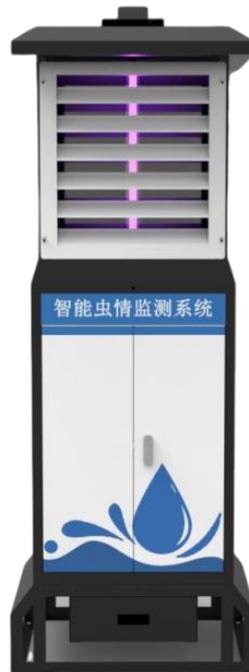# Smart Remote Pest Monitoring System

Instruction manual

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2024

listing

1.Product Overview

1). Product Description

Intelligent Remote Insect Detection System is a new type of insect detection tool developed by our company. The production and processing of this product is in line with GB/T 24689.1-2009 National Standard for Plant Protection Mechanical Insect Detection and Reporting Lamps. Intelligent Remote Pest Reporting System adopts stainless steel overall structure, utilizes optical, electrical and numerical control technology, Internet of Things system, and reserves 485/232 communication interface to access various systems such as meteorological system. Realize the insect body far infrared automatic processing, the whole lamp automatic operation and other functions; in the case of unsupervised, can automatically complete the entrapment, killing, collection, distribution, drainage and other system operations. The system monitors, analyzes and predicts the occurrence and development of insects, provides services for the modernization of agriculture, and meets the needs of insect reporting and specimen collection.

2). Product parameters

1. The production and inspection standards in line with GB/T 24689.1-2009 plant protection machinery, insect collection equipment, national standards.

2. The whole structure is made of stainless steel, which is in line with the national standard GB/T4237.

3. Using light control, rain control, time control and other control methods, using 4G/Ethernet and other equipment and Internet of Things platform for data exchange

4. Power input: Grid power, 400W solar panel & 200AH battery solar power supply system is optional.

5. Insulation resistance: ≥ 2.5MΩ, with leakage protection device

6. LCD display: 10-inch color LCD touch panel computer, real-time display of the current working status and environmental data, local configuration is possible

7. Drainage device: rain automatically into the rain control mode, rain control motor start for drainage

8. Lamp: adopts 365-395 wavelength insect trapping lamps, the start-up time is less than 5 seconds.

9. Insect treatment: using infrared technology, automatic drying of pests at regular intervals, baking time can be set (baking for five minutes up to 85 ℃), the lethality rate of insect treatment is not less than 98%, and the integrity rate of the insect body is not less than 95%.

10. Receiving board: adopting disc-shaped PTFE receiving board

11. Vibrating device: through a short period of time vibration, make the falling insects lay flat on the receiving plate.

12. Cleaning device: used to take pictures after the completion of cleaning the insect catching plate, so that the pests into the next drop insect structure

13. Photographing: Use 1200W industrial camera to take pictures regularly according to the set working hours.

14. Power failure memory: the device will maintain the previous working status after abnormal power failure recovery.

15. Power consumption / life: running power ≤ 225W; standby power ≤ 5W; design life of not less than 5 years

16. lightning protection device: lightning rod and grounding device; to effectively prevent lightning strikes

17. Impact screen: four impact screen at an angle of 90 degrees to each other, single screen size: length 608mm ± 2mm, width 330 ± 2mm, thickness of not less than 5mm

18. Internet of things platform: the device uploads real-time operation status and picture data, users can view pest photos, pest classification and identification, and generate information such as the trend of insect population through cell phones or computers.

19. Pest drawer: 645*500*215 need to be manually swept regularly to discharge the pests.

2.Scope of Application and Features

The Intelligent Remote Pest Monitoring System is widely applied in the fields of agriculture, forestry, customs, horticulture, and research institutions for insect and pest monitoring.

Application Areas: Agriculture, forestry, animal husbandry, vegetables, tobacco, tea, medicinal herbs, landscaping, orchards, urban greening, and quarantine.

