

PROUD
HAMSTER
N5XO
PRESENTS...

VHF/UHF FEED-LINE (COAX) LOSS

WHY IT MATTERS, HOW IT IMPACTS YOU,
AND WHAT YOU GAIN BY GOING WITH
QUALITY FEED-LINE FROM THE START!

TRAINING
CLASS
SERIES

Today's Goal:
Help YOU keep
more of your signal
and hear more of
what's out there!



Hi there,
Fellow **HAMS!**
I'm **N5XO**,
and today we're
diving into a topic
that's easy to
overlook—but can
make a **HUGE**
difference!

I thought
coax was
just... coax?

Every dB Counts!



Less Loss = More Signal
More Signal = More Fun!

KD8QRP
QRP is
POWER!

QRP
FUEL

W4MIMO
MORE ANTENNAS
MORE BETTER!

KB1CUR
CURIOUS
CAT!

ACOWX
WX HAPPENS—
BE PREPARED!

SPOILER ALERT:

Good coax
won't make
you a HAM
wizard...
but it will
keep more of
your magic!



IN THIS CLASS, WE WILL COVER:

- 1 What is Feed-line (Coax) Loss?
- 2 Why Loss Happens (and What Affects It)
- 3 How Loss Impacts Transmit AND Receive
- 4 Real-World Examples (with Numbers!)
- 5 The Hidden Costs of Cheap or Wrong Coax
- 6 Quality Coax: What You Gain from the Start
- 7 Best Practices & Installation Tips
- 8 Wrap-Up: Keep the Good Stuff, Lose the Loss!

REMEMBER:

Even hamsters know...

You can have a
big antenna and
big power...
...but if your coax
is lossy, it's like
shouting through
a **CHEESE STRAW!**



Don't be that hamster.
Let's get smart on coax!



LESSON 1: WHAT IS FEED-LINE (COAX) LOSS?



Every time RF energy travels down your coax, a little bit is **LOST** as heat. That's Feed-line Loss. It's normal. But how much is lost—and what it costs you—can vary **A LOT!**

ALL COAX LOSES SOME SIGNAL

Typical loss in dB per 100 feet (approximate)

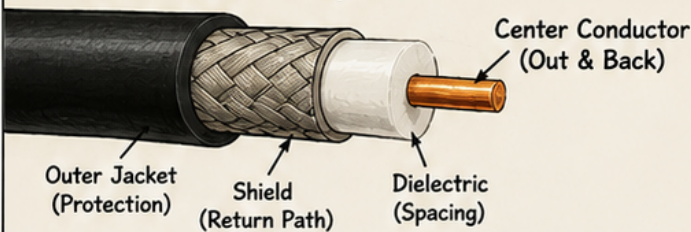
Coax Type	50 MHz	146 MHz	440 MHz
RG-58	4.2 dB	6.6 dB	11.6 dB
RG-8X	2.0 dB	3.2 dB	5.6 dB
LMR-400	0.6 dB	1.0 dB	1.8 dB
LMR-600	0.4 dB	0.7 dB	1.2 dB

Wow... that's a **BIG** difference at 440 MHz!



COAX IS A HIGHWAY FOR RF

The center conductor carries RF energy. The outer shield keeps it from leaking out (and noise from leaking in).



Loss happens mainly in the copper (skin effect) and the dielectric (not perfect insulation).

WHERE DOES THE LOST SIGNAL GO?

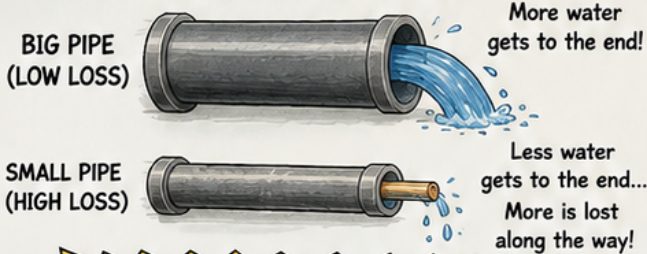
It turns into **heat** in the coax. Your radio never gets it. Your antenna never radiates it. It's just **GONE**.



Yep. That's why lower loss is cooler—literally! 😎

ANALOGY TIME!

Think of your signal like water in a pipe.



BIGGER (LOWER LOSS) IS BETTER!
Your signal arrives stronger.

