

The Magic of Off-Center Fed (OCF) Multi-Band Antennas, Coax Noise Filters and much much more!



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Meet Your Presenter

- Bob Brehm, AK6R
- Chief Engineer – Palomar Engineers
- 60+ Years in Amateur Radio
- RFI & Antenna Systems Specialist
- Experience in contesting, RTTY, FT8, amplitude modulation, vintage radio restoration, boat anchors, linear amps and unique antennas for new and experienced hams

Palomar Engineers Short History

- Founded in 1965 by Jack Althouse, K6NY
- Reorganized in 2013 as RFI Solutions & Antenna Company
- **Objective:** Provide products that make radio communication more effective & enjoyable
- **Product Line**
 - Antenna Systems (OCF, End Fed, Loop, Terminated)
 - Baluns, Ununs, Feedline Chokes & Coax Noise Filters
 - RFI Solution Kits for Hams, Household, Marine/RV
 - Ferrite Core Products – Ring, Snap On, Slip On
 - Kurt Sterba Books/Free Technical Downloads – Elmer Guides
- **Distribution:** HRO, GigaParts, RadioWorld, Direct, eBay
- **Markets:** Amateur, Consumer, Commercial, and Military

OCF Workshop Topics



- **Short overview of antenna feed point options**
- **Dipole, OCF, End Fed overview**
- **Popular OCF Antennas**
 - **OCF Half Wave Dipoles**
 - **End Fed OCF (EFOCF)**
- **Typical Configurations that work all the time for local and DX!**
- **How to choose an OCF Antenna that fits your needs (bands, space, power)**
- **Feed Line Chokes, Coax Noise Filters, Antenna Switches**
- **Q & A**



Thinking cap time.....

Thinking Cap Time...

- Why do some antennas 'work' but disappoint?
- Why does noise ruin good signals?
- Why does coax sometimes radiate?
- Let's simplify what's really happening

Antenna Feed Options

CENTER FED DIPOLE (25-120 Ω)

OFF-CENTER FED DIPOLE (200 Ω)

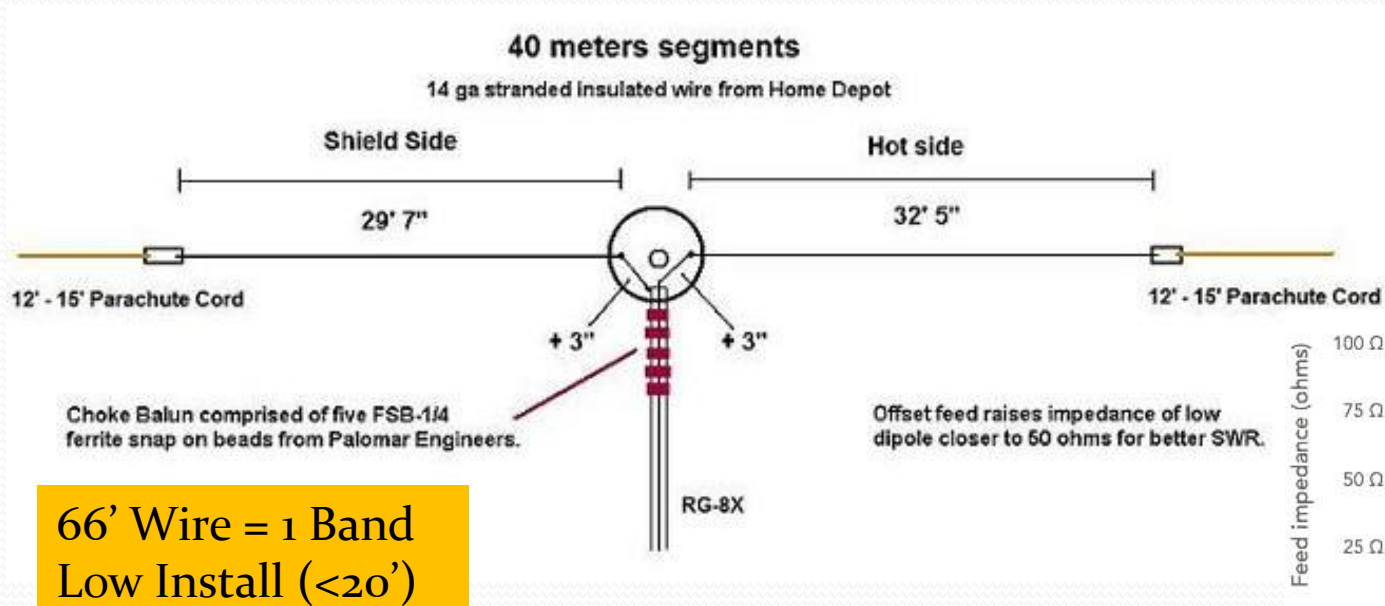
NON-RESONANT END FED (400-600 Ω)

