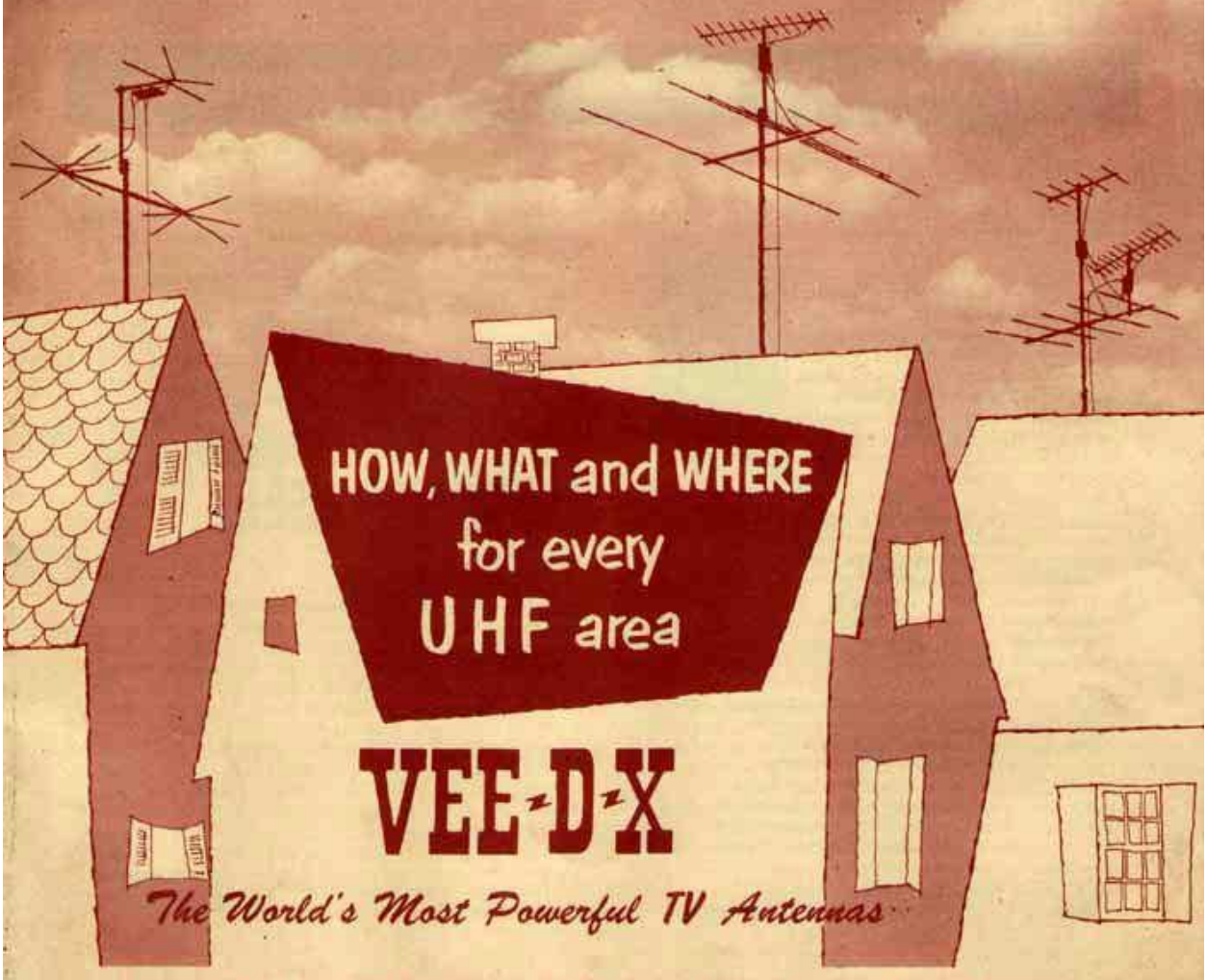
UHF

Antenna Systems



HOW, WHAT and WHERE for every UHF area

VEE-D-X

The World's Most Powerful TV Antennas

LaPOINTE ELECTRONICS INC., ROCKVILLE, CONNECTICUT

Foreword

The advent of commercial telecasting at ultra high frequencies will create many new problems for the service technician and installer. Normal procedures for VHF installations will not usually work in this high frequency range due to signal cancellation and reflection which is not a major problem on channels 2-13. It is the purpose, therefore, of this booklet to acquaint the service dealer with the new forms of television antenna and accessory equipment that is being manufactured by Vee-D-X for use on channels 14-83.

