

Advanced Beverage Antenna Designs

Compiled & Annotated
by
Richard C. Jaeger, K4IQJ
July 9, 2013

Transactions of the AIEE, pp.
215-265, February 1923.

50 pages!

The Wave Antenna

A New Type of Highly Directive Antenna

BY HAROLD H. BEVERAGE, CHESTER W. RICE, and EDWARD W. KELLOGG
of the Radio Corporation of America Assoc. A. I. E. E. Assoc. A. I. E. E.
of the General Electric Co. of the General Electric Co.

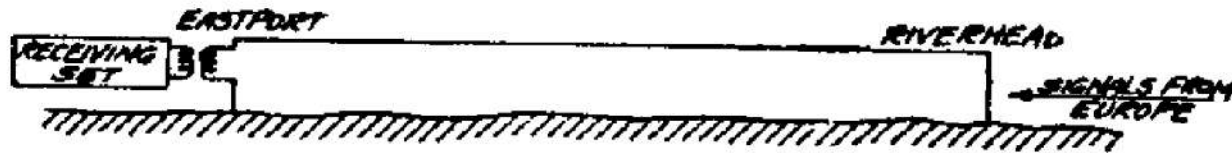


FIG. 1

The capabilities of the wave antenna were discovered through work done by Beverage in studying the properties of long ground antennas, of the order of a half wave length or more long, in which he discovered that under certain circumstances they showed marked unidirectional properties. One of his antennas consisted of a No. 14 B & S rubber covered wire approximately six miles long laid on the scrub oak and sand of Long Island from Eastport to a point near Riverhead. This northeasterly direction was chosen in order to best receive the European stations. The antenna is pictured diagrammatically in Figure 1.

Actually a BOG!

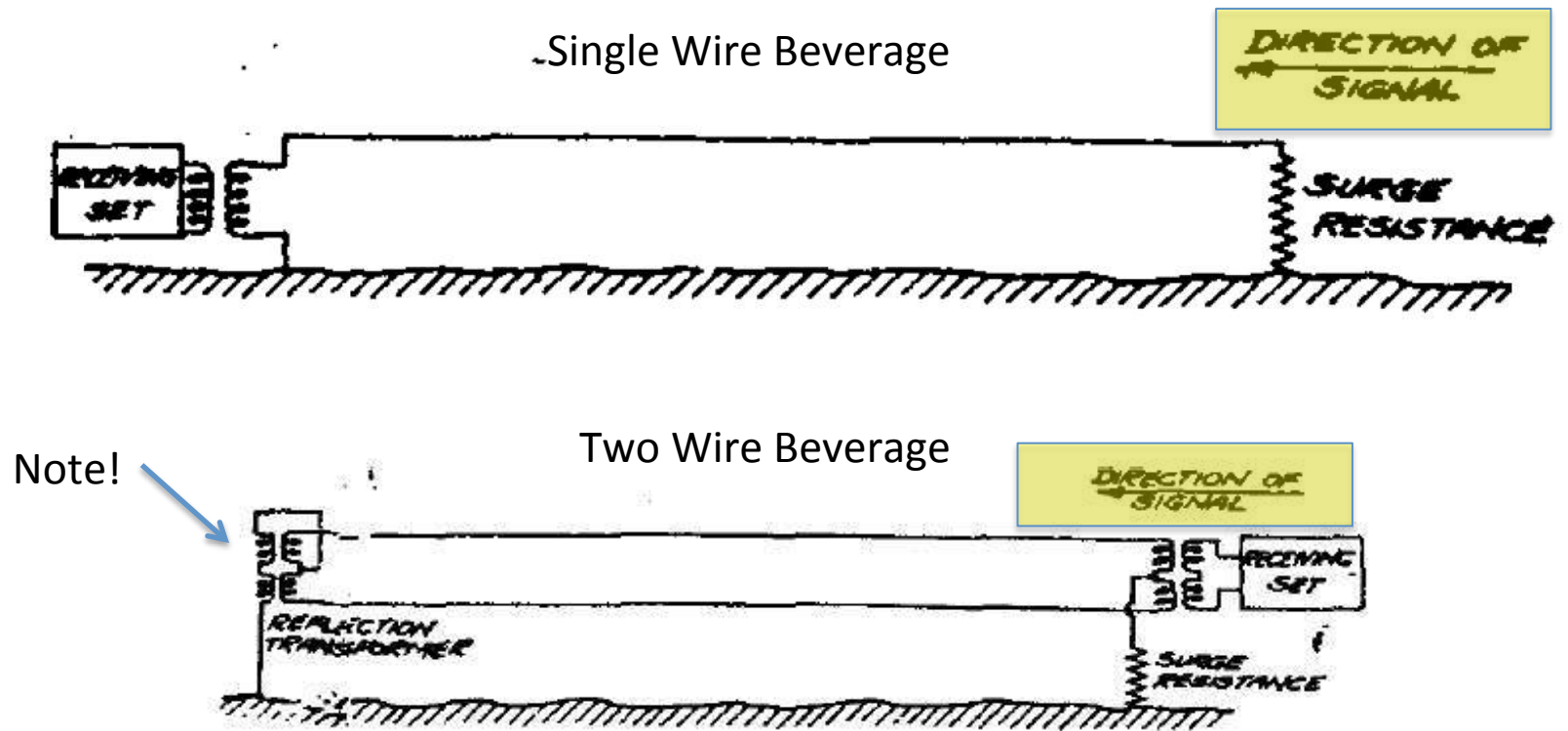


FIG. 18—ARRANGEMENT FOR LOCATING RECEIVING SET AT
SAME END AS SURGE RESISTANCE

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Figures borrowed from: ON4UN's Low-Band DXing Book

- Desired Signal Appears at Antenna Feed Point
 - Unwanted Signal Dumped into Terminating Resistor
- Vertically Polarized Signals
With Wave Fronts Tilted

