

LOU BURROUGHS

MICROPHONE FACTS

for the operating engineer

from *Electro-Voice*[®]

ELECTRO-VOICE, INC.
BUCHANAN, MICHIGAN
PHONE OX 5-6831

THE MODEL 643 CARDILINE MICROPHONE

Three years ago, four prototypes of the Electro-Voice model 643 were constructed to determine the usefulness of this type of unit in each of a number of applications.

The 643 is actually a seven-foot version of the model 642. Its additional length, plus other alterations, have made it five times as directional as its little brother, making it the most directional, wide-range response microphone ever made.

DIRECTIVITY OF THE 643

Since the angle of acceptance of all makes and types of microphones narrows as sound rises in frequency (see polar response curve on 643 specification sheet), it is impossible to give an angle of acceptance without specifying a frequency. In an attempt to give you a reasonably factual rule-of-thumb guide to the angle of acceptance of various microphones we will begin with the model 655C, which is essentially nondirectional. Refer to Fig. 1 for a comparison of Electro-Voice models 655C, 666, 642, and 643. We arrived at the angle of acceptance of each empirically by having a person stand at a given distance in front of each microphone, and, while he was talking, the microphone was rotated until a noticeable drop in level occurred. These are the angles shown on the chart.

To help further in clarifying acceptance angle, Fig. 2 has been included. Here are angles shown in the form of complete cones as they actually exist. Regardless of how these microphones are positioned, the pickup pattern will be symmetrical, except when distorted by the proximity of reflecting objects.

The 643 is shown as having an angle of acceptance of 40° before noticeable drop in level. I want to be certain this is not misunderstood as the cutoff point of sound and that nothing will be picked up outside of the cone. The 40° included angle is just the starting point for cancellation, and, as the 643 is rotated from an on-axis position to 180° off axis, there will be a progressively greater drop in level.