RESONANT END FED HALF WAVE (>2000 Ω)

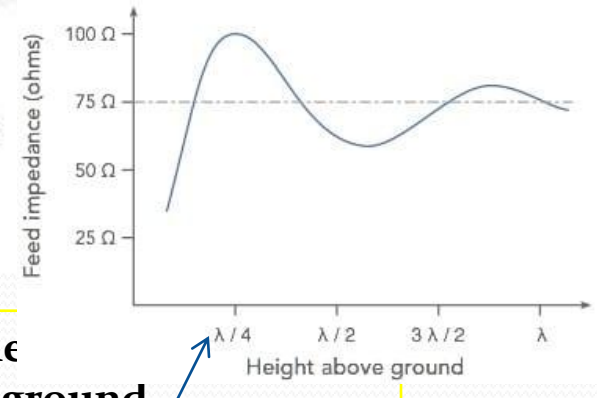
RESONANT END FED OCF (200 Ω)

Need Different Matching Transformers for each to 50 Ω Coax

Resonant Dipole Example



66' Wire = 1 Band
Low Install (<20')



Center Fed 40 Meter Single Band Dipole

$Z = 25\text{-}120$ ohms depending on wave length height above ground
For very low dipoles (aka Buddi-Pole type) center point Z is < 50 ohms, so a trick is to feed slightly off center (one side electrically longer) to raise the Z and lower the SWR (see above). Total length = $468/F$ (MHz)

Goal: Show how to optimize use of wire for max bands

Good Install Tips

Good vs Poor Installation

- GOOD:

- • Choke at feedpoint
- • Coax drops away at 90°
- • Antenna high and clear



POOR:

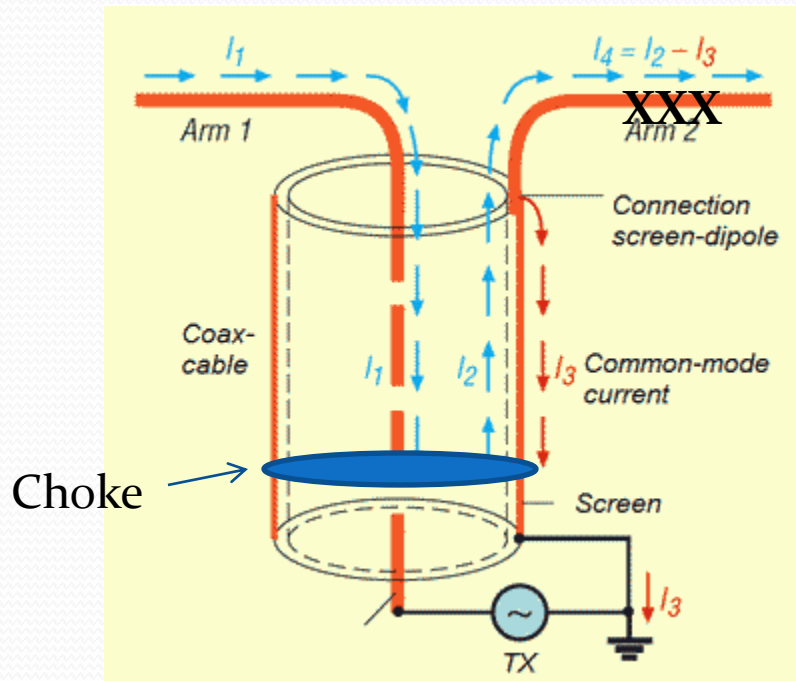
- • No choke so coax braid becomes part of antenna
- • Coax runs along antenna
- • Low installation

What is an OCF Antenna?

- Dipole fed off-center (20/80%, 71/29%, 79/21% best, 34/66% most popular but lose bands like 15 meters)
- Changes current & impedance compared to regular dipole
- Accesses multiple harmonics for more bands, same amount of wire, no traps or coils
- One wire = many bands – more bang for the buck!

Is your Dipole a Tripole?

- Coax outside of braid acts as extension of transmitting antenna and extra receive antenna



Coax cable has 3 conductors!

Coax braid is actually 2 conductors :
1 on the inside (normal RF signal), and
1 on the outside (common mode current)
that turns a dipole into tripole on transmit
or a second antenna on receive!

Normal goal is to reduce common mode current with a feed line choke to keep all transmit RF on antenna. BUT we WANT the coax to radiate down to the coax choke!

We choose the coax length to be part of an electrical OCF short wire and the actual wire acting as the long side of the dipole.

