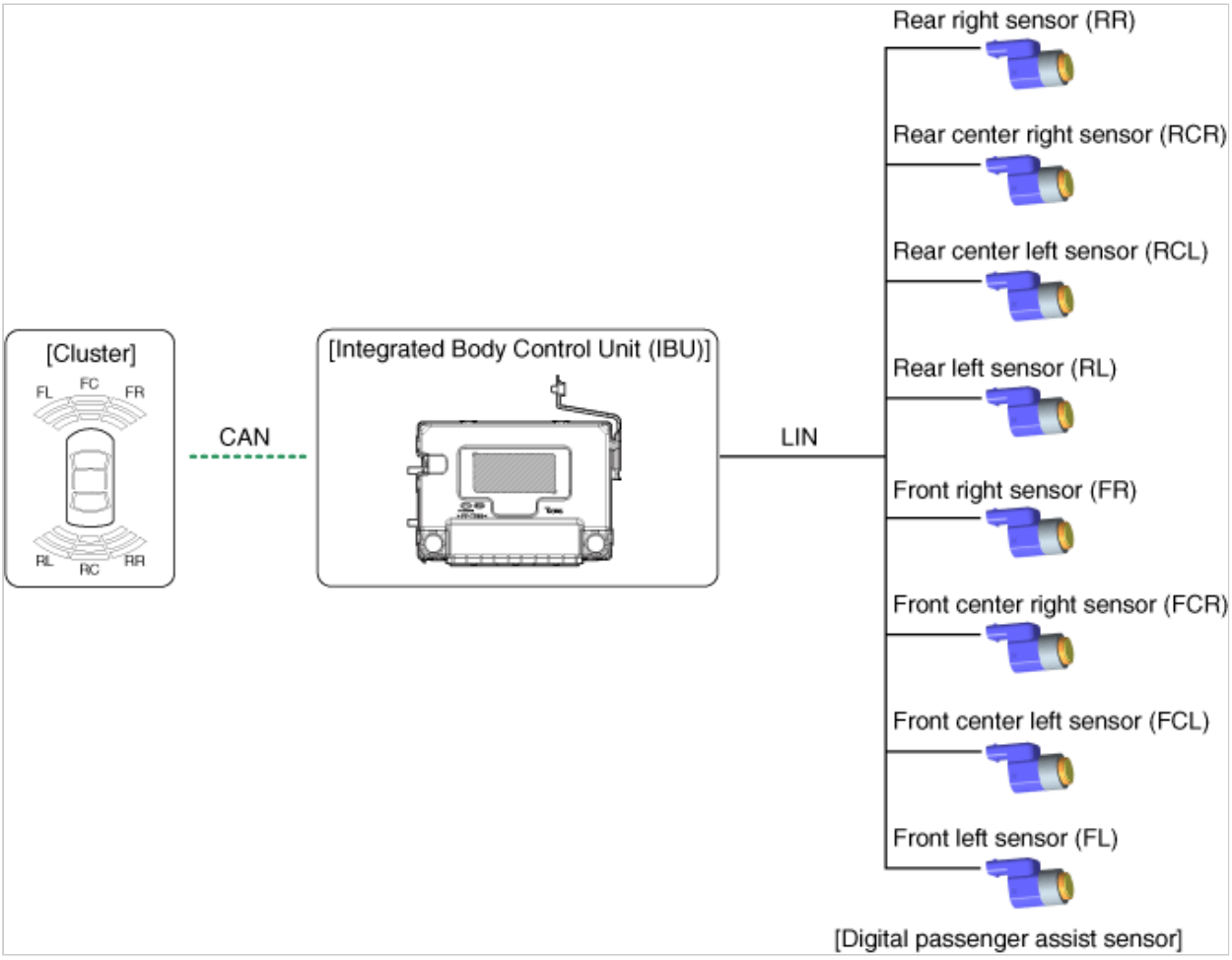
System Configuration

PDW consists of 8 sensors (4 in the front and 4 in the rear) that are used to detect obstacles and transmit the result in three separate warning levels, the first, second and third to IPM (IBU) via LIN communication. IPM (IBU) decides the alarm level by the transmitted communication message from the slave sensors, then operates the buzzer or transmits the data for display.

Block Diagram



System Operation Specification

1. Initial mode - Front sensor
   (1) System initializing time is 500ms after IGN1+ initial D Gear + below 10 Km/h .
   (2) PDW recognizes LID and sets the sensor ID up during initialization.
   (3) PDW activates each sensor and then executes the diagnosis after finishing initialization of IPM(IBU).
   (4) PDW Starting buzzer" is normally worked, when sensor does not send an error message and after finishing error diagnosis.
   (5) If any failure is received from the any sensors, PDW Starting Buzzer" does not work but the failure alarm is operated for a moment.
   If you have display option, warning sign is also shown on it.
   (6) Buzzer for sensor failure is operated once, but display is shown continuously until it is repaired completely.
   (7) IPM(IBU) memorizes the completed initializing status of front sensor until IGN 1 is OFF. It doesn"t activate initializing when next D gear input.
   (8) In case of PDW SW OFF, system initializing does not be activated.
   (9) If PDW switch is ON like as below status, it activates initializing.
   – PDW switch OFF when IGN1 is On.
   – PDW switch ON when vehicle speed is below 10 km/h
   (10) Initializing has nothing to do with parking brake operation.
2. Initial mode - Rear sensor
   (1) System initializing time is 500ms after IGN1+ initial R Gear.