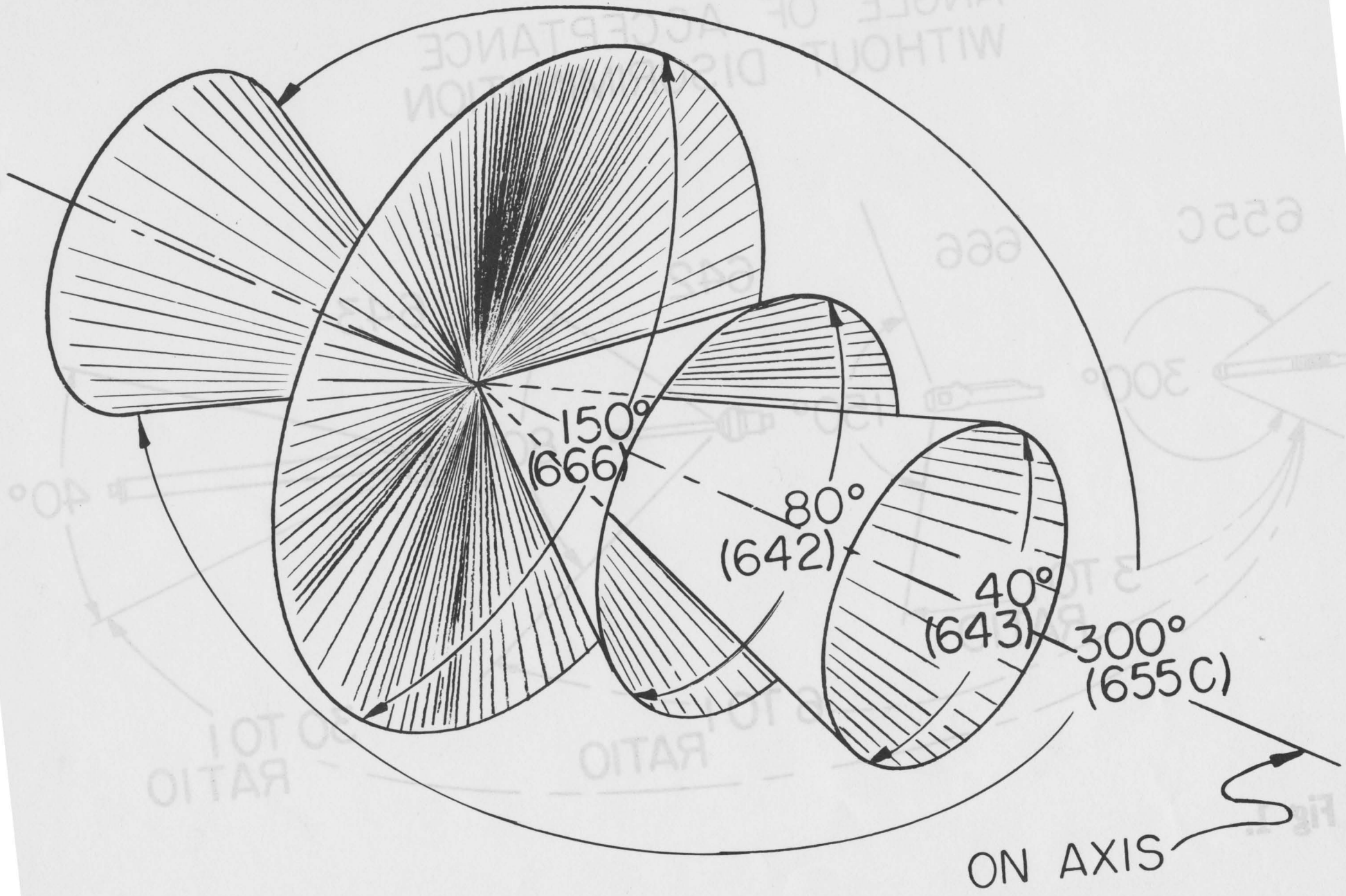


Fig. 2

The ratios of 3 to 1, 6 to 1, and 30 to 1, indicate the difference in random noise rejection between the four units. This does not mean these ratios apply under all conditions. Sound reflected from a wall or any object that happens to be on axis may seriously reduce them. Also, remember, every time distance from the source of sound is doubled, the gain control must be advanced 6 db to maintain level. This fact may also reduce pickup distance when used for public address, since feedback level will be the limiting factor.

A DISCUSSION OF OPERATION

During the months of testing, many individuals have tried one or more 643's on their particular long reach jobs, and, as a result, many problems have been solved, and of course, some failures have occurred. Most of the disappointments were due to a misunderstanding of the capabilities of the unit.

Following are a list of questions and answers which, I hope, will help you in your application of the 643.

Q - The 643 picks up sound from the back and sides and is not dead, as I thought it would be. What is the trouble?

A - There is no such thing as a microphone that will exclude all sound originating at the sides or back. The 643 will cancel sound originating at from 90° to 180° off axis by 20 db or more, as indicated on the polar response chart, but its success will depend on the level and distance of origination of the on-axis sound as related to the off-axis sound. For example, if the on-axis sound originates at a distance of 20 feet from the 643, and a 90° to 180° off-axis sound occurs at the same distance and intensity, the off-axis sound will be reduced by as much as 20 db, if none of the off-axis sound is reflected into the front when used indoors. On the other hand, should the off-axis sound originate at a distance of two feet and remain at the same level, it will then be reproduced at the same level as the on-axis sound. This is the reason: the 643 is still cancelling the unwanted sound by as much as 20 db but, due to the difference in distance, the off-axis sound is 20 db louder than the axial sound, and they both reproduce at the same level.

In summary, the 643 may be expected to give a good account of itself when reduction of random noise and reverberation is the problem. When unwanted sound originates from a definite direction, locate the 643 as far from it as possible and keep the back of the 643 toward it as nearly as possible.

Q - I have tried a 643 inside of a truck, pointing out of the rear door, in a building pointed out of window or door and have tried to pick up sound down a long narrow hall. In each instance, the results were very disappointing. What is the trouble?

A - Before analyzing these failures, I want to be certain the operation of the 643 is understood. The microphone element is located in the large housing at the base of the long tube. If someone stood as close as he could get to the 643, on axis, he would still be 6' 7" from the diaphragm, or pickup source. The long tube has nothing to do with the pickup of sound on axis, its only function is to cancel out unwanted sound originating off axis.

Now for the answers. When the 643 was located in the truck, all sound, both the wanted and unwanted, arrived at the 643 on axis since the only entrance was at the truck door. Therefore, it picked up all sound since none was arriving at the sides to be cancelled, except that originating inside the truck. In this instance, the cancelling ability of the 643 had been nullified and it was operating as a nondirectional unit.

The 643 located in a room and pointed through a door or window produces much the same result as when used in the truck. The main difference is the size of the room and resulting reverberation component. This the 643 will control.

Operating the 643 in a long hall will again nullify its directional effect since an extremely large percentage of the unwanted sound is being channeled by the hall directly into the front of the microphone.