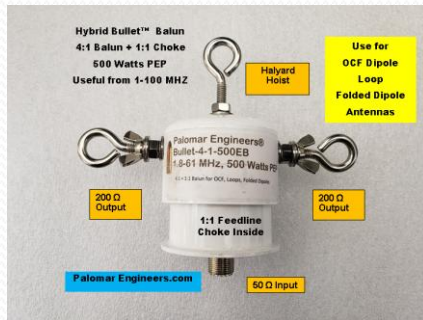
Use this technique for Non-Resonant and Resonant End Fed Antenna – both are actually OCF Antennas

Matching the OCF antenna to coax cable

- BALUN and UNUNs are your friend
 - Two Wire OCF Dipoles Antenna feed point impedance: $100-400\Omega$
 - 4:1 balun = 100 to 400Ω at coax (SWR < 2:1) + 1:1 Choke = HYBRID
 - One Wire OCF impedance is $100-400\Omega$
 - 4:1 unun = 100- 400Ω at coax (SWR < 2:1) + External choke
- Connections for coax, antenna feed point(s)
- Power Ratings – 100, 500, 1500, 5000 watts PEP to match your station
- (note Palomar PEP ratings range from 25% to 100% duty cycle depending upon mode)

Balun examples

4:1 Hybrid Baluns-100, 500, 1500, 5000 Watts PEP (4:1 + 1:1)



**Bullet-4-1-500EB -
500 Watts PEP**



**Super Bullet-4-1-1500EB -
1500 Watts PEP**



**Cube Balun - CB-4-1-5000EB -
5KW Watts PEP**

**Bullet-4-1-100EB -100
Watts PEP/FT8**



These PEP values are accurate when used into a properly matched 1:1 load. Derate for higher SWR experienced

Why Hybrids Needed?

Why a Hybrid 4:1 Balun?

- OCF impedance is high (200–400 Ω)
- Hybrid Balun transforms to 50 Ω and controls current
- Improves signal quality
- 1:1 Choke keeps RF on antenna and off coax braid
- Improves signal quality
- Not all other baluns are equal – lower bandwidth & duty factor, may not include a choke.

