Equipment for hearing-impaired children

by

J.M. Ashton

This report which has been prepared by Mr. Ashton at the end of his assignment as a consultant in Bahrain represents the views of the author and not necessarily those of Unesco or the Government of Bahrain.

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INTRODUCTION

I was recruited by Unesco as a consultant to the Government of Bahrain. My terms of reference were:

i. To advise the Government on the equipment needed in the section for the hearing impaired, both for the classrooms and the diagnostic room, and prepare detailed lists and specifications for the equipment needed. (25 children ages 3 to 6)

ii. To advise on the co-operation and co-ordination between the rehabilitation centre and the E.N.T. unit in the Main General Hospital (Salmaniya) particularly with regard to registration, screening, diagnosis and referral of children.

iii. To submit a typewritten report to the Director General at the end of the mission.

Because of the lack of existing provision in some areas and because of the scale and character of the provision already existing, it was necessary to broaden the areas of enquiry and discussion and to make recommendations about equipment, personnel and training more widely than was originally envisaged. All recommendations are made in the clear understanding that this is an evolving situation and that other priorities may have to be acknowledged, but equally that all recommendations made are essential to a first class service. I will therefore indicate orders of priorities when making my recommendations.

I will include a diary of the visits and meetings undertaken, a list of the recommendations made and a discussion of each recommendation. If more detailed information is required, I will be pleased to provide it. The itemising, costing and additional information is contained in a separate appendix.

The willingness to co-operate and to share knowledge was most apparent. Dr. Jaffa Baleeq and Dr. Cotter were particularly helpful and positive in their approaches to the ideas and activities mentioned in this report. In fact, the co-operation and assistance from almost all the people I was able to meet was of a very high order. I was particularly appreciative of the assistance of Ali Al Mansoor, Alice Ma aloul, Amina Manaii and Hanan Kamal.

1 This, at the Isa Town Rehabilitation Centre, henceforth referred to as the Centre.
MEETINGS IN BAHRAIN

The consultant met with the following people in Bahrain to discuss the development of the Isa Town Rehabilitation Centre:

- Mr. Abdulrahman Khuzayim  
  Resident Representative, UNDP
- Miss Hanan Kamal  
  Project Coordinators in the Ministry of Labour and Social Affairs
- Mrs. Alice Ma alouf  
- Mr. Jamil Al Jishi was absent during the length of the consultant's mission in Bahrain
- Miss Amina Manaii  
  Hope House
- Dr. Jaffa Baleeq  
  E.N.T. Department, Salmaniya hospital
- Mr. Ali Al Mansour  
  Audiometrician, Salmaniya hospital
- Dr. Abdel Daim  
  Chief, Education Arab States, Unesco
- Architect for the Isa Town Centre
- Dr. Abdul Fatah  
  Director of Health Centres, Ministry of Health
- Mr. F. Brown  
  Medical Equipment Centre, Salmaniya Hospital
- Dr. Cotter  
  In charge of Health Centres, Ministry of Health
- Miss Lilah Baker  
  Senior Nursing Officer, Ministry of Health
- Dr. Campbell  
  OTC Expert

The consultant also made visits to:

- Centre at Isa Town
- Private E.N.T. practice with private audiology unit attached
- Waab Pharmacy - to investigate purchase of hearing aid
- Jidd Haffs Health Centre
- Budeha Health Centre
- Bahraini family with six deaf children
DISCUSSIONS AND RECOMMENDATIONS
A1. BUILDING MODIFICATIONS AT THE CENTRE

Space:
The classroom dimensions at the Centre are 442 cm x 594 cm which is quite suitable for the small groups required for education of the hearing impaired. There was some uncertainty about an outside play area. There should be an area immediately adjacent to each classroom of at least the same dimensions as the internal area i.e. 450 cm x 600 cm. These should be capable of being enclosed so as to prevent these non-communicating infant deaf children from possibly wandering off and getting lost.

Toilet Facilities:
The present wash basins (sinks) are too high for infant children i.e. 31" high. I recommend that a second basin be added to each classroom and be fixed at a maximum height of 22" above ground level.

There are two showers, 1 asiatic W.C. and one western W.C. There is no staff toilet.