The equipment described on the following pages is a result of continuous research and "on the air" field testing of each system during the past three years. No single booklet of this length could possibly describe all types of UHF antennae, but the major types illustrated will be standard for the majority of metropolitan and "fringe" installations and are in process of manufacture by Vee-D-X. The Vee-D-X engineering staff as always will be pleased to answer any questions regarding installations not described herein, and to make recommendations for improving reception in this new ultra high frequency range.

QUESTIONS AND ANSWERS FOR THE TECHNICIAN

Question In the new UHF spectrum, what kind of a dependable receiving range may normally be expected?
Answer The reception area of any UHF station is dependent upon many factors. The distance between transmitting and receiving sites, transmitted power and transmitter antenna height areequally important in the UHF range. Terrain problems are much harder to compensate for, however. The UHF signal travels much as a beam of light and locations behind hills, etc. may be in complete signal nulls. In coastal areas the signal suffers only slight attentuation where a high percentage of the route is over water. With present power allocations, the UHF service area has been figured at roughly 40 miles.

Question How is the UHF signal affected by average terrain as compared to a VHF transmission?
Answer The UHF signal being of much shorter wavelength is much more subject to ground attenuation than the VHF wave. Obstructions in the signal path cause scattering of the original signal in several directions, and in many cases complete absorption of the total wave can result.

Question Why is the reflection problem so much more critical at UHF?
Answer The problem of multi-path or reflected signal pickup will be much more serious at UHF. The number of additions and cancellations at any considered point is aggravated by the short distance between the crests of two successive waves. The number of maximum and minimum points that may be encountered at any considered distance is a rather complex addition and out of phase cancellation of all these factors. An easy way to check the existence of "standing waves in space" is to move the antenna horizontally in line with the signal. If a high degree of reflected signal exists, sharp nulls and high signal points will be observed. Almost every installation must be probed for the best antenna location even in an area of high signal level.

Question What is meant by "height cancellation" at UHF?
Answer Cancellation and addition of signal exists to a very marked degree in the vertical plane at UHF. This is due to the sharper angles of bending in the atmosphere, and the greater possibilities of a change in polarization of the original horizontal wave. The combination of in and out of phase components cause layers (horizontal) of high and low signal points in the vertical plane. In areas of weak signal level it is extremely important that these high signal points be located by probing.

Question Will different antenna systems be used for new installations as opposed to additions to existing VHF antennas?
Answer The desirability of using a single transmission line for both VHF and UHF signals has resulted in the design of the MM-30 filter unit for mixing of these two unrelated signals without interaction. Page 6 describes methods of attaching a UHF antenna to an existing VHF installation through the use of an MM-30 and the Vee-D-X Model AB adapting bracket. This is the simplest and most economical method of adding UHF to the present VHF antenna mast. In the case of a new installation the Ultra Q-Tee can be used. This antenna covers channels 2-83, and incorporates an MM-30 as part of its integral construction. The Ultra Q-Tee is described on page 4.

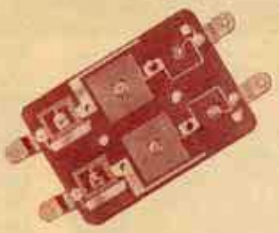
Printed in U.S.A. Form No. LP52-130

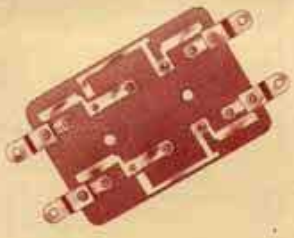
The Mighty Match

A small device destined to play a mighty role in combining VHF and UHF reception.