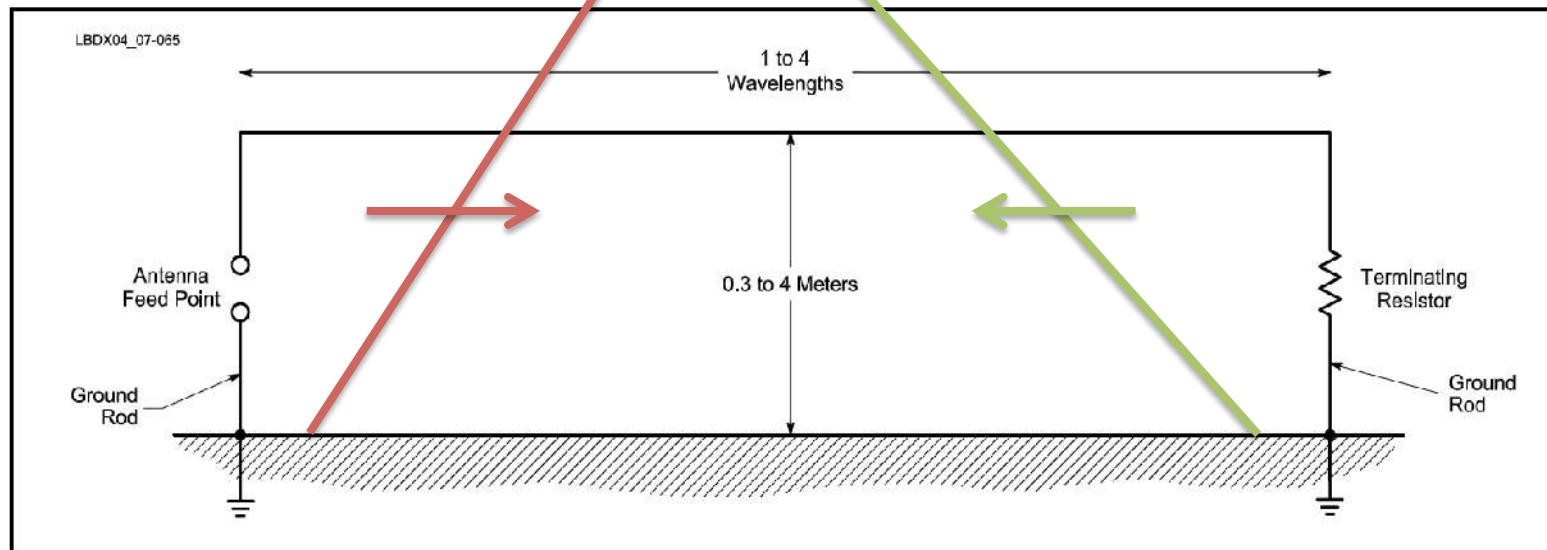
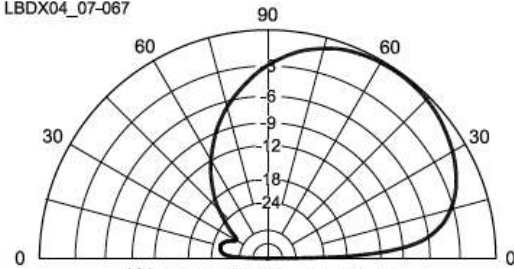


Fig 7-72 — The Beverage antenna is a straight wire, typically 1 to 4 λ long, mounted parallel to the ground at a height of 0.01 to 0.03 λ .

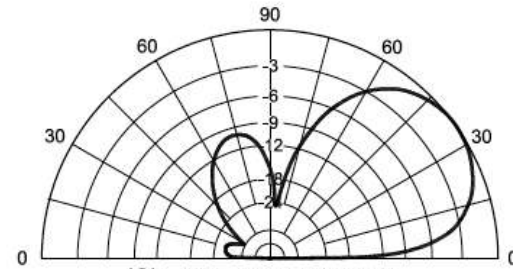
- Lossy Ground \rightarrow Electric Field Tilts
- No Tilt = No Output ($E \cdot dL$)
- Doesn't work well over high conductivity ground
(as discovered by many DXpeditions to remote islands)