I recommend that one shower is quite adequate for this small community. The second shower could be converted into a staff toilet i.e. having a door, a pedestal toilet and the other usual fittings for female toilets!

The western toilet, beside the asiatic toilet, is too large for infants. I recommend that it be replaced by an infant sized toilet.

Illumination:
The existing windows are small (16" tall) and high up (6' from the floor level) and are on one wall only. The walls themselves are painted black, grey or blue. The ceiling is grey. The total effect is to produce poorly illuminated classrooms for pupils whose chief channel of natural reception is certain to be the visual modality.

Adequate illumination is essential. I recommend that new, larger windows replace the present small ones. They should commence at 3' above floor level and be 52" high, so that they will just replace the old ones. Ceilings should be white and walls should be pastel tints.

Acoustics:
The existing wall and floor surfaces form highly reflective surfaces which are acoustically very poor i.e. produce an echo chamber effect. All walls up to 58" should be covered in soft board, straw board or other sound absorbant material which can double as a display surface (this is an acceptable compromise). All wall surfaces above this level (and the ceilings) should be covered by acoustic tiles.

cont...
Acoustics cont...

The tiles on the floor are highly reflective acoustically. I recommend that rugs be provided as floor covers and simple acoustic treatment. This acoustic treatment is also essential for the diagnostic room.

Exits :

Each classroom should have an external door. This for safety and for access to play areas.

Power :

Each room should have at least three electricity points, one on each of the three internal walls. These for charging equipment, audiovisual equipment, audiological equipment and of course normal classroom equipment e.g. record player, film strips etc.

I am thus recommending one additional electrical fitting as the equipment envisaged will make further additional demands.

Wet Area :

The part of the floor near the sinks, an area 2m x 2m should be water proofed and drained as a wet play area (i.e. normal infant provision). I am presuming that the matter of normal infant furniture and educational equipment is already in hand and that it will be of the normal infant character. (Mrs Ma alouf confirms this).
A2. AMPLIFICATION EQUIPMENT AT THE CENTRE

This Consultant is chiefly concerned to make recommendations regarding the buildings and equipment required for a group of twenty-five hearing impaired pupils. Unfortunately, this group is a hypothetical group. No such group has actually been identified at this time. Not one single member is positively identified.

Conversely, the placement and equipping of hearing impaired pupils is a highly individualised process i.e. is totally dependent upon the characteristics of each individual pupil. This hypothetical set could quite easily exhibit a very wide range of hearing impairment characteristics.

It therefore seems reasonable to postulate that such equipment as may be recommended must be capable of adapting to the needs of a wide ranging hearing impaired population. Fortunately, such equipment does exist i.e. Radio Link equipment. For further discussion see Appendix 1. I am, therefore, recommending the Oticon Auditory Training System (T15/R15/C15/P15P). For details and cost see Appendix 2.
A3. **AUDIOMETRIC EQUIPMENT AT THE CENTRE**

Most in-depth audiometric assessment of this population will take place at Salmaniya Hospital E.N.T. Department. The Centre equipment is required for spot check activities by the Teacher of the Deaf and termly checks by the E.N.T. Consultant, and fortnightly visits by an audiometrician.

A Tymponometer and diagnostic audiometer should be adequate for these activities.

An additional, highly desirable piece of equipment is the HC1000 Acoustic Test Computer. This permits testing of all hearing aids to check that they are functioning within the manufacturer's specifications; faults not amounting to total breakdown are very common in hearing aids.

Unfortunately, the Tymponometer and the Acoustic Test Computer are both expensive pieces of equipment. It might, therefore, be best for the Salmaniya Hospital Authority to purchase these two pieces of equipment, both are transportable, and the audiometrician could take them with him on his fortnightly visits to the Centre.

The diagnostic audiometer should certainly be purchased and remain permanently at the Centre.

N.B. For detail of audiometric and amplification equipment see Appendix 2, Pages 24-25.
1. The education of hearing impaired infants on the same campus as the older E.S.N. and disturbed children is wrong on sociological and psychological grounds. I recommend that an altogether distinct and separate location be obtained for these infants as soon as is possible.

2. The site would then be available for use as a vocational training centre for the hearing impaired.

3. An ideal location for a hearing impaired section would be on the same campus as normally hearing children who have no additional handicap. This would provide normal social and linguistic experience and would permit the development of integration.

