

USING A CONNEVANS CRM-220 WITH COCHLEAR IMPLANTS

When radio microphones were first used with cochlear implant systems they were connected to the speech processor using a simple lead suitably attenuated for the input socket on the speech processor. This lead was also used as the aerial of the radio microphone receiver. It was found that the radio microphones worked with the cochlear implant but suffered from poor range and tended to cut in and out. This was clearly unsatisfactory and an investigation was carried out.

SPEECH PROCESSORS

The speech processors of multi channel digital cochlear implant systems generate radio frequency energy during operation. This energy is present on the leads connected to the speech processor and also emanates from the case of the speech processor. Speech processors operate at a clock rate of between 2.5MHz and 49MHz depending on the particular system. The speech processor can generate frequency harmonics in the frequency region used by radio microphone systems. It was found that some of the radio frequency energy generated by the speech processor was present on the connecting lead. As this was also the aerial of the receiver this interference could block the wanted signal from the radio microphone transmitter resulting in poor range. To solve this radio frequency filters were fitted into the lead at the speech processor end of the connecting cable. The new lead was tested and it was found that the range was increased to an acceptable level of between 15 to 20 metres.

Later speech processors use a higher frequency clock rates and as a consequence are less likely to generate radio frequency harmonics in the frequency region used by the radio microphones even to the extent that it has not been necessary to use radio frequency filters in the lead in some cases.

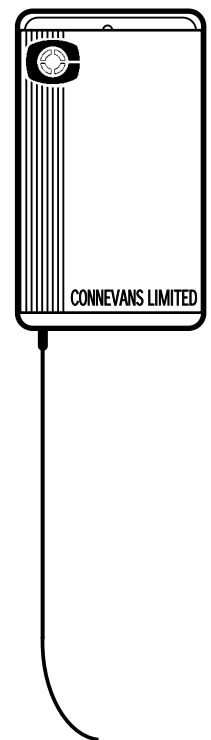
The technical problems have now been addressed by the manufacturers of the cochlear implant speech processors and they are

either already providing suitable cables for connecting radio microphones to their speech processors or will be doing so in the near future.

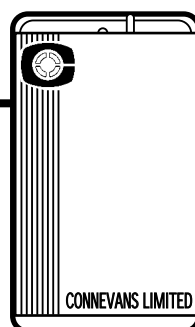
UNDERSTANDING THE PERFORMANCE

Because of the problems associated with the combination of radio microphone systems and cochlear implant processors in the past there has been a tendency for people to feel that trying to use them was not worth the potential problems. From an audiological perspective we need to

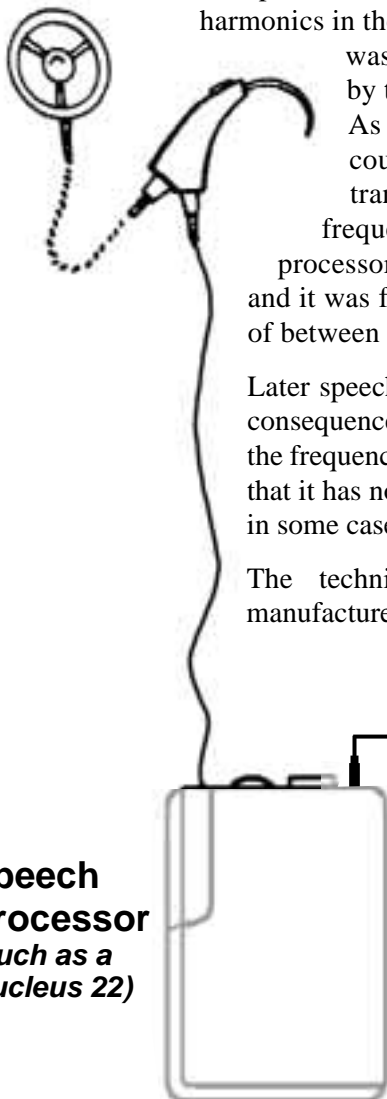
CRM-220 Transmitter



CRM-220 Receiver



**Speech
Processor**
(such as a
Nucleus 22)



remind ourselves that the microphone used to input sound into the cochlear implants is very similar to that of a hearing aid and suffers from the same deterioration of signal to noise ratio over distance. In other words if the cochlear implant user is not within a metre of the sound source they are going to have difficulties in distinguishing wanted sounds from background noise.

Providing the user is able to report signal quality, so that any problems that may occur can be dealt with, the use of radio microphones in these circumstances can provide the same real benefits as for hearing aid users.

GAINING THE BENEFITS OF A RADIO MICROPHONE SYSTEM

The following notes are a guide to those who look after Connevans CRM-220 equipment being used with Cochlear Implant Speech Processors.

The Radio Microphone needs to be initially set up by the Cochlear Implant centre so that the input into the Speech Processor is at the correct level. If this is not done the level will probably be either too low with the result that the user will not obtain any benefit from the Radio system or too high, with a danger of overloading the input of the Speech Processor, either of which will result in poor performance.

