

**PRODUCT INSTRUCTIONS****MODEL AP/W
HIGH VOLTAGE HOLIDAY DETECTOR**

(NEW PRODUCT RELEASE 2015)

ALWAYS CONNECT CABLES PRIOR TO POWERING ON THE INSTRUMENT**1. HOLIDAY DETECTOR FUNCTION**

The Tinker & Razor Model AP/W Holiday Detector is an all-purpose electrical inspection instrument which maintains a given inspection voltage in spite of the electrical load on the circuit. It is recommended for use on any pipe diameter as well as on flat surfaces when such surfaces are coated with a highly electrical resistance material, and when the surface beneath the coating is electrically conductive. The detector works equally well on damp or dry surfaces, and is especially desirable where humid conditions prevail.

The purpose of this instrument manual is to inform the user on the operation of this particular instrument and is not meant as an instruction guide to holiday detection in general. It is recommended that only knowledgeable and trained operators use this equipment. We suggest NACE International (www.nace.org) for this type of training.

2. INSTRUCTIONS FOR UNPACKING & INSPECTION**1) Open the shipping carton and make note of the various accessories.**

Includes:

- (1) Instrument w/ Battery
- (1) Powerpak w/ Cable
- (1) Battery Charger
- (1) Screwdriver
- (1) Ground Cable (20')
- (1) Wand Handle (18")
- (1) Compax Connector (for Full Circle Spring Electrodes)
- (1) Wand Extension Handle
- (1) Paddle Electrode (Use with Full Circle Spring Electrodes)
- (1) Carrying case w/ Foam Insert
- (1) Electrode of Choice*

NOTE: Additional accessories may ship in separate packaging.

- 2) INSPECTION should be made upon receipt. If damage has occurred during shipment, file a claim with the carrier immediately.**
- 3) If it is necessary to contact your supplier or the manufacturer concerning damaged or missing items, be sure to include the serial number, purchase order number, and invoice number of the instrument in question.**

* Instrument ships with electrode of choice. Electrode may be Full Circle Spring Electrode (up to 36" pipe diameter), Half Circle Spring Electrode (up to 8" pipe diameter) or Silicone Rubber Electrode (up to 8" pipe diameter) or



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Wire Brush Electrodes (up to 8" width). Larger size electrodes and additional electrodes available at additional cost.

Safety Information for User

Unpacking and Reviewing your Tinker & Rasor Holiday Detector Before Every Use

- Make certain the inside of the case is clear and dry.
- Inspect each component for damage, such as cables, instrument & wand handles.
- Make sure all of the electrodes are clean.
- Verify the unit is fully charged.
- Verify that the output voltage is correctly set to the coating manufacturers recommend inspection voltage.
- If manufacturers requirements are not stated, NACE International, SSPC or ASTM Standards can be followed.

AND..... **ALWAYS READ THE INSTRUCTIONS THROUGHLY PRIOR TO USING ANY TEST EQUIPMENT!**

WARNING! This is a HIGH VOLTAGE device capable of producing an electrical shock if not properly grounded and/or operated in accordance with the instructions and procedures prescribed in this manual!

DANGER! IF YOU HAVE A PACEMAKER DO NOT USE THIS DEVICE.

If you have a pacemaker, life critical electronic medical devices or any medical condition effected by High Voltage, DO NOT use this type of equipment. Only trained and responsible personnel should operate high voltage equipment. Alert all personnel nearby prior to testing and display warning signs. It is important to realize you are now using a high voltage, low energy holiday detector. Tinker & Rasor holiday detectors, APS & AP/W, are designed to generate between 800 to 35,000 volts, pulsating DC. While these voltages are high, the energy emitted is well within US, OSHA guidelines. <https://www.osap.org/page/GuideOSHA> Rubber or plastic gloves and non-conductive footwear can minimize potential shock. Keep in mind that the shock prevention effectiveness of the rubber or plastic glove and footwear is limited to the condition of their protective surface. Make sure your gloves and footwear are in good condition and have no holes or tears. Most Portable Holiday Detectors are limited to finding defects in nonconductive coating materials. Testing should ONLY be conducted clear of personnel not involved in the testing procedure. Personnel operating Holiday Detectors should always be aware of their environment and the safety limitations imposed by same. Operator should have an alert assistant, to ensure that all unauthorized personnel are kept clear of the testing area.

DANGER!!! Portable Holiday Detectors create an arc or spark. Use of a Portable Holiday Detector in or around combustibile or flammable environments can result in an explosion. When operating in any potentially hazardous area, consult with the plant or site safety officer before proceeding with a holiday detection test in any potentially hazardous or suspect area.