4. I would stress that I would not wish this statement to delay in any way, or deter the opening of this Centre with the hearing impaired population as envisaged.
I fully agree with the decision to commence this project in the area of profoundly and severely deaf infant children. Nevertheless, I would stress that urgent need for additional provision for those sections of the hearing impaired population not yet catered for.

For example: i. A teacher of the deaf should be appointed to be responsible for work preparation, job placement and further educational assistance for the hearing impaired school leaver.

ii. A peripatetic teacher of the deaf should be appointed to support and develop those hearing impaired children not considered to require special school education.

iii. A pre-school teacher of the deaf should be appointed to work at parent guidance and home tuition for children between 12 months and school age.

iv. A Centre for all school age children should be provided.

I am stressing the need for additional teachers of the deaf because:

a. Miss Menaii, the present Bahraini teacher of the deaf, will be getting married in two months' time;

b. The need for three additional teachers of the deaf for 1980 is recognised (p.11 - Project Document) but I understand that no other Bahraini teachers have been sent for additional training.

This project could fail to take off without trained personnel in the right numbers. I therefore recommend that Bahraini teachers are recruited and either sent overseas for further training in deaf education or that a UNESCO consultant be recruited for in-service training. His function would be to visit Bahrain for periods of about three weeks, at regular intervals, in order to supervise and train these teachers in Education of the Hearing Impaired. The first alternative is the better one.

At present there is only one teacher of the deaf on the island and she is not working with the deaf apart from one half hour per day.

I strongly recommend that Miss Amina Menaii be released from the E.S.N. School to work with hearing impaired children. She could, initially, work at the E.N.T. Department where equipment is available and where the records would provide a rich source of information. I know that Dr. Jaffa Baleeq would welcome this course of action. She could, where possible, work at the children's homes. These cont...
activities would permit Miss Menaii to practise her professional skills, assist the hearing impaired population and would create co-operation between the home, the E.N.T. Department and education which is essential for future development.

As well as working with hearing impaired children, Miss Amina Menaii would be able to help identify the existing hearing impaired population from the hospital records and could build up information on those children who might possibly be placed in the section for the hearing impaired at the Centre. I do most strongly recommend that the identification of the school age hearing impaired children be given top priority.

I would also most strongly recommend that, when the hearing impaired infant population has been identified, a UNESCO expert or consultant be invited to assist in the initial selection and placement of pupils at the Centre.
A6. TRANSPORTATION

The hearing impaired infants being educated at the Centre are likely to reside in all parts of Bahrain. It is therefore essential that arrangements be made for daily transportation to and from the Centre. I would recommend that:

i. an escort person as well as a driver is essential for this age group.

ii. No infant child be required to travel on this transportation for more than half an hour on either journey. This will be perfectly feasible if Government transport is made available at the beginning and end of each school day.
THE CO-OPERATION AND CO-ORDINATION ACTIVITIES
A CO-ORDINATOR

Adequate total provision for the hearing impaired involves activity from several professional disciplines e.g. educational, medical, psychological and social. If these various agencies are to work in harmony for the benefit of the children it is essential that mutual exchanges of information and opinion about the provision should take place. Most of the following discussion and recommendations are about ways of facilitating this provision.

In my opinion, there is a need for firm central control. A person of authority, drive and knowledge of deafness should be appointed as overall Co-ordinator. This person should be capable of speaking directly and as a colleague with top Government officials and all associated professional personnel and should be in clear agreement with the requirements indicated in the Project Document and the Restricted Technical Report PP/1975-76/1.2228 on Special Education in Bahrain.
Formal procedures should be implemented to arrange regular monthly fixed conference dates (F.C.D.) so that:

i. a free and frank, face to face discussion may take place.

ii. Mutual exchanges of information should take place informally and formally.

iii. The state of progress of this scheme may be examined and re-assessed; suggestions presented and courses of action arrived at; persons responsible indicated and dates fixed for completion and reporting back.

iv. The hearing impaired population be examined at the "individual case" level. (I.C.)

The Co-ordinator should be the one to call for and fix the dates for these meetings.

This system is considered to be essential if this project is to take off on time and to develop and evolve as envisaged in the previously mentioned documents and as required by Bahraini law. (The Education Act. Chapter 7, Articles 89,90,91.)

