GENERAL ELECTRIC

PRESENTS

A MOTION PICTURE IN FULL COLOR

FEATURING

THE FREQUENCY MODULATION SYSTEM OF BROADCASTING

In simple, easily understood, everyday language, this picture answers the very common question—"What is radio?"

It also describes, by means of familiar analogies and colorful animation, the difference between conventional AM (amplitude modulation) broadcasting and the new improved FM (frequency modulation) system.

If you were asked what you would like to see done to improve radio reception you would undoubtedly mention the following:

(1) Eliminate static.
(2) Eliminate interference.
(3) Eliminate fading.
(4) Improve tone quality.

The manner in which FM overcomes these difficulties is convincingly explained and demonstrated.

APPLIANCE AND MERCHANDISE DEPT.
GENERAL ELECTRIC CO.
BRIDGEPORT, CONN.

"Listen—It's FM!"

THE CAST

CHARACTER	PLAYED BY
Mr. Morrison	Kirk Brown
Salesman	Don Kohler
G-E Representative	Donald Foster
Original Story	C. H. Bell
Technical Advisers	H. J. Deines E. F. Reihman
Photography	H. F. Stiles
Sound	D. Lopez
Direction	H. L. Miller

PRODUCED BY
SALES EDUCATION SECTION
W. D. Galpin, Manager

A customer enters the radio department of a retail store and brushes a few rain drops from his clothes. Examining a console model radio, he turns it on but the program is obliterated by loud static.

He attempts to turn the set off but the same musical program comes in with bell-like clarity.

Amazed, he remarks, "Say, what goes on? I do one thing and get a program with static—then I do something else and the static is gone!"

The salesman is on his job and offers an explanation. "That's right! You see, the *first* program you heard was conventional radio—the kind you've known for years. ***But the other was FM—a brand new type of radio broadcasting, that gives you static-free reception summer and winter!***"

"I was to meet my wife here this afternoon. We wanted to look at radios together. Has anyone been in asking for Mr. Morrison?"

"No, but while you are waiting, Mr. Morrison, why don't you sit down and let me explain a few things about FM?"

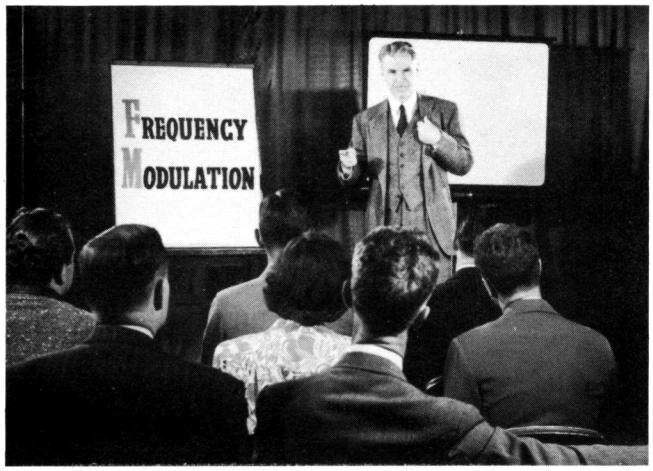
IMPROVING RECEPTION

This new system of broadcasting, using "Frequency Modulation" or "FM" for short offers the solution to many of the natural shortcomings of ***conventional broadcasting.***

If you were asked what you'd like to see done to improve radio reception, you would undoubtedly mention the following:

1. ELIMINATE STATIC.
2. ELIMINATE INTERFERENCE.
3. ELIMINATE FADING.
4. IMPROVE TONE QUALITY.

In order to understand the reason for these evils of conventional radio ***and how FM can correct them,*** let's first answer this very common question: ***WHAT IS RADIO?***

