

Recommended Ultrasonic Procedure for Electrical Surveys and Analysis

I. Introduction:

In order to create a successful electrical survey there should be a planned, organized approach. Consistency is important. If you are performing a scheduled survey, plan your inspections in advance. Always consider safety above all else. Review all equipment and safety procedures before you begin.

The first thing to consider is to determine what you wish to accomplish with this survey. Is it going to be a one-time inspection or a continuous on-going program? Is the need to perform the survey to locate a problem or to determine the health of the equipment?

If your goal is to have a regularly scheduled electrical inspection, first consider how often you would like to perform the inspection. To some this will be once a month to others once a year and still others may choose something in between. Building a route for repeatable test spots is possible using the DMS software that is available for download through the UE Systems website under *Products*; then *Software*.

What about equipment? It is suggested that you use both ultrasound and infrared equipment. Ultrasound will be important for listening to acoustic events such as arcing, tracking, corona, partial discharge and mechanical looseness. IR will detect resistance related conditions and quickly locate hotspots. Since one technology allows users to “hear” and the other to “see” they complement each other.

NOTE: Be sure to have trained inspectors perform the survey.

Before you begin your survey create a plan. Here are some suggestions:

- A. Consult NFPA 70E/B and/or the NEC to ensure you are in compliance and that all safety regulations are being met.
- B. Try to limit the test area to a manageable size. Don't be overly ambitious. It is easier to plan and test small areas rather than large areas.
- C. Walk the areas, section by section to determine your strategy to consider where you will start and where you will go next until you are through. When you walk the plant section by section:
 - 1. Pay attention to closed and open systems
 - 2. Note the voltages (this will affect your inspection approach and your diagnosis)
 - 3. Note potential safety hazards
 - 4. Determine what equipment you will bring along with you such as flashlights, ladders, etc.
 - 5. Plan a safe approach to all equipment. Observe all lockout/tag out procedures.
 - 6. Wear appropriately safe clothing and protective gear.
- D. Select your inspection equipment. Will you need specialized modules such as a parabolic microphone for high or hard to reach areas or will the standard scanner be enough?
- E. Develop a system for reporting faults after they are identified. This could be a templated report, such as in Ultratrend DMS, or a digital photograph, screen capture of the time wave form and FFT, and

sound files of the anomaly. Be sure to include any other technologies' findings in the report such as thermography, if applicable.

F. Be sure to install a system of reporting and follow up to be sure the repairs have been completed.

Required Equipment

- Ultraprobe
- Memory card (for UP10,000 and UP15,000)
- Scanning module
- Rubber Focusing Probe
- Headphones

Accessories (if required)

- Long Range Module, Parabolic Dish, Telescopic Flexible Scanning Module

Safety

- Wrist strap to be worn at all times.
- Never insert any part of the Ultraprobe into any opening of any electrical apparatus. This includes the rubber focusing probe.
- All scans should be performed with electrical apparatus/cabinets/enclosures closed and secured.

Instrument Set-up

A. Analog

1. Ultraprobe 100

- a. Plug in headphone
Check/replace batteries
- b. Set sensitivity at -70
- c. Check sensitivity
 1. Place headphones over ears
 2. Turn instrument on
 3. Rub fingers in front of scanning module & observe the meter. The meter should respond full scale and you should hear the rubbing through the headphones.

2. Ultraprobe 2000

- a. Perform Sensitivity Validation
- b. For Ultraprobe 2000 set sensitivity at Fixed Band
- c. For Ultraprobe 2000 Set Meter Response to Log
- d. Start at Sensitivity level 10
- e. Plug in headphones, and place over the ears

B. Digital

1. Ultraprobe 9000

- a. Be sure the memory is cleared from instrument
- b. Perform Sensitivity Validation
- c. Leave instrument in R for Real-Time mode (this is the default)
- d. Set Frequency to 40 kHz
- e. Click to Sensitivity Mode
- f. Check Battery level

2. Ultraprobe 10,000

- a. If a DMS route has been established, download route to the CF or SD card.
- b. If it is not DMS route based ensure CF/SD card is clear.
- c. With the Ultraprobe turned off insert CF/SD card into the unit.
- d. With Ultraprobe turned off insert scanning module into the front of the Ultraprobe. Align the four pins and push the module straight in DO NOT Twist. Ensure the scanning module is completely pushed in.

NOTE: For normal distance scanning (i.e. low, medium and high voltage enclosures) Select “SCM” (Scanning Module) under “Module type” in the set up menu

NOTE: For long range scanning (i.e. medium/high voltage terminations, substations) Select “LRM” (Long Range Module) under “Module type” in the set up menu:

1. Turn on the Ultraprobe by pulling and holding the trigger in. Note: Pulling and holding the trigger again will shut the Ultraprobe off.
2. Press the sensitivity knob two times and rotate knob to "Setup Menu".
3. Press the sensitivity knob to select "Setup Menu".
4. Press the yellow Enter button to enter "Setup Menu".
5. Rotate the sensitivity knob until "Application Select" is highlighted in black.
6. Press the sensitivity knob to choose "Application Select".
7. Rotate the sensitivity knob to select "Electrical Disabled". Disabled will be flashing.
8. Press the sensitivity knob to enable.
9. Once enabled, press the yellow Enter button to save/exit.
10. While in "Setup Menu" Rotate the sensitivity knob until "Module Type Select" is highlighted in black.
11. Press the sensitivity knob to choose "Module Type Select".
12. Rotate the sensitivity knob until the module that will be used for testing appears (SCM) or (LRM).
13. Press sensitivity knob to select module.
14. Rotate sensitivity knob until "Instrument Setup" is highlighted in black.
15. Press sensitivity knob to choose "Instrument Setup".
16. Rotate sensitivity knob until "Auto" appears.
17. Press sensitivity knob to choose "Auto".
18. Press Enter to exit.
19. Press sensitivity knob until the "S" is flashing.
20. Rotate the sensitivity knob until "S=70".
21. Press sensitivity knob until the "KHz" is flashing.

