

INTRODUCTION

The Calrec Soundfield Microphone System MK IV is a unique product offering a hitherto unobtainable degree of accuracy in the generation of coincident stereo and mono microphone patterns. The user is able to steer and move the generated microphones both in real and post production time. A fully three dimensional output signal suitable for encoding to any surround system and in particular to the UHJ family of Ambisonic surround sound systems is available.

The System comprises:-

1. The MK IV Soundfield Microphone in presentation box
2. The MK IV Soundfield Control Unit
3. 100 metres of connecting cable on a drum (SFC 1)
4. Mains cord
5. A flight case to house items 1, 2 & 4

OPTIONAL ACCESSORIES

Microphone Mounting Bar.

Anti-vibration mount. → *AKG HD-30*

10 metre Microphone Head lead/Extension cable (SFC 2)

Splitter cables type SFS 1/SFS 2 allow the microphone to control unit connection to be made via 5 studio XLR-3 balanced tie lines thus placing the control unit in the listening room (both cables are required).

5 pin XLR female to 4x XLR-3 male B-Format record output leads (SFS 3).

5 pin XLR male to 4x XLR-3 female B-Format replay input leads (SFS 4).

(It is immaterial whether or not the tie lines carry studio 48 volt phantom power).

A foam windshield and a Rycote total Windgag are currently in development and will be available shortly.

calrec
by arns

P.O. Box 31864 • Seattle, WA 98103-1864

E-Mail: 424MC@ar

(206) 633-1956 • Telex: 4900001100 (CALUI)

THE CONTROLS

1. **Input gain** - controls the sensitivity of the microphone over a 40dB range in 5dB steps.
2. **Main Fader** - should normally be operated as near to the zero mark as possible but allows a +5dB to -15dB fine trim. Below -15dB is for fade only. The +10dB position may be used for maximum sensitivity in extreme cases.

These two controls should be used in exactly the same way as the microphone input stage and fader of a conventional audio mixing console.

3. **Mutes - (LB- LF+ RF- RB+)** Interrupt the head lead circuit from the microphone capsule/head amplifier to the control unit and should only be used for continuity checks. All four circuits should be muted and then each one released in turn to establish the presence of a signal. UNDER NO CIRCUMSTANCES WHATSOEVER SHOULD RECORDING TAKE PLACE WITH ANY MUTE BUTTON DEPRESSED. The main use of the mutes is for checking continuity when the head lead has been split-out into existing tie-lines using the SFS 1 and SFS 2 splitter leads. It is good Soundfield practice, though, to check before every recording, as head leads do get damaged, and, while under normal circumstances it would be obvious from the monitored output that all was not well, under difficult monitoring conditions on headphones a discontinuity could go unnoticed.
4. **Osc. test** - the test oscillator produces a 0dBm/1kHz tone at the 'B format' record outputs which should be used to align the multi-track tape machine record circuits. The tone is coded for later identification of the recorded tracks and the following track plan is recommended as a standard for professional use.

Tape Track	B-Format Signal	Oscillator Coding approx. Secs	
		On	Off
1	X	1	1
2	W	Continuous	-
3	Y	3	1
4	Z	7	1

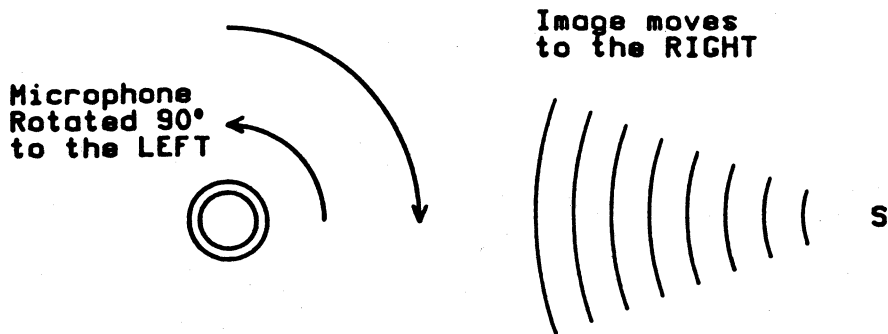
The bargraph meters are arranged in this order thus making direct/off tape comparison very easy.