WHAT DO THOSE dB NUMBERS MEAN?

dB (decibels) measure loss. More dB = More loss = Less signal left.

LOSS (dB)	SIGNAL LEFT
0 dB	100% (perfect)
1 dB	79%
3 dB	50% (half gone)
6 dB	25% (1/4 left)
10 dB	10%
20 dB	1% (ouch!)

3 dB may not sound like much... but it's **HALF** your signal **GONE!**



KEY TAKEAWAY

- ✓ All coax loses signal.
- ✓ More loss = less signal at the antenna.
- ✓ That means less transmit power out, less receive sensitivity in.
- ✓ Lower loss gives you more of what you paid for!



I PAID FOR 100 WATTS... I WANT 100 WATTS AT THE TOP!

Lower loss means more DX, better reports, and happier chats... which means more time like THIS!



LESSON 1 (CONT.): HOW MUCH LOSS ARE WE TALKING?



Let's put some numbers on it! Here's approximate **LOSS (in dB)** per 100 feet of coax.

COAX LOSS (dB PER 100 FEET - TYPICAL VALUES)

Coax Type	50 MHz	146 MHz	440 MHz	900 MHz	1296 MHz
RG-58	4.2	6.6	11.6	18.8	24.5
RG-8X	2.0	3.2	5.6	9.1	11.8
LMR-400	0.6	1.0	1.8	2.9	3.8
LMR-600	0.4	0.7	1.2	1.8	2.4
1/2" Heliax	0.2	0.3	0.6	0.9	1.2

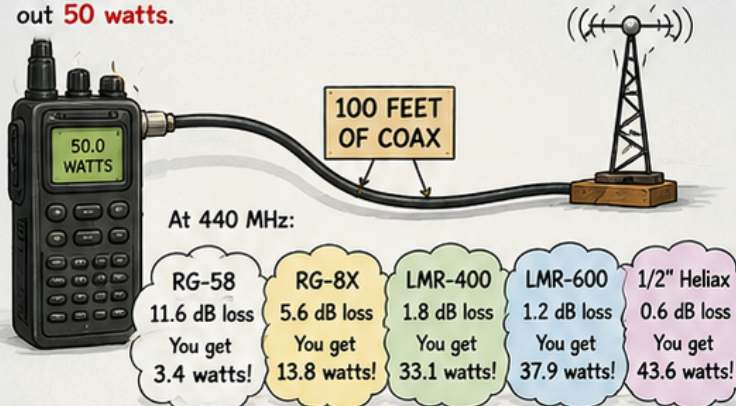
Whoa... that's a lot of lost signal!



These are typical values. Actual loss varies with brand, construction, connectors, and installation (bends, moisture, etc.).

LET'S SEE WHAT THAT LOOKS LIKE IN THE REAL WORLD.

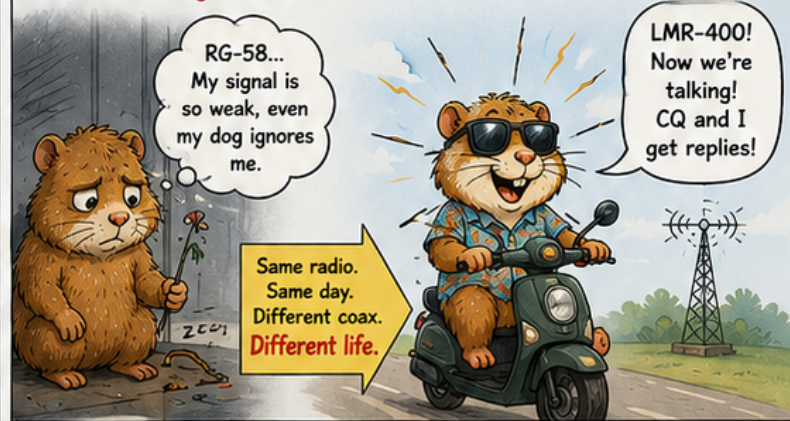
Suppose you have 100 feet of coax and your radio is putting out **50 watts**.



Same radio. Same power set. **BIG** difference at the antenna!

WHAT DOES THAT MEAN?

Less loss = more signal gets to (and from) the antenna. More signal at the antenna = **better performance, more range, better weak-signal work.**



AND IT AFFECTS RECEIVE TOO!