(2) PDW recognizes LID and sets the sensor ID up during initialization.

(3) PDW activates each sensor and then executes the diagnosis after finishing initialization of IPM(IBU).

(4) PDW Starting buzzer” is normally worked, when sensor does not send an error message and after finishing error diagnosis.

(5) If any failure is received from the any sensors, PDW Starting Buzzer” does not work but the failure alarm is operated for a moment.
If you have display option, warning sign is also shown on it.

(6) Buzzer for sensor failure is operated once, but display is shown continuously until it is repaired completely.

(7) IPM(IBU) memorizes the completed initializing status of rear sensor until IGN 1 is OFF. It doesn''t activate initializing when next R gear input.

(8) Initializing has nothing to do with parking brake operation.

3. Normal mode - Front sensor
   (1) Lin communication starts and keeps the routine after IGN1 ON+D gear + below 10 km/h.

   (2) After initializing, the routine starts at once without PDW starting warning sound.

   (3) Alarms of obstacle consists of 3 level 1,2,3 step and 1,2 alarm sounds intermittently and 3 alarm sounds continuously. 1 level alarm doesn''t exist in the front ultrasonic sensor.
   – Type with display
   • 2 level alarm : Display is only operated without alarm.
   • 3 level alarm : Alarm + Display
   – Type without display : Alarm only

   (4) In display, the data of each sensor is sent from IPM(IBU) to display, for example cluster. CAN communication is used for transmission and maximum gateway time is 50ms.

   (5) The efficient vehicle speed of RPDW operation is under 10Km/h.

   (6) It doesn''t work at PDW SW OFF.

   (7) It has nothing to do with parking brake operation.

   (8) Operation doesn''t start or stops at gear N, P.

4. Normal mode - Rear sensor
   (1) Lin communication starts and keeps the routine after IGN1 ON+R gear

   (2) IBU send a message once to each sensor for operating request to check the initial status of the system and four sensors response at a time. At this time, if there is no problem, the alarm starts after 500ms of R gear shifting at 300ms intervals.

   (3) After initialization, normal mode starts 100ms later after finishing alarm output.

   (4) Alarm for obstacles is divided into 3 levels.
   The first and second are intermittent sound, and the third alarms continuously

   (5) In display, the data of each sensor is sent from IBU to display, for example Cluster.
   CAN communication is used for transmission and maximum gateway time is 50ms.

   (6) It has nothing to do with vehicle speed.

   (7) When PDW SW is OFF, if gear R signal is inputted, PDW SW is changed to ON.

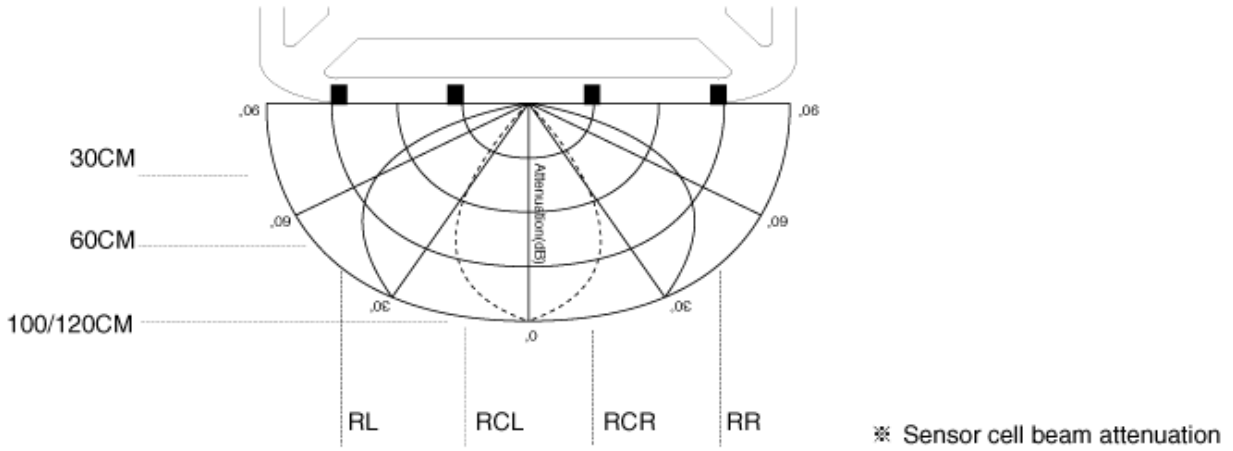
   (8) It has nothing to do with parking brake operation.

   (9) Operation doesn''t start or stops at gear N, P.