The Y tone sequence is twice as long as the X sequence and the Z is twice as long as the Y. IT IS IMPERATIVE THAT

TEST TONES BE RECORDED AT THE BEGINNING OF EACH SESSION and preferably on each reel of tape. If a noise reduction system is used, the Soundfield test tones should be after those of the noise reduction system. The recorded tones may then be used to align the tape replay section and to check for correct connections of tracks. The absolute level of the replayed test tone is not important but it is vital to adjust each track to the same relative level.

5. **Red LED** - Flashes when any of the mute buttons are depressed and continuous when the oscillator is in operation. UNDER NO CIRCUMSTANCES SHOULD RECORDING TAKE PLACE WITH THIS LED ILLUMINATED.
6. **Invert** - when the microphone is suspended upside-down the left-right Y signal and the up-down Z signal are reversed and must be corrected, otherwise the operation of azimuth and elevation would be reversed.
7. **Tape and Dub** - although physically separated, these two buttons are interactive in use. The normal condition is for the B-format output of the microphone input stage to be routed direct to the stereo output via the soundfield controls if selected. "Tape" substitutes the microphone signal with the off tape input to the B-format replay socket and would normally be used for 'tape check' during recording. 'Dub' disconnects the microphone completely and routes the B-format replay input to the main fader and thence to the B-format record output and the stereo output. This action reverses the roles of the B-format inputs and outputs AND SHOULD NEVER BE USED DURING RECORDING. The facility allows B-format to B-format and/or B-format to stereo dubbing with gain control and "Soundfield" control if required. The polar pattern and capsule angle controls are always available in the stereo output.
8. **Left/Right/Back buttons** - with neither buttons selected the normal front of the microphone is indicated by an LED within the body of the mic shining through a hole in the case just above the "Calrec" logo. This is the centre front of any generated stereo configurations and the centre front stage of the Ambisonic surround sound signal.

Selection of either Left or Right moves the electrical front through 90° in the appropriate direction and selection of both (Back) moves the electrical front through 180° . It should be noted that this has exactly the same effect as physically moving the microphone and the sound images will, therefore, move in the opposite direction.



Note that when the Microphone is rotated to the LEFT, the Image previously at the FRONT moves to the RIGHT of the Stereo (or Surround) picture, and Visa-Versa.

When working in stereo, using directional patterns, the sound source would appear "off mic" but in surround sound the image would simply move to the new location.

9. **Azimuth** - allows up to plus or minus 45° of continuous variation on the direction of point selected on the Left/Right/Back buttons. The same rules of steering apply as in the previous section.
10. **Elevation** - allows plus or minus 45° continuous variation on the vertical alignment of the actual microphone.
11. **Dominance** - in effect, this is a form of zoom control allowing the generated microphone to be moved closer to or farther from the original sound source than the actual microphone. The effect in stereo is not exactly the same as moving the microphone because the stereo image does not widen as would be expected, in fact it narrows slightly, but this effect can be corrected with the 'Capsule angle' control. In surround sound the apparent movement is even more realistic.
12. **Soundfield "In" Button** - routes the B-format signal through the 'Soundfield' control section. If no soundfield correction is to be made the section should be switched out of circuit to avoid accidental adjustment.
13. **Soundfield 'Rec' Button** - In normal or "Dub" operation the "Soundfield" controls are inserted into the B-format signal after the B-format Record outputs and only affect the stereo output. "Rec" allows their insertion into the B-format record outputs, thereby enabling corrections to be made onto 4 track tape as well as the stereo output.

