

***Extending the Range of  
Your Handheld  
With an External Antenna***

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# Handheld Pros and Cons

## The Pros

- Low entry cost
- Portability
- Easy to power

## The Cons

- Limited transmit power
- Poor antenna

# Handheld Communication Range

Two components of range:

***How far does my signal reach?***

You can't communicate if you can't be heard

***What can I hear?***

You can't work what you can't hear

# What Can I Hear?

Several factors affect what you can hear:

- Signal path to the other station
- Antenna gain
- Other antenna issues
- Radio capabilities

# Signal Path

Signal path affects both the strength of signals you receive and the perceived strength of the signal you transmit.

- Height
- Obstacles

# Antenna Gain

Antenna gain (or loss) is a measure of the effect the antenna has on the signal.

- Handheld antennas are often referred to as a “dummy load”
- A good base antenna can increase signal strength by nearly 10x

# Other Antenna Issues

Antenna performance is also affected by objects in the “near field region.”

- The most common object in the near field region of a handheld is YOU

# Calculating Antenna Gain

- Antenna gain is expressed in decibels (dB)
- Decibel scale is logarithmic
  - 0 dB = 1x (Unity gain)
  - 3 dB = 2x
  - 10 dB = 10x
  - 20 dB = 100x

$$Gain = 10^{\frac{Gain(dB)}{10}}$$



# Calculating Antenna Gain

Radio catalogs often use different suffixes with dB to qualify the gain.

- dBi = Relative to an isotropic radiator
- dBr = Relative to a reference antenna

**COMET GP-9 / GP-9N DUAL BAND 146**  
BEST SELLER! • Gain & Wave: 146MHz **8.5dBi** 5/8 wave  
Pwr: 200W • Length: 16' 9" • Weight: 5lbs. 11ozs. • Conn:  
plated N-type female • Construction: Fiberglass, 3 Section

**SRH77CA** SMA

High gain 2m/70cm dual band flexible HT antenna.  
15", 10 watts, **+6dBR.**

# Antenna Connectors

Handheld radios typically use two different antenna connectors

- SMA (about 75% of radios on the market)
- BNC (about 25% of radios on the market)



# Antenna Connectors

Using an external antenna will probably require some kind of adapter that allows you to connect your antenna to the SMA connector on your radio.

- Limit wear from repeated connection cycles
- Reduce strain on the connector



# Antenna Selection

There are two approaches you can take to increasing the capability of your handheld antenna.

- High-gain whip antenna (attached to radio)
- External antenna

# Antenna Selection

## High-gain whip antennas



### **RH77CA** BNC

High gain 2m/70cm dual band HT antenna.  
Receive range to 900 MHz. 15", +6dBR.



### **SRH77CA** SMA

High gain 2m/70cm dual band flexible HT antenna.  
15", 10 watts, +6dBR.



### **SRHF40** SMA

### **RHF40** BNC



### **SRH999** SMA

6m/2m/70cm/23cm quad-band HT antenna. Flexible.  
19.5", 10 watts, +6dBR.



### **SRH519** SMA

### **RH519** BNC

2m/70cm slim dual-band HT antenna.  
Flexible. 8", 10 watts, +3dBR.

# Antenna Selection

## High-gain whip antennas

- Easy to replace existing antenna
- Attached to radio – No need for external cables or changing connections
- Can put strain on antenna connector
- Make your radio much larger
- Can introduce some flutter

# Antenna Selection

## Mobile antennas





# Antenna Selection

## Mobile antennas

- Typically designed for use with a ground plane
- Easy to set up and take down
- Often available with different mounts
  - Magnet mount
  - Trunk lip
  - Design your own from an existing mount



# Antenna Selection

## Base station antennas



**COMET NEW CHA-250B BROADBAND HF/6M GROUND-PLANE ANTENNA**  
A newly designed broadband vertical with NO GROUND RADIALS. EXTREMELY easy to assemble, requires no tuning or adjustments and VSWR is under 1.5:1 from 3.5-57MHz! • TX: 3.5MHz – 57MHz • RX: 2.0 – 90MHz • VSWR is 1.5:1 or less, continuous • Max Power: 250W SSB/125W FM • Impedance: 50 Ohm • Length: 23' 5" • Weight: 7 lbs. 1 oz. • Conn: SO-239 • Mast Req'd: 1" – 2" dia. • Max wind speed: 67MPH

**COMET GP-15 TRI-BAND 52/146/446MHZ BASE REPEATER ANTENNA** Gain & Wave: 52MHz 3.0dBi 5/8 wave • 146MHz 6.2dBi 5/8 wave x 2 • 446MHz 8.6dBi 5/8 wave x 4 • Max Pwr: 150W • Length: 7'11" • Weight: 3lbs. 1oz. • Conn: Gold-plated SO-239 • 2MHz band-width after tuning (6M) • Construction: Single-piece fiberglass

**COMET CX-333 TRI-BAND 146/220/446MHZ BASE REPEATER ANTENNA** Gain & Wave: 146MHz 6.5dBi 5/8 wave x 2 • 220MHz 7.8dBi 5/8 wave x 3 • 446MHz 9.0dBi 5/8 wave x 5 • Max Pwr: 120W • Length: 10'2" • Weight: 3lbs. 1oz. • Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

# Antenna Selection

## Base station antennas

- Large (5 feet to 25 feet)
- More difficult to move and set up
- Highest gain

# Signal Path

An external antenna can improve signal path.