MODEL MM-30

*Lic. A.A.K. Pats. 2,422,458;2,282,292 others pending





The Vee-D-X Mighty Match, Model MM-30, is a patented device that is destined to play a mighty role in present and future TV antenna installations. Not only is it used as an integral part of the now famous Vee-D-X (2-83) Ultra Q-Tee, but as more UHF stations go on the air, its use will serve as the simplest and most efficient method of combining VHF-UHF antenna systems. In fact the MM-30 will solve every installation problem even to satisfying antenna terminal requirements at the TV receiver itself. On this and the following pages the many uses of the Vee-D-X Mighty Match are described.

The MM-30 is a multi-section isolation filter employing newly developed printed circuits that permit extremely compact construction. The printed circuits (shown above) consist of six separate sections which are independently resonant at critical frequencies in the VHF and UHF spectrum. The electrical action of the filter is entirely automatic, eliminating the necessity for manually operated switches. The MM-30 filter is a compact single unit 3-1/4" long, 2-1/4" wide and only 1/4" thick. The case is firehouse-red weather-proof polystyrene.

THREE IMPORTANT USES

1 Permits the use of a single transmission line between separate VHF and UHF antennas

Saves time ... looks better. Eliminates the cost of separate transmission line. See application with the Universal Mounting Bracket - page 6.

2 As part of a combination VHF-UHF antenna

The MM-30 makes possible the ultimate in all-channel antennas for receiving both VHF and UHF using a common transmission line. See the Ultra Q-Tee (2-83) on page 4.

3 As a universal filter at the TV set or convertor for all antenna terminal requirements

Permits the use of a single transmission line where separate VHF - UHF terminals are provided. For detailed information see page 8.

HOW TO INSTALL THE MM-30 MIGHTY MATCH

Connections are fast and simple. Using short pieces of 300 ohm line connect both VHF and UHF antennas to terminals as shown on diagram. Transmission line to set or convertor is then connected to center terminals MM-30 can be left supported by the line connections or mounted to mast or bracket. See page 6.

MODEL MM-20 MIGHTY MATCH

This new printed circuit isolation filter is for use with VHF. It permits the use of a single transmission line between separate high and low channel antennas mounted on the same mast. For use in combination VHF-UHF antenna installations, see page 7 - Situation 4. MM-20 is housed in green plastic case.

New Installations

COMBINATION ALL CHANNEL VHF AND UHF (2-83) ANTENNAS

The Ultra Q-Tee

ALL CHANNEL VHF AND UHF (2-83)

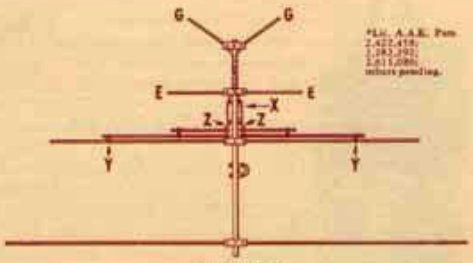
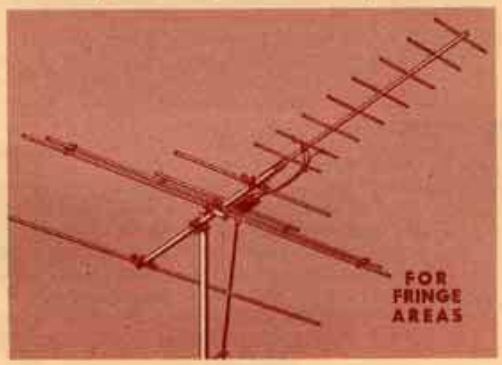


Figure 1

The Ultra Q-Tee is by far the most important antenna ever perfected. It solves one of TV's biggest problems by combining both VHF and UHF (all channels 2-83) into a single antenna using a single transmission line. The Ultra Q-Tee employs eight patented* printed circuit band reject filters that isolate the VHF and UHF portions of the antenna. The Ultra Q-Tee can be installed now for VHF - and it's ready for UHF. The Ultra Q-Tee eliminates the need for two or more antennas and multiple transmission line and switches.