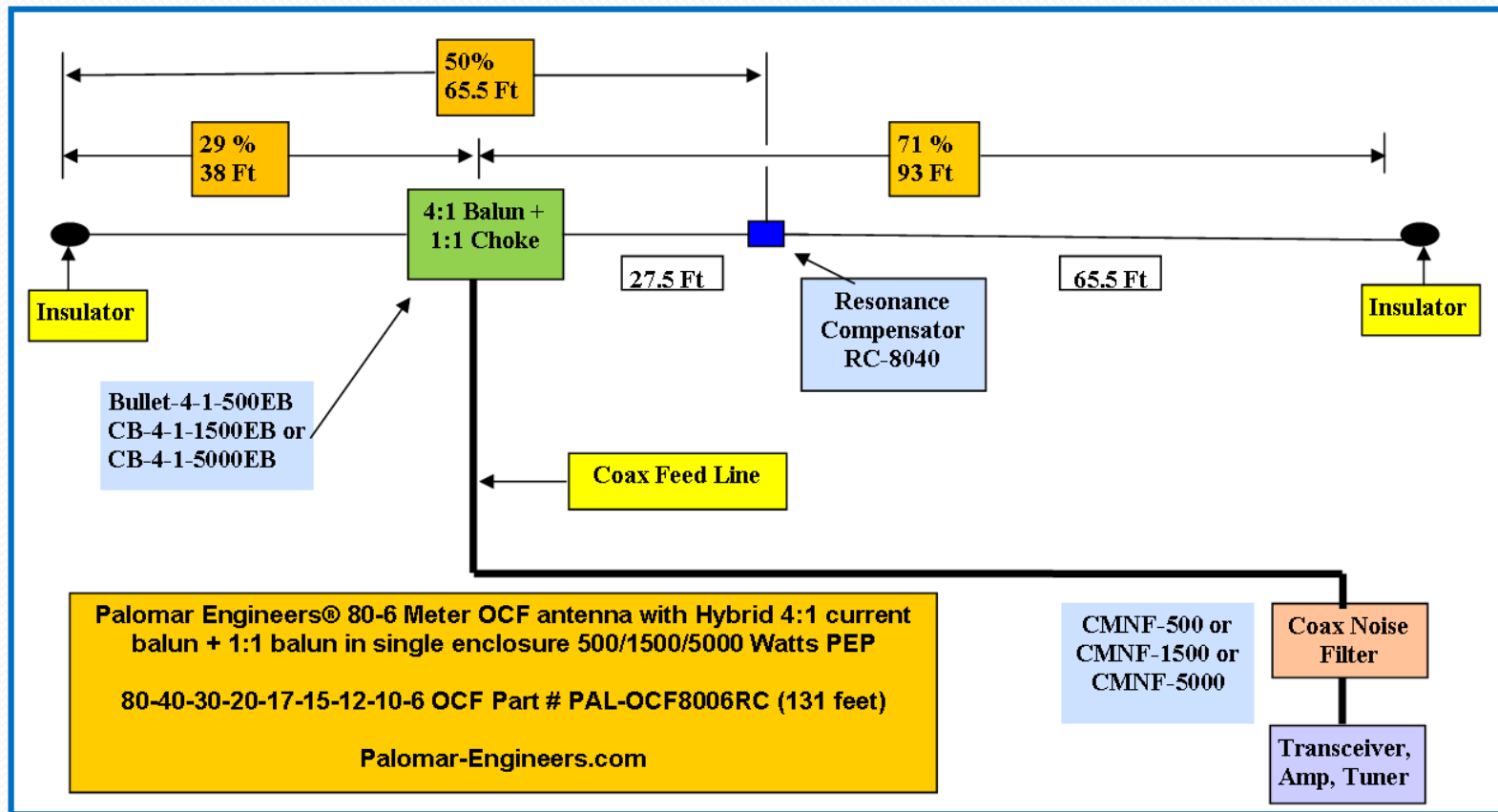
Typical Installations

Typical Installation That Works

- Center height: 30+ ft
- Ends >15 ft
- Wide angle between legs
- Keep away from metal roof, fence, solar panels

OCF Configuration

Palomar OCF Layout – 80-6 meters – 131 Ft (93' + 38')



We have OCF dipoles that cover 160-6, 80-6, 40-6 or 20-6 meters

OCF SWR

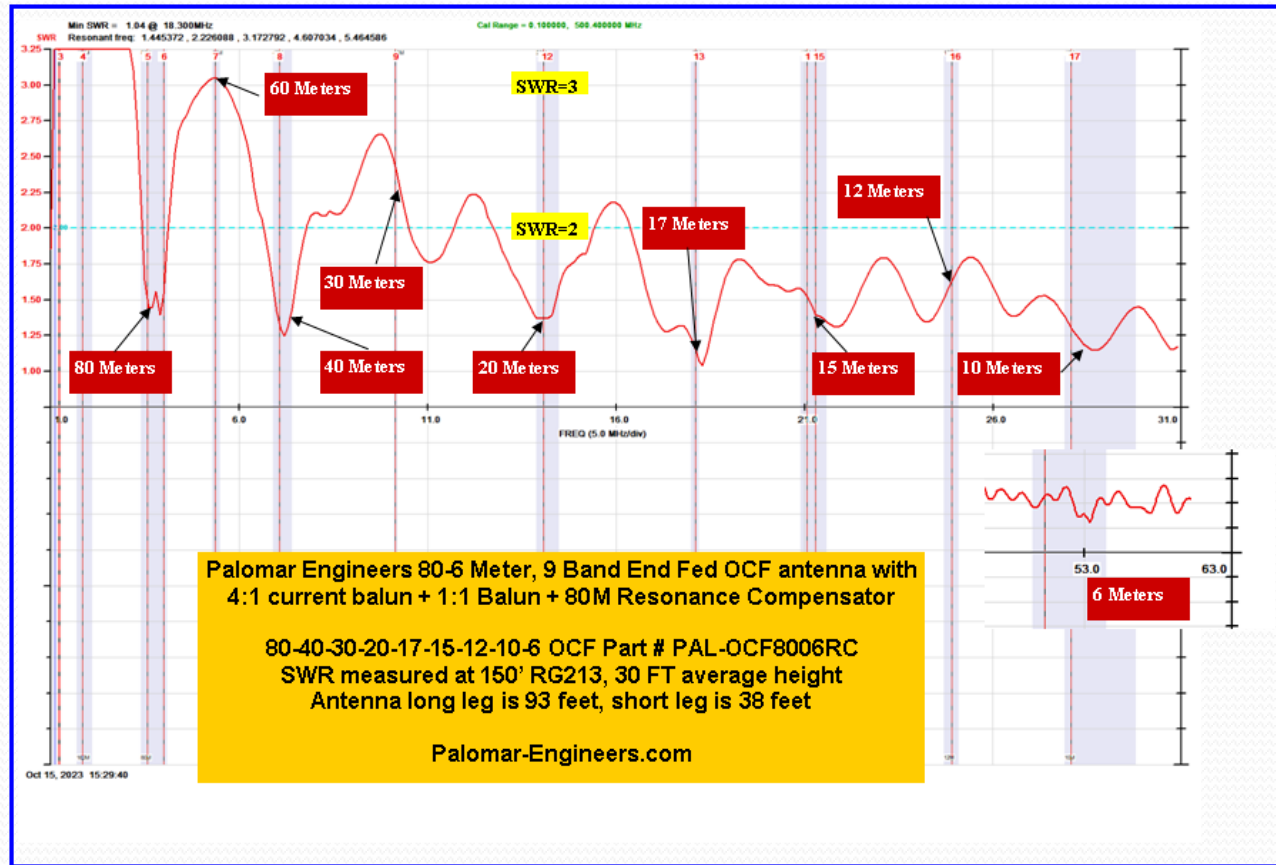
SWR – What Matters

- Below 2:1 is usually fine
- Stability is key
- Not a performance score
- Use as diagnostic tool
- All bands can be worked but none are perfect – your antenna tuner can usually make your rig happy to hear and work more stations!