Target Pests:
1. Vegetable Pests: Beet armyworm, armyworm, diamondback moth, cabbage caterpillar, whitefly, yellow-striped flea beetle, potato tuber moth, cabbage looper, mole cricket.
2. Rice Pests: Rice stem borer, leafhopper, rice yellow stem borer, rice striped stem borer, rice gall midge, rice leaf roller.
3. Cotton Pests: Cotton bollworm, tobacco cutworm, red bollworm, bridge pest, blind stink bug.
4. Fruit Tree Pests: Red-banded leaf roller, fruit borer, measuring worm, fruit-eating noctuid, peach borer.
5. Forest Pests: American white moth, light moth, willow borer, pine caterpillar, pine woodborer, longhorn beetle, cerambycid beetle, birch leaf roller, leaf roller, spring measuring worm, poplar moth, large green leafhopper.
6. Wheat Pests: Wheat moth, armyworm.
7. Grain Pests: Spodoptera frugiperda, sorghum borer, corn borer, soybean borer, bean moth, millet borer, apple codling moth.
8. Underground Pests: Cutworms, tobacco budworm, Japanese beetle, ladybird beetles, seven-spotted ladybug, mole cricket.
9. Grassland Pests: Asian migratory locust, grassland armyworm, leaf beetle.
10. Storage Pests: Granary weevil, rice weevil, wheat moth, black fungus beetle, bean weevil, ladybug, and 1,326 other major pests.

3.Working Principle

Light Control Principle:
When the ambient light increases (daytime) → the contacts controlled by the digital circuit open, and the monitoring light remains in standby mode (off). When the ambient light decreases (nighttime) → the contacts controlled by the digital circuit close, and the monitoring device enters working mode (on).

Time Control Principle:
Users can set specific working time periods based on their needs. The monitoring system uploads data during the set time periods. When the designated working time is reached, the monitoring device activates. The device supports user-defined settings for up to four working time periods. The monitoring light remains in standby mode (off) → the contacts controlled by the digital circuit close, and the monitoring device enters time control mode

(on) → once the working time period ends, it exits time control mode.

Rain Control Principle:

When it rains → the rain sensor detects the signal → the controller automatically activates → the drainage system begins working → preventing rainwater from entering the pest collection channel and directing it into the drainage channel, allowing it to flow out of the box from the bottom. After the rain stops, the device checks if the conditions for working status are met. If not, the monitoring light remains in standby mode.

Insect Handling Principle:

Using LED insect attractant lamps as the light source → insects fly towards it → collide with the glass screen → fall into the funnel → drop into the infrared treatment chamber. Once insects fall in, they will die within 3-5 minutes. After fifteen minutes, the infrared treatment chamber activates → the deceased insects enter a 90°C heating chamber for 15 minutes (configurable) until the insect bodies are dried. After waiting for the remaining time set by the user for taking photos, the heating chamber releases the insects onto the collection plate. → The collection plate vibrates for one second, spreading the insect bodies evenly on the plate. → The photo-taking process is executed. → Clean the collection plate.

