# **Instruction Manual**

# **DS100 Interference and Direction Analyzer**





Ver: 1.0

# **Safety Requirement**

# **Safety Level**

This manual has the following conversions for presenting information.

**WARNING:** A warning marker alerts you any harmful matters that users should pay attention to the operation method. Users must not do any operation or process before the condition of this marker is met, otherwise it might cause personal injury.

**CAUTION:** A caution alerts you to any danger matters that users should pay attention to the operation method. Users must not do any operation or process before the condition of this marker is met, otherwise it might damage the device.

Before connecting to the power switch, please make sure that the voltage and currency of external AC-DC power supply or the cigarette lighter meet the equipment requirements, otherwise it might damage the device or adaptor.

Since there are multiple circuit joints in the device, and touching might cause personal injuries and device damages, only trained maintenance personnel could remove the case and maintain the device.

# Warranty

This instrument is guaranteed for a period of 2 years since the date of shipment, you can extend the warranty for one year before maturity, the battery warranty for one year. Under warranty, any fault which is not caused by improper use will be repaired for free.

Users must use and check the instrument according to the manual. If maintenance is needed, please send back to our company our authorized maintenance stations.

Generally, in the warranty period all faults which are not caused by imporper use would be repaired by our company free. Users need to pay for the freight and insurance to send the product back. The freight sending the product back to users would pay by our company or authorized maintenance stations.

The device would execute the programming command after installing all software and hardware correctly. But we do not guarantee the operation continuity and absence of faults.

The guarantee is limited only to the instrument and does not involve any damage of equipment, personnel and property caused by improper use of the instrument.

### Limitation

The warranty is not applicable for the faults resulted by improper use or inadequate maintenance (including software and interfaces), and unauthorized open of the instrument. Within the 2 years warranty period, calibration, maintenance service and consultation shall be free. After the 2 years warranty period, you can extend the warranty for one year before maturity, to extend the warranty period of one year you need pay 16% of Sales price, fees for material and repair will be charged reasonably.

The following items are not under warranty:

①Damage caused by improper voltage or AC/DC currency input.

② Deformation or damage of panel, switches, devices and case as well as defects involving interval parts caused by external mechanical force (shocking and dropping, etc.).

③Defects caused by unauthorized repair.

④ When users pick up the device, please check it on the nail. If there is any damage, please contact with the transport company. Only receivers (the person and department of receiving the product) has the right to ask for compensation for the transportation damages.

<sup>⑤</sup>Defects caused by the instrument worked beyond the required technology specification.

All specifications and operations might change that we would not inform individually. For any other needs, please ask our company.

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## **1** Instrument overview

The DS100 Interference and Directional Analyzer is a handheld instrument designed for radio monitoring with spectrum analysis, signal demodulation, interference troubleshooting, and directional mode. With features such as rich functions, excellent performance and convenient operation, it is an ideal instrument for field signal detection and analysis.

The instrument has built-in and integrated receiver, direction finder, cluster signal analyzer, road measurement analyzer and other optional accessories. Users can also quickly deploy our directional antennas to the roof and use the controller for concealed monitoring in the car.

# **2 About Instrument**

#### 2.1 Interface

#### Upper panel

1 N-type antenna interface 2 Serial/antenna data and control interface 3 USB2.0 tablet interface 4 Headphone interface 5 GPS antenna interface 6 Volume knob



Fig.2-1 Upper panel

#### Left panel

1 IF Output 2 REF Input



Fig.2-2 Left panel

#### **Right panel**

1 USB2.0 interface 2 100M LAN 3 1000M LAN 4 USB3.0 interface 5 Power adapter interface

Warning: only battery, adaptors and chargers from Deviser could be used.



Fig.2-3 Right panel

# 2.2 Button Panel

① Function key②Digital key③Power button④Up and down key , wheel⑤Unit key⑥Lock key⑦Storage key





# 2.3 Soft Bag

DS100 can be stored in the instrument package when idle, and accessories and adapters can be placed in the side pocket of the instrument package.



Fig.2-5 Instrument package

# 2.4 Interactive Interface

① Parameter status display area②Markers and Lines status display area③Waveform and measurement results④Parameter setting area



Fig.2-6 Interactive interface

# 3 Menu

# 3.1 RX

To set frequency, gain control, squelch level and other basic parameters.