Persons likely to be included in the Conference might include the E.N.T. Consultant, the Public Health Nurse and Doctor, the Social Worker, the class Teacher of the Deaf, the Co-ordinator, the Psychologist and any other concerned professional.

This formal exchange of information would specifically facilitate and implement the keeping of precise and detailed individual case records for all primary school pupils presenting specific difficulties, as required by the Bahrain Ministry of Education.

(Noted on P.3. "Special Education" by L. Saleh)
B3. INDIVIDUAL CASE RECORDS SYSTEM

A major obstacle to making provision for the hearing impaired is the fact that while information may exist about certain hearing impaired children, no one comprehensive system exists possibly because there has been no need until now. Nevertheless, now that provision is evolving and major requirement is that maximum information should be collected and collated so that future decisions may be made on the basis of objective evidence.

I strongly recommend that a detailed record system for each and every hearing impaired child be set up. It should, again, be part of the function of the Co-ordinator. An effective recording system is obviously dependent upon both efficient screening, assessment and dissemination of information.

I therefore recommend that clerical assistance be made available for the running of this record system.
B4. AUDIOMETRY

The hospital is more than adequately equipped audiometrically and replacement equipment is available in depth. Audiological information available from the hospital is first rate from the educationalist’s point of view. I recommend that all audiometric information concerning persons with a hearing loss greater than 25db in the better ear, should automatically be referred to the individual records system.

I would, additionally, recommend that:

i. A Tympanometer be purchased to supersede the impedance equipment because occlusion has been much improved by this new probe and duration of testing has been reduced to three seconds from occlusion.

ii. An Acoustic Test Computer be purchased so that hearing aids etc., may be checked for performance.
SCHOOL ENTRANCE SCREENING PROGRAMME

Screening of the school age population at present is at the experimental stage. Six school counsellors have been employed since the academic year 1978 at three Health Centres. Results indicate that a School Entrance Screening Programme is very much needed.  

I strongly support the recommendations of this report that screening of the total school entry population (6,5000/ann.) should be undertaken. This would vastly assist the identification of hearing impaired children - an essential step if adequate educational assistance is to be given.

All information from this screening programme should automatically be forwarded to the "Individual Case Records System".

B6. INFANT SCREENING

Screening of the pre-school population does not yet exist. An Infant Screening Programme offers such major advantages, relatively quickly and simply, that it is worth digressing to consider this point in slightly more detail.

The Infant Screening Programme depends upon the following three factors:
1. That normally hearing infants at or about the age of nine months are highly distractible by minimal auditory stimuli.
2. That the total infant population is known to the organising authority so that valid check procedures are feasible.
3. That a body of persons exists capable of using normal distraction screening techniques.

All these factors exist in Bahrain. Factor 1 naturally, it is the un-natural or lack of response which we are seeking. Factor 2 because all births must be reported to and recorded by the Government and are then reported to the Child Welfare Centres. Factor 3 because Child Welfare Centres and their staff are already in existence in Bahrain.

The task, therefore, becomes one of organisation and training.

Financially, this scheme should be most attractive; the organisations and personnel already exist, this scheme is simply utilising existing provision. Only the initial setting up and training programme would require financial resources and that would be for a relatively insignificant sum - say $4,000, to bring in an experienced Infant Screening Course Organiser. * Training of new personnel and retraining of established personnel could be invested in the Senior Staff of the Child Welfare Centres. The same doctors would form the second stage of the screening procedure and all cases so screened out could be automatically referred to the existing E.N.T. Department at Salmaniya Hospital and to the Co-ordinator.

Equipment required in this Infant Screening Programme is minimal. No costly equipment is essential. In fact, most equipment for distraction tests occurs normally i.e. cup and spoon, rattle, tissue paper, finger clicking, clapping, drum, human voice etc.

The only desirable extension of this 'normal set' is a free field audiometer and this can be dispensed with if need be (Cost per AP22 Peters Free Field Audiometer = $500)
I would strongly recommend that an Infant Screening Programme be implemented as a matter of urgency and that all audiometric information so obtained be automatically referred to the Individual Case Records System.