Do not choose locations for the 643 such as building entrances, under marquees or porches and close proximity to walls or other reflecting surfaces. It will operate under these conditions but do not expect maximum rejection of unwanted sound.

Q - What should I expect of the 643 in regard to reproduction of the presence range?

A - Due to its narrow angle of pickup and resulting cancellation of a high percentage of off-axis sound, the angle of acceptance path is cleaned of a correspondingly high percentage of random noise. Due to this cleaner path of pickup, on-axis sound is far more free of noise dilution making it possible to increase the microphone-to-subject distance with a decreasing loss in presence.

We have found that the 643 does work under many extremes in P.A. and other applications where we thought it would fail. I suggest that you try it on your "impossible" jobs and see for yourself. It just might work, and then we will both be happy. See your distributor and arrange for a test.

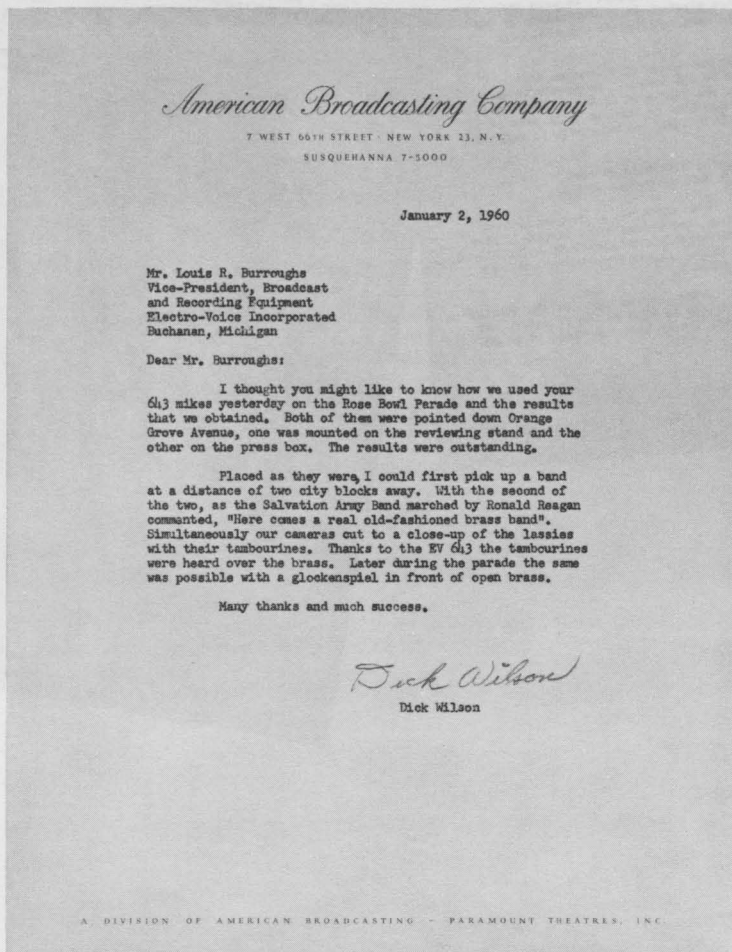
Q - What results may I expect of the 643 in outdoor applications on windy days?

A - The 643 has a built-on wind screen, removable only for replacement. This wind screen in conjunction with a 100 cps cutoff filter (included) eliminates distortion caused by wind, at velocities under 20 mph. The filter may be switched in or out as desired. Three bass level controls are also included to help adjust response for various conditions and may be used in conjunction with the cutoff filter to solve wind and acoustic problems. Indoors, where low frequency reverberation is a problem, these controls will be found invaluable, especially the cutoff filter.

CASE HISTORIES OF THE 643 IN USE

The first test of the 643 where musical pickup was of major importance occurred at the 1960 ABC Telecast of the Pasadena Tournament of Roses Parade. It was the responsibility of Richard W. Wilson to see that an outstanding audio pickup was made.

Following is Dick's letter describing his use of the 643:



One of the very first continued uses of the 643 is the pickup of voices and sounds at football games. The following letter from Charles Buzzard describes another ABC field application. Due to Chuck's proximity to our plant and his continued eagerness to try new things, he and I have made many tests over a period of several years.