### 3.2 SCAN

To set scanning mode and other parameters ( In different scanning modes, the Settings of measurement parameters are also different ).

#### In FFM mode:







### In HSCAN mode:



## **3.3 DISP**

To set display mode, display range and so on.





## 3.4 CONF

To set system parameters, view system information, etc.



# 3.5 FILE





# **4** Function

### 4.1 FFM

#### Measure Mode

Measure mode: FFM、FSCAN、MSCAN、PSCAN、HSCAN、DPS、Digital Trunki、Digital Radio、 SS Outdoor.

Switch measure mode: press the panel key  $\langle SCAN \rangle \rightarrow click$  the virtual key  $\langle Mode \rangle$ 

#### **Display Mode**

Display Mode: RX、Spectrum + RX、Spectrum、Waterfall + Spectrum、Waterfall (The double spectrum mode is introduced under the PSCAN measurement)

Switch display mode: press the panel key <DISP>  $\rightarrow$  click the virtual key <Display Mode>.





	🛱 🗖 🗾 🔶 🏹 🛊	2019-04-10 09:15:53
BW	RX: 99.000000 HHz -58.6 dBm H: 96.052632 HHz -80.3 dBm D: 2.947368 HHz -11 7 dB	Freq
500kHz		VF0-
Demod Mode		A B
FM	Freq: 99.000000 MHz	Freq
Detector		99 0000 MHz
MAX PEAK	LVI: -58.1 dBm	
AFC	F-Offset: Field:	⊖ Gain
Off		
Att	OBW: x dB BW:	⊖ sqL
Normal		<u> </u>
SQL	Lvl	
-50.0 dBm	SQL	→ Tone
Gain	-116 -96 -76 -56 -38 -16	
AGC		<b>⊖</b> Voice Setup
	L Cent:99.0 MHz BBW:30.0 kHz Ant: Span:20.0 MHz	

Fig.4-2 RX mode



#### Fig.4-3 Spectrum mode

Waterfall mode: In the waterfall, different colors represent different signal amplitudes. The instrument can realize the three-dimensional comprehensive monitoring and recording of the signal frequency, time and amplitude, which is helpful to capture the short pulse signal of the order of us. The maximum time for data recording is 72 hours, and it can be recorded according

to the threshold value set by the user and stored directly in the USB peripheral. It supports online playback and looks for interference information at a specified time.



Fig.4-4 Waterfall mode

BW			-120.0	3 dBm			-20.0 di	8m	Wa	iterFall	٩	Freq
500kHz	Lv1:	-42.2	dBm									VFO-
Demod Mode	Field:											A B
FM												Fren
Detector											1.8	2800 GHz
RMS												
AFC	12.34									and the second	€	Gain
Off												
Att			radia da								9	501
Normal	-20.0 dBm										9	
SQL	-40.0 dBm					η					-	
Off	-60.0 dBm										€	Tone
Gain	- -80.0 dBm											
AGC	-100.0 al	he was	manyman	hp Japan and	www.	WWW	mall	MANY	upu Analui	WAW MAY	€	ice Setu
	Cent: 1. 828	GHz	RBW :	30.0 kHz					Spa	n:20.0 MHz		

Fig.4-5 Waterfall + Spectrum mode

FFM: real-time display of field intensity information.

The scanning bandwidth ranges from 1kHz to 20MHz.

The measured parameters (The same parameters under other measurements are not described):

Bandwidth:1.5kHz/2.4kHz/6kHz/9kHz/12kHz/15kHz/30kHz/50kHz/120kHz/150kHz/250kHz/300kHz/500kHz

Demod Mode: FM/AM/USB/LSB/ISB/CW/ASK/PSK

Detector: SAMP/MAX PEAK/AVG/RMS

Att: Normal/L-Distortion/H-Sens.

#### **Measuring steps**

Set the center frequency: press the panel key <FREQ/MEM>, click the virtual key <center freq>, use the number key to Enter the center frequency, and press <Enter> to confirm.

Set the span: press the panel key <DISP> key and click the virtual key <span>, change the span using the up and down keys or spinning wheel.

Set the marks: press the panel key <DISP>, click the virtual key <Mark> to Enter the Mark menu. Click the key <M> or the key <D>, change the frequency value using the up and down keys or spinning wheel, and press Enter to confirm.