- Get your antenna up higher
- Get the antenna away from obstacles
- Separate your antenna from local noise sources

# Antenna Gain

An external gain antenna improves your ability to transmit and receive.

- Higher gain means that your transmitted signal is stronger
- Higher gain means that you can receive weaker signals
- Position the antenna for optimum performance without having to change operating position

# Issues to Consider

## Base station installations

- Convenience
- Lightning protection
- Antenna mounting

# Issues to Consider

## Portable installations

- Ease of setup and take-down
- Mounting methods
- Typical usage scenarios
- Stability and safety

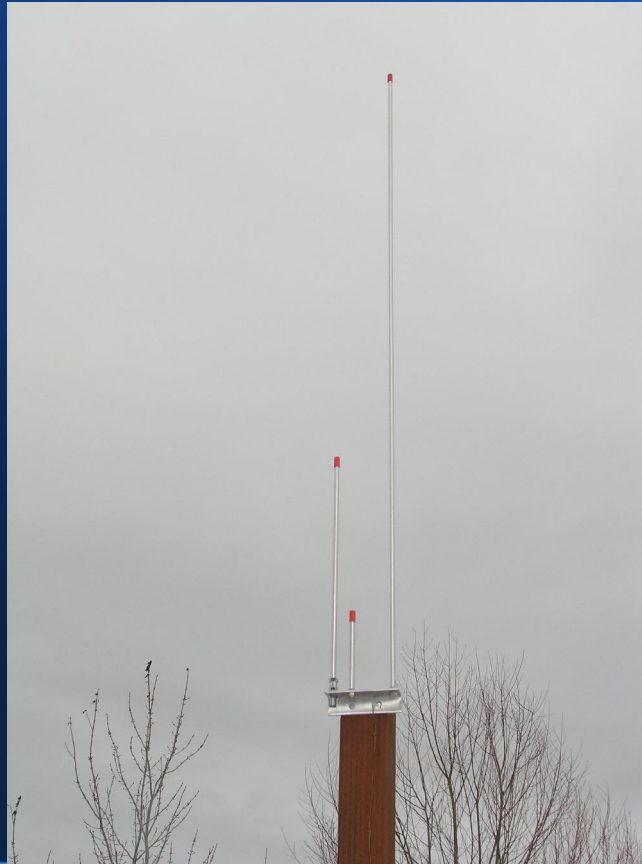
# Example Installations

## Arrow Dual Band J-Pole



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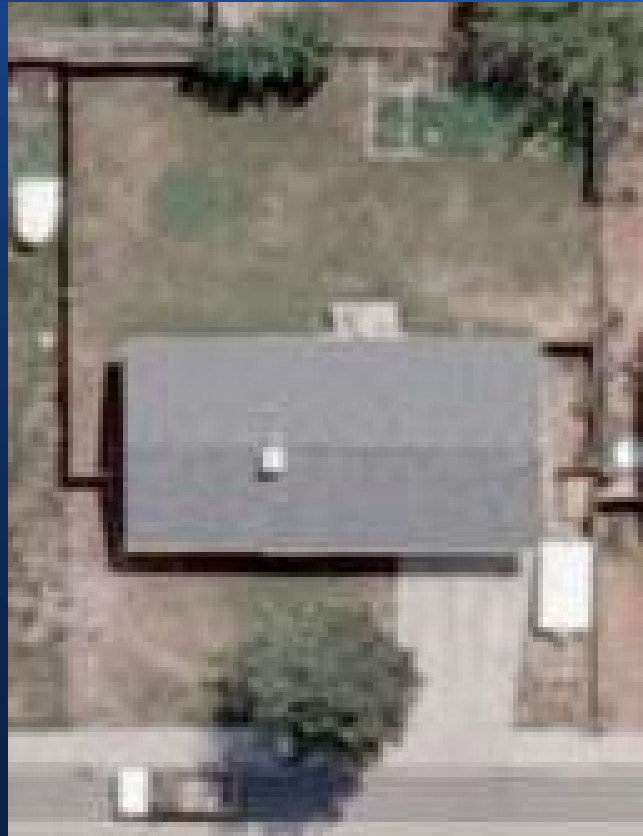


# Example Installations

## Arrow Dual-Band J-Pole



# Example Installations



# Example Installations



Questions?