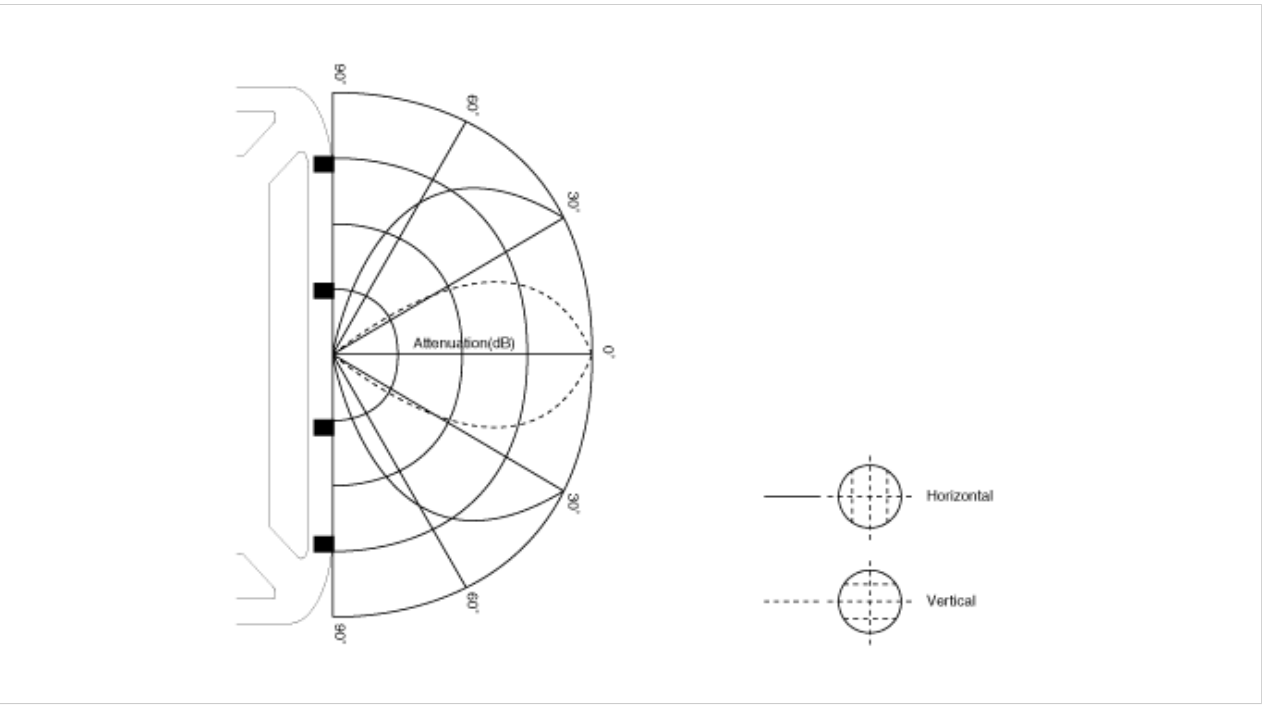
Sensing Area

1. Measurement condition – PVC pole (diameter 75 mm, length 3 m), normal temperature
2. Distance range detected objects (Measured directly in front of sensor)
   • Front sensor
   61 cm (24 in) - 10 cm (39.4 in) : ±15 cm (5.9 in)
   31 cm (12.2 in) - 60 cm (23.6 in): ±15 cm (5.9 in)
   Less than 20 cm (7.9 in) : ± 10 cm (3.9 in)
   • Rear sensor
   61 cm (24.0 in) - 120 cm (47.2 in) : ± 15 cm (5.9 in)
   31 cm (12.2 in) - 60 cm (23.6 in): ± 15 cm (5.9 in)
   Less than 30 cm (11.8 in) : ± 10 cm (3.9 in)

