Base HF Loop Antenna 2.0
(CHA SKYLOOP 2.0)
Operator's Manual

Nevada - USA
WWW.CHAMELEONANTENNA.COM

VERSATILE – DEPENDABLE – STEALTH – BUILT TO LAST

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Be aware of overhead power lines when you are deploying the CHA SKYLOOP 2.0 antenna system. You could be electrocuted if the antenna gets near or contacts overhead power lines.

Photographs and diagrams in this manual may vary slightly from current production units due to manufacturing changes that do not affect the form, fit, or function of the product.

Introduction

Thank you for purchasing and using the Chameleon Antenna™ High Frequency (HF) Base Loop Antenna (CHA SKYLOOP 2.0). The CHA SKYLOOP 2.0 is an extreme performance horizontal full-wave loop antenna. The main advantages of a horizontal loop antenna are reduced background noise and a better gain over a dipole—which means signals will be stronger. In fact, most operators can't believe the increase in performance over their old dipole antenna. The antenna is comprised of 286 feet of wire, insulators, and a matching transformer unit. The integral broadband impedance matching network transformer allows broadband antenna tuning. The antenna will operate from 3.5 - 54 MHz (including 80m – 6m amateur bands) without any adjustment with a wide range antenna tuner. The CHA SKYLOOP 2.0 is suitable for military, government agencies, non-governmental organizations (NGOs), Military Affiliate Radio System (MARS), Civil Air Patrol (CAP), Amateur Radio Emergency Service (ARES) / Radio Amateur Civil Emergency Service (RACES), Salvation Army Team Emergency Radio Network (SATERN), and hams looking for a high-performance wire antenna for HF base stations. Its' low observable characteristics also make it a good choice for hams living in developments with Homeowners Associations (HOAs), deed restrictions, or Covenants, Conditions & Restrictions (CCRs). It is also an outstanding shortwave listening (SWL) antenna. When mounted low, the CHA SKYLOOP 2.0 will provide good Near-Vertical Incident Sky wave (NVIS) communication. The CHA SKYLOOP 2.0 antenna requires an antenna tuner on most frequencies. Antennas built by Chameleon Antenna™ are versatile, dependable, stealthy, and built to last. Please read this operator's manual so that you may maximize the utility you obtain from your CHA SKYLOOP 2.0 antenna.

HF Propagation

HF radio provides relatively inexpensive and reliable local, regional, national, and international voice and data communication capability. It is especially suitable for undeveloped areas where normal telecommunications are not available, too costly or scarce, or where the commercial telecommunications infrastructure has been damaged by a natural disaster or military conflict.

Although HF radio is a reasonably reliable method of communication, HF radio waves propagate through a complex and constantly changing environment and are affected by weather, terrain, latitude, time of day, season, and the 11-year solar cycle. A detailed explanation of the theory of HF radio wave propagation is beyond the scope of this operator's manual, but an understanding of the basic principles will help the operator decide what frequency and which of the CHA SKYLOOP 2.0 configurations will support their communication requirements.

HF radio waves propagate from the transmitting antenna to the receiving antenna using two methods: ground waves and sky waves.

Ground waves are composed of direct waves and surface waves. Direct waves travel directly from the transmitting antenna to the receiving antenna when they are within the radio line-of-sight. Typically, this distance is 8 to 14 miles for field stations. Surface waves follow the curvature of the Earth beyond the radio horizon.

They are usable, during the day and under optimal conditions, up to around 90 miles, see table (1). Low power, horizontal antenna polarization, rugged or urban terrain, dense foliage, or dry soil conditions can reduce the range very significantly. The U.S. Army found that in the dense jungles of Vietnam, the range for ground waves was sometimes less than one mile.

Frequency	Distance	Frequency	Distance
2 MHz	88 miles	**14 MHz**	33 miles
4 MHz	62 miles	**18MHz**	29 miles
7 MHz	47 miles	**24 MHz**	25 miles
10 MHz	39 miles	**30 MHz**	23 miles

Table 1. Maximum Surface Wave Range by Frequency.