The Ultra Q-Tee represents an entirely new electrical approach to broad band reception. Composite operation from Channels 2-83 (54-890 mc.) is achieved by utilizing a multi-section printed circuit filter (X) as an isolating medium between the VHF and UHF receiving sections. When considering operation on Channels 2-13, the extended UHF "V" type antenna (G-G) cannot affect operation because of the series filters connected between the transmission line and antenna (connection) points. Similar filter sections located in each side of the line are resonated at 69 and 195 mc. preventing simultaneous operation of this antenna at VHF. VHF director (E-E) acts as a reflector at UHF adding to the gain and directivity of the UHF receiving element. Throughout the UHF range, the 69 and 195 mc. filters are virtual short circuits. UHF signals are passed without attenuation through these filters to the common transmission line and receiver. Broad band reception on VHF (channels 2-13) is obtained from feed points (Z-Z) through the 680 mc. filters which are short circuits in this range. The use of two 195 mc. filters (Y-Y) make possible electrical isolation of the two separate receiving elements in the present TV bands. Broad band performance of the VHF section is accomplished by proximity coupling of all elements in the "driven" portion of the array. For additional gain the Ultra Q-Tee is easily stacked. A two-bay array increases gain 30% or better; a four-bay array increases gain 80% or better.

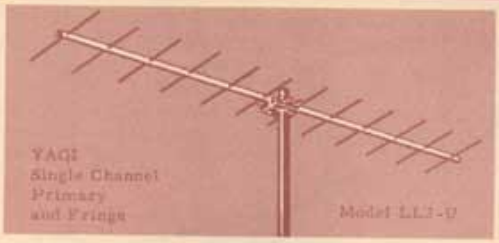


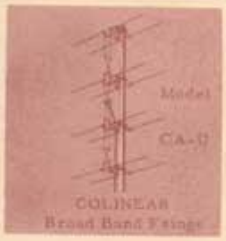
Ultra Q-Tee Suburban

Employing eight patented* printed circuit channel separators, the Ultra Q-Tee Suburban is designed for all-channel VHF and fringe area UHF. Note that a powerful, highly directive 8-element yagi replaces the "V" section front. This UHF Yagi section delivers 11 db gain and has an unusual band width of 60 mc. When ordering, be sure to specify UHF channel desired. For example, on channel 27 order Model UQT-SUB-27.

UHF Antennas

Three basic VEE-D-X types fit every requirement for every UHF area, both single and multi-channel.





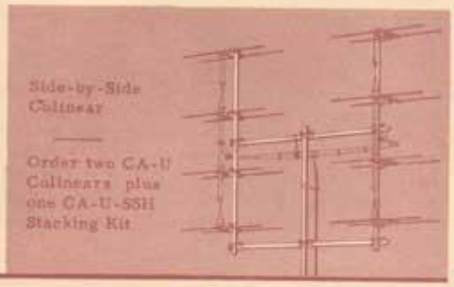
UHF YAGI As in VHF the yagi antenna still has more gain than any other type. In the UHF range, a 12-element yagi, as illustrated above, will deliver 14 db signal gain at its design frequency. This type of yagi has an unusual band width of 60 mc, making it an ideal antenna where two or more UHF channels fall within this range. The boom of the entire series of UHF yagis is constructed of weather-resistant fiberglass, thus permitting extreme mechanical rigidity, and superior electrical performance. Although yagi types have been used almost exclusively in fringe areas at VHF, they will become commonplace in UHF metropolitan areas where signal reflection is a major problem.

