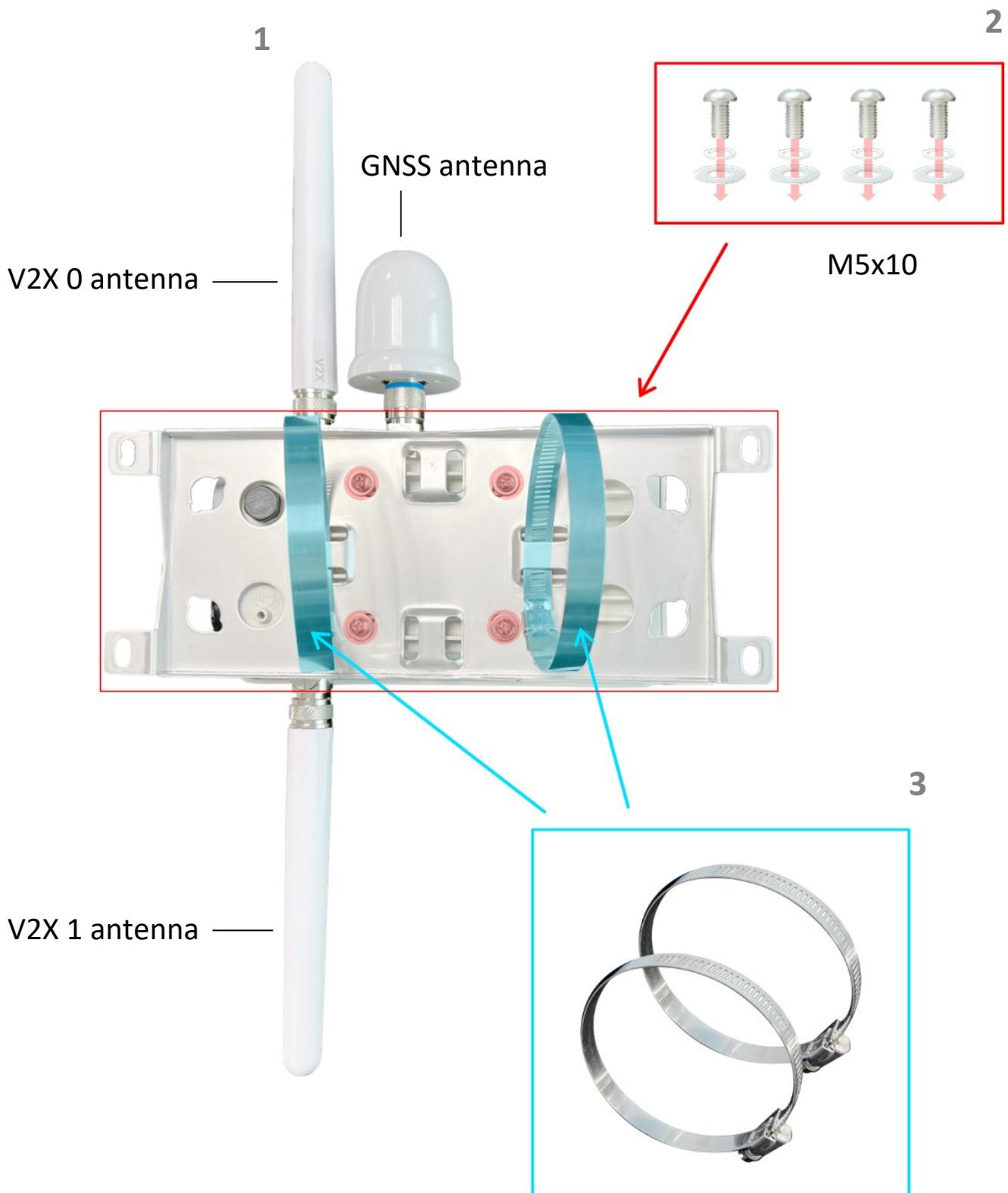
IP67 aluminum enclosure

---

## Product Dimension and Weight

220.5mm (L) x 127.5mm(W) x 72.3mm (H), 2.7 kg

## RSU-352 Mounting Bracket Assembly



# Product SKU and Ordering Information

## RSU-352EC

C-V2X roadside unit, V2Xcast® ETSI C-ITS stack and SDK

## RSU-352ED

DSRC-V2X roadside unit, V2Xcast® ITS-G5 stack and SDK

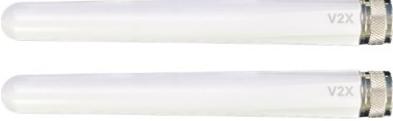
## RSU-352UC

C-V2X roadside unit, V2Xcast® IEEE 1609/SAE J2735 stack and SDK

## RSU-352UD

DSRC-V2X roadside unit, V2Xcast® IEEE 1609/SAE J2735 stack and SDK

## RSU-352EC/RSU-352ED/RSU-352UC/RSU-352UD Package content

<p>One RSU with pre-loaded V2X stack firmware (C-V2X or DSRC-V2X technology with one ITS-G5 or IEEE 1609/SAE J2735 V2X stack)</p> 	<p>Two type-N V2X 7.6dBi omni-directional detachable antennas, 5.9GHz</p> 
	<p>One type-N GNSS active detachable antenna</p> 
	<p>One PoE Surge Protector</p> 
<p>One Ethernet Cable Gland</p> 	<p>One Mounting Bracket Set</p> 
<p>One Earth Wire (1 meter)</p> 	<p>Hardware / Software User's Guide and V2Xcast® SDK download email link after shipping</p>

## Optional Accessory & Application

Installed RSU at lower position to reduce maintenance effort and cost, detachable V2X/GNSS antennas can be installed on another waterproof enclosure with extended 6 or 8 meters cable to the traffic pole top for better signal performance.



### EX-56

RSU antenna extension kit,  
6 meter cable assembly

### EX-57

RSU antenna extension kit,  
8 meter cable assembly

## Unex Technology Corporation

<https://unex.com.tw/>

[info@unex.com.tw](mailto:info@unex.com.tw)

[886-3-6578188](tel:886-3-6578188)