Horizontal Sensing Area



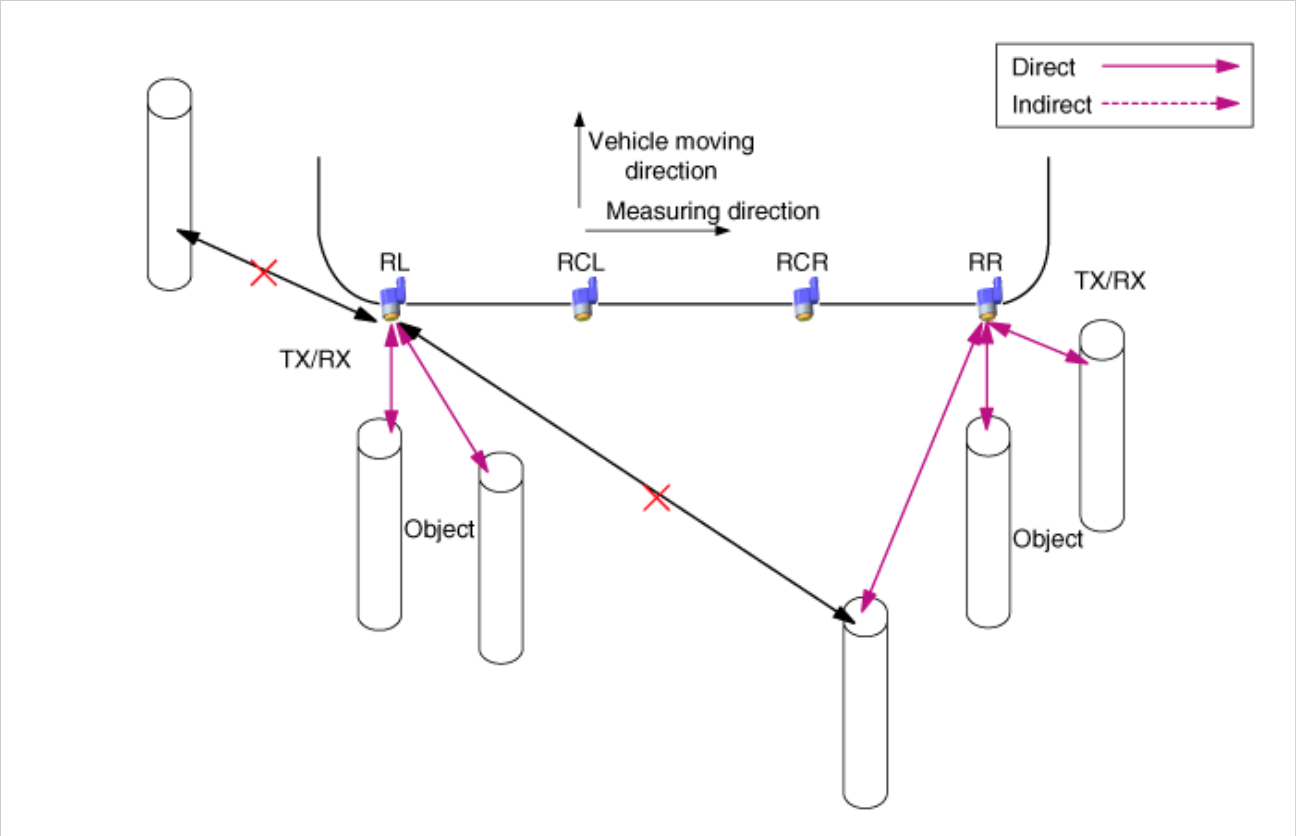
Vertical Sensing Area



Distance Measurement

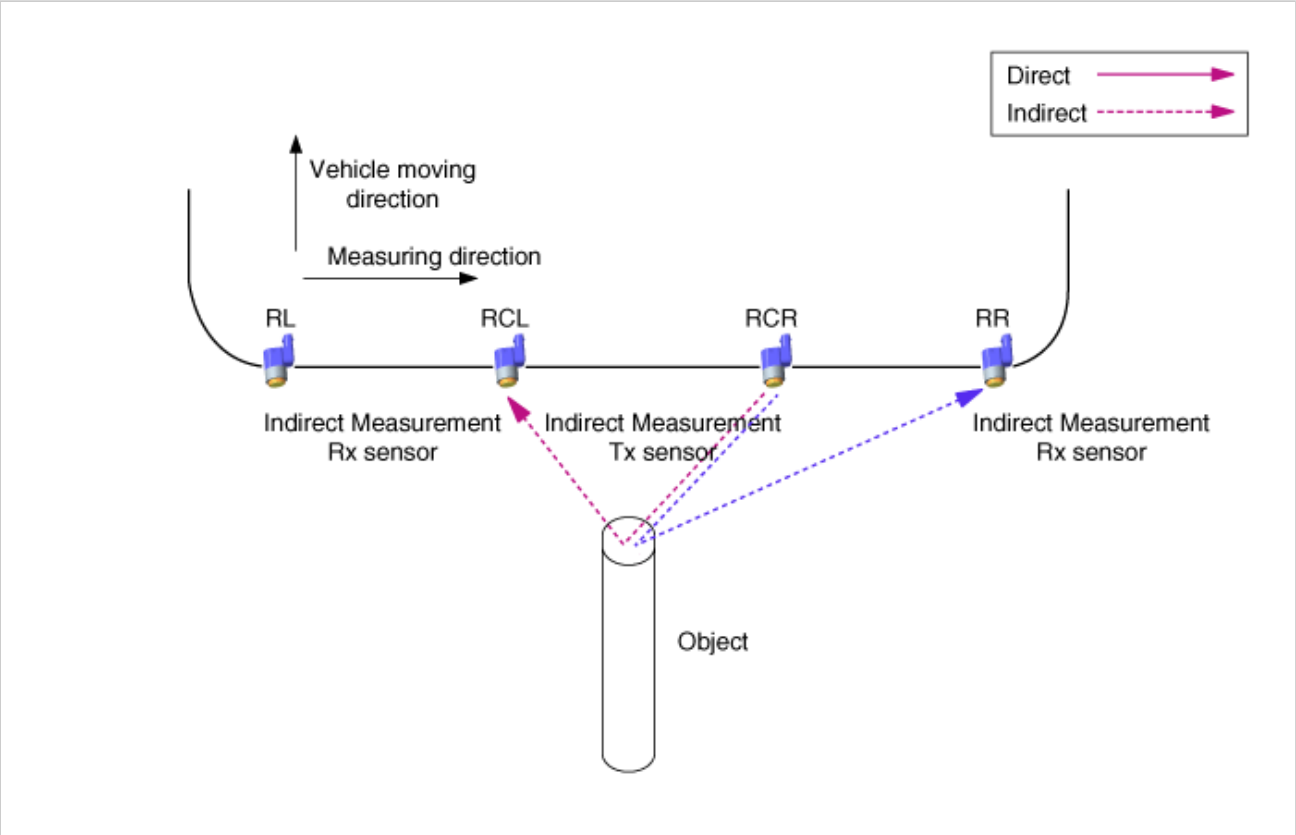
Direct Measurement

Transmission and Reception are executed with one sensor
(FL, FCL, FCR, FR, RL, RCL, RCR, RR each sensor execution)