Pattern vs Length

LBDX04_07-067

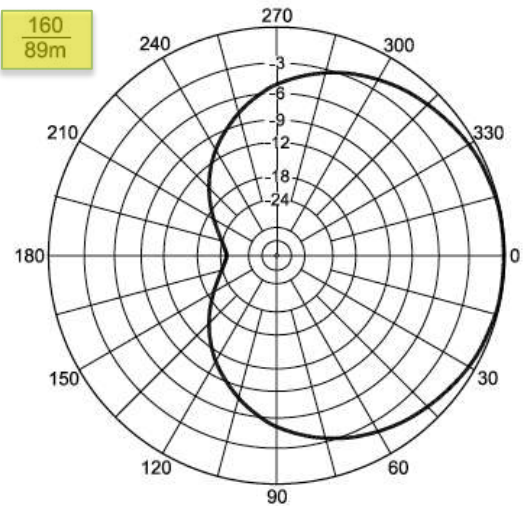


(A) Max. Gain = -13.88 dBi



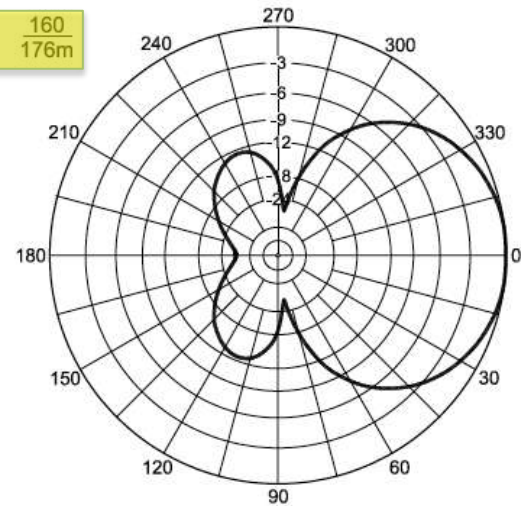
(C) Max. Gain = -9.87 dBi

$\frac{160}{89m}$



(B) Max. Gain = -14.35 dBi

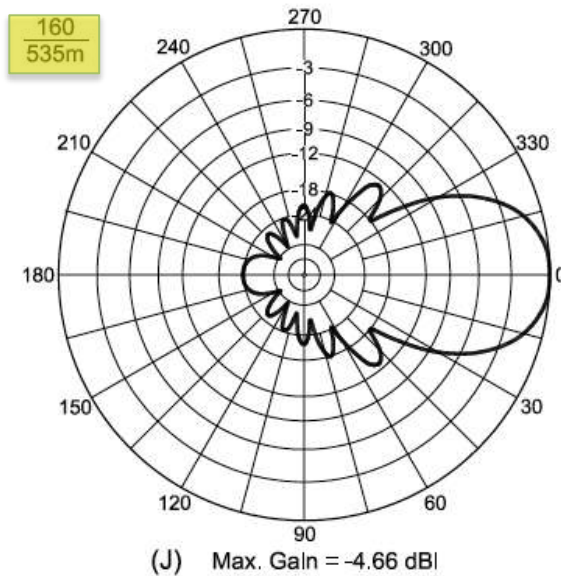
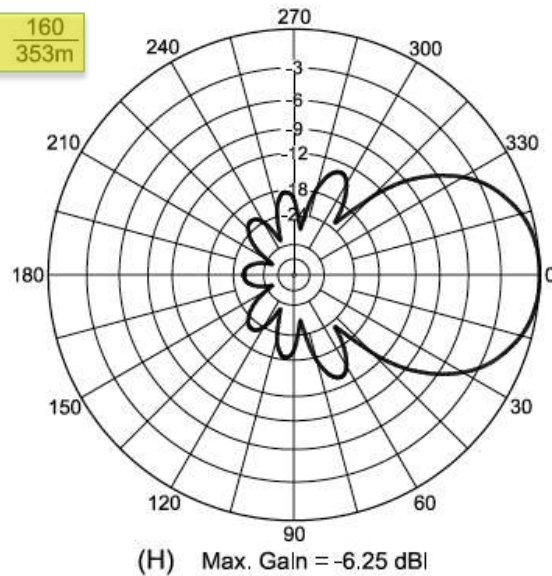
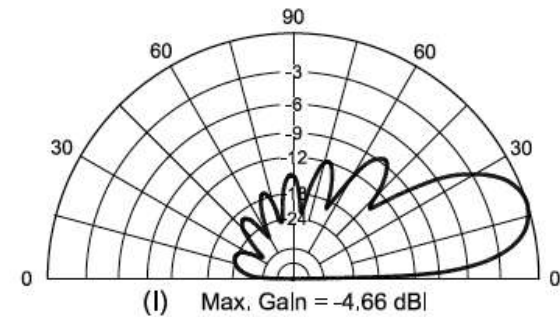
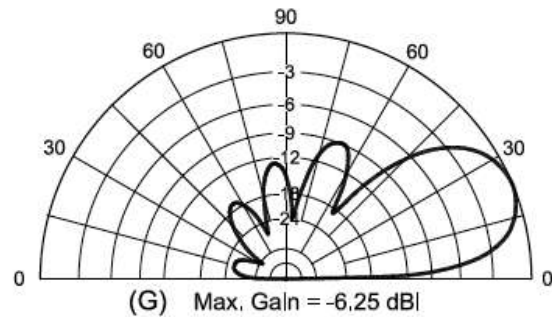
$\frac{160}{176m}$



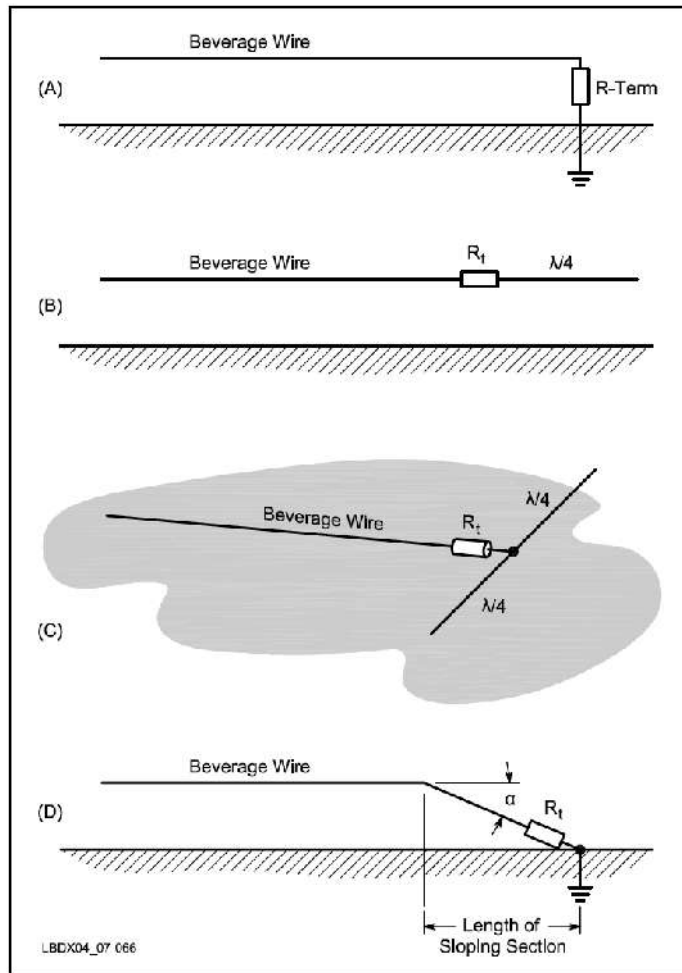
(D) Max. Gain = -9.87 dBi

Similar to a single loop

Pattern vs Length (cont.)