4. Structure

The overall structure of this intelligent remote pest reporting system is divided into two parts, the upper part of which is a trapping device, the middle part is a cabinet structure, and the bottom part is an insect drawer structure, with control circuits and insect treatment devices inside the cabinet.
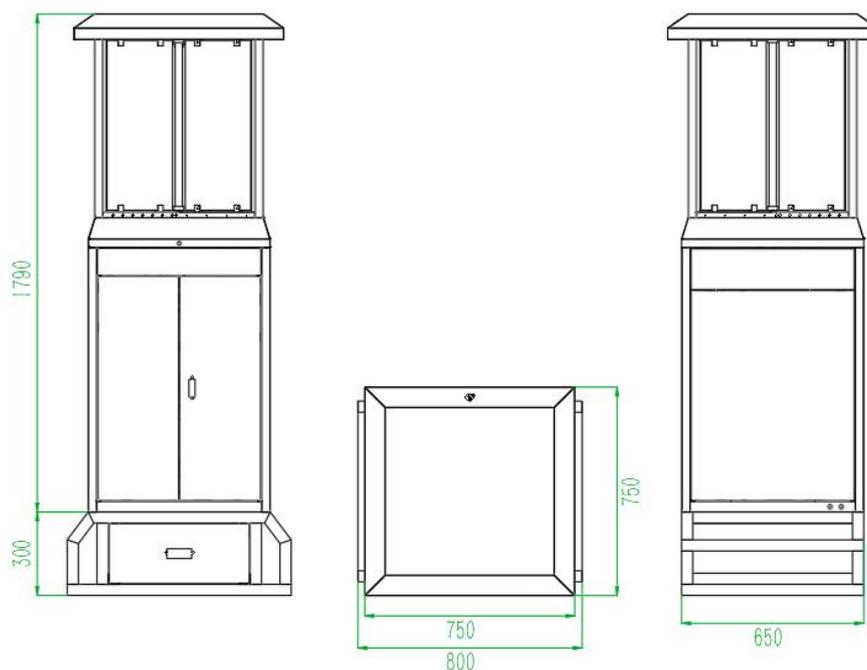
The trapping device consists of an insect attractant lamp, impact screens, and an insect collection funnel. The insect attractant lamp is vertically installed in the central position, surrounded by four impact glass screens arranged radially, with the collection funnel installed below, leading to the treatment chamber inside the cabinet.

5. Main Components

1. Light Sensor: Detects changes in ambient light, enabling automatic control of the entire lighting system through electrical and digital systems.

2. Rain Sensor: Detects rain and stops, transmitting signals to the controller.

3. Attractant Light Source: LED insect attractant lamp with a wavelength of 365-395 nm.

4. Impact Screen: Made of 5mm transparent glass, allowing light to transmit, direct, reflect, and attract insects to collide.

5. Far Infrared Treatment Chamber: Performs lethal treatment on insects, automatically directing processed insect bodies into the collection bag.

6. Positioning Sensor: Facilitates automatic conversion of the collection bag, preventing confusion between insects collected on different dates.

7. Controller: Manages the insect attractant light source, far infrared processor (operational status), activity door of the treatment chamber, and scheduled rotation of the collection bag turntable. The controller panel features nine indicator lights for easy monitoring of device operation and troubleshooting analysis.

6. Installation and Use

1-1 Installation

Construct a concrete base at the installation site (as shown in the diagram on the next page), ensuring that drainage channels are reserved according to the installation distance of the monitoring lamp's base. Once the concrete has set, securely mount the monitoring lamp facing east (toward the cabinet door) onto the base using a power drill to make holes and expand bolts for fixation.

Note: If the monitoring lamp is to be installed in a thunderstorm area, a lightning protection device must be added.
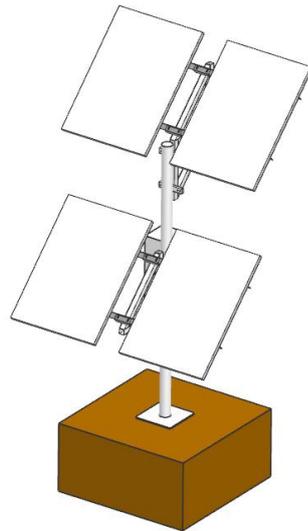
1. Install the solar panel modules and battery components with no buildings or shade trees blocking the sunlight in the surrounding area;

2. Pre-make a concrete platform of 1 meter long * 1 meter wide * thickness > 30 cm;

3. Install the screw on the base of the product measuring light, place the base horizontally on the concrete platform and insert the screw into the soil mix;