# 4.2 FSCAN

FSCAN: The instrument can continuously scan radio signals in a certain frequency range according to the preset scan step. The instrument presets a channel table, which can edit frequency dwell time, no signal time, scan time, etc. Suppression frequency list can be edited, one key to record the current frequency point set to the suppression frequency list.



Fig.4-6 FSCAN

#### **Measuring Steps:**

According to the frequency step set by the user, the instrument performs spectrum analysis in a certain range. Press the panel key <SCAN>, click the virtual key <Param> to enter the start frequency, stop frequency and step, and click the virtual key <RUN+> or <RUN-> to start scan, click <STOP> to end scanning.

# 4.3 MSCAN

In this mode, demodulation mode, demodulation bandwidth and other parameters of different frequency can be set independently. The storage list in the channel table has a capacity of 1024 items, which is convenient for users to continuously scan multiple frequency points.



Fig.4-7 MSCAN

#### Measuring steps:

In the mode, the instrument can perform spectrum analysis according to the channel table set by the users. Press the panel key <SCAN>, click the virtual key <Param> to enter the start line and stop line, and click the virtual key <RUN+> or <RUN-> to start scan, click <STOP> to end scanning.

# 4.4 PSCAN

This mode is a full-band spectrum scan with a span from OHz to 6GHz and RBW range from 30Hz to 1MHz. The display mode is set to double spectrum, and the instrument can display IF-PAN and RF-PAN in the same screen.



Fig.4-8 PSCAN



Fig.4-9 Double Spectrum

#### **Measuring Steps:**

PSCAN can analyze the spectrum of frequency band up to 6GHz. Press the panel key <SCAN>, click the virtual key <Param> to enter the start frequency, stop frequency and RBW, and click the virtual key <RUN+> to start scan, click <STOP> to end scanning.

# 4.5 HSCAN

DS100 has perfect directional and positioning functions. Interference signals are directed using a matching directional antenna with GPS and an electronic compass. Based on the principle of three-point location, the interference source is located on the electronic map.

Directional antenna is used to test the direction of the strongest signal at the interference frequency point. Electronic compass is used to automatically record the direction information of

the value of the test signal. GPS is used to automatically record the longitude and latitude of the current test point, and display the target position in real time in combination with the electronic map.

For complex environment statistical mode, it can carry out a statistical analysis to the multiple measurement results and estimate the direction of maximum probability of interference signal. The yellow pointer shows the direction the current antenna is pointing to in real time. The gray pointer outputs the position of the source determined after a single test. The red pointer shows the azimuth and angle of the transmitting source obtained after multiple probability statistics, and the statistical results are displayed in the bar chart below the interface.



Fig.4-10 HSCAN

The instrument supports open source maps such as OpenStreetMap and updates maps via U disk. Enter map mode: Press the panel key <DISP> and click <Show Map>.



Fig.4-11 Show Map

#### **Measuring steps**

1.Single Scanning: wait for GPS to lock successfully, press the panel key <SCAN> and set "Test" to "Start". The directional antenna in your hand rotates 360 degrees smoothly in place. The final red confirmation Angle will appear on the interface, which is the direction of the maximum probability of interference signal.

2.Multiple Scanning: press the panel key <SCAN>, click <param> and set "Test" to "Start". The directional antenna in your hand totates many turns smoothly in place. For each rotation, add a white arrow to the interface. After multiple white arrows appear in the interface, set "Test" to "Stop". At this time, a red confirmation arrow appears on the interface, which is the direction maximum probability of interference signal.

### 4.6 DPS

In wireless communication system, multiple signals in the same frequency band are often superimposed together, and the strong signal will cover the weak signal. The radio signal monitoring using the traditional spectrum is faced with many difficulties. DPS can superimpose the FFT spectrum within a certain time and use color temperature to display the frequency of signal occurrence. It is a very effective and fast method to find and capture the same frequency interference signal hidden under the normal signal.



Fig.4-12 DPS

# 4.7 Digital Trunking

In the Digital Trunking, the instrument can intercept the voice and short message signals sent by the digital intercom, and it can listen to intercepted voice and display intercepted SMS messages on the DS100 machine.