American Broadcasting Company

190 NORTH STATE STREET - CHICAGO 1, ILL.
ANDOVER 1-0800

WBKB - CHANNEL 7
CHICAGO

November 15, 1961

Electro - Voice
Mr. L. R. Burroughs, Vice President
Broadcast and Recording Equipment
Buchanan, Michigan

Dear Lou:

I believe that you are aware of the fact that ABC-TV has been telecasting the NCAA football game for the last two seasons. When we acquired the rights, it was decided that we should make every attempt to upgrade the pickup techniques that have been used over the years. To this end, we added cameras, deviated from the so called classic locations, utilized video tape, etc., for the picture portion of the telecast.

The audio presented a different problem however. For years the viewer has heard virtually nothing but the crowd, the band, and the announcer. We were aware of the fact that if a person actually sat in the stadium, he could frequently hear sounds of the ball being kicked, the quarter back calling his signals, body contact between linemen, etc.

About this time, your company released a limited number of prototype models of your present 643 microphones. This seemed to be the answer. We proceeded to acquire one of these, mount it on a monopod, and locate it on the sideline with a man assigned to it. Sufficient cable was supplied so that he could move with and keep abreast of the line of scrimmage. It worked! We were able to bring the viewer game sounds he hadn't heard before.

Then a real problem arose --- wind. We struggled with this as best we could, primarily with hi-pass filters, but this was a partial answer at best.

On September 30 of this year, you requested that we check out a production model of the 643 that was equipped with an Acoustifoam wind screen and a hi-pass filter. The game was Notre Dame vs Oklahoma, telecast nationally over ABC-TV from South Bend, Indiana. The weather was fine except for the wind. It was from the south at a velocity of 25 to 35 mph --- right across the mike.

The results were nothing short of astounding! In the pregame quiet of the stadium (11 AM) the heaviest gusts of wind read between - 30 to - 40 on the VU meter. At the same time, we were peaking 0 on a man talking loudly (not shouting) 50 to 60 yards away.

A DIVISION OF AMERICAN BROADCASTING - PARAMOUNT THEATRES, INC.

American Broadcasting Company

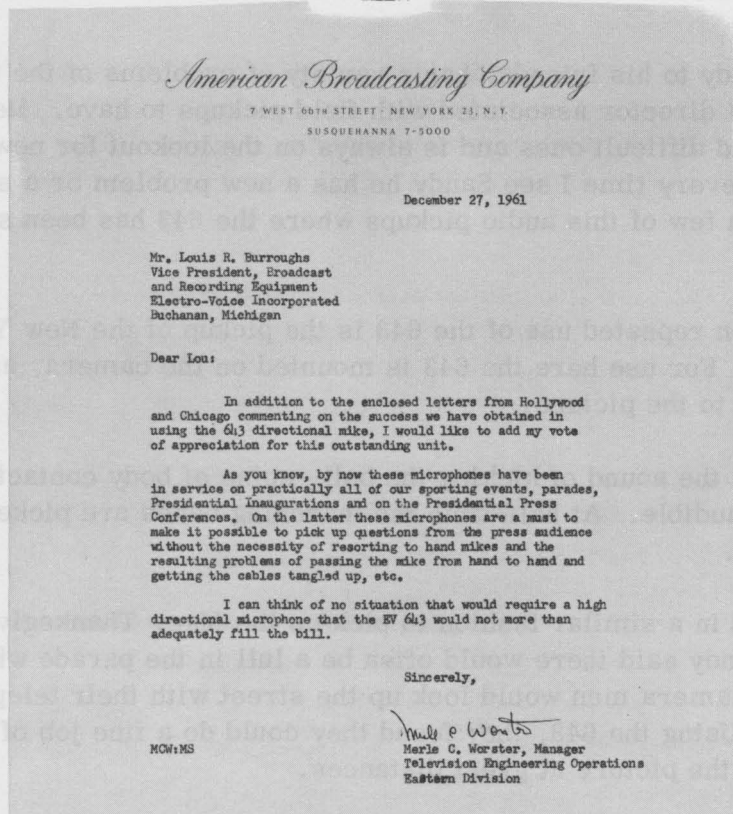
May I say to you that we are most grateful for the use of that 643. It made the difference between an ordinary sound pickup and an ABC-TV Pickup.

Sincerely,

Charles Buzzard
Charles Buzzard
Assistant Chief Engineer

CRB:bu

The next letter describes an application that has been responsible for our receiving many letters and telephone calls requesting information on the 643. This application is the use of two 643 microphones at President Kennedy's New Conferences. After you have read Merle C. Worster's letter. I have an additional comment to make.



The reason for many of the communications received regarding the 643 was that it was thought that the questions asked by the press and picked up by the 643 are fed back through speakers for everyone to hear. This, however, is not the case. All present, including the president, hear both questions and answers without the aid of a P.A. system. The two 666's on the podium and the 643's are for feed to network facilities only.