4. After the soil mix dries, install the lamp on the base;

未干的混泥土平台基座
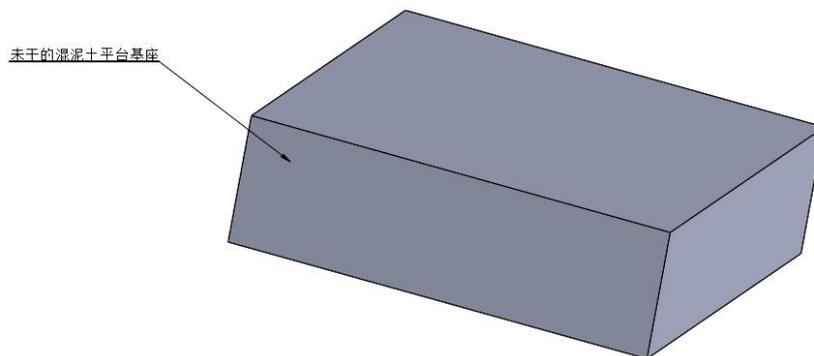
Undried concrete platform base
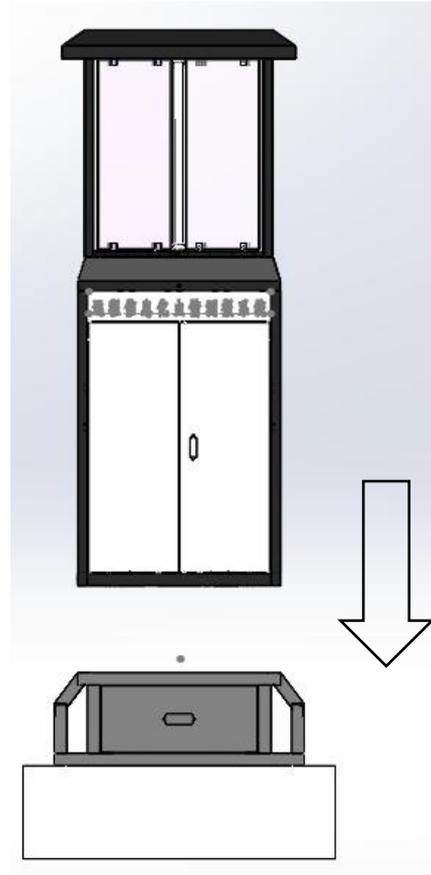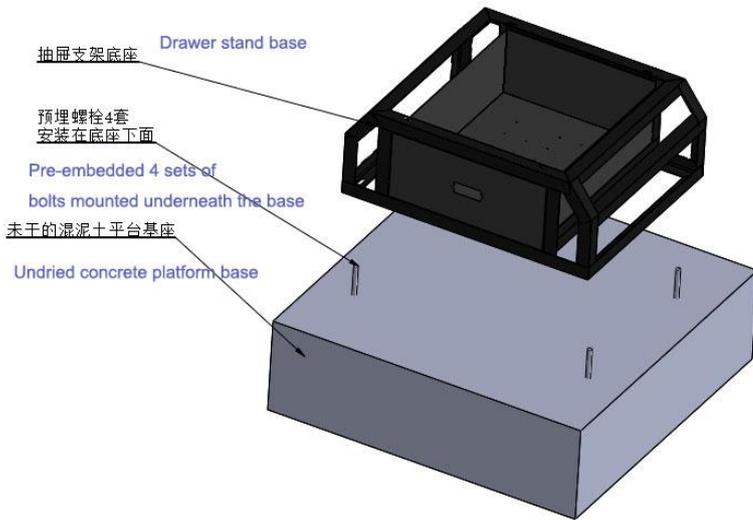
4 sets of pre-embedded bolts mounted under the base

1-2 Usage

Check the power supply method before use.

When using AC power from the utility, you need to push on the power and switch to AC power.

For solar power supply, you only need to switch the power supply mode to DC power supply mode.

Ensure power is supplied, open the cabinet door of the measuring and reporting light through the controller panel inside the cabinet and follow the steps to check the operation of the monitor.