CAUTION! DO NOT USE AROUND SENSITIVE ELECTRONICS OR RADIO EQUIPMENT. When "on" but not in use, Tinker & Rasor Pulse Type Holiday Detectors, APW and APS will generate radio frequency emissions which are within the limit defined by the Electromagnetic Compatibility Directive. Due to its method of operation however, the APW and APS Pulse Type Holiday Detector will generate broadband RF emissions when the unit is generating high voltage or when a spark is produced at the



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electrode. It is therefore recommended that the user does not activate the high voltage within the vicinity of sensitive electronics or radio equipment.

DO NOT SHORTEN THE GROUND CABLE. NEVER TOUCH THE BARE GROUND WIRE WHEN THE DETECTOR IS TURNED ON.

WARNING! USE CAUTION WHEN RAINING. If it is raining then there is a safety concern for the operator. Surface water on the sub straight is usually not conductive enough to transmit voltage, but almost any contaminant will cause water to become more conductive. If water covers the wand handle while connected to the APW Power-Pak or the APS Instrument, then the operator could become the return path for the high voltage. While the output voltage will cause harm to a healthy person, according to OSHA, your environment must be taken into consideration when operating this type of equipment. For example; if you are standing on top of a flag pole and receive a jolt of high voltage, it will most likely cause you to jump, and you will fall off the flag pole. *Stay Alert, Stay Aware and Stay Alive.*

If it isn't raining, but the coating surface is wet, Tinker & Rasor Holiday Detectors are designed to minimize the effects of damp or wet coatings. In extreme cases, "ghost" holidays might be witnessed, should a continual path of water reach a holiday. If this continues, dry the sub straight and continue testing.

It is important to note that all accidents are preventable. Take caution when using Tinker & Rasor holiday detectors or any other high voltage test equipment.

3. CHECK-OUT INSTRUCTIONS

- Remove all accessories from the shipping carton.
- Connect high voltage wand by screwing onto front of PowerPak. Connect PowerPak to instrument by lining up the wide key of the connector with the mating connector on the front of the instrument. Insert the connector fully into its mate and turn clockwise $\frac{1}{4}$ turn. If the connector does not turn easily, try pushing the cable connector more firmly into the instrument case connector mate. A positive lock will be felt when the cable connector is properly attached to the instrument.
- Attach the ground cable to instrument. The cable connector is pushed into its mating connector located on the front of the instrument case, in the lower Left corner. Insert and twist clockwise to lock.

NOTE: Never connect or disconnect the ground cable or PowerPak when the instrument is turned on.

- The Model AP/W Holiday Detector is now ready to be set for a specific voltage.
- Remove the dust cover with the supplied screwdriver, to reveal the voltage adjustment knob.
- Push and HOLD the Power button on the panel of the Instrument case. Then push either the LOW or HIGH button to set the voltage range.

Web: www.tinker-rasor.com

E-mail: Info@tinker-rasor.com



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NOTE: LOW voltage range is 800v to 8,000v, in 100v increments. HIGH voltage range is 3,500v to 35,000v in 100v increments

- Continue holding the Power button on the panel of the AP/W Instrument case and use the screwdriver to adjust the voltage setting, using the digital display for reference.

NOTE: When the Power button on the panel of the Instrument case is held, there is no output from the PowerPak. However, all attachments from the nose of the PowerPak and beyond should always be considered a potential hazard.

- Once the voltage has been set, as shown by the LCD on the panel of the Instrument Case, the Power button on the panel of the Instrument case may be released.
- Attach electrode to the high voltage wand handle assembly and apply to the structure to be inspected. The electrode should always make intimate contact with the surface under inspection.
- Turn the instrument ON by holding the safety switch handle of the PowerPak firmly against the instrument handle. (Instrument handle has neoprene rubber grip), then pressing the "ON" button on the PowerPak.

NOTE: The instrument will turn OFF when the safety handle is released.

- The instrument will "remember" the last HIGH or LOW and voltage setting selected, after being turned OFF and then ON again.
- The instrument is now ready to use.
- See the Addendum *Operational Check* at the end of the manual.

4. INTEGRATED VOLTMETER

The Model AP/W Holiday Detector includes an integrated voltmeter displayed on the front panel of the main instrument.

The LCD of the voltmeter measures and displays the output voltage of the holiday detector. This display gives the user the ability to tune the AP/W to a specific voltage within the 800v – 8,000v Low range and the 3,500v – 35,000v High range. Voltages increment in 100v steps.

Because the Model AP/W includes this integrated peak reading voltmeter, it is not suggested that an external peak reading voltmeter be used with this instrument. Most



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external peak reading voltmeters currently available are not as accurate as the integrated voltmeter of the AP/W, and will not show as accurate results.