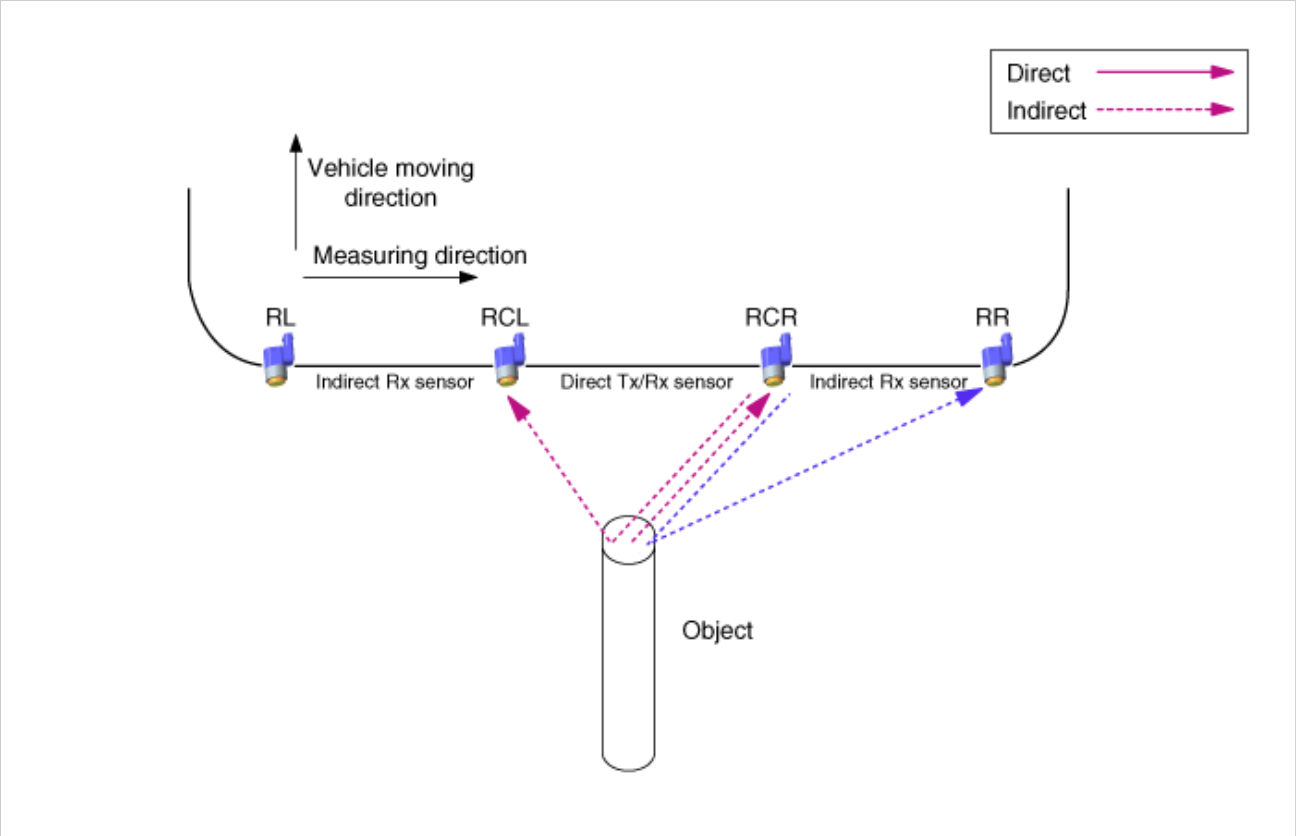
Indirect Measurement

(FCL → FL, FCL → FCR, FCR → FCL, FCR → FR, RCL → RL, RCL → RCR, RCR → RCL, RCR → RR Execution in order)
With two or three sensors, one of them sends the transmission and the others get the reception.



Direct and Indirect Measurement at once

With two or three sensors, the one sensor performs both transmission and reception, and the others perform only reception.



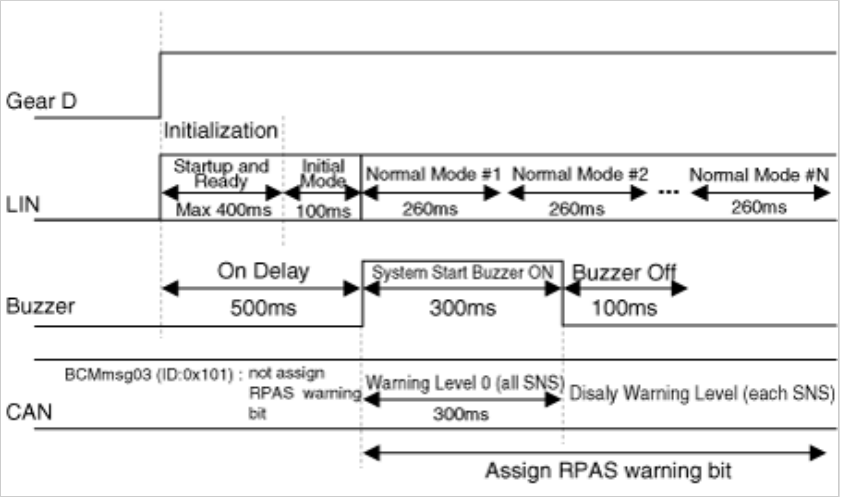
PDW-R alarm system

When the PDW-R sensor detects the object, warning is operated by audible alarm device as like buzzer. PDW-R sensor sends data to IBU with LIN communication and IBU implements audible warning for each PDW-R SENSOR by priority. And it performs a role of gateway only when it sends visible alarm device such as Cluster.

– Sensor buzzer/display information processing method of IBU In case of RL/RR sensor information, the IBU handles each sensor information directly about Display and buzzer output function. Buzzer output of CL/CR sensor, IBU handles center combination information by priority both sensor, Otherwise, about fail display information,IBU send that to cluster each sensor information.

