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Brochure

Worldwide Release

ND-BU001

Standard Anti-Drone System

ND-BU001

Standard Anti-Drone System

System Overview

With exponentially sales of drones around the world, the threat posed by the weaponization of recreational drones already is a reality. The unregulated proliferation of drones in most countries poses a significant danger and threat to their national security. Military bases, public buildings, critical infrastructures, power stations, offshore oil & gas platforms, sport stadiums, mass gathering events, and political leaders are all vulnerable to drone attacks. Terrorists have already used drones to launch attacks against civilian and military targets around the world. The illegal drone threat can no longer be ignored and should be addressed with appropriate technology immediately.

ND-BU001 Standard Anti-Drone System is designed against consumer-grade small rotor drones, merging long-range detection, jamming and record tracking functions into one system, for protection of key areas and response to threats from small rotor drones, e.g., illegal drone invasion, terrorist attack, and drug trafficking.

The system mainly consists of Detecting Unit, Jamming Unit and Camera Unit. Detecting Unit is for detecting and tracking long-distance drones and leads Jamming Unit to interfere with the remote control circuits and navigation signals of drones and force them to land or return. The Camera Unit can efficiently record the tracks of the detected drone for further analysis and assist the Detecting Unit for more accurate and effective monitoring.

Typical Targets

Type	Small rotor drones
Wheelbase	≥350mm
Weight	≥1Kg
Speed	≤30m/s

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Detecting Unit Description

The Detecting Unit which employs the 3D active phased-array radar is the key to the whole ND-BU001 System.

The phased-array radar is a category of radar sensors that are capable of monitoring hostile activities on the surroundings of critical infrastructures and objects; however, such kind of radar can not detect drones directly.

As drone RCS* is quite small, usually around 0.01m^2 (the size of DJI Phantom 4 Micro Drone RCS is 0.01 m^2), it is especially difficult to detect drones. (*RCS: Radar cross-section (RCS) is a measure of how detectable an object is with radar. A larger RCS indicates that an object is more easily detected. An object reflects a limited amount of radar energy back to the source.)

The 3D active phased-array radar we employed with the unique algorithm focused on small RCS flying object, is able to rapidly report the speed, distance, direction, altitude and other information of the invading drone.

By adopting the Detecting Unit, much more accurate tracking data would be obtained through electronic scanning. Within the same detecting range, both the power consumption and the size of the ND-BU001 System are significantly reduced.

Main Features of Detecting Unit

- 3D active phased-array radar
- Low false alarm rate and excellent ability in clutter suppression
- Multiple target capability: able to search at most 128 targets simultaneously
- Fully automatic searching and tracking; supporting all day (24h) working
- Detection range: 3km (depending on circumstances and drone type)
- User-friendly interface

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Specifications of Detecting Unit 1

Radar mode		Linear frequency continuous wave
Working frequency		Ka band (30.25~30.32GHz)
Main specification	Effective detecting range (DJI Phantom 4)	3km
	Blind range	180m
	Target speed range	3~25m/s
	Elevation beam angle	50°
Scanning method	Azimuth	360° Mechanical rotating 5~355° Arbitrary sector scan supported
	Azimuth rotation speed	90°/Sec
	Elevation	0°~50° Electrical phased array
Measuring accuracy	Range error	15m Max
	Max speed error	3m/s
	North finding error	1° Max
	GPS error	30m Max
	Azimuth angle error	≤1° (R.M.S.)
	Elevation angle error	≤1°

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Specifications of Detecting Unit 2

Multi-target	Azimuth resolution	7°
	Elevation resolution	7°
	Max target number	128
Interface	Electrical	TCP
	Mechanical	YW110F01 (Water proof circular connector with RJ45)
	Radar dimension	Width \ Height \ Thickness: 83cm x 44cm x 28cm
	Weight of radar	15kg
	Weight of rotator	15kg
	Water proof standard	IP66
	Radar power consumption	24V, 11A
Software	Function	Real-time target track display
	Target information	Position, altitude, speed, track, RCS
	Geo-system display	2D GIS, Google map supported
Working temperature		-20°C ~ +65°C

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Jamming Unit Description

The Jamming Unit could block radio frequencies used by drones and the frequency bands of GPS L1 system in case that drones fly in auto-pilot mode.

Depending on the application, protection level and geographical location, the Jamming Unit may be adapted in terms of frequency band coverage and output power.

The detected drone may be tracked by radar itself. Combined with the directional antenna mounted on a pan-tilt platform, the tracking allows positioning the jammer antenna directly onto the detected drone, so as to transmit the jamming signal precisely and focused toward the target.

Guided by the target information (e.g., speed, distance, direction and pitching) provided by the Detecting Unit, the Jamming Unit is able to rapidly adjust the antennas to interfere with the invading drone and force it to land or return.