Sky waves are the primary method of HF radio wave propagation. HF radio waves on a frequency below the critical frequency (found by an ionosonde) are reflected off one of the layers of the ionosphere and back to Earth between 300 and 2,500 miles, depending upon the frequency and ionospheric conditions. HF radio waves can then be reflected from the Earth to the ionosphere again during multihop propagation for longer range communication. The most important thing for the operator to understand about HF radio wave propagation is the concept of Maximum Usable Frequency (MUF), Lowest Usable Frequency (LUF), and Optimal Working Frequency (OWF). The MUF is the frequency for which successful communications between two points is predicted on 50% of the days of in a month. The LUF is the frequency below which successful communications are lost due to ionospheric loses. The OWF, which is somewhere between the LUF and around 80% of the MUF, is the range of frequencies which can be used for reliable communication. If the LUF is above the MUF, HF sky wave propagation is unlikely to occur.

The HF part of the Radio Frequency (RF) spectrum is usually filled with communications activity and an experienced operator can often determine where the MUF is, and with less certainty, the LUF by listening to where activity ends. The operator can then pick a frequency in the OWF and attempt to establish contact. Another method is using HF propagation prediction software, such as the *Voice of America Coverage Analysis Program (VOACAP)*, which is available at no cost to download or use online at www.voacap.com. The operator enters the location of the two stations and the program show a wheel with the predicted percentage of success based on frequency and time. ALE, which is the standard for interoperable HF communications, is an automated method of finding a frequency in the OWF and establishing and maintaining a communications link.

Even under optimal conditions, there is a gap between where ground waves end (around 40 to 90 miles) and the sky wave returns to Earth on the first hop (around 300 miles). NVIS propagation can be used to fill this gap. The frequency selected must be below the critical frequency, so NVIS is can normally only be used on frequencies from around 2 to 10 MHz. Frequencies of 2 – 4 MHz are typical at night and 4 – 8 MHz during the day.

Parts of the Antenna

The CHA SKYLOOP 2.0 is comprised of the following components, see plate (1):

a. Matching Transformer. The Matching Transformer provides a starting mounting point and impedance matching for the CHA SKYLOOP 2.0 antenna.

b. Antenna Wire. The Antenna Wire is a 286-foot length of insulated wire.

c. Line Winder. The Line Winder is used to store the Antenna Wire (b) when it is not in use.

d. Carabiner. The Carabiner is a removable pear-shaped stainless-steel hook with a spring-loaded gate used to attach the Isolation Rings (e) to the Transformer Eyebolt (i).

e. Isolation Ring. Five Isolation Rings are permanently attached to the Antenna Wire and are used to suspend three corners of the loop and as insulators at the feedpoint.