Beverage Termination Techniques

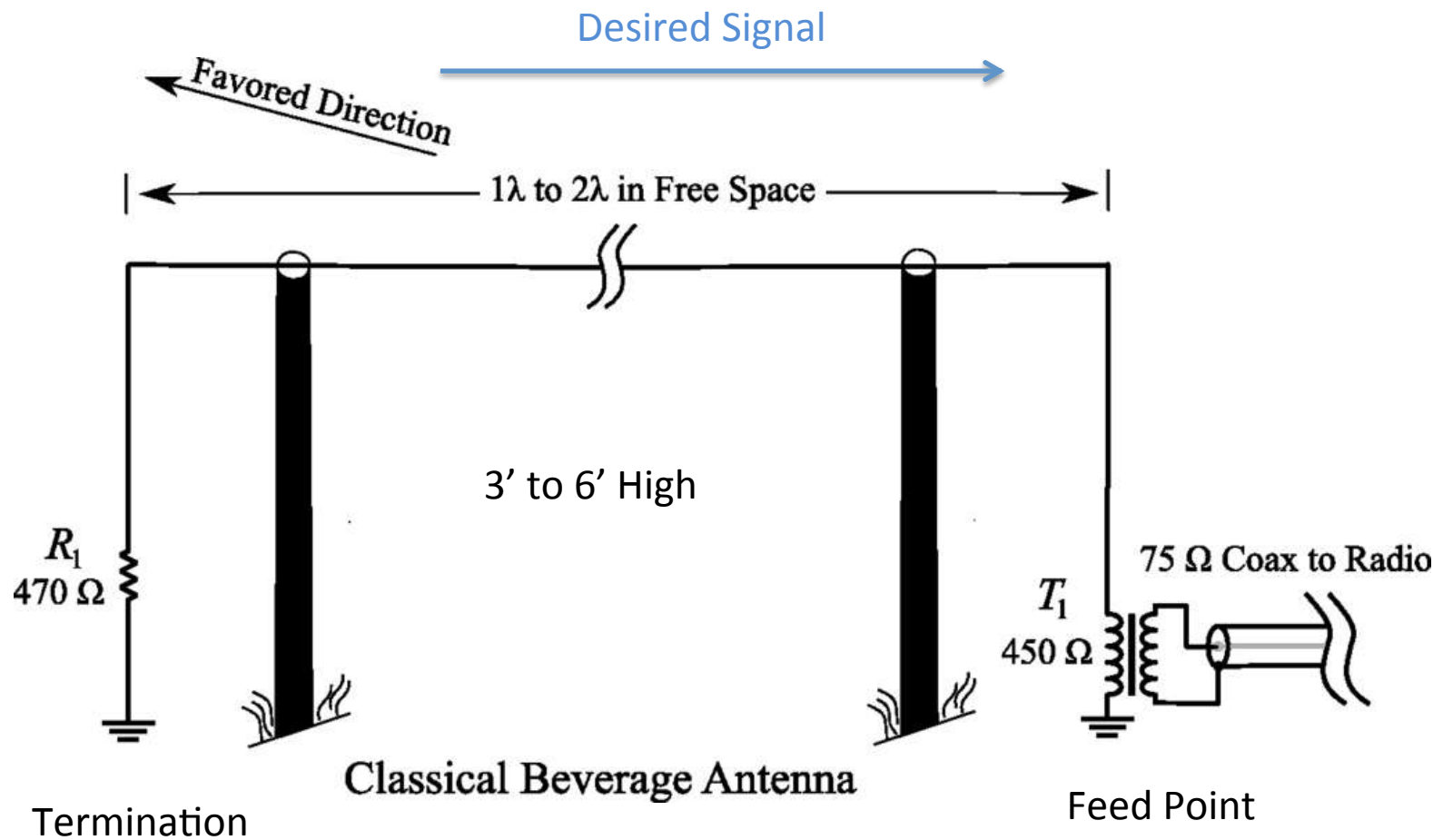


- Basic Termination ($\approx 470 \Omega$)
- (B-C) Good for poor ground and for simulation (EZNEC) – terminated by $\lambda/4$ lines
- (D) Preferred to reduce vertical pickup from vertical end

<http://kw2p.blogspot.com>

Wednesday, August 18, 2010

KW2P Beverage Antenna Designs



Two-Wire Beverage Using “Reflection Transformer”

Remember Beverage's Paper!
& Reflection transformer

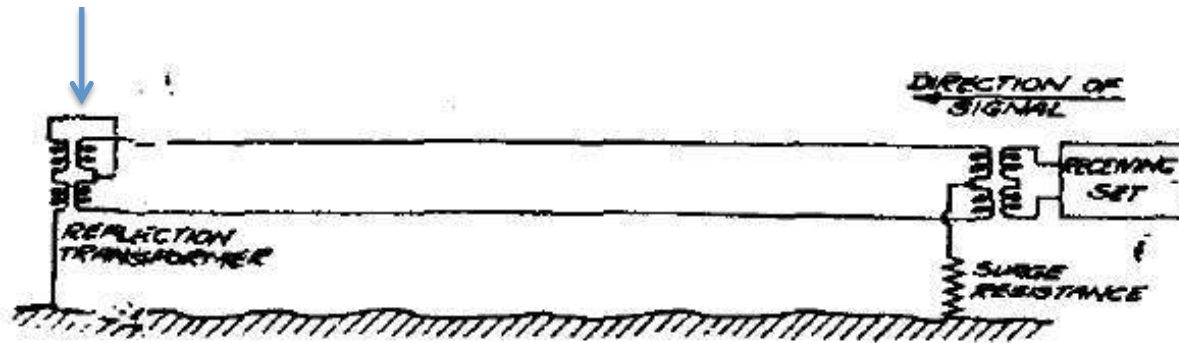
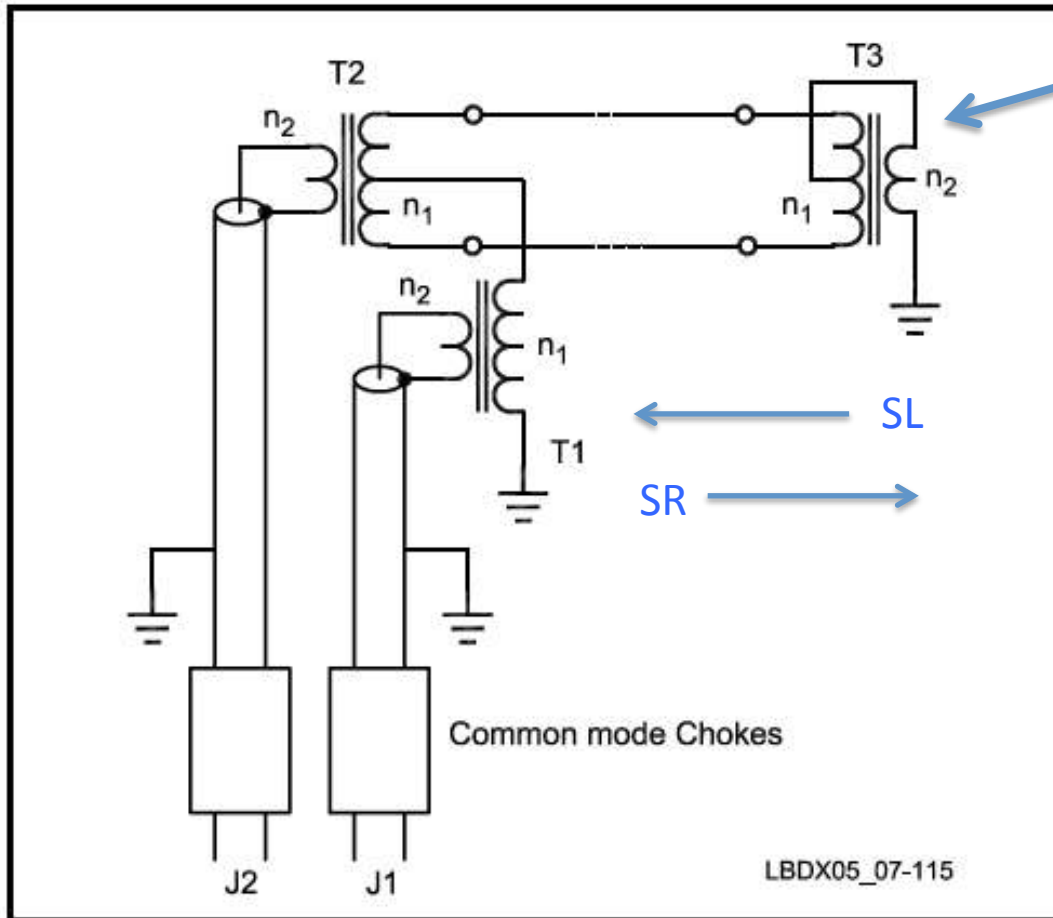