22. Rotate the sensitivity knob until it reads "40 KHz".
23. The Ultraprobe is now ready to begin scanning.

3. Ultraprobe 15,000

- a. If a DMS route has been established, download route to the CF or SD card.
- b. If it is not DMS route based ensure CF/SD card is clear.
- c. With the Ultraprobe turned off insert CF/SD card into the unit.
- d. With Ultraprobe turned off insert scanning module into the front of the Ultraprobe. Align the four pins and push the module straight in DO NOT Twist. Ensure the scanning module is completely pushed in.

NOTE: For normal distance scanning (i.e. low, medium and high voltage enclosures) Select "SCM" (Scanning Module) under "Module type" in the set up menu

NOTE: For long range scanning (i.e. medium/high voltage terminations, substations) Select "LRM" (Long Range Module) under "Module type" in the set up menu:

1. Turn on the Ultraprobe by depressing the power button
2. Touch the "Setup" icon
3. Touch Preferences to adjust general settings of Ultraprobe
 - a. Enter 3 Alpha/Numeric Characters for the Inspector
 - b. Highlight "Module Type".
 - c. Select the module that will be used for testing. *SCM* or *LRM*.
4. Highlight "Instrument Setup". Choose "Auto"

NOTE: It is important to touch "OK" to save your settings.

5. Once back on the "Setup" screen, touch the "Application" icon.
 - a. Choose "Electrical" and touch "OK" to save your setting and exit to the Setup page.
 - b. Touch "Exit" to return to the Home page.
6. Touch "dB Display" icon located in the top left corner
7. The main display is now visible
 - a. Touch the "S = #" to adjust sensitivity. A square rectangle will appear around the letter and number. This indicates that it is ready to be adjusted. It is a best practice to adjust sensitivity to its highest setting. "70". Use the "up" blue arrow in the middle right of your screen to accomplish this.
 - b. Touch "KHZ" in the top right corner. Adjust this to read "40 KHZ"
8. The Ultraprobe is now ready to begin scanning. Follow predetermined and/or loaded route

Scanning Procedure

UP 10,000

1. Insert the headphone plug into the jack located on the face of the Ultraprobe under the view screen.
2. Make sure the correct equipment number and test point is displayed on the view screen.

NOTE: If it is not a DMS based route, start at Record #1. This is displayed as “001 Rec” on the UP10,000

3. Rotate the sensitivity knob until “Record WAV” is flashing.
4. Press the sensitivity knob to select “Record WAV”.
5. Press the sensitivity knob again until “S=#” is flashing
6. Point the Ultraprobe at the desired area.
7. The rubber focusing probe should be placed over the SCM to help eliminate competing ultrasound and to pinpoint the exact location of the sound.
8. Adjust the sensitivity until the decibel reading is steady.
9. Press the **yellow Enter** button then press the sensitivity knob to record the sound wave. The Ultraprobe can be set to record manually (up to 1 minute), 5 seconds, 10 seconds, 15 seconds or 30 seconds.
10. Press the sensitivity button to continue. Follow the instructions on the screen to execute your objective.

NOTE: Ultraprobe will automatically advance to the next test point in sequence once sound wave is saved

11. Once your electrical route or survey is complete download the route back to the DMS software. From here you can generate reports and listen to the sound recording for further analysis. (refer to Software Tutorials online to execute your objective)

UP 15,000

1. Insert the headphone plug into the jack located on the face of the Ultraprobe under the view screen.
2. Make sure the correct equipment number and test point is displayed on the view screen.

NOTE: If it is not a DMS based route, start at Record #1. This is displayed as “REC=1” on the UP15,000.

3. On the main screen, be sure that both the *FFT* icon and *Camera* icon are display in the lower left side of the screen.
4. Touch the “S=#” to allow for sensitivity adjustment
6. Point the Ultraprobe at the desired area.
7. The rubber focusing probe should be placed over the SCM to help eliminate competing ultrasound and to pinpoint the exact location of the sound.
8. While pulling the trigger, adjust the sensitivity until the decibel reading is steady. Release the trigger when it is.

NOTE: Electrical faults often will be too low in amplitude to get a decibel reading. It is most important to ensure you have adjusted the sensitivity so that the intensity meter (rectangular box at bottom of screen) is reading at 20-40% of full scale.

9. If you want to take a picture or pictures of the location, touch the *Camera* icon and follow the prompts to capture and save an image.

10. Touch the *FFT* icon to launch the on board Spectralyzer.

Touch the **RED square** to begin recording the sound wave. The Ultraprobe can be set to record manually (up to 1 minute), 5 seconds, 10 seconds, 15 seconds or 30 seconds.

11. When prompted save the sound recording by touching “yes”
12. Ultraprobe will automatically advance to the next test point in sequence.
13. Once your electrical route or survey is complete download the route back to the DMS software. From here you can generate reports and listen to the sound recording for further analysis. (refer to Software Tutorials online to execute your objective)