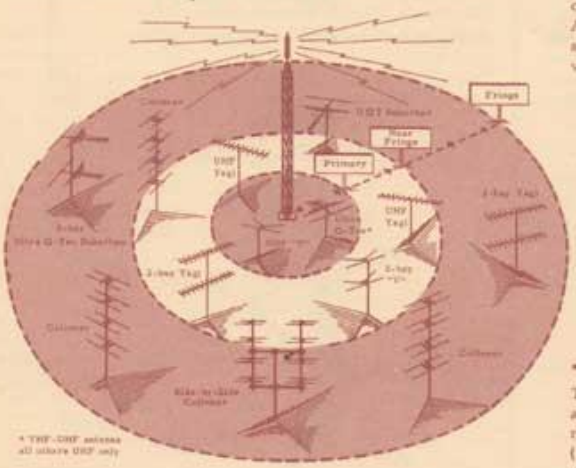
UHF "V" For multi-channel reception of several UHF stations the "V" type antenna is the logical choice because of its simple mechanical design and inherently excellent broadband characteristics. The critical angle of the V type antenna is designed to have an upper frequency limit of 1000 mc, with excellent gain and directivity over the entire UHF range. The reflector is cut to the low end of the UHF spectrum, and so spaced to cancel the normal back lobes of the V. The average gain of the simple V illustrated above is 3 db. Vee-D-X "V" antennas are also supplied with the MM-30 selective filter section which permits their use in combination with existing VHF installations without two or more transmission lines.

UHF COLINEAR The Colinear, much like the yagi type, is principally used in fringe areas where gain is the most important consideration. At the center design frequency the Colinear will deliver a maximum gain of 16 db. Although a "cut to frequency" antenna, the Colinear will cover 20 UHF channels on either side of the channel for which it is cut, yet still provide adequate gain. Such electrical characteristics are extremely desirable in fringe areas served by more than one UHF transmitter. Each of the four bays of the Colinear consist of a full wave radiator and reflector. The harness spacing is critically adjusted at the factory for optimum gain at the desired channel. The cross arms of all Vee-D-X antennas in this series are made of fiberglass for mechanical ruggedness and long life.

SIDE-BY-SIDE STACKED UHF COLINEAR ARRAY

For additional gain two Colinears may be stacked by using VEE-D-X Stacking Kit, Model CA-U-SSH which consists of 2 masts, 2 booms and a stacking harness. According to a leading TV receiver manufacturer, this stacked Colinear is the most powerful antenna yet developed for UHF. Total gain 19.8 db.





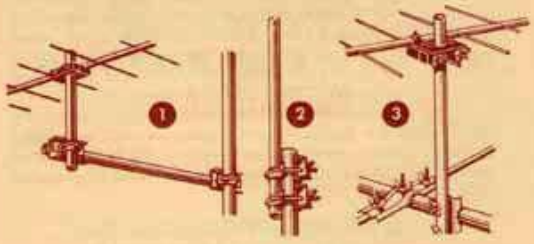
VEE-D-X UHF ANTENNA SELECTOR

The terrain map at left shows the probable UHF installation requirement for various distances from the transmitter. The Yagi types shown located in the first radius (metropolitan area) are not essentially prime signal area antennas but will be used in close to the transmitter to solve multi-path reflection problems in city receiving locations.

ADDING UHF TO PRESENT VHF INSTALLATIONS

THE VEE-D-X
UNIVERSAL mounting bracket

Model AB universal mounting bracket permits simple addition of the UHF antenna to the existing VHF installation. Two reversible U bolt type clamps at each end of the bracket make possible the mounting of practically every type of UHF antenna in 3 different ways. Model AB is also supplied with the MM-30 filter for single transmission line use.



THREE METHODS OF MOUNTING

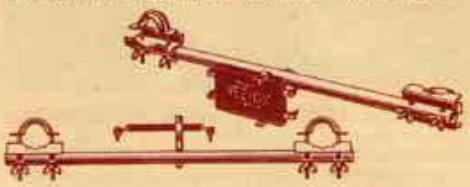
1. Model AB may be mounted horizontally off the existing mast below the present VHF antenna. In this case, the clamps in both ends of the bracket are left in position through the mounting holes in the bracket ends. The mast of the UHF antenna is slipped through the free bracket end, and orientated for maximum signal. The bracket wing nuts are then tightened for permanent installation.