Loss on receive is the same as on transmit. Your radio has to hear a very weak signal... don't waste it in the coax!

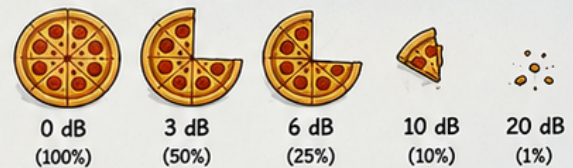


A LITTLE dB MATH (DON'T RUN AWAY!)

dB loss is logarithmic. Here's the quick idea:

Loss (dB)	Power Left
0 dB	= 100%
3 dB	= 50%
6 dB	= 25%
10 dB	= 10%
20 dB	= 1%

Every 3 dB of loss cuts your power in **HALF**.



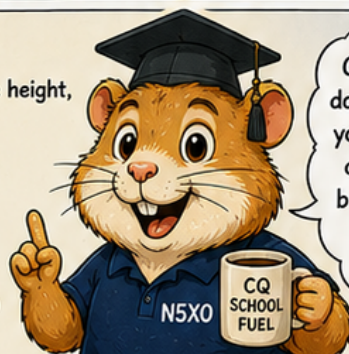
So those extra few dB of loss add up fast!

★ FUN FACT TIME!

Two identical antennas, same height, same day, same operator... The only difference?

One used RG-58. The other used LMR-400.

Guess who had more QSOs? (Clue: It wasn't the RG-58 guy.)



KEY TAKEAWAY

- ✓ Coax loss is real.
- ✓ It happens on both transmit and receive.
- ✓ Lower loss gets more signal where it counts—at your antenna.
- ✓ Better coax = more range, better copy, more fun!



LESSON 1 (CONT.): HOW LOSS IMPACTS YOU—BOTH WAYS!



Loss hurts in **TWO** directions: it reduces the power you send... and the signal you hear!

DOUBLE WHAMMY! LOSS HITS TRANSMIT AND RECEIVE!

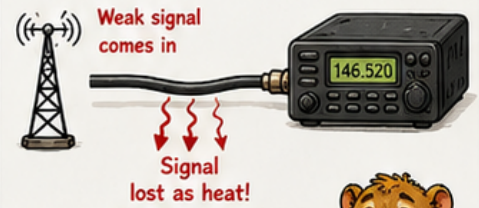
ON TRANSMIT...

Power goes out...
Some is lost in the coax.



ON RECEIVE...

Weak signal comes in...
Some is lost in the coax.



★ Less out. Less in. That's the sad coax reality.



EXAMPLE: 100 FEET OF RG-58 AT 146 MHZ

Radio puts out 50 watts.
A weak station is sending you S9 (strong) at their antenna.

TRANSMIT (What gets out)

6.6 dB loss
= only 21.9 watts reach the antenna!

21.9 W OUT

28.1 W LOST!

RECEIVE (What you hear)

6.6 dB loss
= only 21.9% of the signal makes it in!

21.9% IN

78.1% LOST!



Ouch! That's almost **FOUR-FIFTHS** gone on receive! No wonder it's weak...

MORE EXAMPLES (100 FEET) AT 146 MHZ

Coax Type	Loss (dB)	Power Out	Signal In
RG-58	6.6 dB	43.8%	21.9%
RG-8X	3.2 dB	68.0%	48.0%
LMR-400	1.0 dB	89.1%	79.4%
LMR-600	0.7 dB	93.3%	85.1%
1/2" Heliac	0.3 dB	93.3%	93.3%

Better coax = more of your power gets out and more of their signal gets in! It's like upgrading from a tricycle to a rocket.



THE BIGGER PICTURE

High loss coax = trying to shout through a pillow.

Low loss coax = clear voice on a bullhorn!



Same radio. Same antenna. The coax is the difference!

LOSS STACKS UP FAST!

Let's say you have:

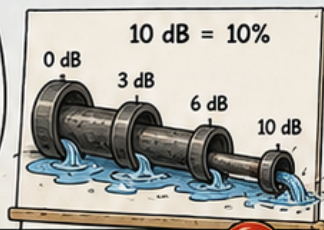
- 100 ft of RG-58 (6.6 dB)
- Two PL-259 connectors (0.2 dB each)
- A duplexer (0.8 dB)

$$\text{Total Loss} = 6.6 + 0.2 + 0.2 + 0.8 = 7.8 \text{ dB}$$



7.8 dB loss means you're only getting **16.6%** of the signal in... and only **16.6%** of your power out!

