INSTRUCTIONS

for

JUNIOR VELOCITY MICROPHONE

TYPE 74-A

(MI-4035)

RCA Victor Division

RCA Manufacturing Company, Inc.

Camden, N. J., U. S. A.

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OPERATING INSTRUCTIONS

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PART I—DESCRIPTION

1. **Introduction.**—The velocity microphone is the result of several years of intensive research and development toward the improvement of the characteristics of microphones as used for broadcasting purposes, and is entirely different in principle and construction from other microphones now in use. This microphone is admirably suited to remote pick-up, public address and sound reinforcement applications.

Instead of a "diaphragm" (in the commonly accepted meaning of the word), the velocity microphone contains a thin metallic ribbon suspended between the poles of a permanent magnet with its length perpendicular to, and its width in the plane of, the magnetic lines of force. The opposite ends of the ribbon are connected to a transformer which matches the impedance of the ribbon to a 250 or 50 ohm line. Sound waves reaching the ribbon vibrate it within the magnetic field set up by the magnet. The vibration of the ribbon is in exact accordance with the sound vibrations and, occurring as it does within the magnetic field, sets up corresponding alternating electric potentials across the primary of its associated transformer. These minute voltages are subsequently amplified to the power level required for broadcasting. The microphone amplifier may be located remotely from the microphone unit when necessary or desirable.

2. **Description.**—The velocity microphone shown in Figure 1 consists of a microphone unit mounted on a swivel at the top of a portable collapsible stand. The swivel mount permits the "aiming" of the transmitter in any desired direction. The transmitter is enclosed within a perforated metal casing which serves to protect it from mechanical injury and adverse wind effects.

The line coupling transformer is contained in a metal case as a part of the microphone unit.

The Type 74-A microphone unit is furnished with cushion mounting to fit a standard Type 59-A microphone stand. A suspension fitting is also supplied with the microphone to permit the unit to be suspended overhead when desired.

The microphone stand (Type 59-A), which is not furnished as a part of the equipment, is of the adjustable folding type with a three point base. The height of the transmitter may be adjusted to maximum and minimum heights of 63 inches and 36 inches respectively.

3. **Sensitivity.**—With an input sound pressure of 10 dynes per square centimeter perpendicular to the plane of the ribbon, the ribbon microphone unit will deliver 635 microvolts across a 250 ohm load, which is equivalent to an output level of –69 db. as compared

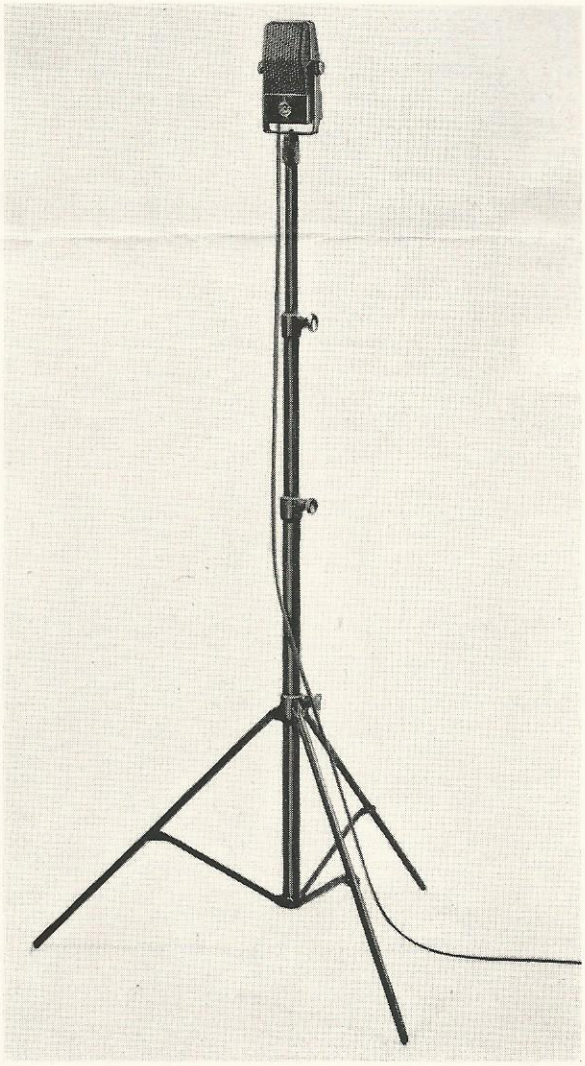

Figure 1—Microphone on program stand

with a zero level of 12.5 milliwatts, or –66 db. as compared with a zero level of 6 milliwatts.