14. **Metering** - The four, bargraph LED meters show the signal levels of the four components of the B-format signal, X, W, Y and Z as they appear either at the B-format output or off tape at the B-format input. In either case they show the effect on signal level of any Soundfield adjustments AND DIRECTLY REPRESENT THE SIGNAL LEVEL AT THE B FORMAT OUTPUTS. When used directly as a stereo microphone or on subsequent mixdown of a B format signal to stereo they only show the energy being fed to the stereo output circuits and do not show the energy level of the stereo output. Nevertheless they should not be allowed to peak into the Red. The stereo output of the microphone should be adjusted, using the 'Dub' facility and the internal oscillator to give the desired line-up level AFTER the correct tonal balance has been achieved with the "Soundfield" and "Stereo Microphone" controls.
15. **'Stereo Microphone' controls** - the polar pattern control is graduated from omni-directional (0) at the anti-clockwise end through cardioid at "12 o'clock" to figure-of-eight at the clockwise end and smoothly adjusts the polar pattern of the generated microphone(s) through all the intermediate sub-cardioid and hyper-cardioid positions. The capsule angle control is graduated from 0 degrees to 180 degrees and smoothly adjusts the angle of the generated microphones between the two extremes. With the control set to zero the two outputs would be of microphones pointing in exactly the same direction from exactly the same point in space and would therefore be identical mono signals.
16. **Monitor** - controls the signal level of the stereo output to the two headphone sockets. (One on the front panel one on the rear panel).
17. **Power** - indicates that the control unit is connected to a mains power source and that the DC supply from the power unit is present on the circuit board.

CHECKS AND ALIGNMENTS

Because the Soundfield System produces near perfect figure-of-eight patterns it is possible to substantially check the microphone using speech tests only, preferably using headphones.

Set the microphone on a stand or boom at a comfortable height to walk around but low enough to get your head over the top. Set the controls as follows:

1. Mutes normal (off)
2. Osc off
3. Invert to suit microphone position
4. Gain to give a comfortable listening level

5. Azimuth "0"
6. Elevation "0"
7. Dominance "0"
8. Left/Right/Back de-selected (forwards)
9. In de-selected
10. Rec de-selected
11. Tape de-selected
12. Stereo Mic Pattern figure-of-eight
13. Stereo Mic Angle 0°

First mute all the capsules and release each one in turn to check the continuity of the head lead. If a speech check is conducted at this point it should be possible to ascertain the direction of each individual capsule in the horizontal and, if the test room is not too reverberant, the vertical.

LB-	=	Left back down
LF+	=	Left front up
RF-	=	Right front down
RB+	=	Right back up

Left and right are defined as being the left and right hand side of the stereo picture ie. they will be reversed if you face the front of the mic.

This test is optional provided that a roughly equal signal is received from each capsule. (Bearing in mind that two face forwards and two face backwards and that two face upwards and two face downwards).

De-select all the mute buttons and select the Soundfield IN button. Reference to the control setting list will confirm that the unit is now set to produce a forwards facing mono figure-of-eight.

TEST 1

To speech check, start at the front of the microphone at about 150mm (6 inches) range and progress clockwise around horizontally, noting the signal peaks at 0° and 180° and the nulls at 90° and 270° . Similar nulls should also be found immediately over the top and underneath the microphone. (See fig 1)

TEST 2

Aim the microphone 90° to the right by selecting the "Right" button and repeat the tests. (See fig 2). The signal peaks and null will have moved round 90° relative to the LED and Badge.

TEST 3

Repeat the test with "Left" selected and results should be as TEST 2.

TEST 4

Repeat the test with "BACK" and results should be as TEST 1. (See fig 1).

TEST 5

Return the controls to forward facing, as in TEST 1 and select 45° clockwise on the "AZIMUTH" control. The peaks and nulls will now have moved 45° to the right of mic front (ie. halfway between figures 1 and 2).

TEST 6

Repeat test 5 with the "AZIMUTH" control selected to 45° anticlockwise. The peaks and nulls will now be 45° to the left of mic front. (Again, halfway between figures 1 and 2, but at 90° to test 5).

TEST 7

Repeat test 5 with the Left/Right/Back buttons selected to "LEFT". The peaks and nulls will be in the same position as test 6 (45° clockwise from the left hand side of the mic is the same position as 45° anticlockwise from the front).

TEST 8

Repeat test 6 with the Left/Right/Back buttons selected to "RIGHT". The peaks and nulls will be in the same position as test 5 (45° anticlockwise from the right hand side of the mic is equal and opposite to 45° clockwise from the front).

TEST 9

Return the AZIMUTH to 0° and turn ELEVATION to $+45^{\circ}$. The peaks should now be at $+45^{\circ}$ relative to microphone FRONT and -45° relative to microphone BACK as in figure 3.

TEST 10

Repeat TEST 9 at -45° and note that the peaks move to this position relative to microphone FRONT and $+45^{\circ}$ relative to microphone BACK as in figure 4.