2. If a UHF antenna such as a Colinear is to be mounted from the top of the existing VHF mast, the clamps at each end of the Model AB bracket must be reversed. The lower clamp is slipped over the VHF mast and tightened into position. The mast of the Colinear (vertical) is slipped through the top clamp, orientated for maximum signal and the clamp wing nuts tightened for permanent installation.

3. Where it is desirable to mount the UHF antenna above the present VHF, there are two methods available through the use of Model AB. For mounting a UHF yagi the bracket clamps are left in normal position (at right angles to the bracket proper). The lower bracket is clamped to the VHF antenna boom, and the UHF yagi boom clamped to the top of the bracket. A 90 degree positioning selection is allowed by a second set of U bolt holes located at right angles to the original clamp alignment holes.

THE UNIVERSAL MOUNTING BRACKET IS SUPPLIED 7 WAYS

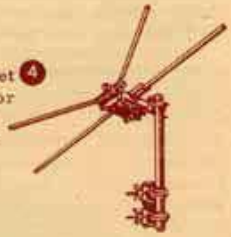
1. The bracket is supplied with the reversible end clamps as a universal mounting assembly. Model AB

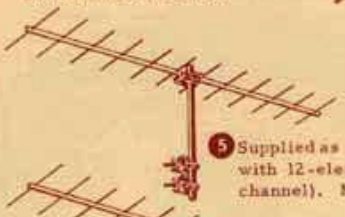


2. Supplied as a universal mounting bracket with a center transmission line connection. Model AB MM-30

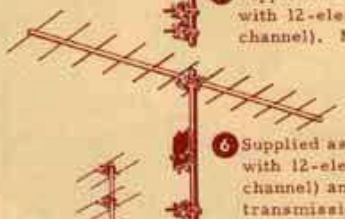
3. As a bracket with a UHF "V" antenna with reflector. Model AB-VR

Supplied as a universal bracket with "V" antenna and reflector and center mounted MM-30 for single transmission line. Model AB-VR-MM-30 4

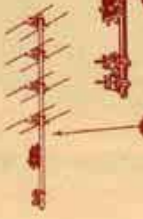




5. Supplied as a universal bracket with 12-element yagi (specify channel). Model AB-LLJ



6. Supplied as a universal bracket with 12-element yagi (specify channel) and MM-30 for single transmission line. Model AB-LLJ-MM-30



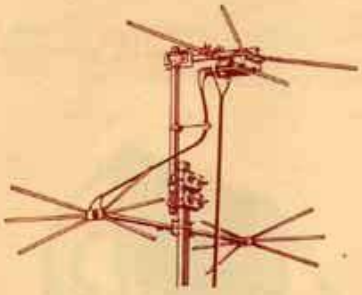
7. Supplied as a universal bracket and mast with a 4-bay Colinear (specify channels) and MM-30 for single transmission line. Model AB-CA-MM-30

Typical VEE-D-X VHF-UHF Installations

The different situations illustrated below are representative of existing VHF installations. Each case has a different solution through use of the Model AB universal bracket, MM-30 selective filter and appropriate UHF antenna.

PROBLEM 1

Prime signal area where an all-channel VHF antenna is used, such as a Conical or Q-Tee. Several UHF channels allocated in this area.



SOLUTION

Use Model AB with MM-30 and UHF "V" broad band antenna. Mount the V antenna in one of the positions described on page 6. Make appropriate connections to the MM-30, and use a single down lead to set.

PROBLEM 2

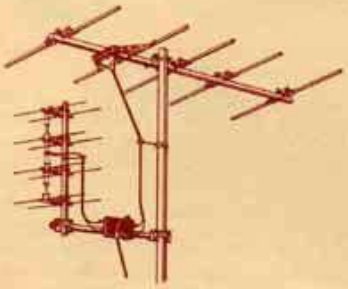
Prime signal area where an all-channel VHF antenna is used (Q-Tee). Single channel UHF allocation. Heavy reflection problem.

