USER MANUAL

HDMS – HDMS FMCW Radar

- **USER MANUAL**

Version : 1.02

Datum : 10.09.2019

Created : Bonggu Yeo

HDMS LAB

Project Manager	----
Technology	----
Quality	----
Production	----

Contents

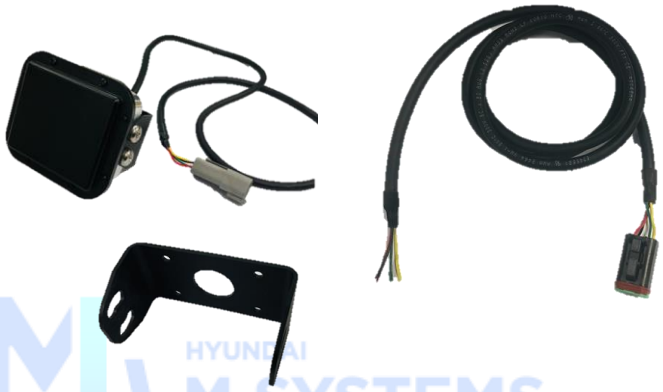
1 Brief description 3
The Test Module consists of : 3
1.1 FMCW Radar 4
1.2 Bracket 5
1.3 Connect Cable 6
2 Set up the HDMS FMCW Radar Test Module 7
2.1 Mount FMCW Radar with Bracket on Mount point 7
2.2 Connect Cable and connecter with FMCW Radar 8
2.3 Power on and connect CAN communication 8
3 Example measurement setup 9
3.1 Set up the HDMS FMCW Radar 9
3.2 Basic measurement setup 10
3.3 Measurement setup in the state mounted on the vehicle 12
3.4 Sensor Output – CAN Data 13

1 Brief description

The test kit brings all necessary devices and stuff for a quick installation setup to evaluate the HDMS FMCW Radar performance.

The Test Module consists of :

- FMCW Radar
- Bracket
- Connect Cable



1.1 FMCW Radar

➢ Construction Equipment Safety Radar

Safety
✔ Avoid collisions, reduce accidents and injuries

Efficiency
✔ Efficient equipment operation

Compatibility
✔ Superior performance at the construction site

Ruggedness
✔ Excellent performance due to moisture, dust, vibration and weather

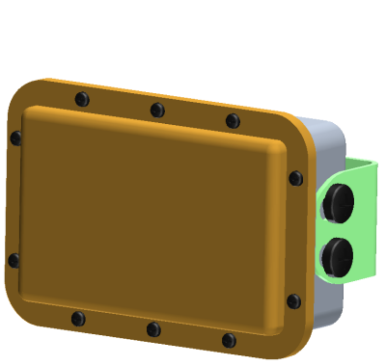
➢ HDMS FMCW Radar Specification

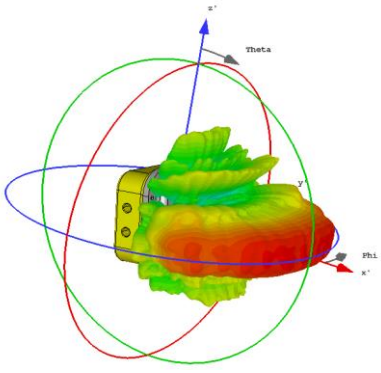
Items		Specification Type* Wheel Loader	ETC
Frequency		80~81GHz	
Modulation		FMCW	
Power supply		DC 12 / 24 V	
Max Range	Static Target	10m	
	Dynamic Target		
Distance Accuracy		0.5 m	
Azimuth FOV		100 °	
Elevation FOV		20 °	
Frame Per Second		3 FPS (20 FPS**)	
Maximum Velocity		9m/s (32.4km/h)	
Velocity Accuracy		0.5m/s	
Interface		CAN 2.0	
Reliability		HES-T200 / T201	
Size		129 mm(H) x 88 mm(W) x 43 mm(D)	

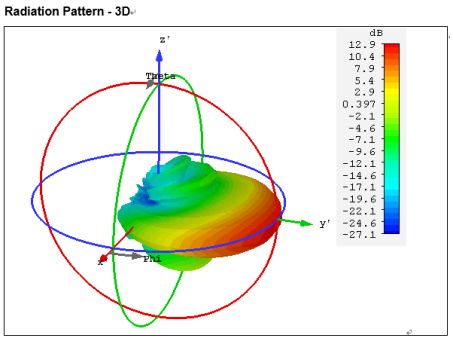
* Refers to a target with RCS of -10 dBsm
** Maximum Performance, It can be set by user program.

현대엠시스템즈

See the included documentation (Radar Specification Doc) for basic radar specifications







> This device complies with part 95 subpart M.