5. ACCURACY & CALIBRATION

The Model AP/W voltmeter is accurate to +/- 5% of the output voltage, as shown on the LCD display on the instrument panel.

It is recommended that the Model AP/W follow an annual calibration cycle to ensure the instrument is in good working order and that the LCD of the integration voltmeter is accurate.

6. OPERATING METHODS

A good ground return system for both the pipe and the detector will always provide the best and most reliable inspection. The pipe to be inspected must be grounded from the bare pipe to earth at some point along the pipe. If individual joints of the pipe are to be inspected that are not electrically connected, each joint must be grounded.

The speed of the electrode's travel along the pipe should never be excessive, as faulty inspection may result.

Occasional checks of the detector operation should be made, particularly if no holidays are being found. This can be accomplished by testing for the spark and signal at the edge of the coating where bare pipe exists or by touching the probe end to the bare pipe and noting the length of the spark and the visual and audible signal effectiveness. If the visual and audible signal do not both occur when the spark discharges from the electrode into a known holiday, the ground return (i.e. the path between the metallic pipe and earth and the earth to the ground trail of the detector) is of high resistance. In this case, a better ground is required and a direct connection between the metal pipe and the ground wire may be necessary. This type of grounding is extremely uncommon unless the soil is very dry (if using a grounding rod) or the detectors output is low.

The most accurate and recommended inspection voltage should be obtained from the coating manufacturer spec or by contacting the coating manufacture or rep. Correct voltage output for a given thickness of coating has long been a matter of controversy. However, formulas have been suggested which may be used as a guide for correct peak voltages on various coating thickness. The calculation is as follows:

$$V = K \sqrt{T}$$

WHERE
V = Peak voltage in volts
T = Thickness of coating in mils
K = Constant of 1,250 for coatings over 20 mils thick



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NOTE: Formula taken from NACE International Standard RP0274-04. This standard and others available for free download to members at: www.nace.org

A common practice used in setting inspection voltages in the field is to adjust the output voltage by visual observation. It is the general consensus that a spark discharge across a gap distance of at least twice the thickness of the coating will give adequate inspection voltage and compensate for any irregularity in coating thickness and grounding conditions. If this practice is desired for determining inspection voltage, it should be done while the electrode is in the normal operating position and under actual grounding conditions.

The formula and suggestions for setting voltage are supplied as a guide, and are not necessarily recommended by the manufacturer of this detector.

Consult the coating manufacturer for recommended voltage applications.

7. ADJUSTING THE SENSITIVITY SWITCH

The Model AP/W now comes standard with a sensitivity adjustment switch. The switch is located on the Right side of the instrument, as you look at the front.

The 6 position switch is set to a factory default at the 1 position, which is turned all the way counter-clockwise.

Adjustment is usually not necessary on steel structures. However, on other types of structures, specifically concrete and some lining systems, it may be necessary to adjust the instrument to more sensitive. Follow the decal around the switch, turning the switch clockwise (as you look at it) will increase sensitivity and counter-clockwise to decrease sensitivity.

8. CHARGING THE BATTERY

The Model AP/W comes with an internal rechargeable battery. The internal lithium-ion battery provides a full day of use for the Model AP/W. It is recommended that the battery be charged after each use.

NOTE: Do not use the AP/W while battery is being charged. Significant damage can occur to battery and charger.

The Green Power LED on the main panel of the AP/W will blink when the battery is low. This indicates the battery needs charging.

The battery charger has an LED as well. RED color LED indicates the battery is being charged. GREEN color LED indicates that battery is fully charged. GREEN color LED also means that the battery is on trickle charge, and can be left in this condition. The charger can be used with 110v / 240v AC. It is an auto sensing charger that can be used throughout the world.



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Older Model AP/W instruments used a different type of battery and charger. See below for details on Serial Number less than 1333.

DISCONTINUED BATTERY INFO

The Model AP/W will indicate when the battery voltage is low, by a flashing or flickering of the Green Power LED, instead of providing a steady glow. The Power LED referred to is on the panel of the Instrument case. The Red *BATT. CHARGE INDICATOR* LED will light when the battery charger is correctly connected to the Model AP/W instrument.

Beginning with AP/W serial number 588, the battery charger included with the instrument has a slide switch that will allow the charger to operate from 115V AC or 230V AC. The factory setting of this slide switch is set for 115V AC, which is correct for the US. To adjust for 230V AC, slide the switch so that 230V AC Shows.

The new battery charger also now comes with a standard computer –style AC cord that plugs into the battery charger and the wall outlet. When the charger is being used outside of the US, a different plug configuration may be required. This type of computer –style cord should make it easy to find an appropriate AC cord throughout the world.