**Measuring Steps:** First, set the correct center frequency that is sent by the digital intercom. Then, after receiving the intercom signal of the space, turn on the voice playback, and the voice of the interphone can be heard locally in DS100. If the device intercepts the message, we can observe the content of the message in the interface.



Fig.4-13 Digital Trunking(audio)

			ō	-			¢		Ŷ		20 19	019-05-12 5:11:01
BW								Digi	ital T	runking	٩	Scan
500kHz	120	1	250	00	MI	0	2 6	dD.			М	ode>
Mode DPMR	Color C	• 上 ode: Num:	250 768969	3	Power:	-74.7 dBm 1	<b>3.0</b> Calli	abr ng Num:	n 1000	11 05	Digit	al Trunk
Detector	SMS con	tent:	Hello		5115 116141.			Jee.			Pa	iram>
RMS												
AFC											Dif	F Mode
Off											Un	UFF
Att	-10.0 dBm										Field	d Mones
L-Distortion	-30.0 dBm			_							Flei	u neasz
SQL												
Off	-50.0 dBm			-			2 10					
Vocoder	-70.0 dBm		. 6 G du las e		. And Jo b	and we defined	Mu Ma M	A. MAR. 6 .	المراجع	total nu		
AMBE+2	-90.0 day	WYWV	ster Attlink	why. whe	M la da do	xM <sup>ha</sup> w.M. i W. i	e mane filter i	L. A MA	** <u>*</u> *14	VIET PR		
	Cent:420.1 M	Hz	RB	¥:30.0 k	Hz	Ant:			Spar	1:20.0 MHz		

Fig.4-14 Digital Trunking(SMS content)

# 4.8 Digital Radio

In the Digital Radio, user can demodulate the modulated digital signal sent by the digital radio transmitter and display the demodulation result on the interface. At present, the instrument only supports demodulation LoRa mode.

**Measuring Steps:** First, set the correct center frequency that is sent by the digital transmitter. Then, the demodulation data is displayed on the interface.

	<b>[]</b> 8	1			¢	<b>)</b>				019-05-07 1:59:49
BW							Digita	l Radio	٩	Scan
500kHz	422	000	000	MIL	00	لہ م	Dim		1	lode>
Demod Mode	433. Power:	-68.6	000 IBm Fi	MHZ reg Off:	-80.	9 a SMS Num	BW		Digit	al Radio
LoRa	757677787	797a7b7c	d7e7f808	18283848586	8788898a8b8	c8d8e8f	909192939	495969		
Detector	798999a9t babbbcbdt	09c9d9e9 0ebfc0c1	a@a1a2a3 2c3c4c5c	a4a5a6a7a8a 6c7c8c9cacb	9aaabacadae cccdcecfd0d	afb0b1b 1d2d3d4	2b3b4b5b6 d5d6d7d8d	b7b8b9 9dadbd	P	aram>
RMS	cdddedfel	Be1e2e3e	ie5e6e7e8	e9eaebecede	eeff0f1f2f3	F4F5F6F	7F8F9Fafb	fcfdfe		
AFC	FF0001020 122232425	03040506 52627282	07 08 09 0a 0 2a2b2c2d	1b 0c 0d 0e 0f 1 0 12e2f 3 03 1323	11121314151 33435363738	6171819 393a3b3	1a1b1c1d1 c3d3e3f40	e1f202 414243	Dif	f Mode
Off	444546474	18494a4b	ic4d4e4f5	05152535455	565758595a5	b5c5d5e	5F6061626	364656		
Att	-20.0 dBm								Fiel	d Meas>
Normal	-40.0 dBm				8					.u neusz
SQL									Ch	eating
Off	-60.0 dBm			A						<b>ype&gt;</b> 169
Vocoder	-80.0 dBm									
AMBE+2		Alle In	Math Anta	Marcala	MANAM	MA MAN		MMAAW		
C	ent:433.0 MHz		RBW:30.0 kH		Ant:		Spa	a:20.0 MHz		

Fig.4-15 Digital Radio

### 4.9 SS Outdoor

In SS Outdoor, the instrument provides outdoor road test for users. The user can import the map of the area to be tested through the PC, and after obtaining the GPS information, the user can conduct automatic dotting test by according to the "time" or "distance" interval.