SOLUTION

Use Model AB with MM-30 and 12-element yagi cut to channel. Probe and orientate critically for maximum signal and minimum reflected interference. Make proper connections to MM-30 from each antenna and use single down lead.

PROBLEM 3

Semi-fringe area for VHF; fringe location for UHF. Two UHF allocations separated 30 mc. Present VHF antenna is a single yagi.

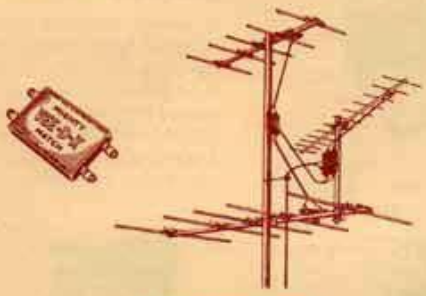


SOLUTION

Use Model AB with MM-30 and Colinear UHF antenna. Mount off VHF mast as described on page 6. Make proper connections from both antennas, and use a single down lead.

PROBLEM 4

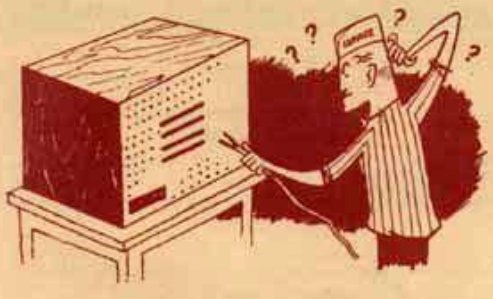
Fringe area for VHF. Present antennas one high and low band yagi. Common transmission line in combination with Vee-D-X "Mighty Match" (MM-20). Single UHF allocation.

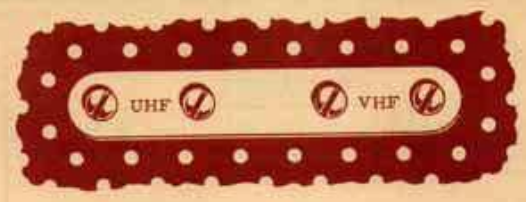


SOLUTION

Use Model AB with MM-30 and 12-element -yagi UHF antenna. Connect common line from VHF antennas to VHF terminals of the MM-30. Connect UHF yagi to UHF terminals of MM-30. Use common down lead.

Transmission Line connections to set or convertor





Typical terminal arrangement for both TV sets and convertors showing separate terminals for UHF and VHF.

At present, all TV set manufacturers are providing two separate sets of antenna terminals for UHF and VHF, using an internal mechanical switching arrangement for changing over from VHF to UHF and vice-versa. The same holds true for convertors. This terminal arrangement requires the use of a Mighty Match MM-30 when using a single transmission line for both VHF and UHF. The diagram at right shows a typical MM-30 installation at the set or convertor. Note that the line and terminal connections are made exactly the same as at the antenna (described and shown on page 3). It is entirely probable that, in the near future, aggressive manufacturers of both TV sets and convertors will incorporate the MM-30 within the chassis, thus allowing for a common transmission line and at the same time simplifying the installation.

Will I need special Lightning arresters for UHF?

KW-200-S TWO-WIRE STRAP MOUNT

KW-210 TWO-WIRE SCREW-TYPE

ANSWER -- NOT IF YOU USE VEE-D-X

Extensive tests by an independent laboratory using General Radio equipment, has proven all Vee-D-X lightning arresters to be satisfactory in performance throughout the UHF frequency. This is important as some arresters now being used at VHF will cause line loading and mis-match at UHF. All six VEE-D-X Lightning Arresters (shown here) have been thoroughly checked to 1000 mc.

KW-200 TWO-WIRE

KW-204 FOUR-WIRE

KW-300 ORIGINAL Heavy Duty TV LIGHTNING ARRESTER

KW-310 NEW OPEN WIRE ARRESTER

LaPOINTE ELECTRONICS INC., ROCKVILLE, CONNECTICUT