Main Features of Jamming Unit

- Precise jamming without violence
- 6 frequency bands of jamming signals (frequency bands and output power can be customized)
- Supporting automatic/manual mode switching
- Remote control frequency jamming: coverage of all available civil drones
- Directional high-gain antennas mounted on Pan-Tilt platform can effectively track drone and transmit jamming signal in the direction of the drone
- Frequency jamming can be done automatically upon drone detection or supervisor assistance

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Specifications of Jamming Unit

	Output band	Frequency band	Channel output power	Total output power
Output power	6 Bands	410-440MHz	10W	60W
		840-930MHz	10W	
		1440-1480MHz	10W	
		GPS L1	10W	
		2.40-2.50GHz	10W	
		5.70-5.90GHz	10W	
Jamming distance	3km			
Power supply	220V, AC power			
Power consumption	500W			
Physical and environment	Weight		18kg	
	Protection		IP66	
	Operating temperature		-25°C ~ +65°C	
	Storage temperature		-25°C ~ +65°C	

*Note: Frequency bands and output power may be customized to address customer needs.

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Camera Unit Description

The drone detecting and tracking results could be indicated by optical camera. When a drone is detected, the long-range video tracker with daylight camera would slew to the position of the drone and follow with precision, allowing further close inspection of such vehicle and its payload.

Specifications of Camera Unit

Visible camera	Detection range	2484m	
	Recognition	497m	
	Image sensor	1/1.9" 2.1 Megapixel CMOS	
	Lens	Focal length	6-218mm f/1.5-4.8
		Optical zoom	36X zoom
		Angle of view	62°~1.9° horizontal
	Digital zoom	4x digital zoom	
Thermal camera	Image sensor	Uncooled vanadium oxide (VOx) microbolometer, 30Hz or 9Hz upon request	
	Resolution	640 x 512 / 640 x 480 pixels or 384 x 288	
	Lens	120mm	
	Field of view on 640 x 512	3.7° horizontal FOV	
	Field of view on 384 x 288	2.2° horizontal FOV	
Additional system	Pan angle & speed	Endless 360° continuous rotation, 0.4°~60°/s	
	Tilt angle & speed	-90° ~ +90°, 0.4° ~ 40°/s	
	Weight	<8.5kg	
	Operational temperature	-30° ~ +60°C, <90% relative humidity	
	Environmental	IP66 weatherproof housing	

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Worldwide Release

ND-BU002

High-End Anti-Drone System

ND-BU002

High-End Anti-Drone System

System Overview

With exponentially sales of drones around the world, the threat posed by the weaponization of recreational drones already is a reality. The unregulated proliferation of drones in most countries poses a significant danger and threat to their national security. Military bases, public buildings, critical infrastructures, power stations, offshore oil & gas platforms, sport stadiums, mass gathering events, and political leaders are all vulnerable to drone attacks. Terrorists have already used drones to launch attacks against civilian and military targets around the world. The illegal drone threat must be addressed with appropriate technology immediately.

ND-BU002 High-End Anti-Drone System is designed against consumer-grade small rotor drones, merging long-range detection, jamming and record tracking functions into one system, for protection of key areas and response to threats from small rotor drones, e.g., illegal drone invasion, terrorist attack, and drug trafficking.

The system mainly consists of Detecting Unit, Jamming Unit and Camera Unit.

- The Detecting Unit, which employs the advanced 3D active phased-array radar, is specifically designed for detecting and tracking long-distance drones. It can detect the drone position not only in horizontal angle but also in vertical angle.
- Guided by the accurate drone position information, the Jamming Unit with tall antenna and low power jammer will interfere with the remote control signals and navigation signals of the drone and force it to land or return.
- The Camera Unit can efficiently record the tracks of the detected drone for further close inspection, and also assist the Detecting Unit for more accurate monitoring.

Typical Targets

Type	Small rotor drones
Wheelbase	≥350mm
Weight	≥1Kg
Speed	≤30m/s

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Detecting Unit Description

The Detecting Unit which employs the advanced 3D active phased-array radar is the key to the whole ND-BU002 System.

The phased-array radar is a category of radar sensors that are capable of monitoring hostile activities on the surroundings of critical infrastructures and objects; however, such kind of radar can not detect drones directly.

As drone RCS* is quite small, usually around 0.01m^2 (the size of DJI Phantom 4 Micro Drone RCS is 0.01 m^2), it is especially difficult to detect drones. (*RCS: Radar cross-section (RCS) is a measure of how detectable an object is with radar. A larger RCS indicates that an object is more easily detected. An object reflects a limited amount of radar energy back to the source.)