The following three case histories were written after conversations with Buell Taylor, Audio Technical Staff CBS-TV New York City. Sanford Bell, Technical Director CBS-TV New York City and Harold Shutzman, Audio Technical Staff CBS-TV New York City.

Buell Taylor, better known as Bill, is responsible for sound on several CBS-TV productions, one of which is the Garry Moore Show. Bill was the first to use the 642's at CBS and since that time has used them continually to solve boom problems on the Garry Moore and other shows.

Bill was also one of the first to test the 643 for distant pickup of music in the Garry Moore theater type TV studio. When a group of four singers were to be picked up, a 643 was used in the balcony, at the balcony rail. This placed the microphone between 40 to 50 feet from the voices. In this position it was compared with the 642 on a boom working at a distance of 5 to 8 feet. When the balcony was compared with the boom, I understand the pickup from the two was so nearly the same the producer was never sure which he was hearing. Since then, the 643 has been used to pick up choral groups and orchestras such as Count Basie, The Dukes of Dixieland, and similar groups.

American Musical Theatre, another of Bill's shows, used the 643 at a distance of 50 feet. Aimed at the string section, it was possible to pick up the fullness desired as well as giving bottom to the orchestra.

Sanford Bell, Sandy to his friends, has a variety of problems of the type you might expect a technical director associated with field pickups to have. He is continually faced with new and difficult ones and is always on the lookout for new solutions. It seems as though every time I see Sandy he has a new problem or a solution to talk over. Here are a few of this audio pickups where the 643 has been successfully applied.

Sandy's most often repeated use of the 643 is the pickup of the New York Giants Football Games. For use here the 643 is mounted on the camera, assuring that sound is always related to the picture.

During the game, the sound of kicking the ball, noise of body contact, and players' voices are quite audible. At half-time the marching bands are picked up with improved fidelity.

The 643 was used in a similar fashion to pick up the Macy Thanksgiving Day Parade in New York. Sandy said there would often be a lull in the parade where the cameras were set up and camera men would look up the street with their telephoto lens to pick up a band. Using the 643, they found they could do a fine job of picking up the music along with the picture at great distances.

Sandy also used the 643 at many press conferences. The last reported was at the Virgil Grissom press conference. It was used both inside and out to pick up the questions asked by the reporters and was used in tracking the Mercury Redstone Rocket. Here again, I am told that the audio pickup was clean, with a lot of presence.

A few months ago, the program "Accent" telecast a dramatic show, "Little Mary Sunshine". Sandy says it was picked up from the smallest theater he had ever seen. There was no room for a boom anywhere, on or off stage, so they gambled and told the production people they could do it with a 643 placed in the balcony. Sandy said he had confidence in the 643, but the audio man assigned for this remote did not believe it possible, so time was spent hiding microphones all over the stage. As it turned out almost all of the show was picked up with the 643.

Harold Schutzman, audio man for the show "Edge of Night", reports on a solution to a problem. A dramatic scene was to take place on a dock in a thunder storm. He was reluctant to operate the boom, and a 666R microphone in the rain so the boom arm was removed and an improvised mounting for the 643 was made to fit the carriage. Frank Mallow, the boom operator, normally uses the 666R at a distance of from two to three feet, but when using the 643, he worked at distances of from twelve to eighteen feet from the action, enabling him to stay clear of the water. I understand the producer did not know a change had been made, since there was such a slight change in the sound.

The 1962 Pasadena Tournament of Roses Parade was telecast by CBS, and once again, a pair of 643's were used, but this time they were production units, the first to be used where the musical pickup was of major importance. One 643 was located at the camera booth, forty feet in the air, at the rear of a section of stands, placing it at about 150 feet from the center of the street. The other was located on top of a camera platform, 21 feet in the air and about ten feet from the street. During the parade, when a band came in sight, over a block away, the music would be picked up, and the band followed by one 643 or the other until it rounded the corner and passed out of sight.

After the parade, I found Brooks Graham (studio operations engineer) happy with the results and feeling that the 643's had performed as anticipated in picking up the program material. A few weeks ago, I stopped in to see Paul Levitan (Director of Special Events for CBS) to discuss the New Year's Day activities. I found Paul very happy with what had been accomplished, since there had been only compliments from all concerned, from sponsor to operating personnel.

I have several more case history letters on file that will appear later in another letter. They will include information on theater, motion picture, and other applications.