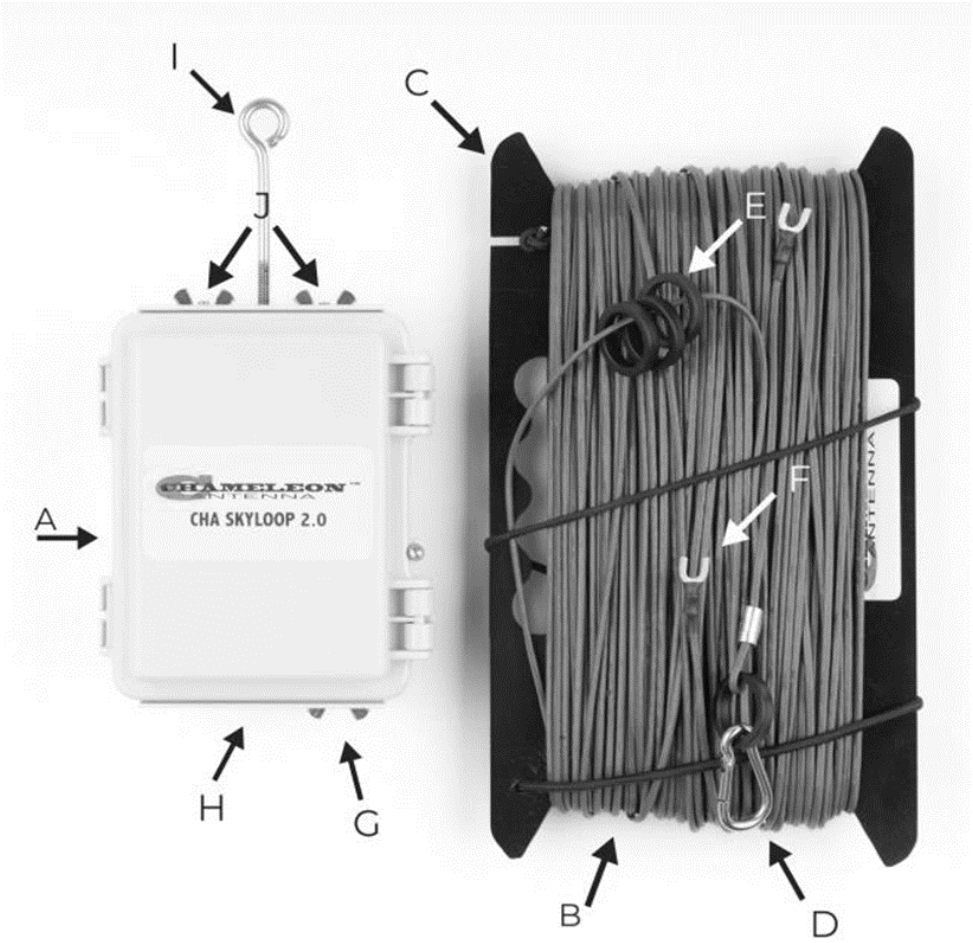


Plate 1. CHA SKYLOOP 2.0 Antenna.

f. Wire Connector. The Wire Connectors are terminal lugs located at each end of the Antenna Wire.

g. Ground Connection. The Ground Connection is located on the bottom of the Matching Transformer (a) and provides an optional electrical ground for lightning protection.

h. UHF Socket. The UHF Socket, SO-239, is located on the bottom of the Matching Transformer.

i. Transformer Eyebolt. The Transformer Eyebolt is located on the top of the Matching Transformer.

j. Antenna Connection. The two Antenna Connections are located on the top of the Matching Transformer and are used to attach the Wire Connectors (f).

k. Support Line. The Support Line *(not included)* is Polyester or Nylon abrasion-resistant rope used to suspend the antenna from the necessary supports.

SKYLOOP Installation

The CHA SKYLOOP 2.0, see figure (1), is installed horizontally and requires four supports at least 72 feet apart that, when the antenna wire is suspending from them, will form the CHA SKYLOOP 2.0 approximately in the shape of a square. The supports should also be 30 to 40 feet high, although heights as low as 10 feet will work, but with reduced performance. The coaxial cable should be at least 25 in length.

