CIRCUIT DESCRIPTION

CAPSULES
The 16 cardioid capsules in each array are physically arranged in a 'honeycomb' pattern so as to occupy the minumum space; two identical arrays are mounted back-to-back. Each array is connected as shown, with the capsules in series-parallel groups of 4. Each capsule requires about 1.5v and 1mA to function correctly, so each array requires a supply of 6v at 4mA. The capsule supplies and head amplifiers (below) are duplicated, one for each capsule array.

CAPSULE SUPPLY
The capsules are fed from a constant current source formed by Tr1 and R1. The voltage across C1 determines the voltage across R1 and, hence, the current through the capsules. When the steady current through the capsules is correct, there will be approximately 6v across the array. This voltage is fed to the non-inverting input of Ic1, with R3 and C2 removing any audio signal. Ic1 compares the capsule voltage with a reference supply of 6v derived by R7 and R6 from the stabilised 9v supply and, if necessary, adjusts the current through Tr1 until the capsule voltage is correct. The gain of Ic1 is determined by R4 and R5, with R2 and C1 removing any noise which might otherwise be superimposed on the capsule current.

HEAD AMPLIFIER
Any voltage change across the array is applied to the inverting input of Ic2 through C4; a current sufficient to counteract the voltage change is applied via the feedback resistors R8 and R9. This arrangement presents the capsules with a very low impedance load, which optimise the signal-to-noise ratio of the capsules. This particular type of capsule has a built-in 6dB/octave bass rolloff below 300 c/s, so some correction is necessary in order to realise a flat frequency response across the whole audio frequency range. This is provided by the combination of R9 and C5 which gives an extra 20dB of gain at low audio frequencies.

HEAD AMPLIFIER POWER SUPPLY
There are two capsule supply circuits and two head amplifiers fed from a single 9v power supply in the microphone head. This consists of Ic3, a 78L05 reculator 'stood up' on an extra reference voltage across R11 to give a stabilised 9v supply. C6 and C7 ensure stability and C3 reduces any noise which might appear as the result of current fluctuations through R11.

MICROPHONE CABLE
The microphone is connected to its control box by a cable which is 2 metres long, but can be extended up to 45 metres. R10 prevents the capacitance of this long cable from causing instability in the head amplifier.

SIGNAL COMBINING
The signals from the two head amplifiers are combined by Ic4 and Ic5. Ic4, in conjunction with R13, R14, R15 and R16 gives an output which corresponds to the difference between the two signals. Ic5, in conjunction with R17, R18 and R19 gives an

output which corresponds to the sum of the two signals. The difference signal cancels the pressure responses of the two arrays and enhances the velocity responses - this corresponds to a bipolar or ribbon-type response. The sum signal enhances the pressure responses of the two arrays and cancels the velocity responses - this corresaponds to an omnidirectional response. The front/back switching interchanges the two arrays and alters the colour of the pilot light C1 to indicate which configuration has been selected.

DIRECTION CONTROL
The direction control selects the difference signal at one extreme of its travel and the sum signal at the other extreme. In the mid position, a mixture of the two signals is obtained, whereby the output from one capsule array is doubled and the output from the other array is cancelled. This results in a cardioid response from just one array, the position of the front/back switch determining which of the two arrays this will be.

BASS CUT
C8 in conjunction with R21 to R27 forms a bass cut circuit. R21 remains in circuit at all times, so as to prevent switch clicks caused by stray voltages building up on C8. The 6dB/octave roll-off of this arrangement exactly compliments the increase in bass response resulting from a too-close microphone technique.

GAIN BLOCK
Ic6 and Ic7 form a circuit block with a gain which can be varied from 0dB to 44dB in steps of 4db using a single pole switch. The feedback network around Ic6 consists of R28 and the equivalent resistance of R29 which can be shunted by R30 to R35. As the gain switch is turned, the shunt resistors are progressively switched out of circuit until, by the 28dB gain position, the feedback around Ic6 is determined only by the ratio of R28 to R29 and the stage is giving its maximum gain of 28dB.

The gain of Ic7 is determined by the ratio of R41 to the equivalent resistance of R40 which can be shunted by R36 to R39. As the gain switch is advanced beyound the 28dB position, resistors are progressively shunted across R40 until, at the maximum gain position, this stage is contributing a further 16dB and the combined gain of both circuits is 44dB. C10 ensures stability but has no significant effect on the response in the audio band.

OUTPUT
The signal from Ic7 is taken to the output socket through R42, to give an output impedance of 600 ohms, and C11 which blocks any residual DC compoinents. C11 is discharged through R45, so that no clicks are generated when plugging into the output socket. The output socket is a ‘Gauge B’ type (also known as a G.P.O./ B.B.C switchboard jack or 316 plug). The output signal is single-ended but the ‘earthy’ side of the signal is only indirectly connected to chassis via C12 and R44.

POWER SUPPLY

An A.C. mains supply is transformed to 12v and rectified by D3 and D4 to give at least 12v D.C. across C13, which smooths out most of the ripple. C13 can also receive a battery supply of 12v to 24v through D2. Both power sources can be left connected and the unit will draw its power from whichever supply give the higher voltage,. In the event of one supply failing, the unit will automatically change over to the remaining supply without audible disturbance.

The voltage regulator Ic8 gives a stabilised 12v +ve supply from the voltage across C13. C14 and C15 ensure stability. C16 removes any further noise from the supply. From the positive supply, Ic9 generates a negative supply of about 12v using the 'flying capacitor' principle. This is an inherently noisy process and the power lines must be well protected from the current surges it produces. R45 and C37 prevent disturbances being sent back into the +12v line and C18, R46, C19, R47 and C20 are necessary to remove noise from the -12v line. C21 is the 'flying' capacitor and is located well away from any audio circuits.