The information you have read was supplied by these men in their unselfish desire to pass on ideas in operating technique to you, in the hope that a problem solved by them may be a problem solved for you.

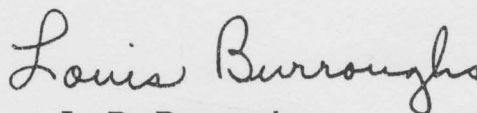
These men are eight out of many who have been instrumental in the field testing and ultimate design of the 643. I want to thank all of you for your most valued assistance.

The 643 is now in production in limited quantities. When ordering you may anticipate from two to four weeks delivery.

Anyone desiring to test a 643, contact your local distributor and he will make arrangements with our sales department.

Cordially yours,

ELECTRO-VOICE, INC.



L. R. Burroughs

Vice President

Broadcast and Recording Equipment

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May, 1962

ANGLE OF ACCEPTANCE WITHOUT DISCRIMINATION

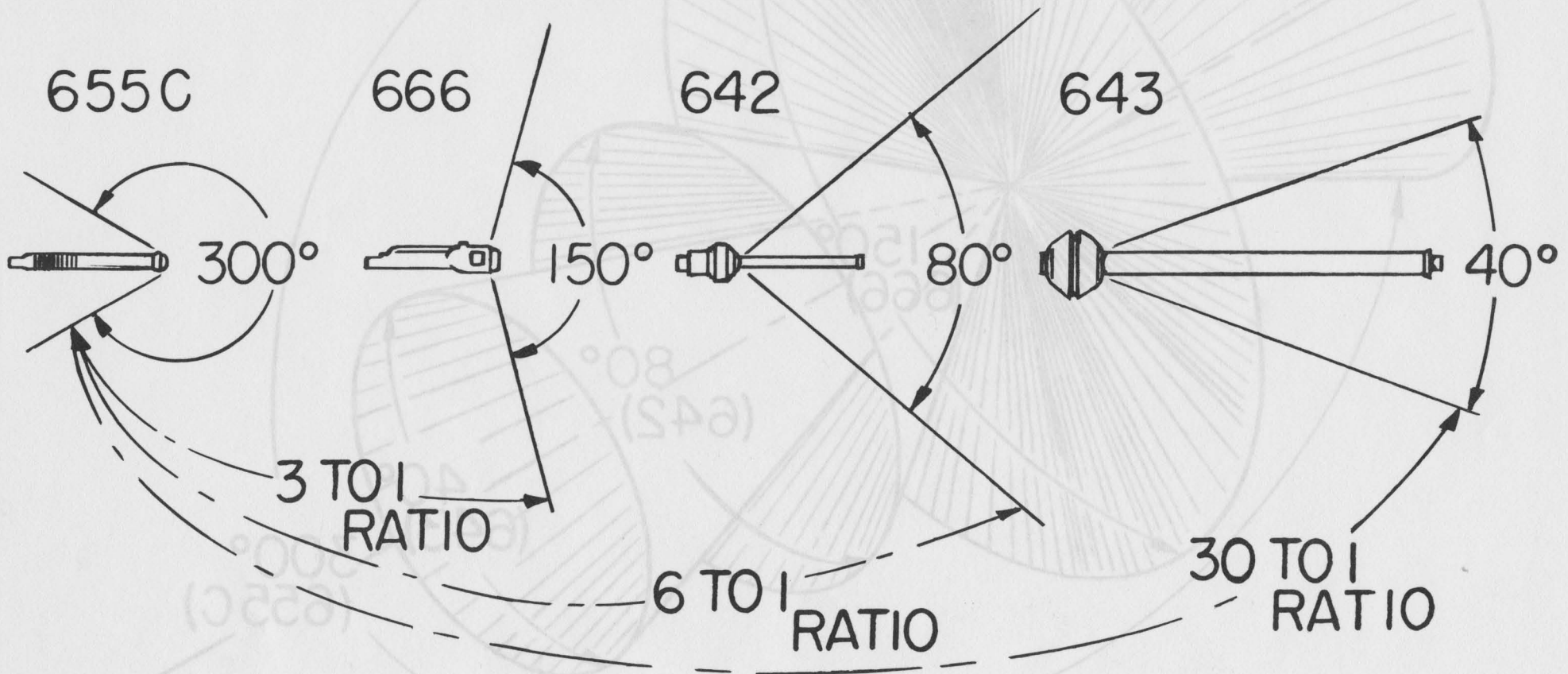


Fig 1.