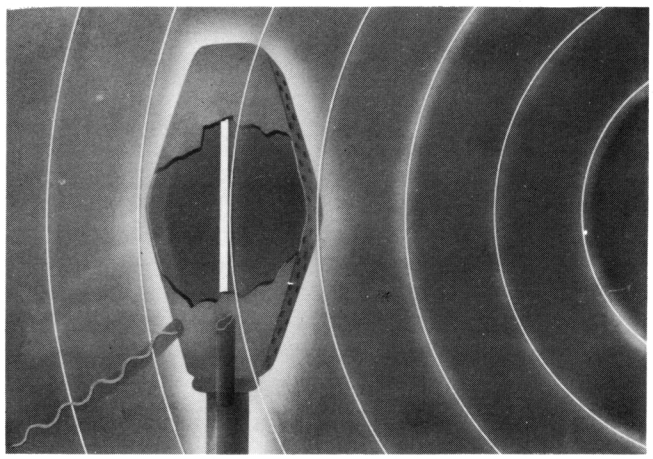


Radio is a system of wireless communication in which the sound waves in the studio are changed into an electrical wave by the transmitter. This is radiated into space and picked up by your receiver, which changes the electrical wave back again to sound through the loud-speaker.

FREQUENCY

We know that day and night extend over a 24-hour period. Any change such as this which reoccurs regularly is what we call a "***cycle.***"

Now suppose we reduce the period of time from 24 hours to only one second. If the change repeats itself in this length of time, we say the "***frequency***" is one cycle per second.



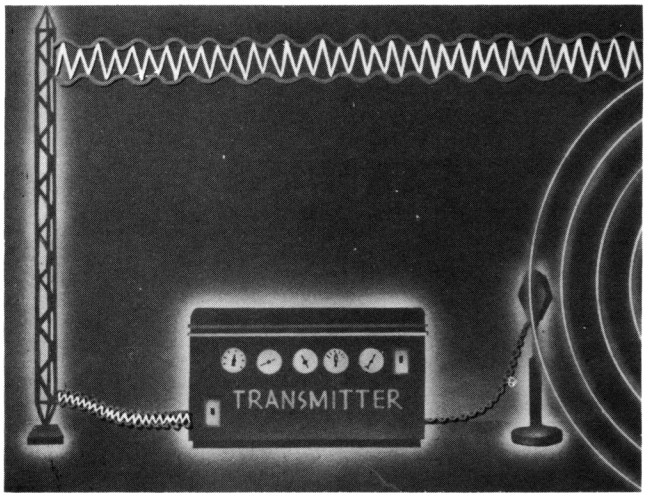
Electrical waves are also measured in cycles per second. When a sound wave strikes the microphone in a broadcasting studio, the delicate diaphragm vibrates in accordance with the waves. This motion sets up a series of electrical waves which correspond to the sound waves.

CARRIER WAVES AND FREQUENCIES

The electrical waves, however, do ***not*** have the ability to travel through space. In order to "carry" them from the microphone to the receiver in your home, a wave of much higher ***frequency*** is required. ***This is called the "carrier wave" and simply acts as a means of transportation for the sound wave!***

Your conventional radio dial covers a range of carrier frequencies from 550,000 to 1,700,000 cycles per second.

FM programs, however, are broadcast on much higher frequencies; 42,000,000 to 50,000,000 cycles per second.



MODULATION

The electrical sound wave is placed on the carrier by the transmitter. We call this modulation! When your conventional type receiver is tuned to a station, it picks up the "modulated wave" and discards the carrier which has served its purpose. The receiver then amplifies this electrical wave which is changed by the loud-speaker to a mechanical motion of "the cone." This produces "sound" vibrations in the air which should correspond to those produced in the studio.

WHAT FM DOES

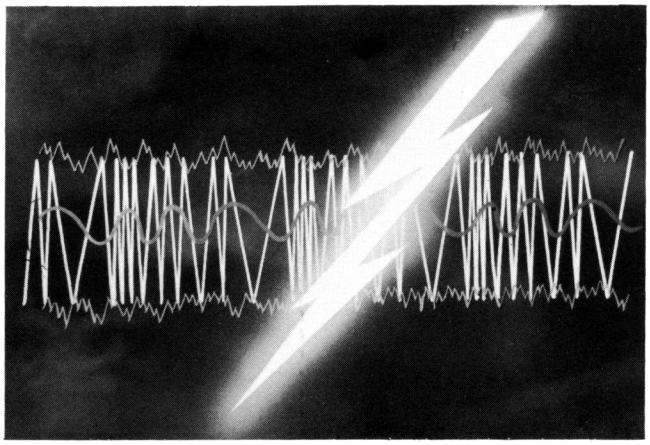
What happens when the electrical wave from the microphone is placed on the carrier?