FIG. 18—ARRANGEMENT FOR LOCATING RECEIVING SET AT
SAME END AS SURGE RESISTANCE

Two-Wire Bi-directional Beverage

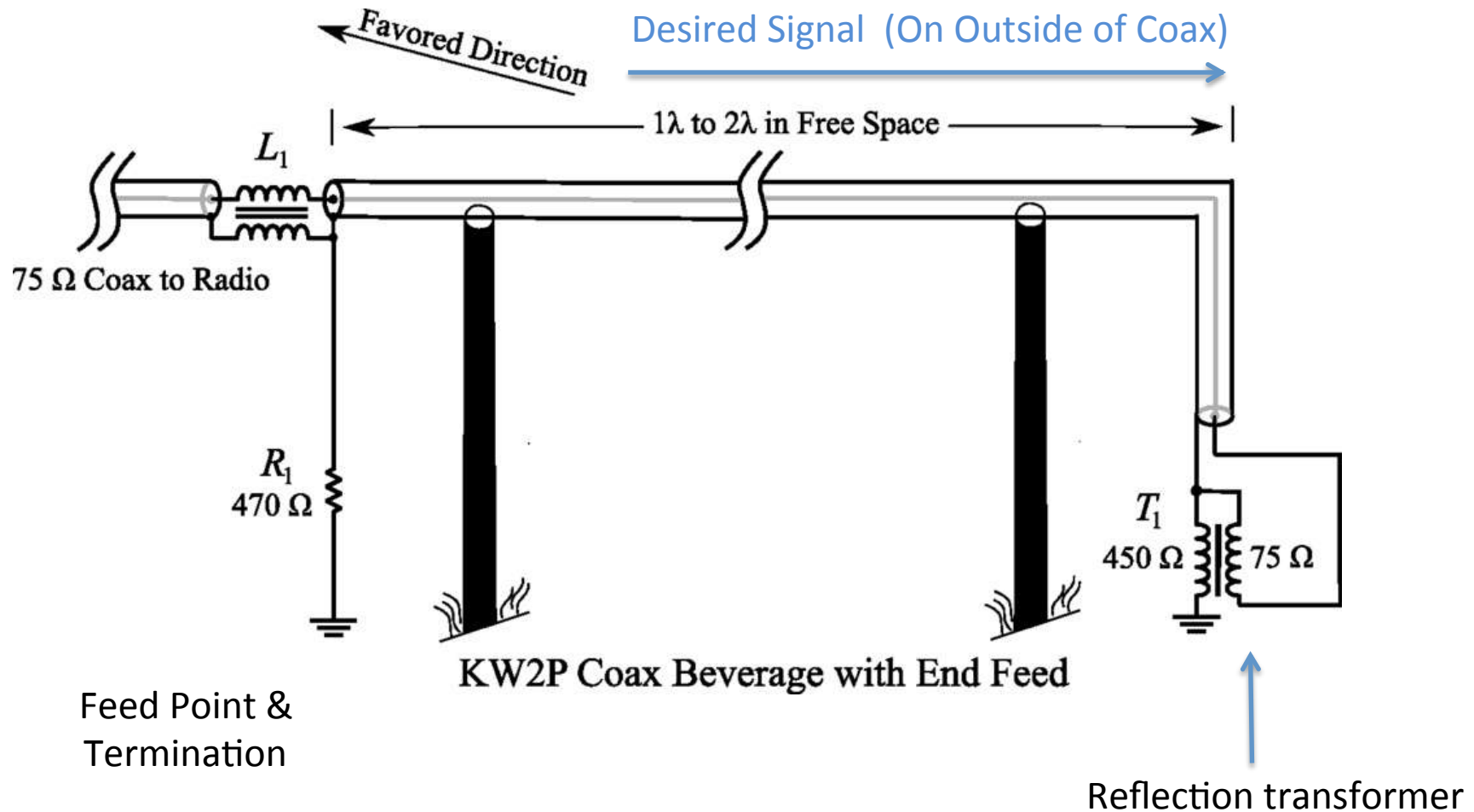
Clever Use of Transformers!



Reflection Transformer!
(only a 90 year old concept)

- Received signals SR and SL are common to both closely spaced wires (common-mode signals)
- SL is picked off by at center-tap of T2 by transformer T1 and fed to J1
- SR is picked off from center-tap of transformer T3 and sent back down the two-wire transmission line as a differential-mode signal and into coax connected to T2 and J2