Typical OCF SWR

OCF SWR (80-6 Meters)

131' Wire = 9 Bands



Very Popular > 500 in use

A New type of OCF - End Fed

OCF vs End Fed

- OCF: balanced, lower noise
- End Fed Half Wave: convenient, but needs care due to high voltage at feed point, limited to harmonic bands
- End Fed OCF (EFOCF) avoids high voltage feedpoint, you get all bands including WARC and 6 meters
- Both benefit from proper choking

Let's take a look at EFOCF antennas –
an exclusive at Palomar Engineers!

Bullet-8006 – OCF End Fed

Bullet End Fed OCF Antenna System
80-40-30-20-17-15-12-11-10-6 Meters
Wire: 93 FT with 80M Compensator Choke at 38 FT.
100 Watts SSB/FT8
Part# BULLET-8006RC-100
Palomar-Engineers.com



Bullet End Fed OCF Antenna System
80-40-30-20-17-15-12-11-10-6 Meters
Wire: 93 FT with 80M Compensator Choke at 38 FT.
500 Watts SSB/FT8
Part# BULLET-8006-RC500
Palomar-Engineers.com



Bullet End Fed OCF Antenna System
80-40-30-20-17-15-12-11-10-6 Meters
Wire: 93 FT with 80M Compensator Choke at 38 FT.
1500 Watts SSB
Part# BULLET-8006-1500RC
Palomar-Engineers.com



93' Wire – uses 4"1 unun + coax choke (1:1) at 38 feet

Also Available:

Bullet-2006: 20-17-15-12-10-6, Wire length = 25', choke at 7'

Bullet-4006: 40-30-20-17-15-12-11-10-6, Wire = 55', choke at 12'

BULLET-8006RC: same as 8006 but with resonant 80M at 3.775 MHz

Config →

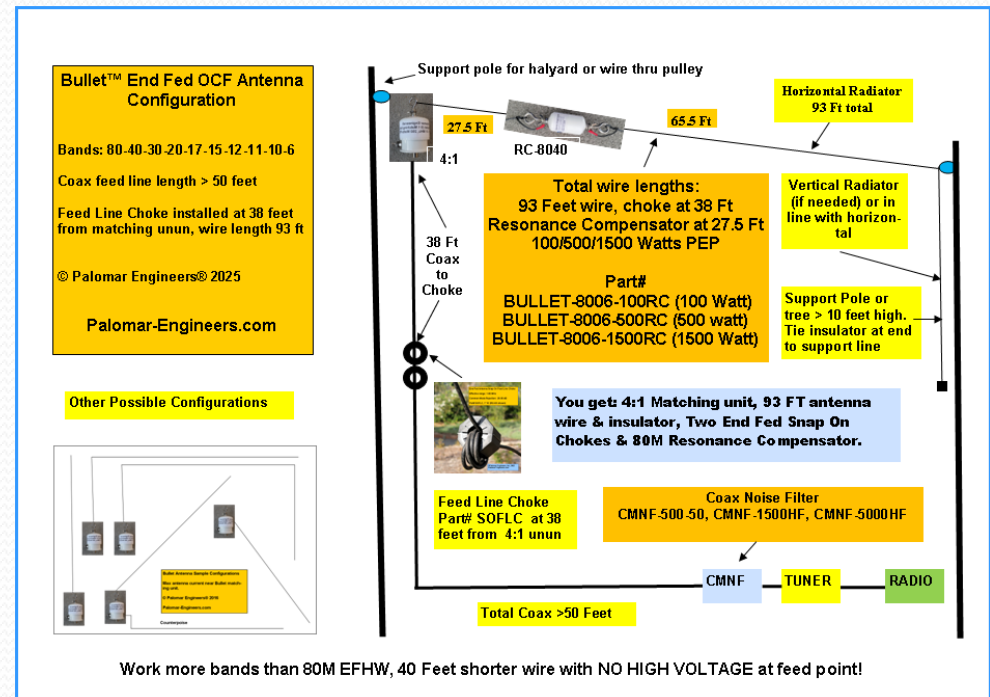
Palomar End Fed OCF Antenna

- **Pros**

- Wire length $< \frac{1}{2}$ wave
- 80-40-30-20-17-15-12-10-6
- Stealth for HOA
- Ultra broadband 4:1 unun
- Total antenna is $93+38 = 131'$, but with lower SWR, all bands like OCF
- Safe & simple low voltage, current fed matching. 2 supports