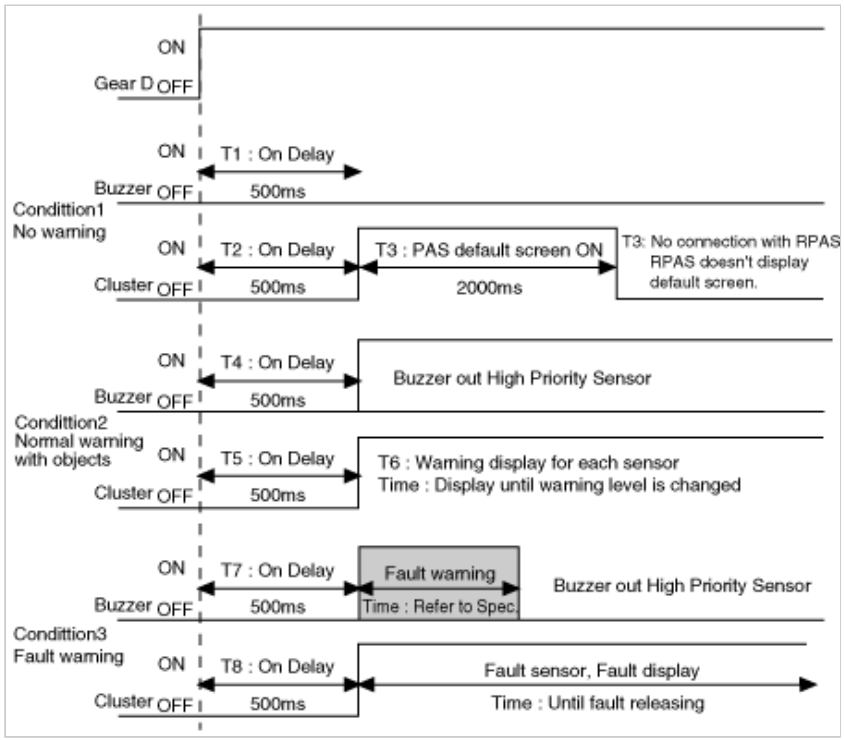
System operation Spec - Front sensor

When the system has the power (after IGN ON and D gear), MICOM checks every sensor channel. In case it is not find any error, it sounds 500ms afterward. But it finds any error even a sensor, it sounds buzzer corresponding fault sensor instead of initial starting alarm. If PDW ON switch in OFF, system doesn"t work. Function for normal mode entrance is as below.

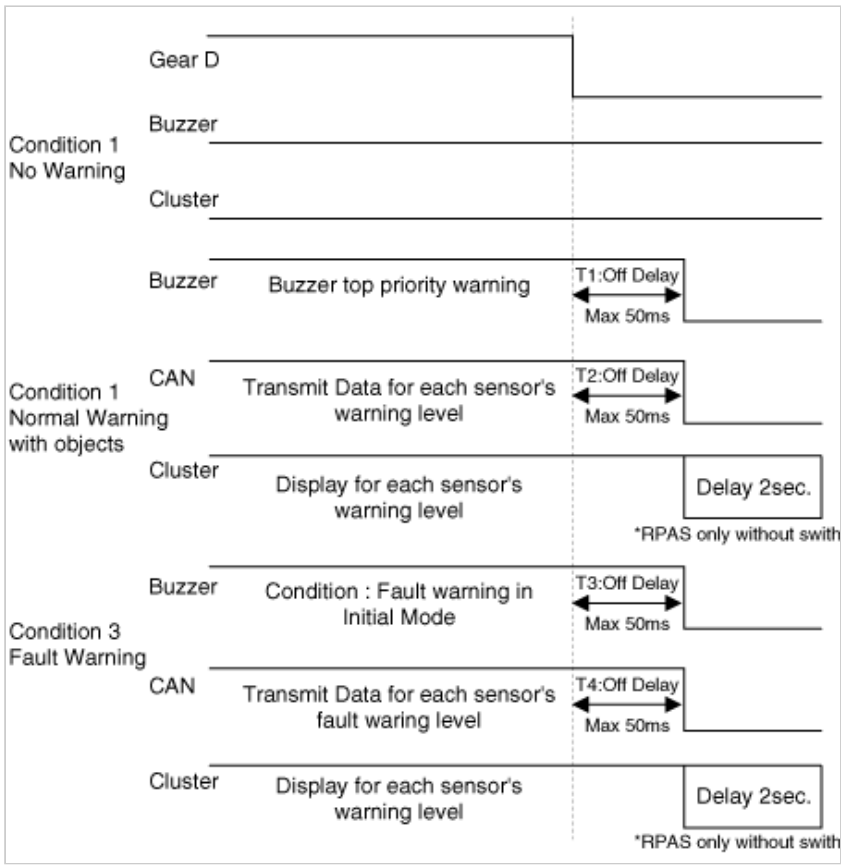


* In the initial mode, IPM (IBU) judges only sensor fail.

With D gear, system function is as below.