On an open circuit basis of measurement, *i. e.*, with an input of 1 dyne per square centimeter (1 bar) perpendicular to the ribbon, the output of the microphone across an open circuit is the equivalent of –83 db. with reference to a zero level of 12.5 milliwatts.

4. Quality of Response.—The operating range of the microphone extends from 70 cycles to 8,000 cycles. When the microphone is located less than 2 feet from the source of sound the low frequency response is increased somewhat, and when operated at a greater distance (up to 4 feet) the low frequency response is slightly attenuated. Beyond the 4-foot operating distance the response characteristic is unchanged by changes in the operating distance. The frequency response is essentially unchanged by the direction of the incident sound.

5. Directional Characteristics.—One of the most important characteristics of the velocity microphone is its directional property. Since the ribbon is suspended in free space, sound waves approaching the microphone from a direction in the same plane as the ribbon have no effect upon it. Sound waves *from either direction* along an axis perpendicular to the plane of the ribbon have the maximum effect. For equal distances from the transmitter, the relative response to sound originating at various angles to the axis perpendicular to the ribbon is shown in Figure 5.

It is at once apparent that this characteristic is of considerable value in the solution of some of the difficulties usually encountered in reverberant locations by the reduction of the effect of undesired sound reflections, and in the increased possibilities of obtaining better balance, clarity, naturalness, and selectivity in sound pick-up. Extraneous direct or reflected sounds approaching the microphone from side directions will have little effect, and therefore background noises and reflected sounds in the broadcast are considerably reduced, which increases, by comparison, the quality of the direct sounds reproduced. The degree of soundproofing necessary for sound originating within the "dead zone" is, of course, dependent upon the reflecting surfaces present which may return the undesired sound to the microphone from such directions that response may be obtained.

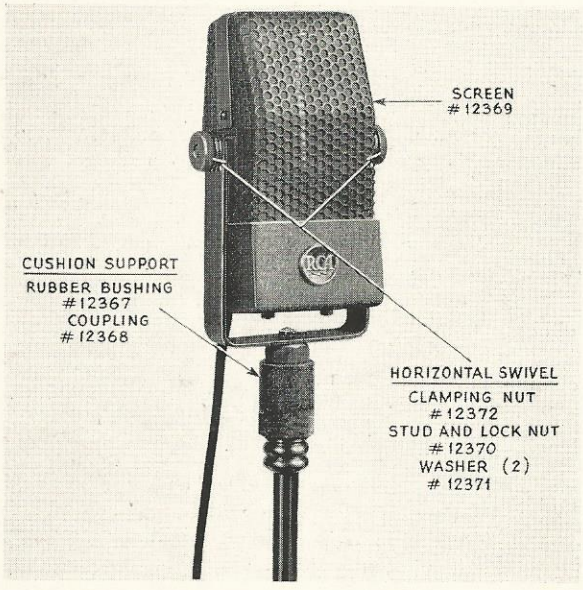

Figure 2—Close-up of microphone on program stand

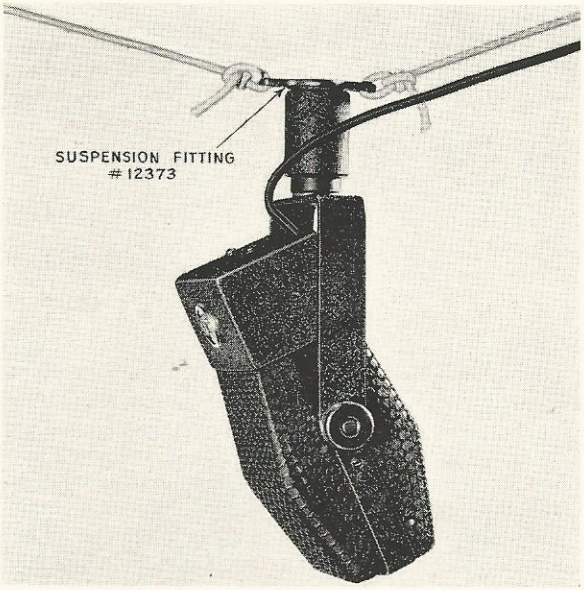

Figure 3—Microphone suspended

For the same allowable reverberation pick-up the operating range of the velocity microphone is approximately 1.7 times greater than a non-directional microphone having the same sensitivity.