> 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 has been tested and found to comply with the limits for a 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. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

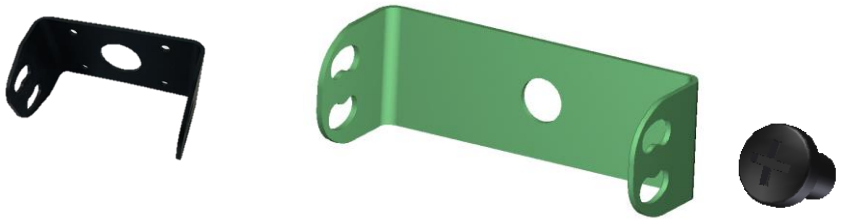
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device should be installed and operated with minimum 20 cm between the radiator and your body.

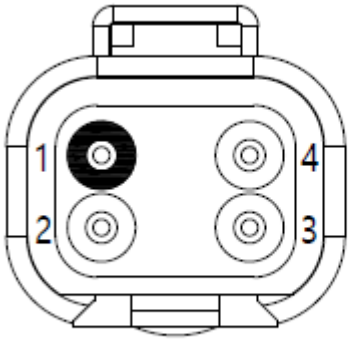
Prohibited applications of radar equipment under this service rule include fixed radar use outside of airport areas and airborne radar operations.

1.2 Bracket



> A bracket is an auxiliary device and fixed the radar with screw.

1.3 Connect Cable



1	4
2	3

* DEUTSCH-DT04-4P

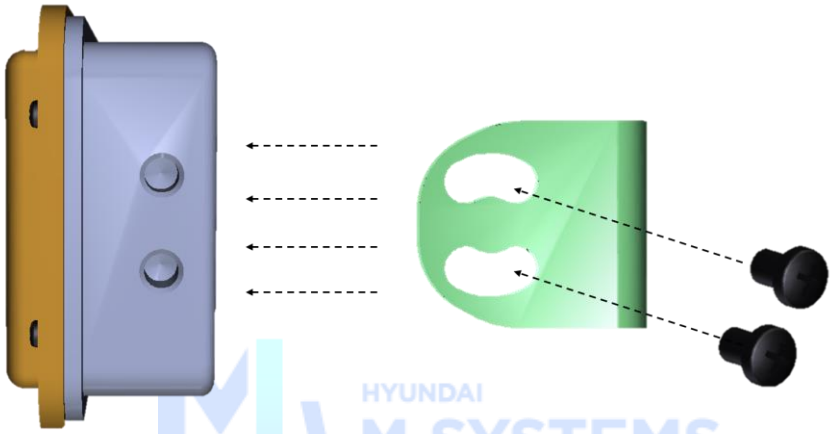
> The cable image is as above, and the connector pin map is the table as below.

PIN	Pin DESCRIPTION	WIRE DESCRIPTION
1	POWER(12V/24V)	RED
2	GND	BLACK
3	CAN HIGH	YELLOW
4	CAN LOW	GREEN

2 Set up the HDMS FMCW Radar Test Module

Prepare the HDMS FMCW Radar Test kit in a few steps :

2.1 Mount FMCW Radar with Bracket on Mount point

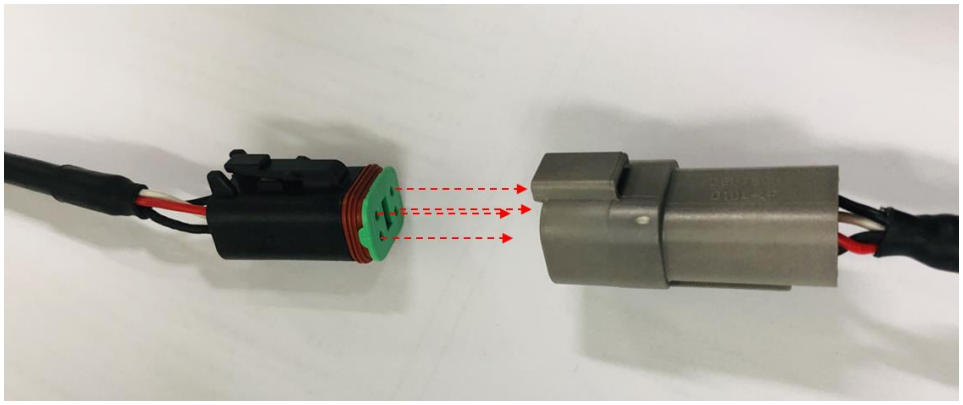


[Figure 2-1. Radar and bracket assembly]

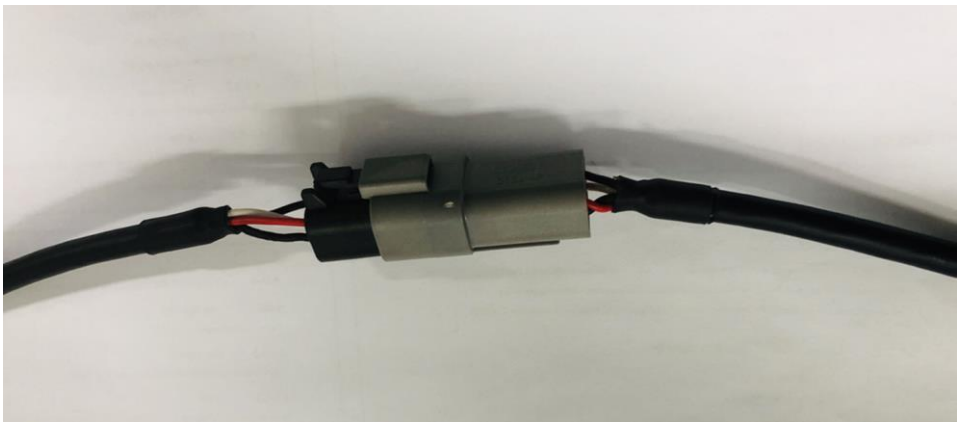
> First, connect the radar and the bracket, then tighten the four screws in each position as Figure 2-1 shown.