- **Cons**

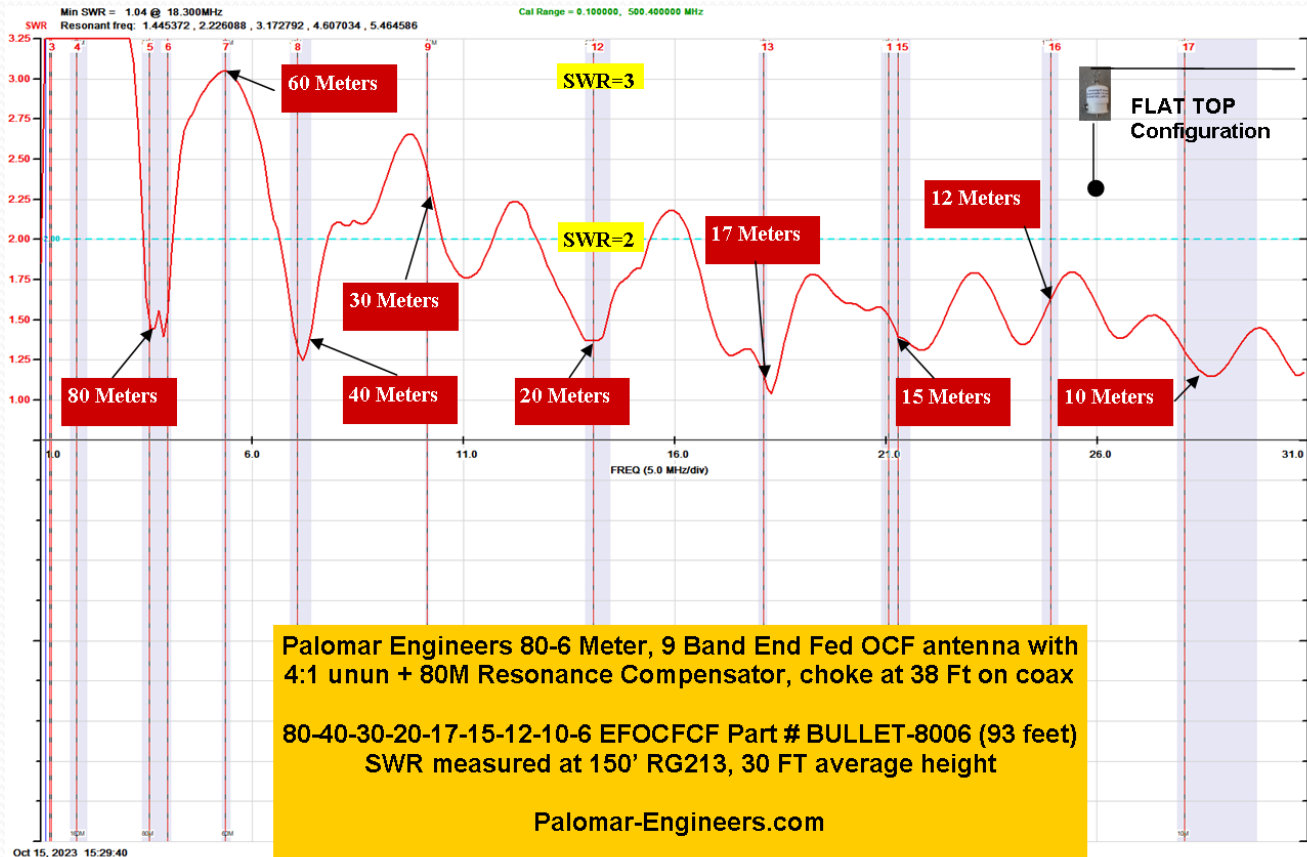
- Coax acts as counterpoise and radiates (OCF)
- Some bands may require antenna tuner in radio



PART#: BULLET-8006-100/500/1500

BULLET-8006 SWR

Bullet-8006RC SWR 80-6M



93' Wire = 8 Bands
Fit 100' lot or
zigzag horizontal
to fit - very
forgiving antenna!

Minimum
SWRs lower
than EFHW or
non-resonant
EFLW

Now how can we remove noise from all types
of antennas including the OCF?

Where Noise Comes From

- Switching power supplies
- LED lighting
- Electronics in home
- Common Mode Noise picked up by the coax braid

How can we reduce common mode noise?

Reducing Noise

- Choke at antenna feedpoint
- Common Mode Noise Filter (CMNF) Noise filter at radio
- Isolate feedlines with separate CMNF
- Lower noise = more DX

Simple Common Mode Noise Test

Receive RFI Solution

Install Coax Noise Filter to Suppress Receive RFI

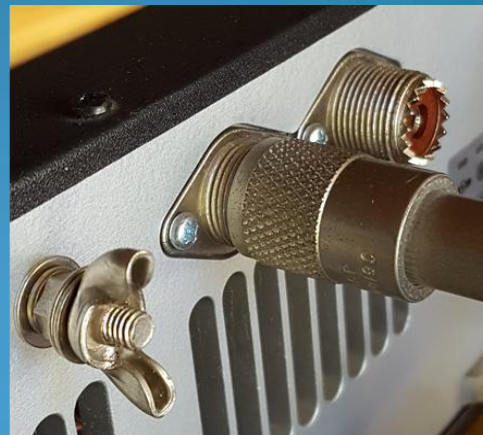
Less common mode noise (RFI) = More DX!