I. Insect Monitoring System Settings

(1) Insect Monitoring Device Status Interface:
This interface consists of the insect monitoring working status screen and the extended device status screen. Confirm the information on the insect monitoring working status screen.

Error Code: x. 0: No error; 1-1024: Error.

Operating Mode: x. X = Manual, Time Control, Light Control, Rain Control.

(2) Mode Settings Interface:

Set Working Mode: Time Control / Light Control.

- Time Control Mode: Requires setting the photo interval (minimum interval is 20 minutes). Up to 4 working time periods can be set.

- Light Control Mode: Requires setting the photo interval (minimum interval is 20 minutes). The insect monitoring light will activate when the light intensity is below 850 Lux for 30 seconds, and will upload data at the set photo interval. When the light intensity exceeds 850 Lux for 30 seconds, it will exit the working mode.

(3) Device Control Interface:

Primarily used for single-step debugging, power-off restart, and other functions.

II. Rainwater Separation Mode:

This mode cannot be manually activated; it will only start when the insect monitoring light's rain/snow sensor detects rain or snow. Upon entering rain control mode, the device exits the insect monitoring working mode, activates rainwater separation, and turns off all switches of the insect monitoring light. During this time, the insect monitoring light will perform rainwater separation and drainage, while other modules remain in standby.

The insect monitoring light will revert to its saved working state when exiting rain control mode, and it will automatically determine whether to enter working mode based on the current conditions.

Activation Method:

Place a damp paper towel on the device's rain control board; the insect light source will extinguish within 30 seconds, and the entire light will turn off. Once the rain control board dries, the device will exit rain control mode, and the insect monitoring light will enter the corresponding working mode based on current conditions.

Additionally, in the event of an abnormal power outage, rainwater separation will automatically activate to ensure the device remains dry.

III. Working Mode Usage:

(1) Time Control Mode:

Determine if the current time is within the set working period. If it is, the insect light will activate, and after ten minutes, the far-infrared processing chamber will execute insect capture, activating the heating chamber to maintain a temperature of 90°C for 15 minutes to process the insects. Processed insects will be transported via a conveyor belt to the camera for data collection. After data is uploaded, the insects will be placed in the storage chamber. The insect monitoring light will wait for the set photo interval to upload data again until it exits the working period and enters standby mode.

(2) Light Control Mode:
If the light intensity is below 850 Lux for 30 seconds, it will enter working mode; if above 850 Lux for 30 seconds, it will exit working mode. The insect processing workflow is consistent with the time control mode.

(3) Manual Mode:
Can be accessed through the device control interface to switch modes for debugging the insect monitoring light.

(4) Insect Capture Plate Cleaning:
After each photo, the insect monitoring light will clean the capture plate using a brush driven by a stepper motor. After cleaning, the insects will be expelled via a sloped structure below the insect monitoring light.

IV. Platform Data Monitoring and Remote Control:
The insect monitoring system uploads device status data every 5 minutes, and images are uploaded at intervals set by the user. Users can perform functions such as mode switching, taking photos, restarting, and single-step debugging through platform controls.

1-3. Insect Monitoring Manual Debugging

Click the "Pause" control button at the top of the "Device Control" interface to terminate the current working state of the insect monitoring light. Then click the button to the right of "Mode Switch" to return to the "Device Status" page to refresh the status. If the "Mode Switch" at the top of the device control interface shows "Manual," you have successfully entered "Manual" mode.

After entering manual mode, the light control, rain control, and time control will not be triggered. You can manually control the operation of each component. Manual mode is intended for debugging purposes only, and it is advisable to avoid using it if you are not familiar with the device.