The 3D active phased-array radar we employed with the unique algorithm focused on small RCS flying object, is able to rapidly report the speed, distance, direction, altitude and other information of the invading drone.

By adopting the Detecting Unit, much more accurate tracking data would be obtained through electronic scanning. Within the same detecting range, both the power consumption and the size of the ND-BU002 System are significantly reduced.

Main Features of Detecting Unit

- Advanced 3D active phased-array radar
- Low false alarm rate and excellent ability in clutter suppression
- Multiple target capability: able to search at most 128 targets simultaneously
- Fully automatic searching and tracking; supporting all day (24h) working
- Detection range ≥5km (depending on circumstances and drone type)
- User-friendly interface

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Specifications of Detecting Unit

Radar mode	Linear frequency modulation pulse	
Working frequency	Ku band	
Scanning method	360° horizontally mechanical scanning, and vertically wide beam phased scanning	
Detection range	≥5km (Mini drone RCS=0.01 m2)	
	≥10km (Small drone RCS=0.2 m2)	
Blind range	200m	
Detection angle	Azimuth angle	0°~360° scanning
	Elevation angle	0°~60°
Measuring dimensionality	Distance/azimuth/pitching angle/speed	
Detection accuracy	Distance accuracy: ≤10m	
	Azimuth accuracy: ≤1°	
	Pitching accuracy: ≤1°	
Resolving ability	Distance: ≤20m	
	Azimuth resolution: ≤3°	
	Pitching resolution: ≤5°	
Tracking	TWS/continuously tracking	
Weight of radar host	≤23kg	

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Jamming Unit Description

The Jamming Unit could block radio frequencies used by drones and the frequency bands of GPS L1 system in case that drones fly in auto-pilot mode.

Depending on the application, protection level and geographical location, the Jamming Unit may be adapted in terms of frequency band coverage and output power.

The detected drone may be tracked by radar itself. Combined with the directional antenna mounted on a pan-tilt platform, the tracking allows positioning the jammer antenna directly onto the detected drone, so as to transmit the jamming signal precisely and focused toward the target .

Guided by the target information (e.g., speed, distance, direction and pitching) provided by the Detecting Unit, the Jamming Unit is able to rapidly adjust the antennas to interfere with the invading drone and force it to land or return.

Main Features of Jamming Unit

- Precise jamming without violence
- 9 frequency bands of jamming signals (frequency bands and output power can be customized)
- Supporting automatic/manual mode switching
- Remote control frequency jamming: coverage of all available civil drones
- Directional high-gain antennas mounted on Pan-Tilt platform can effectively track drone and transmit jamming signal in the direction of the drone

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Specifications of Jamming Unit

	Output band	Frequency band	Channel output power	Total output power
Output power	9 Bands	430-440MHz	50W	266W
		459-461MHz	50W	
		868-870MHz	25W	
		902-928MHz	25W	
		GPS L1:1575.42±5MHz	25W	
		GPS L2:1227.6±5MHz	25W	
		GPS L3:1381.05±5MHz	25W	
		2400-2490MHz	25W	
		5725-5850MHz	16W	
Jamming distance	5km (depending on circumstances)			
Frequency interval	100KHz			
Initial time	<10s			
Power supply	AC220V/50Hz			
Power consumption	800W			
Physical and environment	Host weight		≤25Kg	
	Protection		IP66	
	Operating temperature		-25°C ~ +65°C	
	Storage temperature		-25°C ~ +65°C	

*Note: Frequency bands and output power may be customized to address customer needs.

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Camera Unit Description

The drone detecting and tracking results could be indicated by optical camera. When a drone is detected, the long-range video tracker with daylight camera would slew to the position of the drone and follow with precision, allowing further close inspection of such vehicle and its payload.

Specifications of Camera Unit

Optical camera	Resolution	2MP/1080p @ 60fps (1920 x 1080)
	Image sensor	1/2.8" 2.1 Megapixel CMOS
	Lens	Focal length
		Angle of view
	Optical fog filter (NIR)	Yes
	IP protocol	ONVIF, HTTP, RTSP, RTP, TCP, UDP
	EIS	Electronic image stabilization (on/off)
Thermal camera	Image sensor	X-Hot 10μm 1280 x 1024 MWIR sensor (1280 x 720 IP output)
	Lens (motorized focus)	115-1200mm (10.5X) *f*4.0, Autofocus Ge zoom lens
	Field of view	6.4° ~ 0.61° HFOV (±3%)
	Image enhancement	Digital image contrast enhancement(dice) & digital zoom
	Cooler lifetime	20,000+ hour rated Rotary Stirling cycle cooler
Pan and tilt	Pan angle & speed	Endless 360° 0.001°/s ~ 110°/s
	Tilt angle & speed	+65° to -65°, 0.001 ~ 70°/s
	Accuracy	0.005°
Environmental	Operational temperature	-50°C ~ +65°C
	Environmental	MIL-STD-810F, EMI MIL-STD-461E, IP66/67

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ND-BU003

Basic Anti-Drone System

ND-BU003

Basic Anti-Drone System

System Overview

With exponentially sales of drones around the world, the threat posed by the weaponization of recreational drones already is a reality. The unregulated proliferation of drones in most countries poses a significant danger and threat to their national security.