Earlier Model AP/W units were supplied with either a 110V or 240V charger with a hardwired cable. Check the packing list or invoice of your order to verify which battery charger was included with your Model AP/W.

The battery charger has a special plug that is designed to fit into the connector on the side of the battery, so that polarity of the connection is not an issue.

The battery charger has an LED on its side. This LED will glow steady while charging the battery. The LED will begin BLINKING when the battery is fully charged.

On earlier Model AP/W instruments (up to s/n 575), to charge the battery, first connect the PowerPak to the instrument. The PowerPak connector must be connected to the main instrument to charge the battery. On newer Model AP/W instruments the PowerPak does not need to be connected to charge the battery.

Connect the charger to the instrument body, using the special connector, fitted into the charge port on the front and lower Right of the AP/W case. Attach the battery charger to an AC power source, ensuring the slide switch is in the appropriate AC supply position: 115v AC or 230V AC (or, on earlier versions, 120v or 240v, depending on which charger you have. Each charger has an “Inspected By” label which shows this information.) Leave on charge for 8 to 10 hours between uses. The battery charger is equipped with a trickle charge feature, so the battery will not be harmed by leaving the instrument on charge for too long.



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9. INSTRUMENT SERVICING INSTRUCTIONS

- A.** Cleaning: Keep the instrument clean and dry. Clean the instrument case with a soft, damp cloth, then wipe dry. Do not use solvents such as lacquer thinner, methyl ethyl ketone, etc.

KEEP ALL ELECTRICAL CONTACTS CLEAN

B. Voltage Output Checks

a. In case of LOW output voltage:

- i. Check the LED indicator for the HIGH or LOW Range selector, to ensure the instrument is in the correct Range.
- ii. Check the display for voltage output. Voltage displayed is in kilovolts. (22,000volts = 22.0 on display)
- iii. Check green ON LED. If flashing, this indicated low battery voltage.

b. In case of NO output voltage:

- i. Check green ON LED. If flashing, this indicated low battery voltage.
- ii. Check ground cable and wand handle connections.

10. FACTORY REPAIRS

Holiday Detectors returned to the factory for repairs should be sent TRANSPORTATION PREPAID. In most cases the detector can be repaired and returned the same day it is received at the factory.

**WHEN ORDERING PARTS FOR YOUR DETECTOR OR REQUESTING FURTHER INFORMATION
ALWAYS GIVE THE DETECTOR'S SERIAL NUMBER.**

Mailing Address

Tinker & Rasor
2828 FM 758
New Braunfels, TX 78130
Phone: (830) 253-5621

Shipping Address

Tinker & Rasor
2828 FM 758
New Braunfels, TX 78130
Phone: (830) 253-5621

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SPECIFICATIONS

Holiday Detector Type	Pulse –type DC
Battery Type	Lithium (LiFePO4)
Battery Output	6 volts DC
Battery Charger Voltage Input	110v - 240v A/C Auto Sensing
Battery Charger Output	7.4V, 2A DC
Max. Voltage Output	35,000 volts (35kV)
Min. Voltage Output	800 volts (0.8kV)
Max. Current Output	1.3 mA (0.0013A)
Integrated Peak Voltmeter	
Accuracy	+/- 5% of voltage shown
Calibration Cycle	Annual



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OPERATIONAL CHECK

Prior to use, the Model AP/W Holiday Detector should be given an operational check to ensure it is working properly. The Operational Check ensures that the audible and visual alerts are working properly and the instrument has voltage output. The Operational Check is not a calibration check and should not replace the recommendation of annual service.

The instrument should be completely assembled and ready for use in the application in which it is required.

Operational Check

- Ensure the instrument and all components are assembled.
- Visually inspect each cable and connection.
- Squeeze the safety handle on the PowerPak.
- Press and Release the Power button on the top of the PowerPak.
- Note the Power LED on the Powerpak near the Power button. It should be on with a steady glow. A slow blinking of the Power LED indicates a Low Battery condition.
- An audible alert should be noted when the instrument turns On.
- A visual alert on the top of the PowerPak should be seen when the instrument turns On.

On the panel of the AP/W instrument:

- Note the LCD Voltage display does not fluctuate and change significantly. A small letter "b" on the display indicates a Low Battery condition.
- Note the Power LED near the Power button remains steady and not flashing. A slow blinking indicates a Low Battery condition.
- Touch the electrode to the bare ground wire. Note the audible and visual alerts. Repeat this step several times.

NOTE: Spark may or may not be seen and heard. When using lower voltage outputs and on bright sunny days, the spark may not be seen or heard.

- Release the safety handle to turn the instrument Off.

The Model AP/W is now ready to use.