When used for public address and sound reinforcement purposes the directional characteristic is of considerable value in reducing feed-back effects between the microphone and loudspeaker.

Sound concentrators and baffles used with condenser microphones are unnecessary with and inapplicable to the velocity microphone because of the fundamental difference in the principle of its operation. The transmitter must be used in free space where the flow of air particles is unimpeded. However, "pick-up" from the rear direction of the microphone may be eliminated by placing a baffle or shield of heavy sound absorbing material, such as heavy felt, at a distance of not less than three feet from the transmitter and so confine the "pick-up" to the area in front of the microphone.

PART II—OPERATION

6. Microphone Assembly.—Packed in the box with the microphone unit proper is the suspension fitting.

(*a*) *Stand Mounting.*—If it is desired to mount the microphone unit on a program stand, unscrew and remove the suspension fitting from the threaded socket of the microphone cushion mounting and screw the cushion mounting on the ($\frac{1}{2}$-inch pipe, threaded) col-

umn of the program stand. See section 9, List of Parts and Accessories, for the type of stand recommended for this purpose.

(*b*) *Suspension Mounting.*—If it is desired to suspend the microphone overhead, the suspension fitting, which contains the eyelets for cord attachment, must be securely screwed into the base of the microphone cushion mounting.

NOTE.—When the microphone is suspended see that its weight is carried by the suspension fitting with no strain on the cable.

(*c*) *Cable Connections.* — Remove the microphone screen by taking out the two round head retaining screws, located above the horizontal swivel clamping nuts at either side of the screen, and withdrawing the two halves of the screen from the microphone base. For 250 ohm output, connect the cable to terminals "S" and "F." For 50 ohm output, connect the cable to terminals "T" and "F." All cable connections should be soldered. See Figure 4.

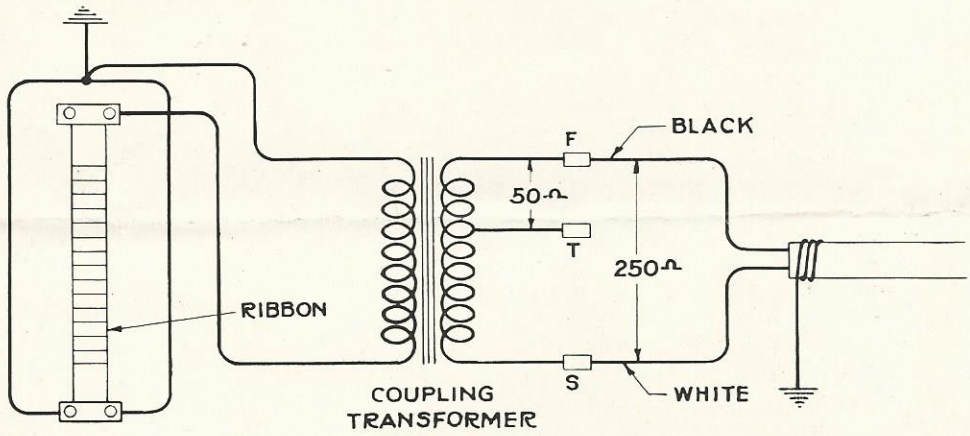

Figure 4—Schematic wiring diagram of microphone and cable (K-828589)

(*d*) *Phasing.*—When more than one microphone is used in a single pick-up, it is possible that the output of the various microphone circuits may not be in phase when fed into a common circuit. The microphone circuits include the microphones themselves, microphone pre-amplifiers, microphone attenuators (mixers) and the necessary connecting lines. The output of the microphone attenuators (mixers) when fed into the overall attenuator (mixer) must be in phase, or varying degrees of distortion will result, depending upon the relative placement of the microphones. If two microphones are placed close together, the result will be practically zero output if their circuits are out of phase at the overall mixer.