Fig.4-16 SS Outdoor

#### Measuring Steps:

**Setup mode:** Press the panel key <SCAN>. If the "Cur Location" is set to "Auto", the map automatically adjusts the map with the change of the GPS position; if it is set to "Manu", the user need to move the map through the "Browser" function.

**Setup frequency:** press the panel key <SCAN>, and click <Freq point>. Start and stop frequencies can be set, and up to 12 frequency points can be set in this range.

Setup parameter: press the panel key <SCAN>, and click <Param> to set "record mode".

Time mode: Select time mode to set the "Time" interval.

Distance mode: Select the distance mode to set the "Distance" interval.

Time interval: In Time mode, the instrument automatically marks the sample points on the map at the set time interval during the measurement. The setting range is from 100ms to 60sec.

Distance interval: In distance mode, the instrument automatically marks the sample points on the map at the set distance interval during the measurement. The setting range is from 1m to 500m.

**Setup Threshold:** Press the panel key <SCAN>, and click <Threshold> to set the threshold values of "Excellent", "Very good", "Good", "Poor" and "Fail". When the measurement starts, the trace will be displayed by the color of the set threshold.

**Map Manager:** Press the panel key <DISP>, and click <Map Manage>. The user can import outdoor map to the instrument via USB peripherals, and set the "Location" to "Local" to load the map.

**Browser:** Press the panel key<DISP>, and click <Browser> . The user need to touch the screen to click the up, down, left, and right buttons.

Measure: Press the panel key<SCAN>, and click <Measure> to set the "Start" or "Stop" test.

File Save: Supporting set file name, file type, saving location.

File Type: The rdo format file can load measurement results in the instrument and view the test track. The csv format file belongs to the data table file, which is opened by the EXCEL of the PC to view the test data. The kml format file needs to use Google Earth software to open the test file for data analysis.

Location: The default is local disk. If the user insert USB Disk, USB disk can be used as a save location.

# 5 File Manager

**Screen Shot:** Press the storage key " <sup>(C)</sup>". The user can take a screenshot of the current interface and save it to the local disk. The file is named after the current time.

**Recording Audio:** Press the storage key " , users can start or end recording audio. Click <save file> to choose a variety of saving forms, including Setup file, Measurement file, Image file and wav file.

**File List:** Press the storage key " **I**", users can directly enter the file management menu. The users can preview the file, export to the USB disk and delete by checking the specified file.

**Channel Table:** In the MSCAN mode, press the storage key "**L**<sup>**C**</sup>", the users enter the channel table manager interface. We can view each channel parameter information, edit and delete operation.

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File Name:       snap_2014-12-18_22-26-46.bmp       Image       Preview         File Type:       Setup       Measurement       Report       Preview         Image       Trace       Audio       Delete       Delete         IQFile       MemoryList       Direction       Delete       Delet	File Manager							
File Type:         Setup         Measurement         Report         Preview           Image         Trace         Audio         Delete           IQFile         MemoryList         Direction         Delete           Location:         Local Disk         USB Disk         Refresh           e.bmp         bmp File         937 KB         2018-01-15 11:34:40         Export To USB Disk           ertbmp         bmp File         937 KB         2018-07-16 14:23:16         Export To USB Disk           snap_2014-12-18_22-28-48.b         bmp File         937 KB         2014-01-06 10:45:47         Snap_2015-01-05_18-45-47.b           snap_2015-03-04_19-08-35.b         bmp File         937 KB         2015-03-05 11:08:36         Snap_2016-02-03_17-08-56.b         bmp File           937 KB         2016-02-04 09:08:56         Snap_2016-02-03_17-08-56.b         bmp File         937 KB         2016-02-04 09:08:56	File Name:	snap_2014-12-	-18_22-26-48.bmp					🕭 Manager
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FileNa	ame: me	mory_list	.CSV				
Index	State	Memory	Freq(Hz)	Mode	Desc	Active	Ilsed
0	Used	0	600000000	ISB	Memory_0000	Active	
1	Used	1	500000000	AM	Memory_0001	Active	Not IIsed
2	Used		4000000000	IQ		Active	Hot Obed
3	Used	3	300000000	FM	Memory_0003	Active	Viow
4	Used	4	200000000	USB	Memory_0004	Active	VIEw
5	Used		100000000	AM	Memory_0005	Active	
6	Not Used	6	5000000	AM	Memory_0006	Active	
7	Not Used		6000000	AM	Memory_0007	Active	
8	Not Used	8		AM	Memory_0008	Active	
9	Not Used	9	0	АМ	Memory 0009	Active	