With the conventional AM or amplitude modulation system the carrier wave increases and decreases in height, depending on the sound in the studio. ***But the distance between each wave (the "frequency") remains the same!***

In FM, however, the sound wave may be considered as nestled ***inside*** the carrier, thereby causing the carrier wave to "bunch together" in some places and "stretch out" in others ***so the distance between the waves changes rather than the height of the wave which does not change!*** In other words, the frequency is modulated.

STATIC AND DISTORTION

Man-made static and natural static do much to spoil radio reception. Thunderstorms are probably the worst enemy of ***conventional*** broadcasting because lightning has a nasty habit of distorting radio waves. The hills and valleys of the conventional wave lose their original contour and become jagged in appearance.



In conventional radio it is necessary to use the entire upper half of the carrier wave in order for the ***sound*** to be intelligible which, unfortunately, also allows static to enter.

But in the FM system, although the waves are just as susceptible to lightning, ***it is not necessary to use the entire height of the carrier wave.*** So, the FM receiver "shaves off" the distorted top and bottom of the wave, thereby reducing the static to the vanishing point, provided you live within the "service area" of the station. ***The result is clear, clean-cut, sound reproduction even during a storm!***

STATION INTERFERENCE

The familiar chattering and garbled reception caused by conventional stations on the same or adjacent channels interfering with each other Is Practically Eliminated by FM!

One of the Amazing Things About FM Is That Although You May Live Within the Service Area of Two Stations of Equal Power, Broadcasting on the Same Channel, You Receive Only the One Nearest to You!

Two conventional stations interfere because there is insufficient "clearance" between the channels. So, one station's program can "overlap" that of another on an adjacent channel.

In the case of FM Stations, sufficient clearance is available to prevent this interference. ***Actually FM Stations Use Only 75 Per Cent of Their Channel Width, Thereby Leaving a Comfortable "Safety Zone" to Guard Against "Overlapping!"***

FADING

All radio stations, both conventional and FM, actually send out a ***series*** of waves. Some of these follow more or less the contour of the earth and are called "ground waves."

Others go shooting up into the sky and are known as "sky waves." At night, the sky waves hit a ceiling called the "Heaviside layer" which reflects these sky waves down to the earth again.

When these ***two*** waves reach the set ***at the same time***, the volume is normal. But occasionally the sky waves are delayed, causing the annoying distortion and fading common with conventional receivers.

BUT NOT WITH FM!

Being of much higher frequency, the FM sky wave is ***not*** reflected by the Heaviside layer, but goes right on through and leaves the earth.

It is only the ground wave you hear when tuning in an FM station! Since (1) there is no need to depend on the Heaviside layer as a reflector and because (2) there is no sky wave to interfere, our FM reception is ***not*** interrupted ***And the Program Volume Remains Practically Constant Through Day or Night Broadcasts!***

IMPROVED TONE QUALITY

The human ear is sensitive to sound waves as low as 16 cycles per second and to as high as 16,000 cycles per second.

Remember that it is necessary to hear the ***entire*** range of frequencies created by any sound to achieve "natural reproduction." ***This is not possible in conventional broadcasting because of channel crowding!***

Since the conventional receiver is only designed to reproduce frequencies not exceeding 5,000 all of the important high notes are lost!

A Good FM Receiver, However, Is Capable of Reproducing a Much Wider Range of Frequencies —This Not Only Improves Tone Quality, But Actually Achieves Life-like Reproduction.

G-E sets are tops in quality not only because they're made by a pioneer in the FM field, but by a manufacturer famous for quality in all electrical products the world over.

A FOREGONE CONCLUSION

"Gosh, I wish my wife was here," says Mr. Morrison after listening to this demonstration. "I'll call home and see if she's left. Do you have a 'phone handy?"

"Why not ask Mrs. Morrison if she'd like to come down to the store tonight after dinner," suggests the salesman. "I'll be glad to call for you in my car."

When his wife answers the 'phone, Morrison bursting with enthusiasm says, "Honey—come on down and hear this new FM radio, with no static, no interference, and perfect tone."

He hangs up, turns to the salesman and winks with evident satisfaction. There's going to be an FM set in his home or his name isn't Morrison!

THE END.

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