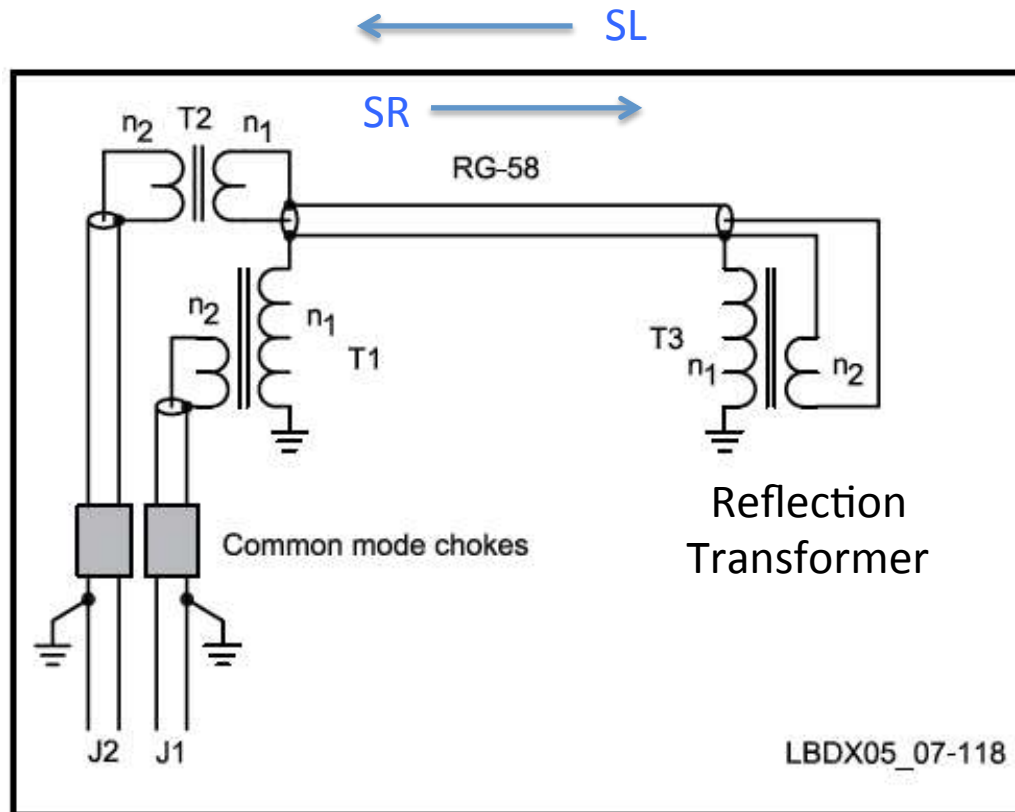
End Fed Coax Beverage



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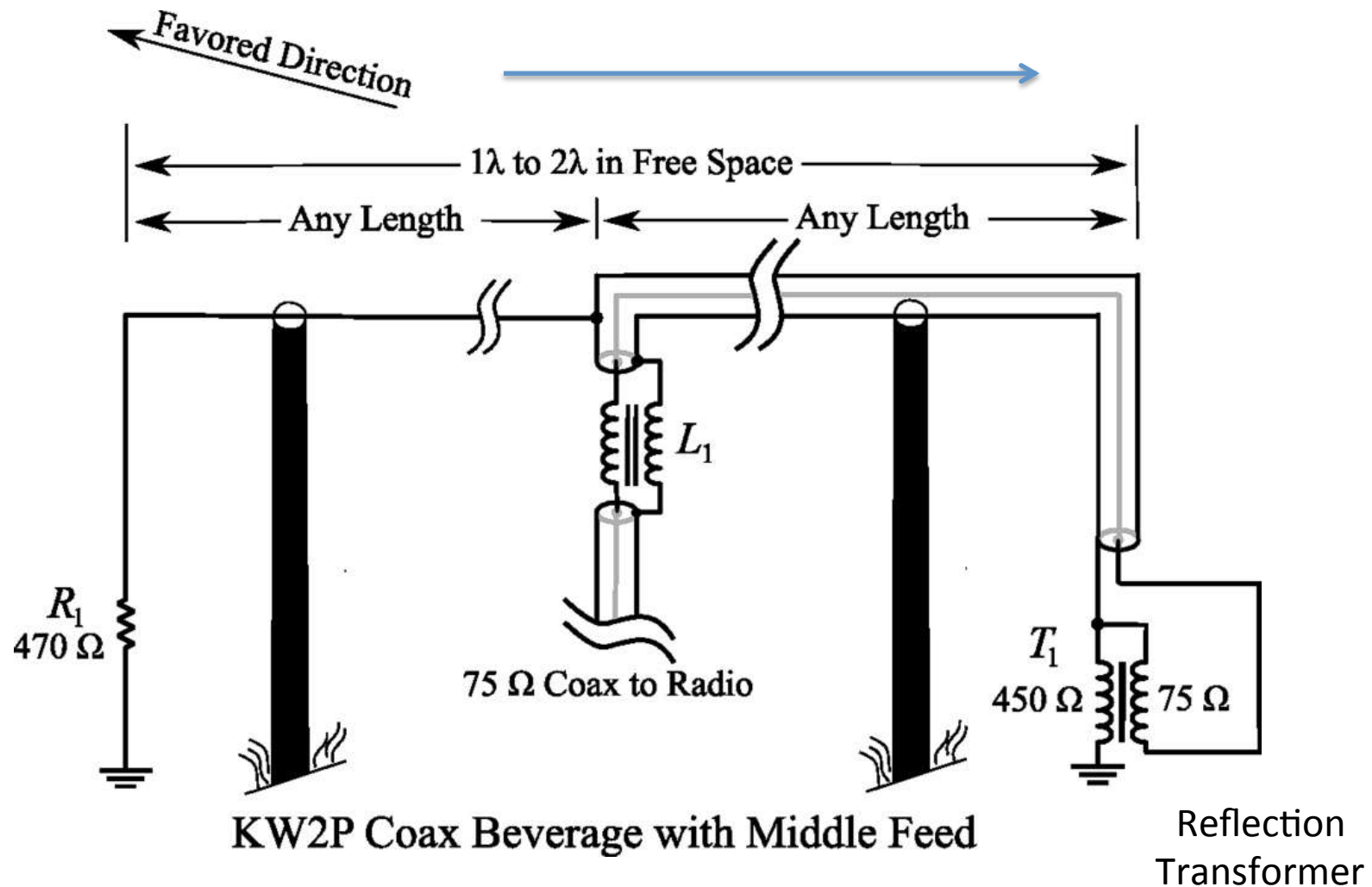
Coaxial Bi-Directional Beverage

More Clever Use of Transformers!

