

D. E. Stearns Company, Shreveport, Louisiana U.S.A.



OPERATING INSTRUCTION

D. E. STEARNS MODEL 14/20 REGULATED 800-35,000 VOLT HOLIDAY DETECTOR

1. HOLIDAY DETECTOR FUNCTION

The D.E. Stearns Company Model 14/20 Holiday Detector is an all-purpose electrical inspection instrument which maintains a given inspection voltage in spite of the electrical load on the circuit. The Detector 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.

2. INSTRUCTIONS FOR UNPACKING & INSPECTION

A. Open the shipping carton and make note of the various accessories which include:

- | | |
|---|--|
| (1) Instrument w/Battery | (1) Adapter, use with SPY® brand spring electrodes |
| (1) Power Pack w/Cable | (1) Wand Handle Extension |
| (1) Battery Charger (115v or 230v) | (1) Paddle, silicone-rubber |
| (1) Screwdriver | (1) Belt |
| (1) Ground Cable (20') | (1) Carrying case |
| (1) Wand Handle (18") | (1) Electrode of Choice* |
| (1) Compax Connector (for use with Full Circle Spring Electrodes) | |

NOTE: Additional accessories may ship in separate packaging.

B. INSPECTION should be made upon receipt. If damage has occurred during shipment, file a claim with the carrier immediately.

C. 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 16" pipe diameter), Half Circle Spring Electrode (up to 8" pipe diameter) or Silicone Rubber Electrode (up to 16" wide). Wire Brush Electrodes, larger size electrodes and additional electrodes available at additional cost.

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 14/20 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.

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 14/20 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. The PowerPak will output voltage only when the Safety handle of the PowerPak is held and the PowerPak ON button is pressed.

- 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.

4. INTEGRATED VOLTMETER

The Model 14/20 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 14/20 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 14/20 includes this integrated peak reading voltmeter, it is not suggested that an external peak reading voltmeter be used with this instrument. Most external peak reading voltmeters currently available are not as accurate as the integrated voltmeter of the 14/20, and will not show accurate results.

If it is desired that the Model 14/20 be compared with an external measuring device to ensure the accuracy of the instrument, it is suggested that a digital oscilloscope and high voltage probe be used for this purpose. As of the writing of this manual, the D. E. Stearns Co. uses Tektronix TDS 2002C oscilloscope and P6015A high voltage probe for calibration, as examples of the type of equipment suggested.

5. ACCURACY & CALIBRATION

The Model 14/20 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 14/20 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

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.

7. ADJUSTING THE SENSITIVITY SWITCH

The Model 14/20 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 14/20 comes with an internal rechargeable battery. The internal lithium-ion battery provides a full day of use for the Model 14/20. It is recommended that the battery be charged after each use.

The Green Power LED on the main panel of the 14/20 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.

Older Model 14/20 instruments used a different type of battery and charger. See below for details on Serial Number less than 1333.

DISCONTINUED BATTERY INFO

The Model 14/20 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 14/20 instrument.

Beginning with 14/20 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 14/20 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 14/20.

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 14/20 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 14/20 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 14/20 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.

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 keytone, 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.
 - 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.

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Grounding Procedures

A proper ground is necessary for the detector to identify a holiday. If the ground is inadequate, the detector will not spark or signal with a beep tone. When grounding is a problem, the detector operator will often increase the voltage to compensate. This is an unsound practice which you should avoid. The correct procedure is to improve the ground to the detector.

The following guidelines will help in establishing a good ground.

General guidelines

1. Do not allow the ground-trail cable to twist or crimp.
2. Keep the ground wire in contact with the soil. Avoid grassy and rocky areas, surface debris such as mulch, and dry soil when possible.
3. Keep the ground-trail clean.

Normal to damp soils

Place the twenty-foot long ground-trail on the dirt with the entire length of bare cable in contact with the soil.

Dry, sandy or rocky soil options

1. Connect the ground-trail directly to a bare portion of the pipe using a set of jumper cables or similar clamp.
2. Wet the soil around the ground-trail, and place a sandbag over the bare wire to increase the contact with the wet soil.
3. Drive a metal rod about two feet into the ground to contact moist soil, and clamp the ground-trail to the rod. Move the rod as necessary to maintain proper grounding while advancing down the length of pipe.
4. If a track-driven machine, such as a bulldozer, is parked nearby, connect the detector ground to the machine via a set of jumper cables or similar clamps.