Please note, although the available leads would also allow a CRM-200 system to be used, we do not recommend this as the CRM-220 system has been found to give much better results due to its modern design and superior performance.

When the patient returns from the centre with their radio microphone correctly set up the output level of the radio microphone needs to be established, otherwise the patient will have to return to the implant centre to have it set up again if the output is altered by mistake or if the radio microphone receiver needs to be changed. This will involve unnecessary expense and lost time. The output of the Speech Processor can only be heard if you have a cochlear implant. The interface used in conjunction with a personal computer to set up the Speech Processor is only available at Cochlear Implant centres. A means of accurately measuring the output of the radio microphone receiver is therefore needed and this can be done in two ways.

1. BY USING AN OUTPUT LEVEL SETTER

A Connevans Output Level Setter (*OLS Connevans pt no 229010*) gives a value that can be noted on the patient's record. Any CRM-220 can be then set to that value using any OLS and you can be confident that the radio microphone input into the Speech Processor has been accurately re-set to the same level as that originally set by the Cochlear Implant centre. Details of the OLS can be found on page 45 of the CRM-220 Information Booklet and in the CRM-220 Radio Microphone section of the Connevans Catalogue. (The Output Level Setter has been designed for use with Connevans equipment and is not suitable for use with other systems)

2. BY USING A TEST BOX AND A WIDE BAND EARPIECE

This method is more complicated and requires you to measure the CRM-220 output acoustically using a wide band earpiece. It is important to use the same earpiece each time otherwise the measurement and output re-setting will be inaccurate. Full details are given in appendix A.

The CRM-220 Receiver is able to receive on either the resident or module channel. The output level does not require resetting if the receiver is being used with different CRM-220 Transmitters.

When used with Nucleus Spectra 22 Speech Processors the tone controls of the CRM-R220 Receiver should be set to normal – see page 19 of the CRM-220 Information Booklet for further details on setting these controls.

CONNECTING TO TV'S, VIDEOS, ETC.

If you want to use other equipment such TV, video, keyboards, tape recorders etc with the Cochlear Implant this can easily be achieved by connecting them to the CRM-220 Transmitter using the Transmitter Input Adaptor (pt no 2206S see CRM-220 Radio Microphone section of the Connevans Catalogue and page 41 of the CRM-220 Information Booklet for further information).

Connevans recommend that the CRM-220 and its accessories are regularly checked using a Listening Stick to make sure that they are working correctly. It is not possible to check the lead to Speech Processor directly without additional test equipment, however a good indication that it is working will be obtained by looking at the sensitivity light on the Speech Processor. This light should flash with peaks of speech into the CRM-220.



APPENDIX A: USING A TEST BOX AND A WIDE BAND EARPIECE

The radio microphone aid receiver output can be measured on any good quality wideband body aid style earpiece 'receiver' which has an impedance greater than 100 Ohms, by using a connecting lead and hearing aid test box. Connevans can supply a suitable earpiece together with an example print out – to order, quote part number M0RM220 for an earpiece and X9565 for a connecting lead.

NOTE: *Do not use the earpiece supplied with the listening stick since the response characteristics are not good enough for this type of testing.*

- (a) Read the instruction manual for the hearing aid test box!
- (b) Connect the system with the earpiece connected to the 2cc coupler as you would connect a body aid. The transmitter microphone should be placed on the 'spot' as usual. ***DO NOT ADJUST*** either the 'E' or 'Tx' controls on the receiver.
- (c) The test box sound input level should be set for a radio microphone aid transmitter at 75dB SPL.
- (d) Select a 1KHz tone on the test box and note the output level of the wideband earpiece at this point. The level obtained and i.d. of the wideband earpiece used to carry out the measurement need to be noted on the patient's record.
- (e) Check the frequency response and distortion of the radio microphone system in comparison to the example printout provided with the wideband earpiece. The output level will not necessarily be the same but the frequency response curve shape should be similar.
- (f) If you need to reset the output level of a radio microphone receiver to the value originally set by the implant centre then carry out steps (a)-(c) detailed above. Select a 1KHz tone on the test box and adjust the 'Tx' setting on the receiver until the same output level is obtained as is noted on the patient's record.
- (g) If you are using the environmental microphone facility on the radio microphone receiver the same steps should be carried out with the environmental microphone in the test box instead of the transmitter microphone using an input level of 65dB instead of 75dB SPL.

APPENDIX B: CHOICE OF RADIO SYSTEM CHANNEL FREQUENCY

It is possible that harmonics of the speech processor signals to the cochlear implant can clash with the channel frequency of the radio system. Guidance on identifying this possible problem is given in the speech processor setting up procedure and the solution is simply to use an alternative channel. If you have any concerns please talk with your implant centre.

The Connevans catalogue shows the various connecting leads available for using cochlear implant speech processors with radio aid systems together with other useful accessories.