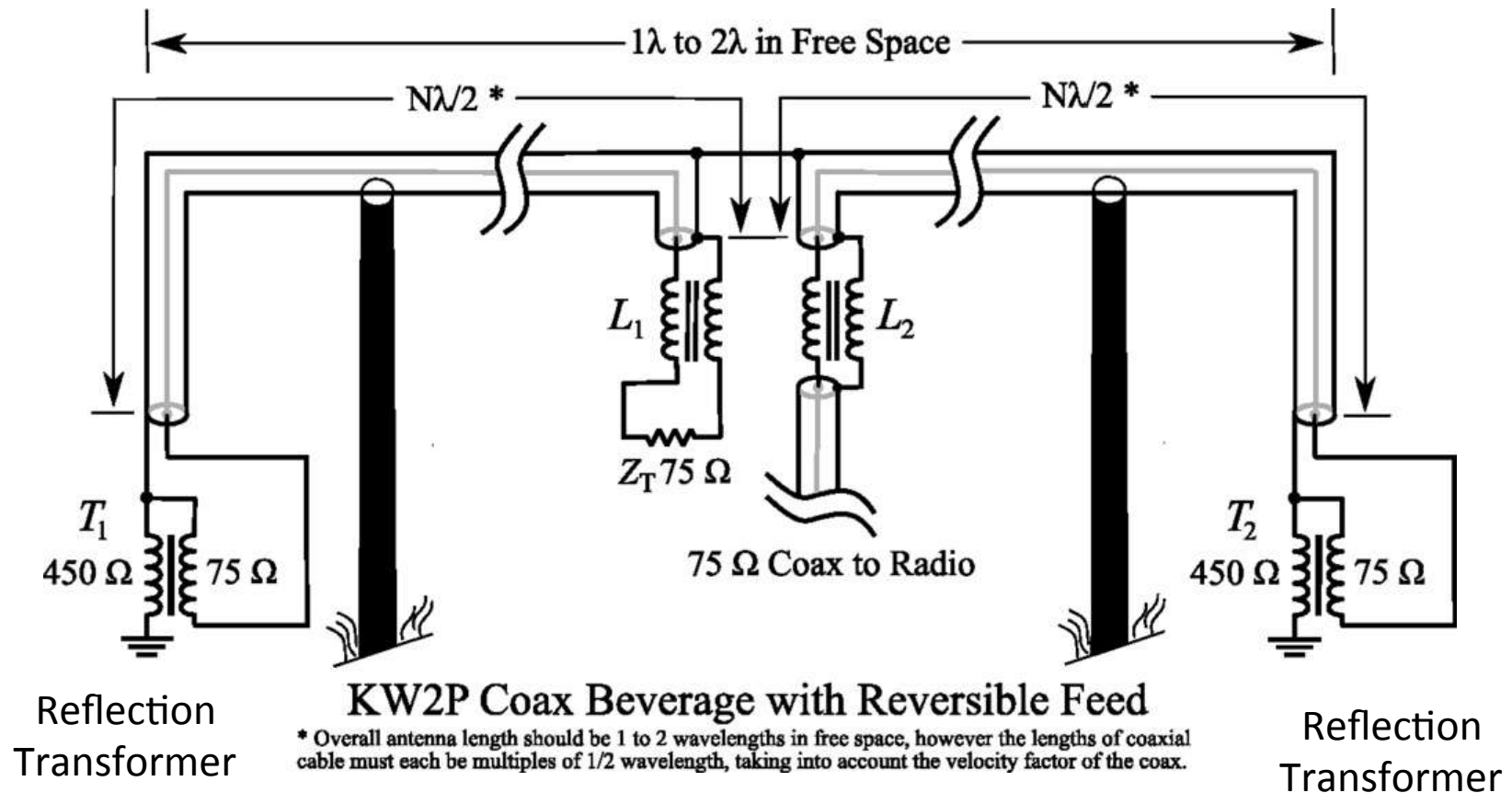


- Received signals SR and SL are both on the outside of the coax
- SL is picked off by transformer T1 and fed to J1
- SR is picked off by transformer T3 and sent back down the inside of the coax transmission line and into the coax connected to T2 and J2

Coax + Wire Beverage – Middle Fed



Coax Beverage with Reversible Feed



Switch Coax and Termination Z_T to Reverse Directions

Beverage on Ground (BOG or Snake Antenna)

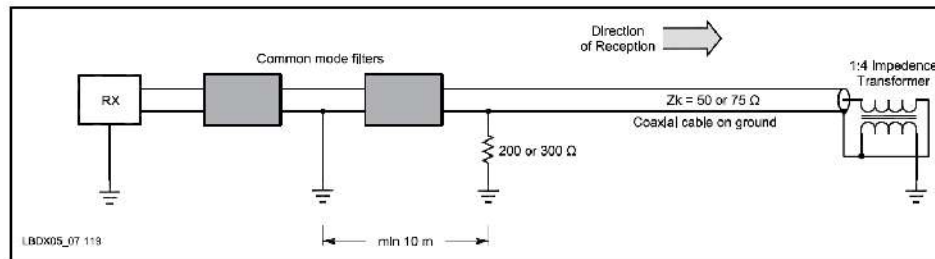


Fig 7-119 — The snake antenna is the back-firing version of the BOG (Beverage On Ground). See text for details.

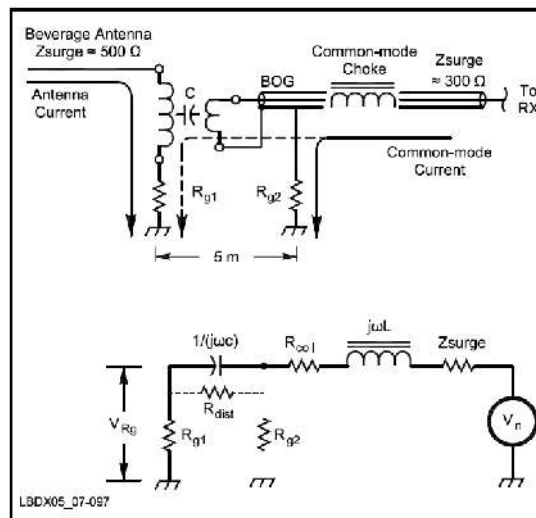


Fig 7-97 — Adding a common-mode choke next to the feed line ground rod is a common way to further improve common-mode signal rejection. See text for details.