> After fixing the radar on the bracket, fix the bracket to the desired position to use the radar sensor.

2.2 Connect Cable and connecter with FMCW Radar



[Figure 2-2. Radar connector and cable assembly]



[Figure 2-3. After finished connect radar and cable]

> Connect each connector in the correct direction. (If the direction is wrong, the connection will not work.)

> The connector pin map is shown in Figure 1.3 and the power supply and CAN cable must be connected.

2.3 Power on and connect CAN communication

> According to the contents of 1.3, connect power (12/24 V), GND and CAN H / L to check whether normal operation is possible.

3 Example measurement setup

3.1 Set up the HDMS FMCW Radar

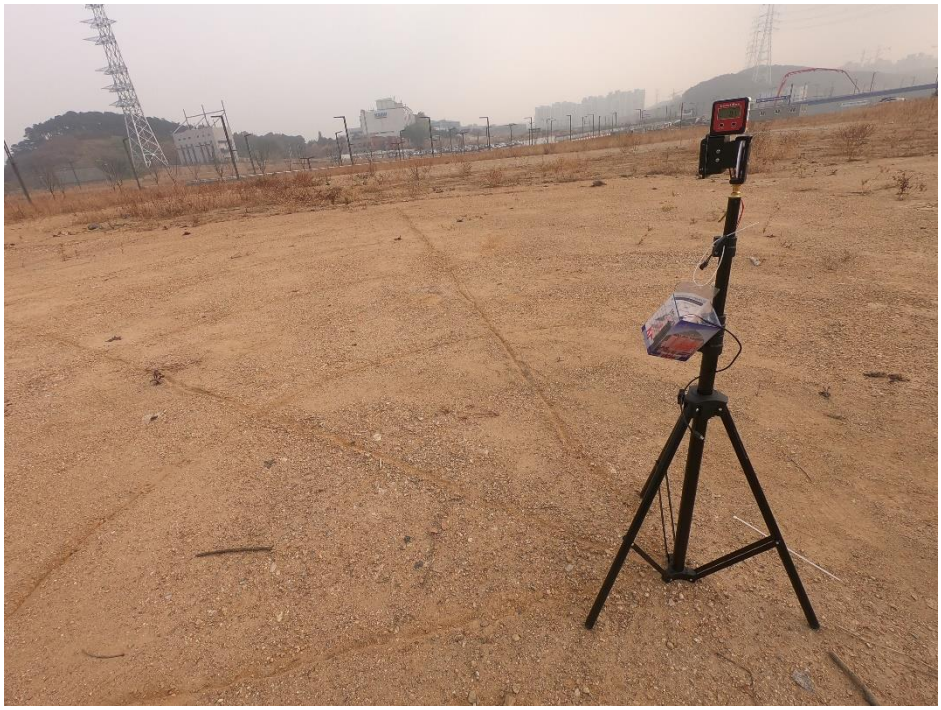
[Figure 3-1. Simple Radar Mounting Test Image]

> The radar should be mounted 1.5 m from the ground, and the angle of inclination should be tilted upward about 5 to 10 degrees.

> If you installed it with 0 degree reference, it should be necessarily checked because ground effects may be occurred while moving.

3.2 Basic measurement setup

[Figure 3-2. Radar Test Environment 1 (empty space)]



[Figure 3-3. Radar Test Environment 2 (empty space)]

[Figure 3-4. Radar Test Environment 3 (Human detect)]

> Put on the iron bar and attach it 1.5 m from the ground.

> After mounting test, measure at wide open space.

> The preference angle of the radar is upward 5 ~ 10 degree

> There is a misrecognition possibility if the environment is complicated

3.3 Measurement setup in the state mounted on the vehicle

[Figure 3-5. Installation on an excavator(From the ground 1.5 m)]

[Figure 3-6. Installation on a wheel-loader (From the ground 1.5 m)]

[Figure 3-7. 50 ° measurement range from left to right at mounting height]

> For wheel loader, mounting position is 1.5 m from the ground

> In the case of excavators, mounting position is 1.5 m from the ground.

> The test area is a wide open space (about 10 m behind the object should not be exist)

> For moving tests, it is also recommended to test in wide empty space.

> Moving test requires additional function to remove ground effect.
(Able to be customized functions from a user request)

3.4 Sensor Output – CAN Data

> Radar output data is Can communication and refer to Output document.