TEST 11

Return the ELEVATION control to 0° and whilst speaking at microphone FRONT note that increasing DOMINANCE increases microphone sensitivity and reducing DOMINANCE reduces it.

TEST 12

Return the DOMINANCE control to 0° . Exercise the POLAR PATTERN control and observe that the microphone works as a single cardioid with a null at 180° (microphone BACK) in CARDIOID position and all around equally in OMNI position.

TEST 13

With the microphone set as a CARDIOID check that the DOMINANCE has a similar effect as TEST 11. Return the DOMINANCE control to 0° and de-select "SF IN".

TEST 14

Set the STEREO controls to CARDIOID and 90° and observe that the LEFT signal peaks when speaking at 45° MICROPHONE LEFT (to your right) and the RIGHT one at 45° MICROPHONE RIGHT (to your left), with corresponding opposite nulls.

CONCLUSIONS

If all these tests have produced the results described, then the system can be assumed to be working correctly. There are no servicable parts within the soundfield System. Maintenance should always be carried out by a qualified service engineer in possession of a current service manual.

IMPORTANT

The microphone is factory adjusted and aligned to the control unit by the A to B Module which is housed in the rear of the control unit and contains the microphone input socket.

The microphone serial number is engraved on the panel of the A to B module to indicate that the microphone and A to B should always be kept together.

If the microphone is changed for any reason, this module should be withdrawn by removing the four fixing screws, inserting the mic cable plug and pulling gently. The A to B connects to the control unit by means of a gold plated edge connector.

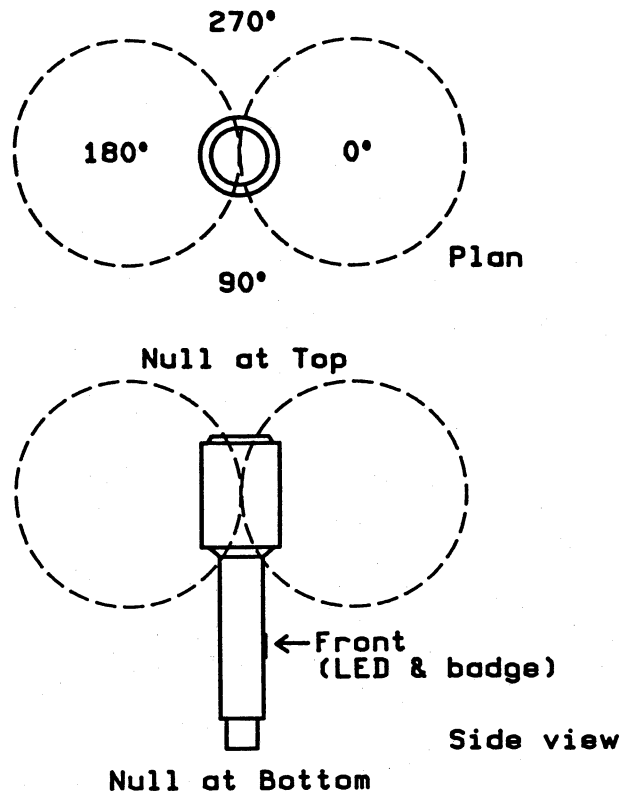


Fig. 1: Figure of Eight: Angle, Azimuth, Elevation: 0°, Azimuth: FRONT.