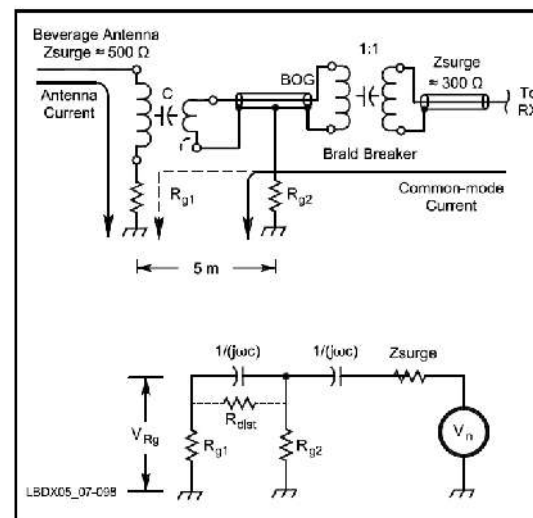
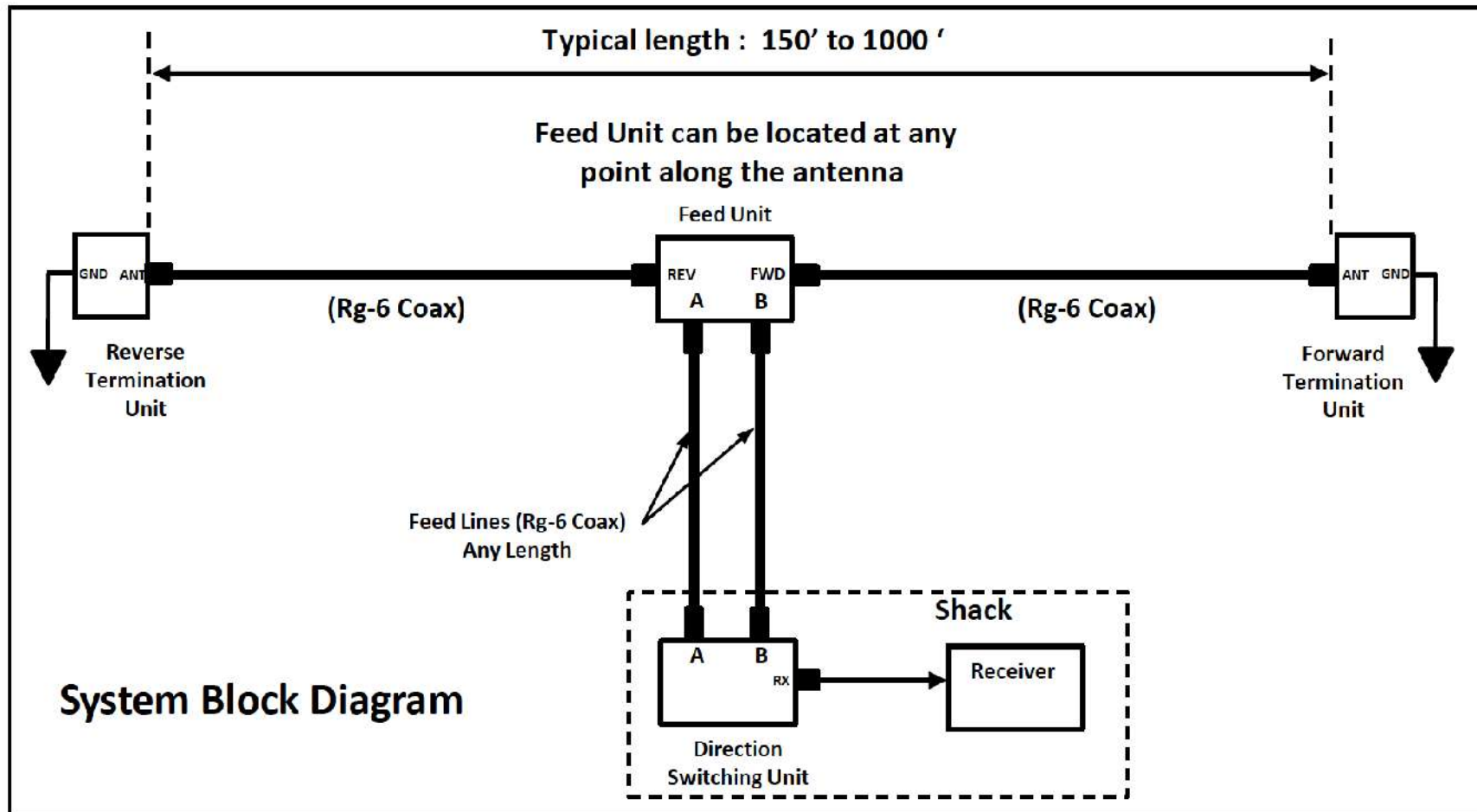
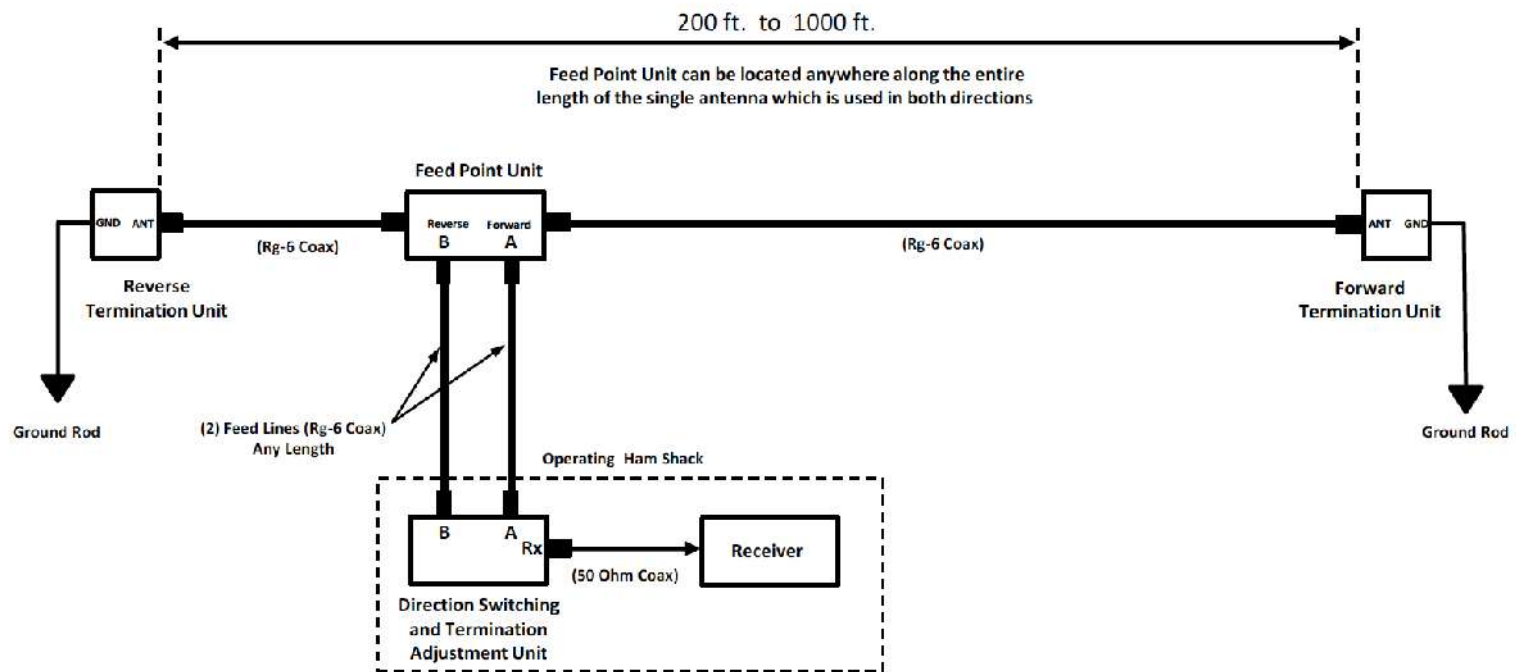


Fig 7-98 — Instead of using a common-mode choke, a braid breaker can be used to insert a high impedance for the common-mode signals. See text for details.





The following block diagram illustrates the various components of the unique BevPro-1 system





\$ 299.95