To check the phasing of two or more microphones connected in a single pick-up, place the units close together, two at a time, and note the output. Now reverse one of the pair so that it is facing back to the front as compared with its companion. If, under this condition, there is a drop in the output, the two microphones when facing correctly, (*i. e.,* in the same direction) are in phase. If there is an increase in the output when one of the microphones is reversed, reverse the leads at the cable plug of that microphone. If more than two microphones are employed, use as a reference one of the two microphones already phased, and check and reverse the cable connections of the other microphones if it is found necessary. Note that the cable plug is not furnished as a part of the equipment.

As may be gathered from the foregoing paragraph, in set-ups in which velocity microphones are used, it is possible to phase them by turning those out of phase through 180 degrees. This is not possible with any pressure operated microphone.

It is particularly important that the phasing problem be borne in mind when inspecting, testing, repairing or replacing any unit or component thereof, and care be taken to see that the internal connections of the various units are made strictly in accordance with their wiring diagrams.

7. Technique of Velocity Microphone Placement.—The proper placement of the microphone is essential in order to realize fully its inherent advantages. For this reason, the following instructions should be carefully studied, and close attention be given to the results of any special placement with a view towards future improvement of the technique. These instructions can of course only serve as a guide, and a study should be made to determine the best microphone placement for each condition.

(*a*) *General.*—The source of sound, speaker, announcer or musical instrument, should not be placed closer to the microphone than 2 feet and a distance of 3 to 4 feet is to be preferred. At shorter distances there is a tendency toward accentuation of low frequencies, which may result in making voices sound "boomy." In this respect, the use of the velocity microphone differs greatly from that of the condenser microphone with which the speaker or soloist has usually worked at a distance of 4 to 6 inches.

