

**Amtrak®****ENGINEERING  
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REVISED DATE

TITLE

**PROCEDURES FOR LOCATING BURIED CABLES**RECOMMENDED  
**Al Dempsey**DATE  
**01/10/08**PAGE  
**1**APPROVED by Chief.  
Engineer C&S  
**Keith Holt**DATE  
**01/14/08**OF  
**4****SCOPE AND NATURE**

The purpose of this engineering practice is to establish and identify guidelines for all C&S employees that will be excavating along the Amtrak System right of way for the installation of signal cable, cable trough, conduits and foundations etc. while using machinery such as Backhoes, Excavators, Trenchers, etc.

**SPECIAL REFERENCE**

Electronic Cable Locator (Manufactures Equipment Operating and Maintenance Manuals)

**SPECIAL MATERIALS**

Electronic Cable Locator

**RESPONSIBILITY**

Director C&S Maintenance & Staff

Procedure Modifications & Ensure Compliance

Director C&S Production & Staff

Procedure Modifications & Ensure Compliance

Asst. Div. Engineer C&S

Ensure Compliance with Procedure

Supervisor C&S Maintenance

Ensure Compliance with Procedure

Supervisor C&S Production

Ensure Compliance with Procedure

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## PROCEDURE

If the below procedure fails in anyway, cable must be located by hand digging.

Before excavating with machinery along Amtrak right of way or Interlockings you must make every attempt to locate cables either manually by hand or with an electronic cable locator.

Make every attempt to locate cables with Electronic Cable Locator using the following method:

Conductive Mode: (Metal to Metal)

Using a spare conductor out of the cable being located, apply the red lead of the Locator Transmitter to the spare conductor and the black lead of the Locator Transmitter to ground. The same spare conductor at the other end of the cable being located must be grounded also. If there are no spares, use the outside copper or aluminum cable sheath and apply the same way as using a spare. If either of the above-mentioned methods cannot be done see (Inductive ring clamp method). Turn the transmitter on and set frequency to desired signal. Turn receiver on and make a circular sweep of the area with the receiver, looking for signal tone and signal strength. Once you have good tone and signal strength by readings on receiver locator, follow cable watching signal strength for approx. 25'. Once you establish you have a good signal and you are over top of cable perform the following: Find Peak signal on the receiver, once found switch to Null mode and find Null signal, if peak and null agree in the same spot, check the depth. **Note:** If depth is 5 foot, still checking depth raise receiver 6 inches and make sure depth on receiver changes to 5 foot 6 inches then depth should be correct.

If peak and null agree and depth agrees you should have a nice round signal shape around your cable. To further verify that signal shape is round and that you have the cable you are looking for, perform this procedure called Triangulation. Note: Place receiver in null mode at the point in which you had peak and null verification (over cable), hold receiver at a 45 degree angle to the cable and drag away from cable until you obtain a null signal, mark the spot and take receiver back to original peak location (over cable) and hold receiver at a 45 degree angle on the opposite side of original peak location and drag back until you obtain a null signal and mark. The distance between the two marked locations should be your depth reading. If all the above agree, you should have a circular signal in shape and should be on the cable you are trying to locate.

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Inductive Mode: (Non-Metal to Metal using Inductive Ring Clamp)

This procedure uses an inductive ring clamp that is clamped around the cable being located. Clamp inductive ring clamp over cable being located, plug into transmitter and turn transmitter on and set the desired frequency. Make a circular sweep of the area with the receiver, looking for signal tone and signal strength. Once you have good tone and signal strength by readings on locator receiver, follow cable watching signal strength for approx. 25'. Once you think you have a good signal and you are over top of cable, perform the following: Find Peak signal on the receiver, once found switch to Null mode and find Null signal, if peak and null agree in the same spot, check the depth. **Note:** If depth is 5 foot, still checking depth raise receiver 6 inches and make sure depth on receiver changes to 5 foot 6 inches then depth should be correct.

If peak and null agree and depth agrees you have a nice round signal shape around your cable. To further verify that signal shape is round and that you have the cable you are looking for, perform this test called Triangulation. Note: Place receiver in null mode at the point in which you had peak and null verification (over cable), hold receiver at a 45 degree angle to the cable and drag away from cable until you obtain a null signal, mark the spot and take receiver back to original peak location (over cable) and hold receiver at a 45 degree angle on the opposite side of original peak location and drag back until you obtain a null signal and mark. The distance between the two marked locations should be your depth reading. If all the above agree, you should have a circular signal in shape and should be on the cable you are trying to locate.

**Note:** The below method can be utilized but is not recommended

Inductive Mode: (Non-Metal to Metal)

This procedure uses the transmitter in its inductive mode with transmitter box over cable being located and no wires hooked to cable or transmitter (not recommended because don't know where cable is to begin with, use as last resort)

Keep the following in mind when locating:

There are three levels of detectable current (signal).

- Peak signal only
- Peak and Null signal only
- Peak, Null and Validation of Depth

There are five methods that will increase (or decrease) current flow on a cable.

- Changing Frequency on transmitter
- Moving the transmitter's location

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- Changing the deployment of the grounding antenna (LOCATOR RECEIVER)
- Using the transmitter in inductive mode
- Changing the location of the close-end or far-end grounds on cable and transmitter

There are five methods to determine signal shape (Circular Field)

- Peak vs. Null
- Depth estimation validation
- Peak method
- Null Method
- Triangulation

There are five methods that may change a non-circular field into a circular field.

- Changing Frequency
- Moving the transmitter's location
- Changing the deployment of the grounding antenna (LOCATOR RECEIVER)
- Using the transmitter in inductive mode
- Changing the location of the close-end or far-end grounds on cable and transmitter

Also understand that current (signal) may be present that is not produced by the transmitter.