Fig.5-2 Channel Table

Rev Freq(Hz):	600000	0000		Squelch					Save
Demodulation:	ISB			Attenua		0			
BandWidth:	1.5 kH			Auto Fr	eq Ctrl:				Cancel
Attenuation:	Normal			Describ	e:	Memory_0	000		
Squelch Level:	-10			Memory		Active			
q	w	е	r			u	i	o	р
		d	f	į	ş	h	j	k	
		x	с			n	m	-	
	bc	123@							$\langle X \rangle$

Fig.5-3 Edit Channel

# **6** Technical Parameters

# **RF** indicators

Frequency Range	9kHz-6GHz
Input Impedance	50 Ω
VSWR	≤3:1
Input Level	Typical Max 0dBm
Primary Function	
9kHz-30MHz	30MHz low pass filter
20MHz-1140MHz	Tunable bandpass filter
1140MHz-1900MHz	1140MHz high pass filter
1.8GHz-3GHz	1.8GHz high pass filter
3GHz-6GHz	2.7GHz high pass filter
Noise Factor (High ser	nsitive mode)
9kHz-20MHz	Typical 23dB
20MHz-1140MHz	Typical 10dB
1140MHz-1900MHz	Typical 12dB
1.8GHz-3GHz	Typical 13dB
3GHz-6GHz	Typical 27dB
IP3(normal mode)	+15dBm (-20dBm two tone signal frequency interval is 1MHz, when the center frequency is 150MHz)
IP3 (low noise)	-10dBm (-40dBm two tone signal frequency interval is 1MHz, when the center frequency is 150MHz)
Phase noise	Typical≤-100dBc/Hz@10kHz carrier frequency 150MHz

### **IF indicators**

	13 filter (3dB bandwidth)
IF demodulation bandwidth	1.5 kHz, 2.4 kHz, 6 kHz, 9 kHz, 12kHz, 15 kHz, 30 kHz, 50 kHz, 120kHz, 150 kHz, 250 kHz, 300 kHz, 500 kHz
FFM	FFT, internal (4,096 points) average 18 frames/sec
Display frequency Range	10kHz-20MHz
Control	
Squelch	-120dBm~0dBm (step 1 dB)
Frequency control	AFC
signal processing	FM, AM, USB, LSB, ISB,CW,PULSE,ASK,FSK
Digital Trunking demodulation	DMR, DPMR
Digital Radio	LoRa

### Scan

FSCAN	
start/stop frequency	selectable
scan step	selectable
PSCAN	
scan step	selectable
scanning speed	6GHz /s (300FFT/s)
MSCAN	
Memory location	512 channel, programmable
Measurement accurat	cy and display
Frequency resolution	1Hz
Frequency accuracy	≤1ppm
Operating temperature range	≪1ppm
Aging rate	≤1ppm/year
Signal reference level	-137dBm~20dBm, 0.1dB resolution
Display error	Max $\pm$ 3 dB/Typical 1.5 dB
Level display mode	Max, Min, Avg, Normal

### Interface

RF Input		
9kHz-6GHz	N type (50 $\Omega$ )	
Maximum damage level	+20dBm/ 0VDC	
External Reference Input		
10MHz	SMA (50 $\Omega$ )	
Input amplitude range	0dBm~+10dBm	
IF Output		
138.24MHz	SMA (50 $\Omega$ )	
IQ Output	USB3.0 (bandwidth 20MHz)	
Audio Output	Stereo socket/100 Ω	
	LAN (48kHz sps)	
Data and control interface	LAN (100/1000M)	
	choose between USB2.0 and WIFI	

# **Power Supply**

Adapter	15V
Battery Type	10.8V, 6800mAh
Charging Time	>4.5 hour
Full Power Supply Time	>3 hour

### **Other Index**

Size (W x H x L)	293.6mm×196.5mm×74mm
Weight	Abt. 3.5kg
Storage Temperature	-30℃~70℃
Working Temperature	-10℃~+50℃
Display Resolution	800 x 480 pixel

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