ND-BU003 Basic Anti-Drone System with sufficient detection range is the basic version of our anti-drone systems and has an obvious advantage in price. Due to its short production cycle, high-volume and high-quality production are available.

The system has been designed and developed against consumer-grade small rotor drones, merging long-range detection, jamming and record tracking functions into one system, for protection of key areas and response to threats from small rotor drones, e.g., illegal drone invasion, terrorist attack, and drug trafficking.

The system mainly consists of Detecting Unit (RF Detector) and Jamming Unit (Directional Jammer). Detecting Unit can detect and track long-distance drones and lead Jamming Unit to interfere with the remote control circuits and navigation signals of the drones and force the drones to land or return.

Typical Targets

Type	Small rotor drones
Wheelbase	≥350mm
Weight	≥1Kg
Speed	≤30m/s

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Detecting Unit Description

The Detecting Unit (RF Detector) could search and detect target activities within low space areas and other protection areas in all-direction and under all-weather, and achieve direction and distance measurement of target drones and their controllers.

By adopting the Detecting Unit, much more accurate tracking data would be obtained through electronic scanning. Within the same detecting range, both the power consumption and the size of the ND-BU003 System are significantly reduced.

Main Features of Detecting Unit

- Precise direction measurement and stereo protection

  Able to achieve precise direction measurement of invading drones, and ensure regional three-dimensional protection through high deployment

- Functional integration with reverse positioning

  Multi-point RF detector network deployment on positioning target drones and their controllers and warning the operator to timely make next command can be achieved

- Omni-directional passive reception without electromagnetic radiation

  Equipped with 360° detection of drones, the RF detector will not emit electromagnetic waves or have electromagnetic interference to the surrounding environment

- Complete drone signature database with synchronous data update mechanism

  Imported with the characteristics of mainstream drones, the control terminal platform is able to judge and show the brand and model of the detected drones. The drone feature database can be updated synchronously

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Specifications of Detecting Unit

Detection range	3km
Detecting frequency range	300-6000MHz
Detection antenna frequency	915MHz, 2.4GHz and 5.8GHz (433MHz is optional)
Detection direction	All direction 360°
Detection accuracy	≤3°(RMS)
Device dimension	455 x 265 mm
Communication port	LAN
Installation method	Fixed installation/portable tripod installation
Deployment/retreat time	≤2min
Power supply	AC110-220V
Power consumption	≤20W
Weight	≤8Kg
Working temperature	-25℃ ~ 65℃
Protection grade	IP65

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Jamming Unit Description

The Jamming Unit could block radio frequencies used by drones and the frequency bands of GPS L1 system in case that drones fly in auto-pilot mode.

Depending on the application, protection level and geographical location, the Jamming Unit may be adapted in terms of frequency band coverage and output power.

The detected drone may be tracked by radar itself. Combined with the directional antenna mounted on a pan-tilt platform, the tracking allows positioning the jammer antenna directly onto the detected drone, so as to transmit the jamming signal precisely and focused toward the target .

Guided by the target information (e.g., speed, distance, direction and pitching) provided by the Detecting Unit, the Jamming Unit is able to rapidly adjust the antennas to interfere with the invading drone and force it to land or return.

Main Features of Jamming Unit

- Precise jamming without violence
- 6 frequency bands of jamming signals (frequency bands and output power can be customized)
- Supporting automatic/manual mode switching
- Remote control frequency jamming: coverage of all available civil drones
- Directional high-gain antennas mounted on Pan-Tilt platform can effectively track drone and transmit jamming signal in the direction of the drone
- Frequency jamming can be done automatically upon drone detection or supervisor assistance

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Specifications of Jamming Unit

	Output band	Frequency band	Channel output power	Total output power
Output power	6 Bands	410-440MHz	10W	60W
		840-930MHz	10W	
		1440-1480MHz	10W	
		GPS L1	10W	
		2.40-2.50GHz	10W	
		5.70-5.90GHz	10W	
Jamming distance	3km			
Power supply	220V, AC power			
Power consumption	500W			
Physical and environment	Weight		18kg	
	Protection		IP66	
	Operating temperature		-25°C ~ +65°C	
	Storage temperature		-25°C ~ +65°C	

*Note: Frequency bands and output power may be customized to address customer needs.

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