* See Appendix 4 for detailed information re Course Organiser.
B7. PRESCRIPTION OF HEARING AIDS

The servicing and maintenance of all hearing aid equipment in Bahrain raises particular problems. All aids should be individually prescribed by a competent audiologist. All aids require ear moulds for efficient use. Advice, dispensing, check and repair services should be standard. These services may be provided by the Health Service or by private hearing aid services. Unfortunately, private hearing aid services do not exist in Bahrain, and universal provision by the State does not exist.

Two types of aid may be purchased over the counter in Bahrain (Rione & Bosch) but no testing facilities, prescription fittings, advice, maintenance or check procedures are offered. This is extremely unsatisfactory.

I recommend, most urgently, that the provision of hearing aids by the State be improved and extended. Whether universal provision is economically possible I am not competent to judge. Nevertheless,

i. all school children requiring hearing aids should be prescribed them as a matter of urgency.

ii. all children attending the Centre for the Hearing Impaired at Isa Town will require competent prescriptions, setting, fitting, maintenance and repair facilities if they are to be able to benefit to a maximum from the services and equipment provided.

iii. all hearing aids at the Centre should be checked regularly by the hospital audiologist for which purpose he should make fortnightly visits to the Centre.
B8. EAR MOULD LABORATORY AND THE TRAINING OF E.N.T. TECHNICIANS

Bearing in mind the points raised in B7, I make the following recommendations:

1. An Ear Mould Laboratory be purchased to up-date and facilitate ear mould production (See Appendix 5).

2. The audiometrician at Salmaniya Hospital (Ali Al Mansour) should be sent on a training course to extend his already considerable skills. This course to be chiefly concerned with hearing aid technology i.e. the production of a range of ear moulds in various materials (See Appendix 1) the fitting, counselling and first level maintenance of hearing aids.

3. The technical expertise for checking and repairing the radio link amplification equipment already exists in Bahrain e.g. The Medical Equipment Unit at Salmaniya Hospital - Ibrahim Yakuub and F. Brown, the Cable and Wireless Company - D. Burke.
   Unfortunately, the turn round period is greater than four weeks, in which case additional equipment spares must be purchased.
   If this turn round period cannot be reduced then it would be more efficient to simply return the faulty equipment to the manufacturers by air.

4. Laws governing the use of radio frequency channels already exist in Bahrain. This should create "clear air space" but all equipment transmitters must be licensed.

I would further recommend that the provision of hearing aids by the State be rationalised i.e. that for pre-school and school age children a full range of hearing aids be made available as of right, that allocation is by the examining audiologist and that hearing aid test equipment be obtained.

In particular, I would recommend that the Oticon range of Hearing Aids be utilized by the Health Service (e.g. E11P (P.a.) and P11P (B.W.) ) as this would compliment and extend the equipment recommended for the Centre for the Hearing Impaired.

1 Full details of transmission frequencies for the Oticon A.T.E. are included. See Appendix 8.
B9. AUDIOLOGY

Audiology is a diffused subject area. Its content is derived from a variety of associated disciplines, for example - Medicine, Technology, Acoustics, Electronics, Education, Psychology. It is a developing and changing subject. It is therefore incumbent upon any practitioner in the field of audiology to keep abreast of modern developments.

It is the practice in advanced societies to constantly organise courses and conferences so that practitioners may keep abreast of developments. For example, the British Audiology Society organises several conferences each year. (Appendix 7)

I would not wish to comment on the personnel in the E.N.T. Department. It would be presumptive and I am not competent to do so.

I would, however, most strongly associate myself with Dr. Jaffa Baleeq's statement that "with the rapid developments in the field of audiology, particularly regarding hearing aid prescription, then every E.N.T. Consultant should attend a revision course at least every five years". (Personal Communication 1979)

I would most strongly recommend that the members of the Salmaniya Hospital E.N.T. Department be encouraged and supported, by the Government of Bahrain, in their desire to attend such courses and conferences.
THE APPENDIX
APPENDIX 1.