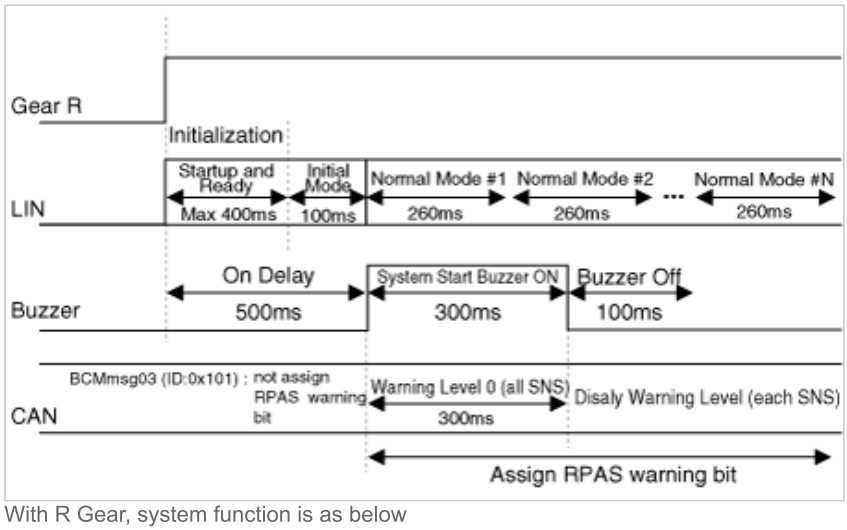


With D gear releasing, system function is as below

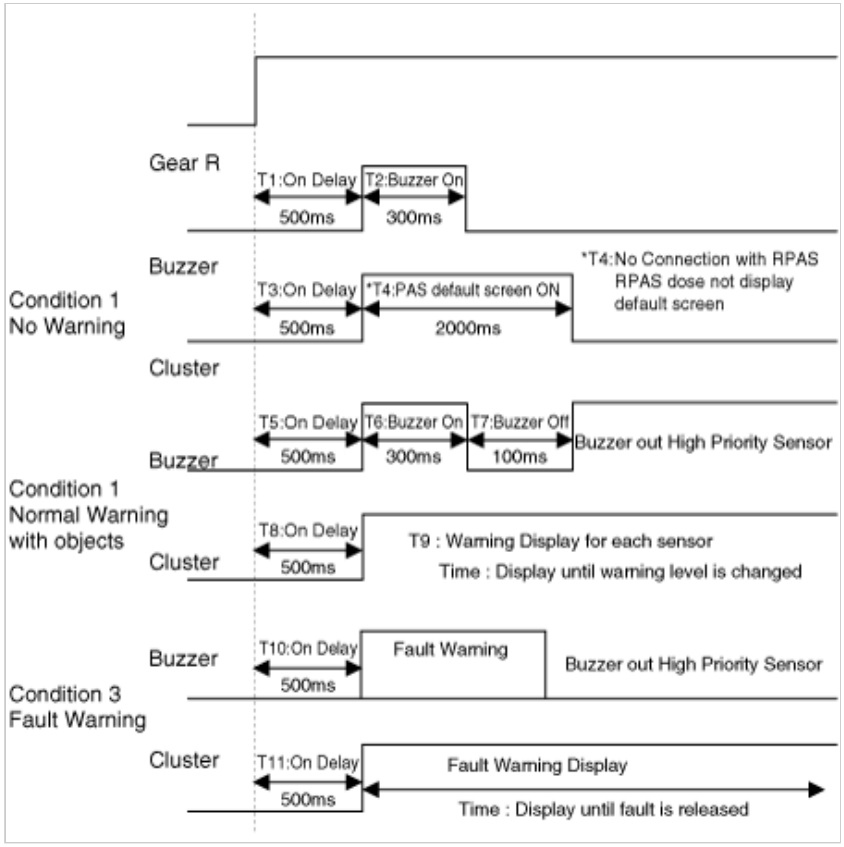


System Operation Spec - Rear sensor

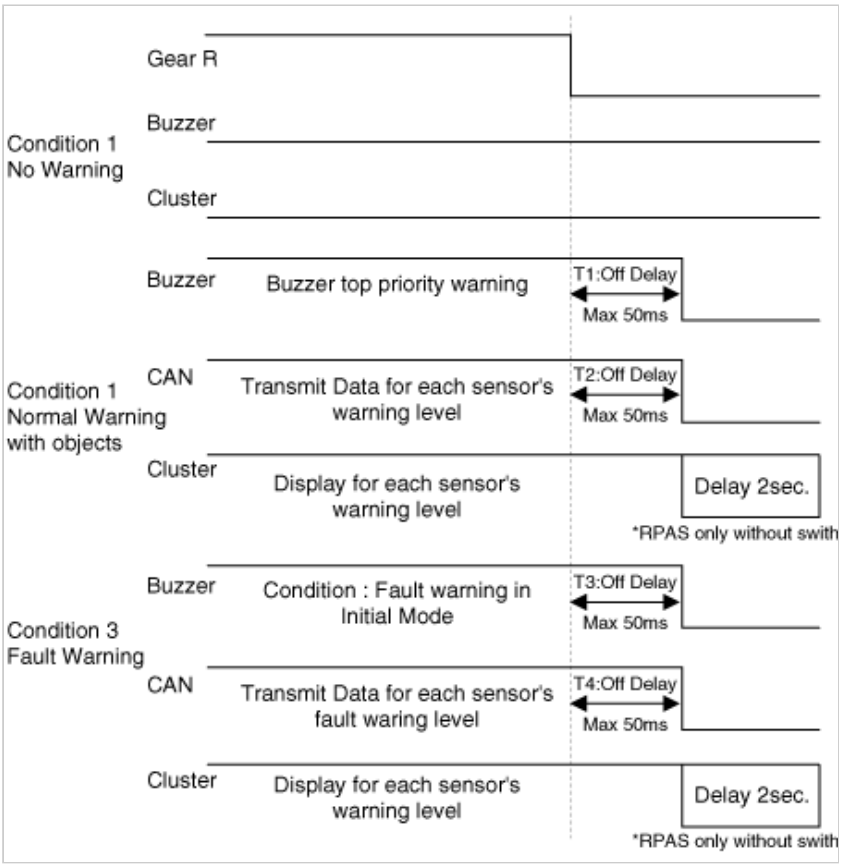
When the system has the power (after IGN ON and R gear), MICOM checks every sensor channel.In case it is not find any error, it sounds 300ms buzzer 500ms afterward.But it finds any error even a sensor, it sounds buzzer corresponding fault sensor instead of initial starting alarm. Function for normal mode entrance is as below