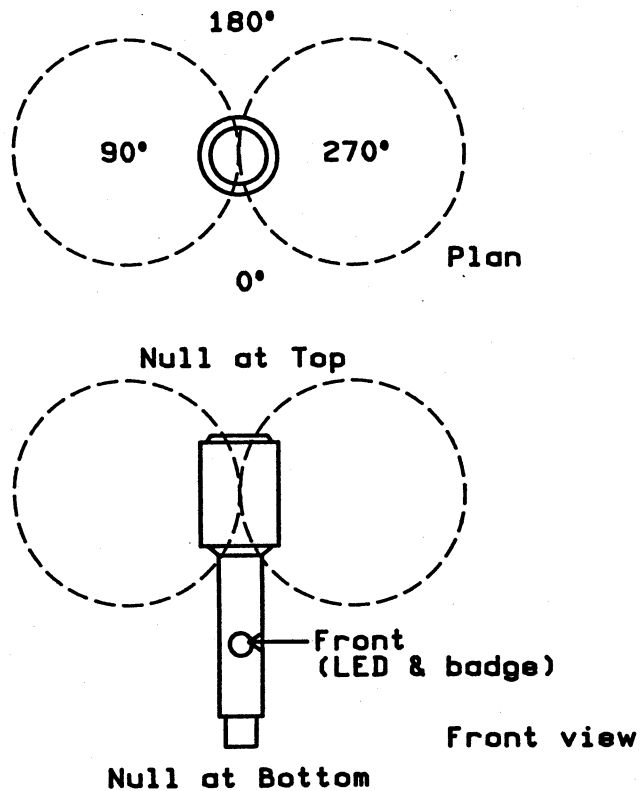
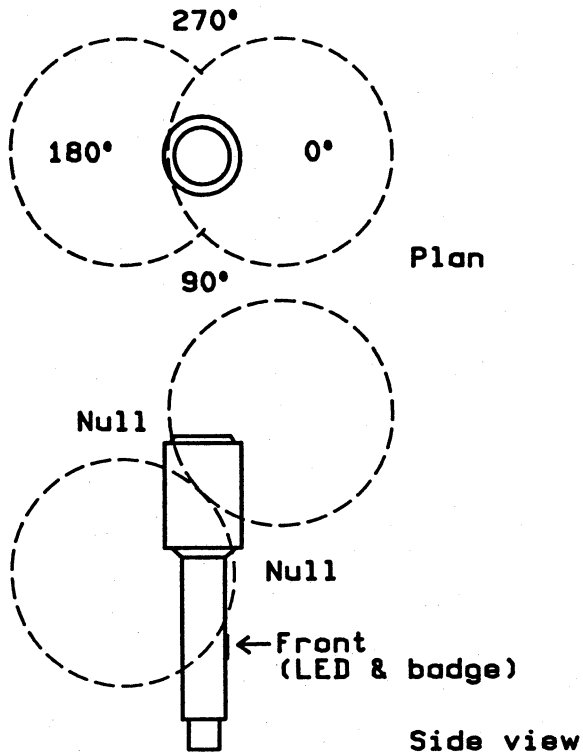
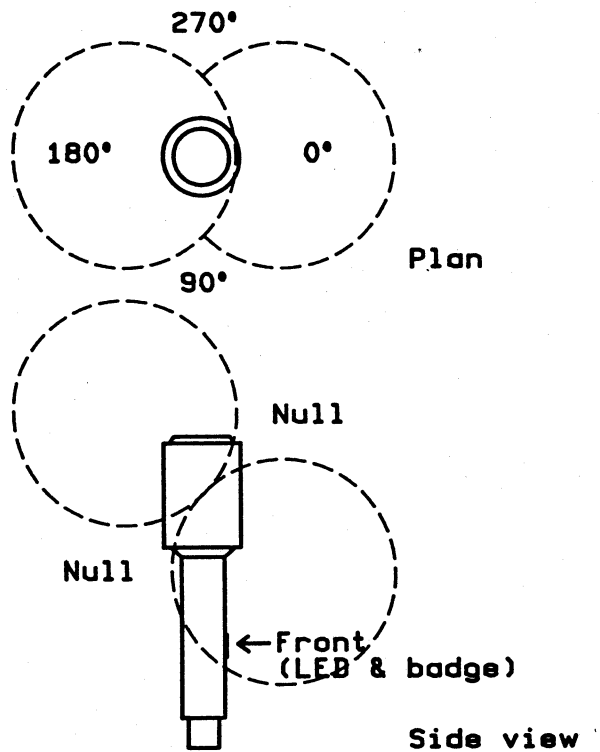


Fig. 2: Figure of Eight: Angle, Azimuth, Elevation: 0°, Azimuth: LEFT or RIGHT.



**Fig. 3: Figure of Eight: Angle, Azimuth, Elevation: 0°,
Azimuth: FRONT,
Elevation: +45°.**



**Fig. 4: Figure of Eight: Angle, Azimuth, Elevation: 0°,
Azimuth: FRONT,
Elevation: -45°.**