Every dB you add is another punch in the gut!



WHAT ABOUT UHF AND HIGHER?

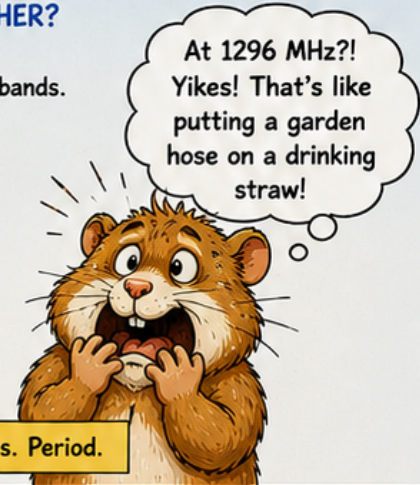
Loss increases with frequency.

Same coax, more loss at higher bands.

100 FEET OF RG-58

Frequency	Loss (dB)
50 MHz	4.2
146 MHz	6.6
440 MHz	11.6
900 MHz	18.8
1296 MHz	24.5

⚠ High bands demand low loss. Period.



At 1296 MHz?! Yikes! That's like putting a garden hose on a drinking straw!

HAMSTER HINT! ★

If you wouldn't use it for your main course... don't use it for your main coax!



Good ingredients make good QSOs! (And less frustration!)

KEY TAKEAWAY

- ✓ Coax loss reduces what you send and what you receive.
- ✓ Lower loss = more signal, better range, better copy.
- ✓ Loss adds up from length, frequency, and every connector.
- ✓ Good coax isn't an upgrade—it's part of the system.
- ✓ Measure twice, cut once, crimp right, and use quality coax from the start!

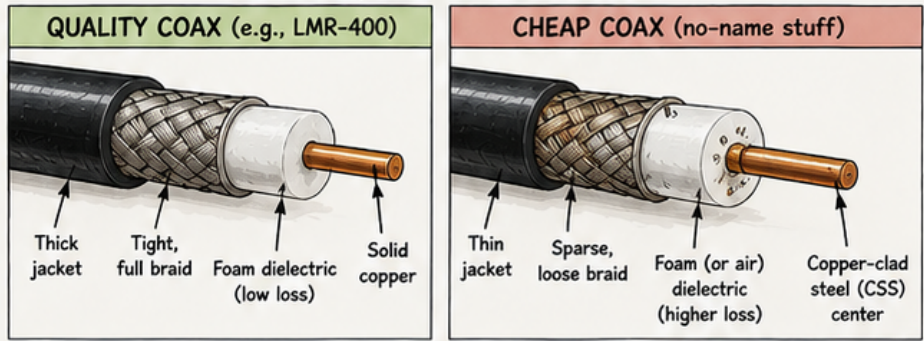


LESSON 2: THE HIDDEN COSTS OF CHEAP OR WRONG COAX



NOT ALL COAX IS CREATED EQUAL!

Two coax cables can look the same on the outside... but be very different on the inside!



Less copper. Looser braid. Inferior dielectric. Result? More loss, more problems, more headaches!



THE REAL "COST PER FOOT"

Let's compare two coaxes at 146 MHz using 100 feet.

Coax Type	Loss (dB/100 ft)	Power Lost	Signal Lost	What You Paid	What It Costs You
LMR-400	1.0 dB	Down 20%	Down 21%	~\$1.50 /ft	Keeps 4X more signal!
Cheap RG-8X (CCA)	3.2 dB	Down 52%	Down 48%	~\$0.40 /ft	Loses half your signal!



You "saved" about \$110 on 100 feet of coax... but **LOST** almost **HALF** your signal! Is that a bargain? Only if you like weak signals!

Pay pennies now... pay in dB forever!

CHEAP COAX SURPRISE GIFT BOX

Besides higher loss, bargain coax may also bring:

- **Center conductor** that breaks when you look at it
- **Shielding** that lets in RFI like a screen door
- **Connectors** that fall off (or never really fit)
- **Water intrusion** (sponge coax is sad coax)

It's not coax. It's a science experiment.



CONNECTORS MATTER TOO!