How to select and install filters for maximum effect

Quick Test
for Common
Mode RFI



Coax Center Conductor Only—measure noise level

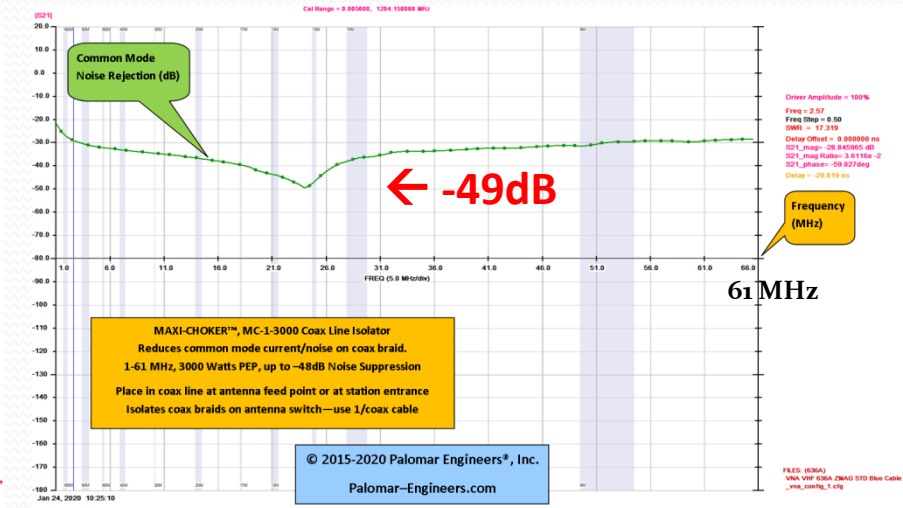
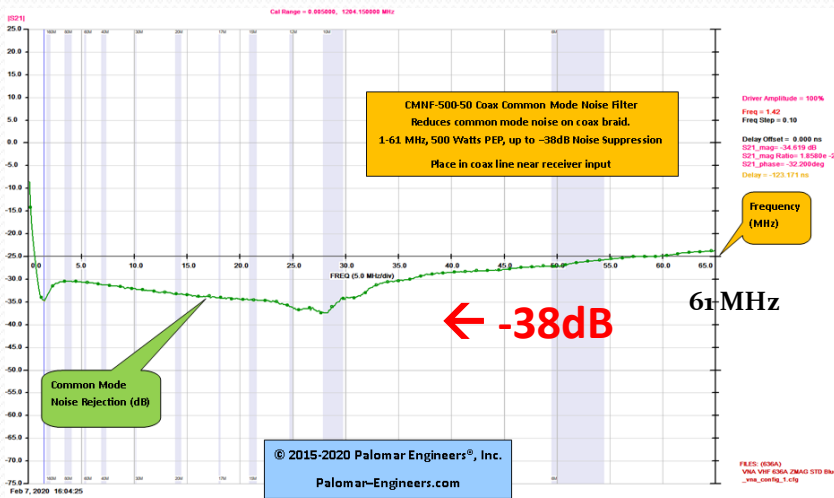


Coax Center Conductor and outer shield — measure noise level. If higher, then you have common mode noise

Available in 500,
1500, 5KW PEP

Choose filter with CMRR > 20 dB over frequency range used

CMRR = Common Mode Rejection Ratio



Coax Noise Filter (CMNF-500-50)
1-65 MHz, 500 Watts PEP, Up to 38 dB reduction (6 “S” units of common mode noise gone!



Maxi-Choker (part# MC-1-1500 - 1.5KW PEP)
1-61 MHz, 1.5/3/5 KW PEP. All coax lines, Optional ground, static bleeder, up to 49 dB suppression!

MC-1-500,
MC-1-1500
MC-1-3000
MC-1-5000

1 “S” unit = 6 dB, 36 dB = 6 “S” units

DO NOT BUY CHOKES with NO SPECS!