In manual mode, you can also take manual photos. A successful photo will display a "Photo Completed" message.
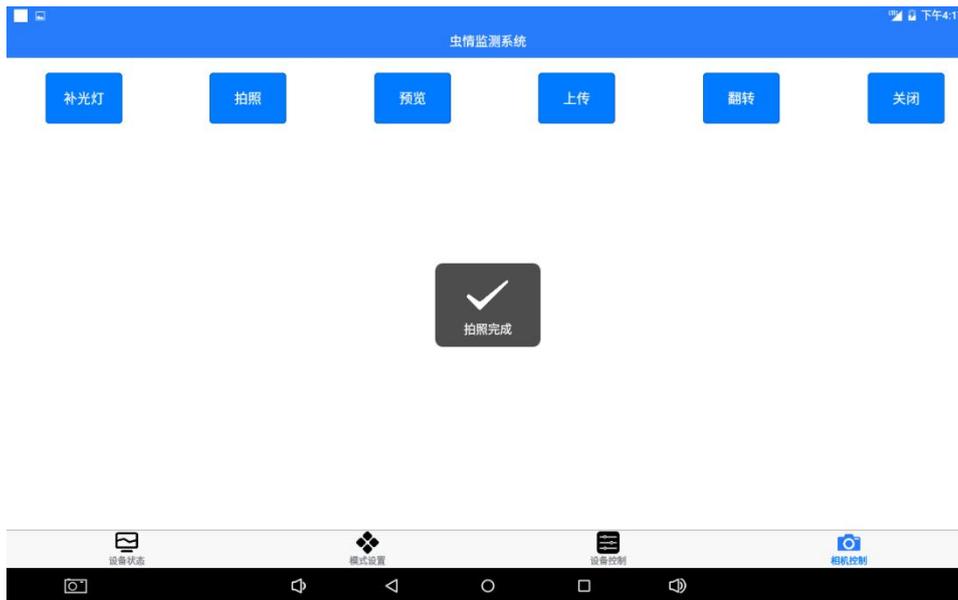
7. Precautions

1. Ensure the use of power for 400W solar panels and supporting batteries.

2. The front of the light must face east.

3. Installation of the fixing bolts should be tightened to ensure that the light body is stable.

4. Installation according to the light body grounding signs will be connected to the ground.

5. Set the working interval should be greater than the baking time.

6. In the event of stormy weather should be promptly cut off the power supply to prevent lightning damage to the machine circuit. After the sky is clear shall

wait until two hours before sending power to avoid leakage inside the machine due to excessive humidity.

7. power should be seen to work properly before leaving.

8. Insect light source and impact glass screen should be regularly cleaned of dirt, so as not to affect the trapping effect.

9. After the rain should be cleaned up the insect body in the catching bag in time, in order to prevent the insect body from rotting when it meets water.

10. Clean the rain control sensor regularly.

11. When loading or transporting, be sure to operate in accordance with the markings on the box, and it is strictly prohibited to put it flat or upside down.

8.Troubleshooting and Handling

Malfunction	Cause	Processing method
Night light source does not light up or day light	Failure of the light sensor or poor contact with the plug connected to the sensor	Please check the light sensor, connect the sensor plug
After the installation of the utility power supply, the control system indicator does not light up	Poor contact at power connection, power cord or switch	Check, replace, adjust
Monitor trips	Leakage in the internal circuit	Check the cause of leakage
More live insects are trapped	1. Damaged far infrared processor 2. Falling insect system failure	1. Inspection of far infrared processors 2. Inspection of insect drop systems
Insects can not be induced	1. Light source does not light up	1. Check the light source.

	2. Faulty controller 3. Rain sensor malfunction	2. Contact the manufacturer directly. 3. Rinse the rain sensor inside and out with water.
Controller falling insect lamp does not light up	Controller malfunction	Checking the controller
Insects can't enter the treatment bin smoothly	Pest funnel not working well	Clean the pest funnel
Machine does not work	1. The power supply is not sent on 2. Fuse blown 3. Switch disconnected 4. Leakage protection misoperation	1. Power on 2. Replace the fuse (wire) 3. Close the switch 4. Repair leakage protector

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