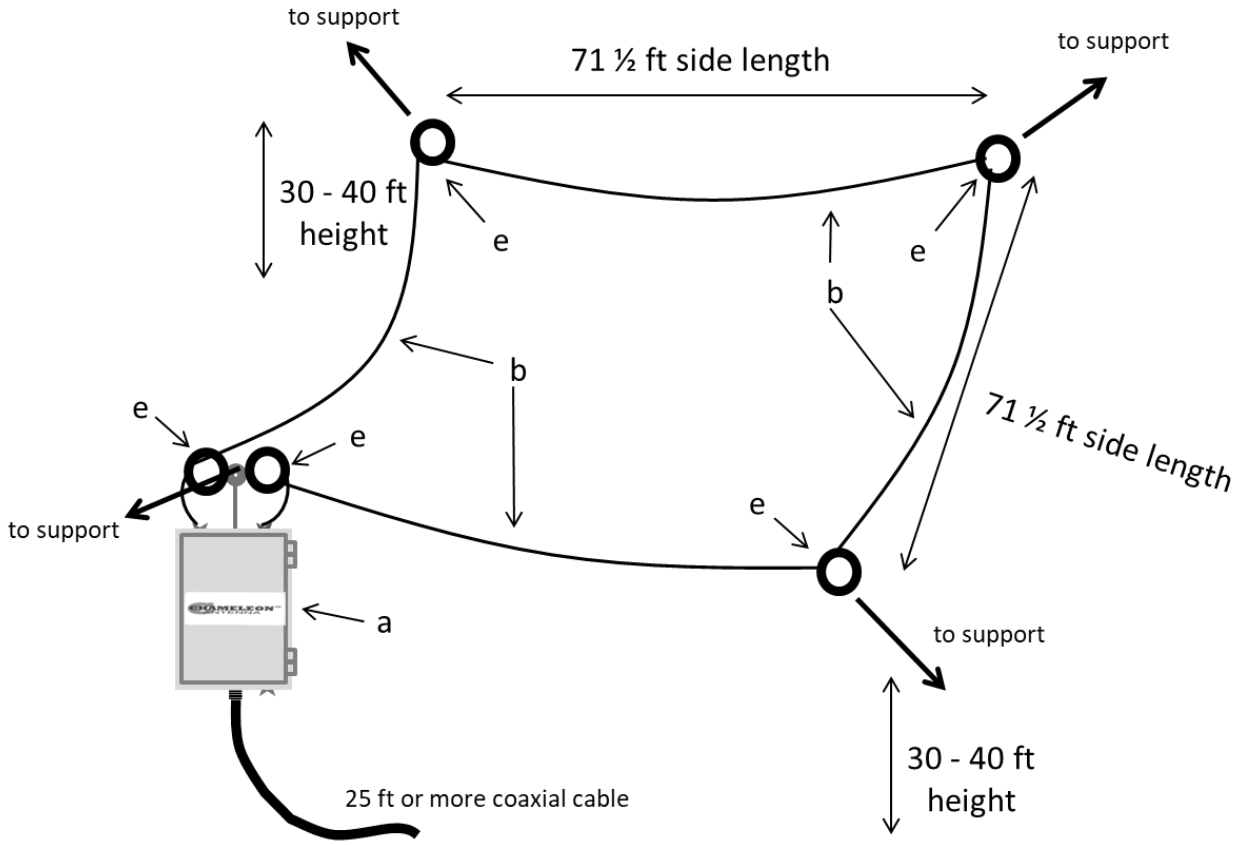


Figure 1. SKYLOOP Antenna Installation.