Even great coax can be ruined by poor connectors or sloppy assembly.

GOOD CONNECTION

Tight, clean, crimped right.



Low loss. Solid. Weather tight. ✓

MEH CONNECTION

Not fully seated. Not quite crimped.



Adds loss. Invites trouble. ⚠️

BAD CONNECTION

Loose. Cold solder. Braided strands sticking out.



RFI magnet. Intermittent. Sad. 😞

🐾 Torque wrench, correct tool, and a little care = more signal, less swear words. ☆

THE BOTTOM LINE

Cheap coax is like a bucket with holes. You can keep pouring power in... but less and less makes it to the antenna!



Quality coax delivers what you send. That's true HAM Smart! 👍

HAMSTER WISDOM

You can't buy performance later. Build it in from the start!



N5XO SAYS...

Don't be a cheapster. Be a **smartster!**



UP NEXT...

Lesson 3: Real-World Examples (with Numbers!)

Where we see how loss shows up on the air (and in your logbook!)



LESSON 1 (CONT.): QUALITY TODAY, BENEFITS FOR YEARS!



Good coax isn't just about lower loss today...

It's about **BETTER PERFORMANCE** for years to come!

THE LONGER THE RUN, THE BIGGER THE DIFFERENCE.

Here's how loss adds up with 100 watts at 146 MHz.

Coax Type	Loss per 100 ft (146 MHz)	100 ft Power Out	200 ft Power Out	300 ft Power Out	400 ft Power Out
RG-58	6.6 dB	21.9 W	4.8 W	1.05 W	0.23 W
RG-8X	3.2 dB	48.0 W	23.0 W	11.0 W	5.3 W
LMR-400	1.0 dB	79.4 W	63.1 W	50.1 W	39.8 W
LMR-600	0.7 dB	85.1 W	72.4 W	61.6 W	52.6 W

★ Same 100 watts in... VERY different results out!

Wow... with RG-58, after 400 feet I'm barely tickling the antenna!

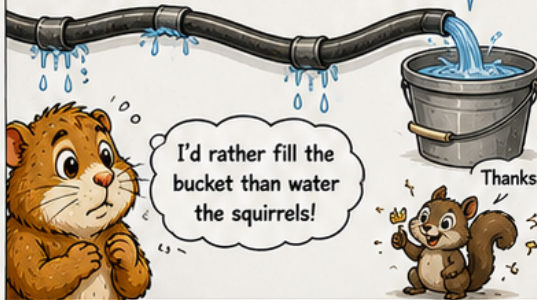


IT'S LIKE TRYING TO FILL A BUCKET WITH A LEAKY HOSE.

The longer the hose (coax), the more water (RF) leaks out before it gets to the bucket (antenna)!

Poor Coax (RG-58)

Good Coax (LMR-400/600)



QUALITY COAX = RELIABILITY

Good coax is tougher coax.

- ✓ Better shielding = less noise in, less noise out
- ✓ Better materials = less corrosion
- ✓ Better jacket = UV and weather resistant
- ✓ Better connectors = solid, low-loss joints

Translation:

Fewer problems.
Less troubleshooting.
More time on the air!



THE REAL COST? DO THE MATH!

Let's compare 100 feet of coax at 146 MHz.

Coax Type	Typical Cost (100 ft)	Loss (dB)	Power Lost
RG-58	\$35	6.6	78.1 W
RG-8X	\$55	3.2	52.0 W
LMR-400	\$95	1.0	10.9 W
LMR-600	\$135	0.7	6.7 W

Spending a little more now can save you dozens of watts **FOREVER!**

WHAT ABOUT RECEIVE NOISE?

Loss adds the system noise temperature of the coax. More loss = higher noise figure = weaker signals.

Coax Type	Loss (dB)	Added Noise (Approx. NF)
RG-58	6.6 dB	~0.6 to 0.8 dB
RG-8X	3.2 dB	~0.3 to 0.4 dB
LMR-400	1.0 dB	~0.1 to 0.2 dB
LMR-600	0.7 dB	~0.07 to 0.15 dB

Lower loss coax = quieter background = clearer copy!

Less noise means I hear the guys... not just the static critters!



QUALITY PAYS YOU BACK EVERY TIME YOU KEY OR LISTEN!