The placement of a speaker or musical instrument

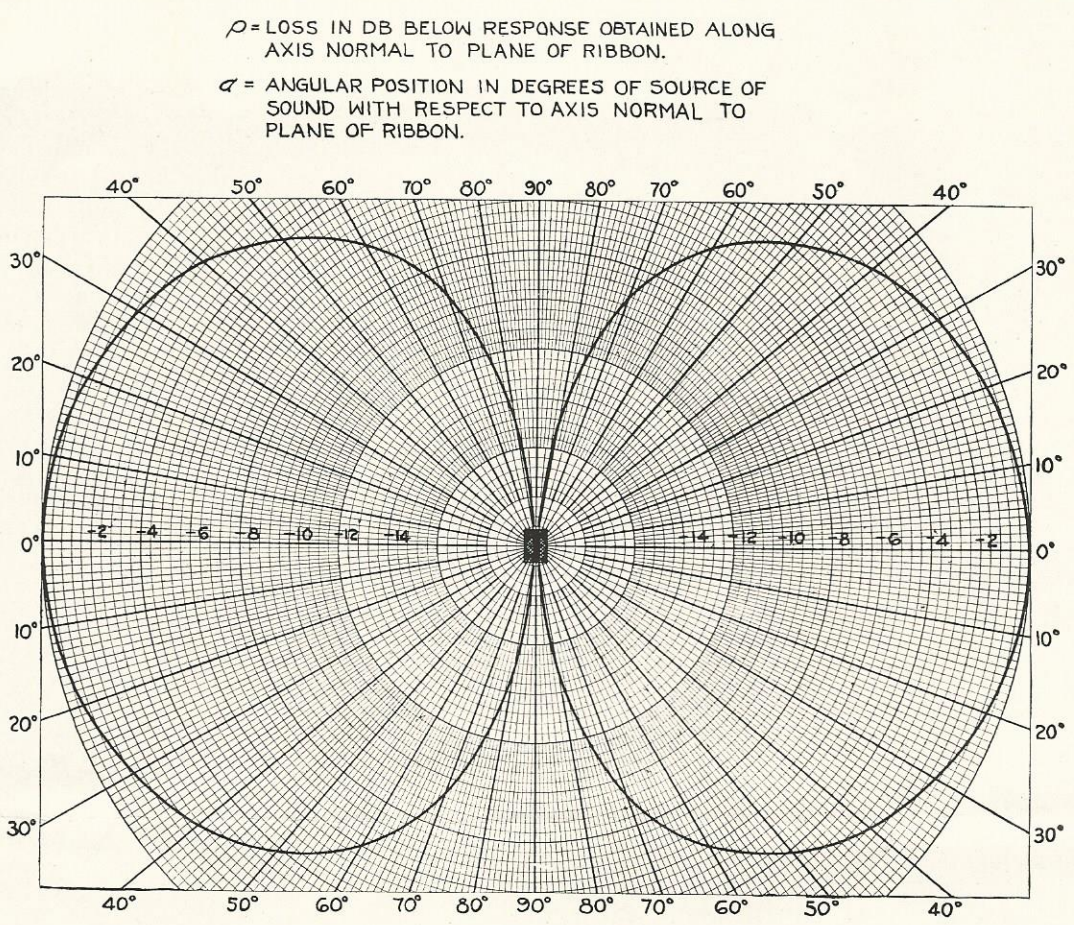

Figure 5—Frequency characteristics of velocity microphone

off from the center line of the microphone will in no way affect the quality of pick-up, but will merely attenuate the direct sound pick-up, thereby raising the ratio of reverberation to direct pick-up.

The microphone is bi-directional. Speakers, instruments, or players may be placed on either or both sides of the microphone with equal effect. The diagrams (Figures 6, 7 and 8) will serve as examples of the advantages which arise from the bi-directional characteristic.

For the most satisfactory results, the microphone should not be placed closer than 3 feet to any solid reflecting surface. This statement is, of course, general and specific conditions may require otherwise, such as in footlight mounting.

The diagrams referred to in the subsequent paragraphs and the discussion concerning them can only serve to indicate some of the possible placements under particular conditions. The final decision as to what constitutes the proper placement must rest with someone who is competent to judge the quality of the results as reproduced by the monitor speaker.

(*b*) *Soloist with Piano.*—Interesting effects may be obtained by changing the angle of the microphone with respect to the piano, thus changing the ratio of reverberation to direct pick-up. The distance between the soloist and microphone should be determined by the strength of his (or her) voice, and the piano should be placed accordingly. The general arrangement is shown in Figure 6. Under no conditions should the soloist be less than 2 feet from the microphone.

(*c*) *Plays.*—The bi-directional characteristic of the microphone may be used to its fullest advantage in broadcasting by grouping the players about the microphone at such positions that their voice levels match to form the desired composite. See Figure 7. With such an arrangement, considerable if not all of the moving and dodging back and forth of the characters seeking positions advantageous to the presentation may be avoided.

When the microphone is used by a speaker located at a table or desk, the microphone should be so placed that it picks up direct sound from the speaker rather than reflected sound from the surface of the table, desk or manuscript.

(*d*) *Dance Orchestra.*—The diagram (Figure 8) is self-explanatory, the only precaution necessary being to keep the soloist at least 2 feet, and preferably 3 feet, from the microphone.

Due to the fact that artists and announcers cannot work close to the microphone, some difficulty may be experienced in obtaining the proper balance between

the artist or announcer and the orchestra. This difficulty can be overcome quite satisfactorily by using two microphones, one to pick up the orchestra and the other to pick up the artist or announcer. The artist's microphone should be located so that its "dead zone" is toward the orchestra. By a proper setting of the mixing controls, the level of the orchestra can be controlled so that a satisfactory background accompaniment of music is obtained.

In locating the microphone with respect to an orchestra, care should be taken to avoid reflected pick-up from hard surfaced floors. Such reflections can be avoided by the use of carpets or similar material on the floor.

(*e*) *Public Address.*—For public address use, the microphone can usually be placed near the speaker (within 3 or 4 feet). It is important to see that the direction of minimum pick-up is toward the loudspeaker system to prevent acoustic feed-back. If the speaker must have latitude of movement on the stage, it may be necessary to have a microphone installed at each side to obtain satisfactory pick-up.

(*f*) *Sound Reinforcing.*—Microphones used for this purpose must generally be concealed and may be placed and successfully operated in the wings, footlights, flys, etc., of the stage. When the microphone is placed in a footlight trough, heavy sound absorbing felt should be placed behind the microphone to prevent undesirable reflection effects. Such a system usually requires a number of microphones and the detailed location of these microphones is largely determined by the exact use of the microphone, constructional details of the stage and other conditions so numerous as to preclude any definite statement of rules or methods of application. The plane of zero sound may be utilized to great advantage in eliminating undesirable resonance, reflection and diffraction effects usually encountered when a microphone is located in a cavity. This fact accounts for the highly successful application of this microphone to footlight trough mounting. Detailed information as to the method of installation for a particular condition may be obtained on request.