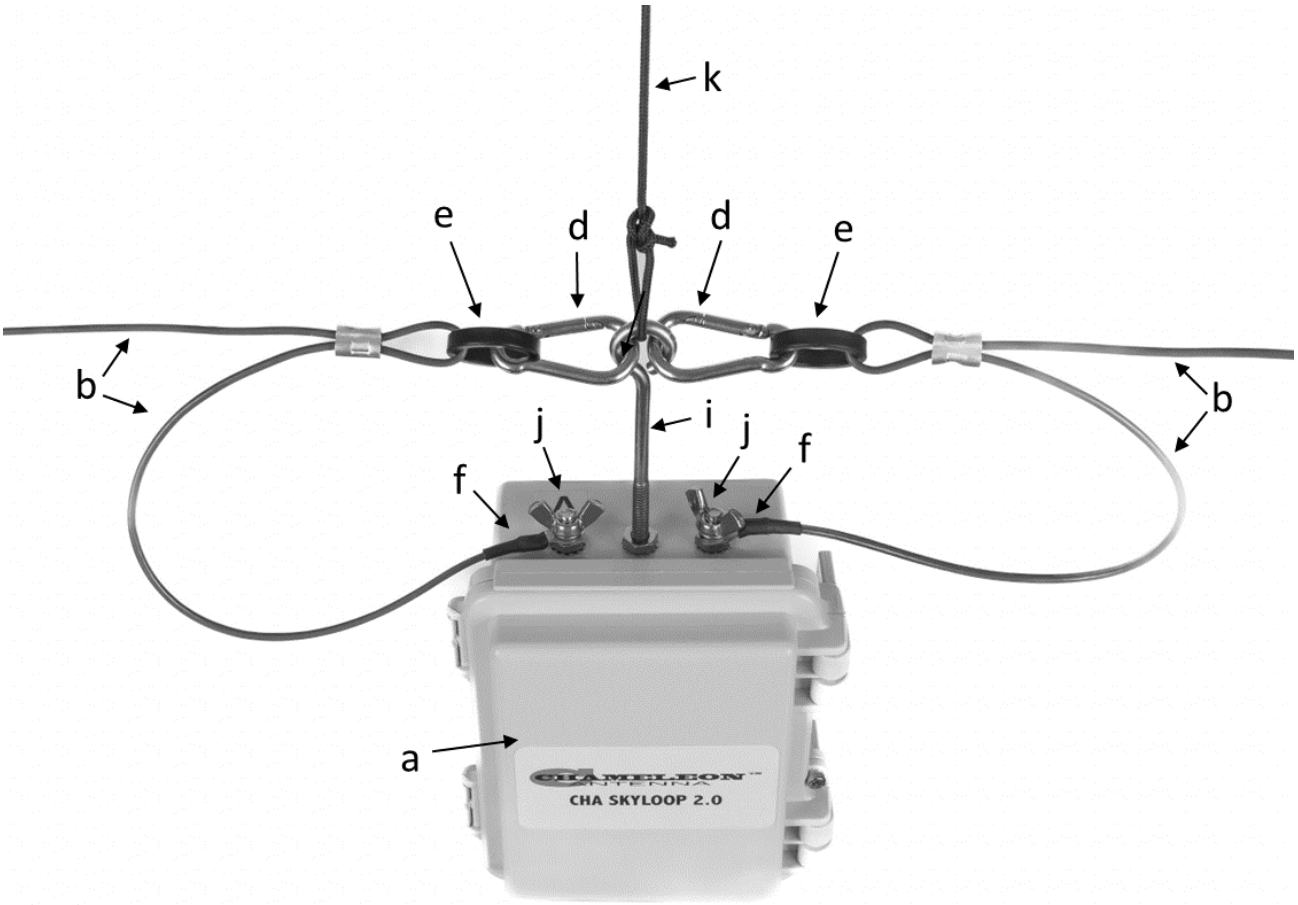


Figure 2. SKYLOOP Electrical and Mechanical Connections.

Site Selection and Preparation.

1. Select a site to deploy the CHA SKYLOOP 2.0 horizontal loop antenna. The site must have four supports that will position the corners of the antenna at least 72 feet apart and 30 to 40 feet high. Further apart is better as it will allow for shaping and leveling the antenna loop. *The loop does not have to be perfectly square.*
2. If not already attached, connect a Carabiner (d) to each of the Isolation Rings (e) at the ends of the Antenna Wire (b).
3. Unwind the Antenna Wire (b) from the Line Winder (c). Lay out the Antenna Wire on the ground approximately under where the antenna will be erected.
4. Move the Isolation Rings (e) along the Antenna Wire until they are near the support where they will be suspended.
5. Using a Bowline, or similar knot, tie a long length (minimum of 50 feet) of Support Line (k) to each of the three Isolation Rings
6. Place the Matching Transformer (a) on the ground near the support where it will be suspended.

Connect the Matching Transformer. Refer to Figure (2) for steps (7) – (11).

7. Attach the Carabiner from one of the Antenna Wires to the Transformer Eyebolt (i).

8. Attach the Wire Terminal (f) on the end of the Antenna Wire to one of the Antenna Terminals (j) on the Matching Transformer.
9. Attach the Carabiner from the other end of the Antenna Wire to the Carabiner from step (7).
10. Attach the Wire Terminal on the end of the Antenna Wire to the other Antenna Terminal.
11. Using a Bowline, or similar knot, attach a long length (50 feet) of Support Line to the Carabiner from step (7). Your assembly should look like Figure (2).
12. If used, connect the ground wire to Ground Connection (g) on the Matching Transformer.
13. Connect a CHA RFI CHOKE and coaxial cable or Integrated RF Choke end of the CHA Coaxial Cable assembly to the UHF Socket (h) on the Matching Transformer.

Raise the Antenna.

14. For each corner of the antenna, using a throw weight or other method, loop the Support Line attached to the Insulator or Matching Transformer over the closest support.
15. Alternately raise each corner of the antenna to the desired height, ensuring the antenna retains a mostly square shape, see Figure (3). *Also, be sure to not pull the antenna too tight, as you don't want the only thing keeping your trees from swaying is the antenna wire!* Secure the ropes to the supports using a Round Turn and two Half Hitches, or similar knot.

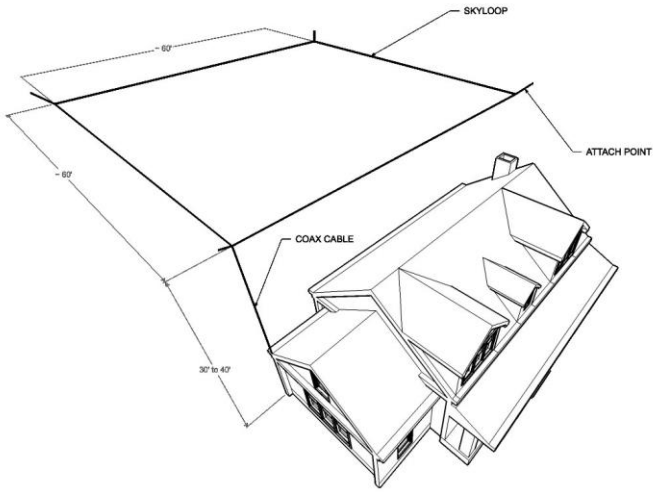


Figure 3. Installed SKYLOOP antenna.