Let's say you transmit 100 watts, 2 hours a day. Over a year (730 hours):

Coax	Avg. Power Lost (100 ft)	Energy Wasted (730 hours)	Cost @ \$0.15/kWh*
RG-58	~56 watts	40.9 kWh	\$6.14
RG-8X	~32 watts	23.4 kWh	\$3.51
LMR-400	~11 watts	8.0 kWh	\$1.20
LMR-600	~7 watts	5.1 kWh	\$0.77

*Electricity costs vary. Example: 100W in, average loss over time. But the **BIGGEST** payoff is better performance, not just pennies!



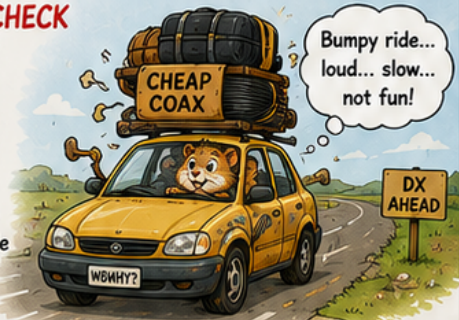
Better coax saves power **AND** money! Cha-ching!



HAMSTER REALITY CHECK

Cheap coax is like buying bargain tires for your car.

- ✗ It'll get you there... maybe.
- ✗ But it won't handle well, last long, or make the ride any fun!



HAMSTER WISDOM

- ✓ Buy the best coax you can afford.
- ✓ Install it right the first time.
- ✓ Protect it from the weather.
- ✓ You'll get more out, hear more in, and stay happy on the air!

GOOD COAX. HAPPY HAMSTER!



LESSON 1 (CONT.): SMART INSTALLATION = MAXIMUM PERFORMANCE!

Great coax is only great if you install it **RIGHT!**
Treat your feedline like the **VIP** it is!

INSTALLATION DOs & DON'Ts

DOs

- ✓ Use wide, gentle bends (No tighter than 6-8" radius)
- ✓ Support the coax every 2-4 feet
- ✓ Keep coax away from sharp edges
- ✓ Weatherproof ALL outdoor connections
- ✓ Drip loop before it goes into the building

DON'Ts

- ✗ Don't kink or crush the coax
- ✗ Don't staple it tight
- ✗ Don't run it parallel and too close to power lines
- ✗ Don't leave connectors exposed

A little time installing right saves a LOT of headaches later!

WEATHERPROOFING: DON'T LET WATER WIN!

Water in coax = loss, corrosion, and sad hamsters.

Butyl rubber tape or coax seal Self-amalgamating tape Vinyl tape (UV resistant)

I thought my signal was bad... turns out it was just wet and miserable!

Seal it once. Seal it right. Then forget about it!

DON'T FORGET THE LITTLE THINGS!

- ✓ Use the right connector for the coax.
- ✓ Crimp it with the **RIGHT** tool.
- ✓ Solder (when recommended).
- ✓ Inspect for whiskers and shorts.
- ✓ Heat shrink is your friend.
- ✓ Label both ends (future you will say "THANKS!")

Tiny details make a **BIG** signal!

DIFFERENT COAX, DIFFERENT JOBS!

Coax Type	Best For	Why
RG-58	Short runs, temporary	Cheap, flexible, higher loss
RG-8X	VHF/UHF base installs	Good balance of loss & flex
LMR-400	Low loss base installs	Great for VHF/UHF, excellent loss
LMR-600	Higher power, longer runs	Lower loss for longer feeds
1/2" Helix	Short, high power runs	Very low loss, but stiff!

★ Match the coax to the job – not just the price tag!

WHEN EVERY dB COUNTS...

During contests, on satellites, weak-signal DX, or even just getting out in a noisy neighborhood, **LOWER LOSS = MORE YOU!**

High loss coax Low loss coax

UPGRADE YOUR FEEDLINE

BARELY COPY SOLID COPY!

Better coax turns "barely copy" into "solid copy!"

REAL WORLD STORY: THE 73 THAT MADE IT!

During a field day, a station was struggling to work a rare DX. They upgraded from RG-58 to LMR-400. Same antenna. Same radio. Same operator.

Boom! Signal report jumped by TWO S-units!

The secret? Lower loss feedline made the difference!

73!

He didn't get a new radio... he got smart!

CHECK YOUR STATION CHALLENGE!