8. **Operation.**—In general, the microphone will operate satisfactorily and require very little attention. It should give the normal output listed in section 3.

The microphone is furnished with a threaded ($\frac{1}{2}$-inch pipe thread) socket and is designed, primarily, for use with the portable, collapsible stand. This stand is adjustable as to height. The center of the velocity microphone may be located at any height from 36 to 63 inches above the floor. In order to raise or lower the stand, the vertical clamping screw should first be loosened. The microphone can then be adjusted to the desired height and the clamping screw tightened to hold it in position.

It is not recommended that the customer attempt to repair the microphone, but, rather, that it be returned to the RCA Manufacturing Company, Inc., for repair. This may be done by writing to the RCA Manufacturing Company, Inc., for a "RETURNED APPARATUS" tag and "REPORT BLANK." Before doing this, however, make absolutely certain that the trouble is in the microphone and not elsewhere in the circuit.

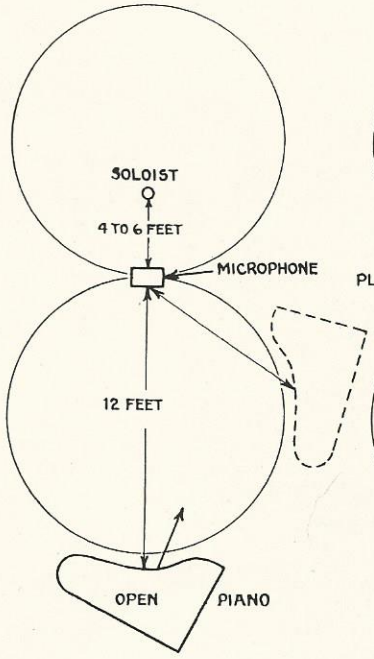

Figure 6—Soloist with piano

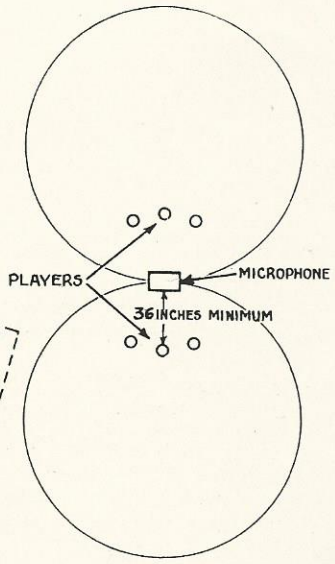

Figure 7—Plays

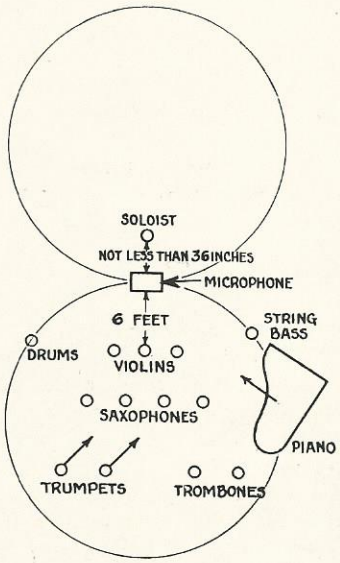

Figure 8—Dance orchestra

VARIOUS MICROPHONE ARRANGEMENTS

9. List of Parts and Accessories.—

Description	*Type*	*Stock No.*
Velocity Microphone *(see Figure 2)*	Type 74-A	MI-4035
Program Stand (portable, collapsible type) *(see Figure 1)*	Type 59-A	MI-4059
Bushing—Rubber bushing for microphone		12367
Cable—30-foot, 2-conductor, shielded cable		12035
Coupling—Knurled and threaded coupling		12368
Nut—Knurled thumb nut		12372
Screen—Microphone screen		12369
Stud—Stud and locknut (for securing microphone to yoke)		12370
Suspension Fitting *(see Figure 3)*		12373
Transformer—Microphone transformer *(see Figure 4)*	RT-407	12366
Washer—Set of 2 spacing washers (between thumb nut and yoke)		12371

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