With R Gear, system function is as below



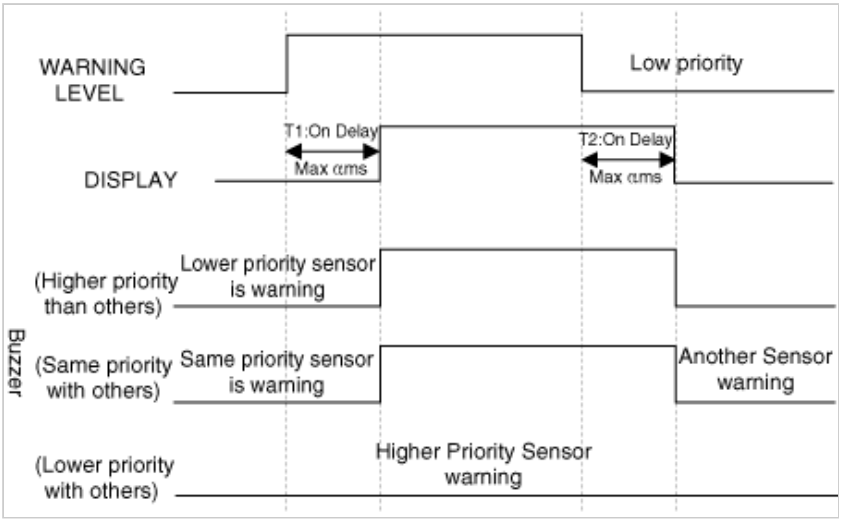
With R gear releasing, system function is as below



※acceptable error range on waveform ±10%

Alarm Output Specification classified by distance between sensors

Condition logic according to priority of alarm level is as below. (the identical sensor)



*α value definition

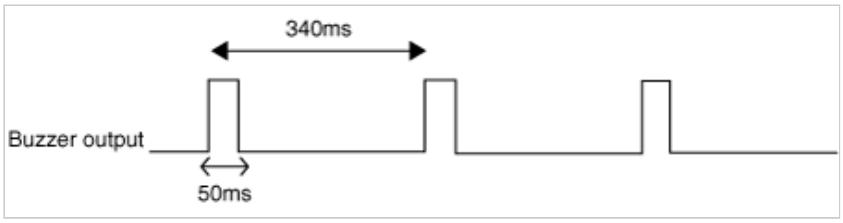
1. low priority sensor off : α = 0ms
2. low priority sensor is 1st warning level : α < 340ms
3. low priority sensor is 2nd warning level : α < 170ms

*β value definition

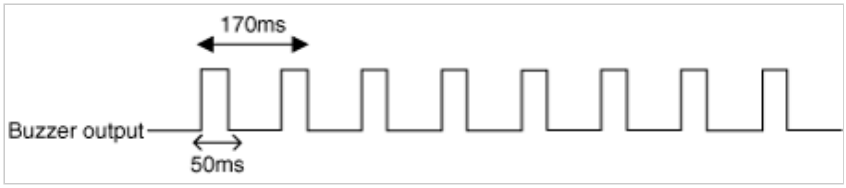
1. low priority sensor is 1st warning level : β = 1700ms
2. low priority sensor is 2nd warning level : β = 1700ms
3. low priority sensor is 3rd warning level : β = 700ms

Alarm control by sensing distance is as below

1. First warning area (Front: 61 cm (24 in) - 100 cm (39.4 in), Rear: 61 cm (24 in) - 120 cm (47.2 in))



2. Second warning area (Front/Rear: 31 cm (12.2 in) - 60 cm (23.6 in))



3. Third warning area (Front/Rear: less than 30 cm (12.2 in))

Visible Alarm Indicator Specification

1. Alarm level per distance - Front, Rear sensor

   When the gear is applied to R, cluster lights the indicator as below figure.When the system finds an object, it lights indicator immediately. During sensing an object, if there is no object, it lights indicator that is no alarm status for two seconds and then turns out afterward detecting an object. (But when it turns third step alarm to No alarm status, it lights third step alarm for two second and turns out.)

Warning level	system check	1st (61Cm ~ 100Cm)	2nd (31Cm ~ 60Cm)	3rd (0Cm ~ 30Cm)
Indicator display				

* It only displays the position of detected obstacle.
* Indicator flickers every 1 second at third step alarm.
* Integrated display (FCL/FCR, RCL/RCR).