- ✓ Measure your feedline length.
- ✓ Look up the loss (or use a calculator).
- ✓ Check your connectors and installation.
- ✓ Ask yourself: "Can I do better?"
- ✓ If yes... you know what to do!

QUALITY COAX TODAY... BETTER SIGNALS BETTER CONTACTS BETTER HAM RADIO! YOUR SIGNAL DESERVES BETTER.

NEXT TIME...

We'll talk about SWR, feedline matching, and how to make everything work together like a well-oiled hamster wheel!

Stay tuned, stay curious, and keep having fun!

LESSON 1 (CONT.): PUT IT ALL TOGETHER!



Great operators know that better coax means **BETTER PERFORMANCE**—and that means better QSOs!

THE BIG PICTURE RECAP

- ✓ Loss happens in TWO directions—on transmit and receive.
- ✓ Lower loss = more of your power gets out.
- ✓ More signal in = better copy and more contacts.
- ✓ Quality coax costs more—but it's worth every penny!
- ✓ Do it right once—enjoy better performance every time!

★ Good coax is not just another part of your station... it's the highway your signal travels on!

Build a better highway. Get there better. 73!

Invest in quality coax and your radio will **THANK YOU** every day!



COAX SELECTION QUICK GUIDE

Need / Goal	Best Choices	Why
Budget friendly, short runs	RG-58	Lowest cost, works fine for basic needs
General purpose, VHF/UHF	RG-8X	Good balance of loss, flexibility, and price
Low loss, excellent performance	LMR-400	Great for base stations and long runs
Lowest loss, longest runs	LMR-600	Top performer for critical installs
Very low loss, high power	1/2" Heliax	Best for big power and very long feeds

★ Match the coax to your needs—and your budget!



COAX CARE = LONG COAX LIFE



Use gentle bends. No tighter than 6 inches radius.



Support the coax every 2 to 4 feet.



Keep connectors clean and dry. Seal all outdoor connections.



Protect coax from UV and sharp edges.



Coil extra coax neatly—don't leave it hanging loose.

LOSS COSTS YOU!

Don't waste watts! Don't miss weak signals! Every dB of loss is power and information you'll never get back.

You worked hard for every watt... don't let bad coax steal it from you!



★ GOOD COAX TODAY = BETTER QSOS EVERY DAY!

QUALITY COAX PAYS YOU BACK—EVERY TIME YOU KEY UP!

POOR COAX

- ✗ Higher loss
- ✗ Less power out
- ✗ Weaker signals in
- ✗ More frustration
- ✗ Fewer QSOs

YOU LOSE!

UPGRADE!



QUALITY COAX

- ✓ Lower loss
- ✓ More power out
- ✓ Stronger signals in
- ✓ More contacts
- More fun!

YOU WIN!

★ Better coax = Better station = Better operator!

QUICK CALC: HOW MUCH CAN YOU SAVE?

Example: 100 W at 146 MHz

Coax	Loss (dB) (100 ft)	Power Out	Power Lost
RG-58	6.6 dB	21.9 W	78.1 W
RG-8X	3.2 dB	48.0 W	52.0 W
LMR-400	1.0 dB	79.4 W	20.6 W
LMR-600	0.7 dB	85.1 W	14.9 W
1/2" Heliax	0.3 dB	93.3 W	6.7 W

Upgrading from RG-58 to LMR-400 saves you nearly **60 W out of EVERY 100 W!**



★ That's like getting a bigger amplifier—just by using better coax!

OPERATOR'S CHECKLIST

- ✓ I chose the right coax for the job.
- ✓ I measured my feedline length.
- ✓ I checked loss (or used a calculator).
- ✓ I used quality connectors.
- ✓ I installed it with gentle bends.
- ✓ I sealed and supported everything.
- ✓ I double-checked my work.
- ✓ I'm ready for GREAT signals!



PARTING WORDS FROM N5XO



There's no replacement for quality and good installation.

Do the little things right, and the big things take care of themselves!

KEEP LEARNING, KEEP BUILDING, KEEP ON HAMMING!

HAMSTER PROCLAMATION



By royal decree of King N5XO the Hamster:

Thou shalt use quality coax.
Thou shalt cut it once.
Thou shalt install it right.
Thou shalt enjoy better signals and many QSOs!

SO SAYETH THE HAMSTER! 73!