16. Perform operational test.

Troubleshooting

1. Ensure Wire Connectors are securely connected to the Antenna Connections.
2. Inspect Antenna Wire for breakage or signs of strain.
3. Ensure UHF Plug is securely tightened.
4. Inspect Coaxial Cable assembly for cuts in insulation or exposed shielding. Replace if damaged.
5. If still not operational, connect a Standing Wave Ratio (SWR) Power Meter and check SWR.
6. If SWR is greater than 10:1, check antenna tuner using the technical manual or manufacturer's procedure. Be sure to check the Coaxial Patch Cable that connects the radio set to the antenna tuner or coupler.
7. If still not operational, replace Coaxial Cable assembly. *Most problems with antenna systems are caused by the coaxial cables and connectors.*
8. Connect a Multi-Meter to the Antenna Wire to check continuity. Replace assemblies that do not pass a continuity check.
9. If still not operational, replace Matching Transformer.

Specifications

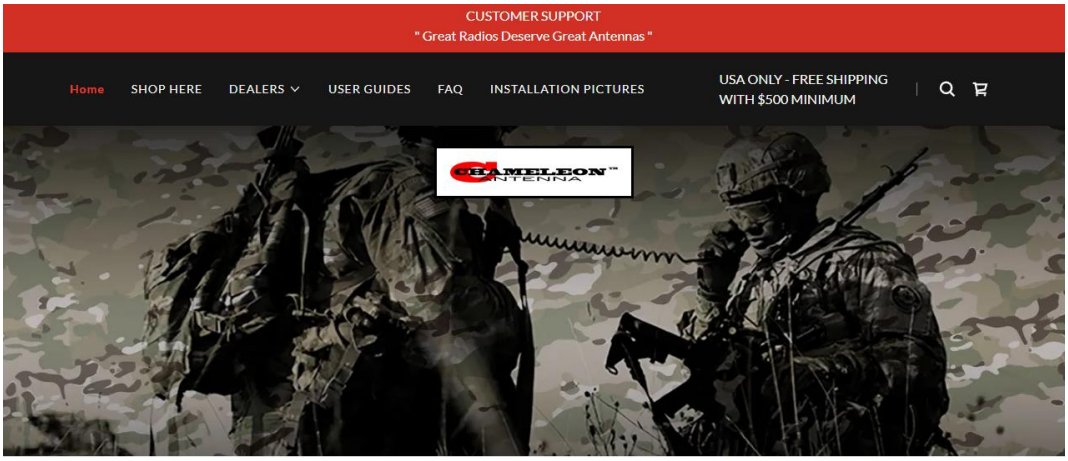
- Frequency: 3.5 – 54 MHz (80m through 6m ham bands) - *requires an antenna tuner*
- Power: 500W SSB Phone, 250W CW, 100W High Duty Cycle Modes
- Length: 286 feet wire, 71 ½ feet each of four sides.
- RF Connection: UHF Plug (SO-239)
- SWR: Varies by frequency, but within limits of most antenna tuners.
- Weight: 3 lbs.
- Polarization: Horizontal
- Personnel Requirements and Setup Time: one operator, approximately one hour

References

1. Silver, H. Ward (editor), 2013, *2014 ARRL Handbook for Radio Communications*, 91st Edition, American Radio Relay League, Newington, CT.
2. 1987*, Tactical Single-Channel Radio Communications Techniques (FM 24-18)*, Department of the Army, Washington, DC.
3. Turkes, Gurkan, 1990, *Tactical HF Field Expedient Antenna Performance Volume I Thesis*, U.S. Naval Post Graduate School, Monterey, CA.

Chameleon Antenna™ Products

Please go to http://chameleonantenna.com for information about quality antenna products available for purchase from Chameleon Antenna™ – The Portable Antenna Pioneer.



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