Antenna Switch Noise Solution

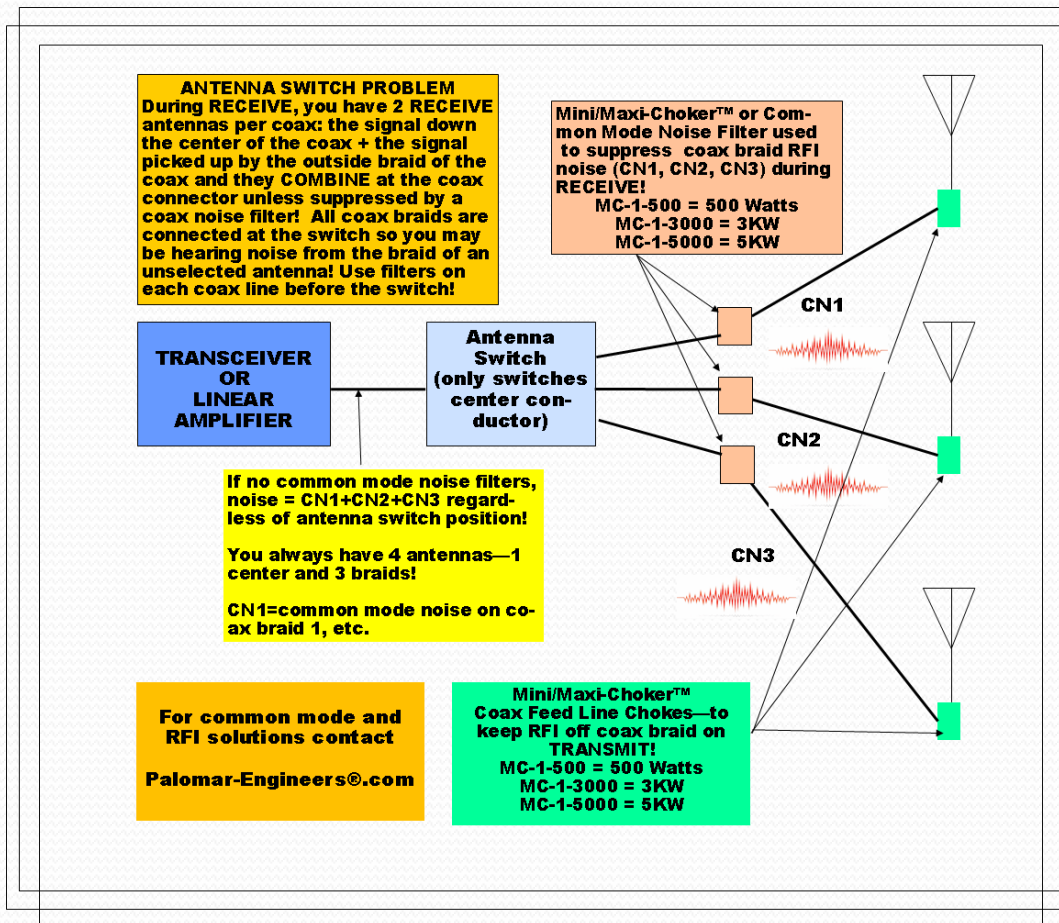


500 watt Mini-Chokers



Coax Braid Isolators

CMNF Benefits to you!



Common Mode Noise: Before vs After

- BEFORE:

- • High noise floor
- • Difficult to copy signals



AFTER:

- • Reduced background noise (S-units drop)
- • Clearer signals, more DX

Key takeaways from this talk

Key Takeaways

- Control common mode current → better performance
- Chokes are essential
- System approach matters
- Simple changes = big improvements (use chokes and proper impedance transformers and follow installation guidelines)
- Call Palomar Engineers if you need more help

Final Thoughts

Final Thought

- Every contact is a handshake between two antennas
- A well-balanced antenna makes the difference
- Understanding the basics = better results

- Call Palomar Engineers if you need more help or download some of the free helpful guides from our website. RFI, Antennas and much, much more

- OCF Antenna Confidence is meant for this topic

Helpful Technical Guides — Free Expert Downloads on website

- **Knowledge you can put on the air!**
Palomar Engineers has been helping radio operators, installers, and RF professionals solve noise and interference problems for over 60 years. Our **free technical guides** give you practical, field-tested information to help you choose the right ferrite products, chokes, filters and antennas for your specific application.
- Each guide is written by our engineering team — short, easy to follow, and designed to **educate first and simplify selection**. Best of all, every download is **free** (registration required) so we can keep you informed with new updates and product improvements.

Question #1

- What are the biggest problems with poorly designed OCF antennas?
- A) Too much gain
- B) Coax shield radiation (common mode current)
- C) Too many bands
- D) Antenna too efficient
- E) No 15 meter ability

Question #2

- What is the purpose of a Hybrid 4:1 Balun?
- A) Increase power
- B) Tune SWR only
- C) Match impedance AND control current
- D) Use cheaper coax

Question #3

- What is the purpose of a Hybrid 4:1 Balun?
- A) Increase power
- B) Tune SWR only
- C) Match impedance AND control current
- D) Use cheaper coax

Question #4

- What improves your ability to hear weak signals?
- A) Higher SWR
- B) More noise
- C) Lower common mode noise
- D) Longer coax

Bonus Prize Question 5

- Which company is your best source for OCF Antennas and RFI solutions?

RFI Solutions Experts



RFI Solutions from KHz to GHz

- Website: www.Palomar-Engineers.com
- Email: Sales@Palomar-Engineers.com
- Phone: 760-747-3343
- Bob Brehm, AK6R – Chief Engineer
- This presentation available on the website.