RECOMMENDATIONS IN BRIEF

Organisational:

1. That a person of authority, drive and vision be appointed as Co-ordinator for the Service for the Hearing Impaired.
2. That a system of Individual Case Records be inaugurated to facilitate collection, organisation and dissemination of information about hearing impaired children.
3. The reference of hearing subjects to the Co-ordinator be mandatory.
4. That a system of monthly Case Conferences be inaugurated, called by the Co-ordinator for all concerned professionals, for example - Medical (Dr. Jaffa Baleeq), Psychological (Dr. Saad Al Sharmi), Educational (Miss Amina Manaii), Social Workers and Administrators (Dr. R. Campbell, Miss Hanan Kamal, Mrs Alice Ma alouf) and Teaching - to advise on placement of hearing impaired pupils.
5. That the present site at the Centre be utilised as a Craft Centre as soon as possible and that the Infant Section be relocated.
6. That a UNESCO consultant/expert advise on individual cases for initial placements in the section for the hearing impaired at the Centre.
7. That all organisation and placement be seen as a co-operative and consultative activity.

Educational:

That Amina Manaii be released to work full time at identification and education of hearing impaired infants at the hospital, in the homes and in school, as an essential preliminary activity to setting up the section for the hearing impaired at the Centre.

That Bahraini teachers are recruited for work and training as teachers of the deaf as a matter of urgency.

That teachers be appointed to deal with:
1. work preparation for the hearing impaired
2. pre-school work with the hearing impaired, and
3. hearing impaired pupils in normal schools.

That training for newly appointed teachers should be by:

a. secondment to established teaching centres,

or b. in-service training by visiting UNESCO consultant.
APPENDIX 1.

Educational cont.

That the Centre classrooms be modified for acoustic and infant requirements.
That the period of travel for hearing impaired infants be limited to 30 minutes for any one journey.
That visits to the Centre by the E.N.T. Consultant, for a termly check, be normal procedure.
That fortnightly visits to the Centre, by the audiometrician, be normal procedure.

Medical:

That an Infant Screening Programme be inaugurated.
That Public Health Nurses and Public Health Physicians be trained in Distraction Technique Audiometry by an expert.
That a School Entry Screening Programme for all first year pupils be implemented.
That referral to the E.N.T. Department be mandatory for all hearing impaired children.
That provision of hearing aids be rationalised.
That constant up-dating of Audiological Practice be an accepted feature of the E.N.T. Department.
That an Ear Mould Laboratory be purchased.
That an audiometrician be sent on an audiotechnology course to study specifically:
- Ear mould manufacture
- Hearing aid fitting
- Hearing aid technology
- Hearing aid audiometry

at the Oticon Factory in Denmark.
That the audiometrician visit the Centre fortnightly to check equipment and ear moulds.

Amplification:

That the Oticon Auditory Training Equipment be purchased and that 25% spares be a normal feature of this provision.
That first stage check procedures is a daily occurrence at the Centre.
That second stage check procedures be in the hands of the E.N.T. Department audiologist.
That initial maintenance procedures be in the hands of Cable & Wireless Ltd., (Bahrain) or The Medical Equipment Unit, Salmaniya Hospital.
That major repairs should be handled by the manufacturer, and that faulty equipment be flown to Oticon for check and repair.
APPENDIX 2.

EQUIPMENT DETAIL AND COSTING

A1. Building Modifications at the Centre, in order of priority

1. Window enlargement
   Colour change
   Acoustic Tiles
   Soft Pin-boarding
   Two Rugs.

2. Outside play area
   Enclosing fencing.

3. Sinks
   Wet Area.

4. Toilet Changes
   Staff Toilets.

5. Four new doorways - to extend play areas
   Four additional Power Points.

These should be put out for tenders.

A2. Amplification Equipment

"Oticon Auditory Training Equipment" from H. Fenger
Oticon A/S
Klaedemaalit
D.K. 2100
Copenhagen, Denmark.

Per Classroom of 8 children -

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Number</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>T15 (Transmitter)</td>
<td>1985 DK</td>
<td>1</td>
<td>1985 DK</td>
</tr>
<tr>
<td>R15 (Receivers)</td>
<td>1590 DK</td>
<td>8</td>
<td>12,720 DK</td>
</tr>
<tr>
<td>P15P (Hearing Aids)</td>
<td>1250 DK</td>
<td>8</td>
<td>10,000 DK</td>
</tr>
<tr>
<td>C15 (Chargers)</td>
<td>1222 DK</td>
<td>1</td>
<td>1222 DK</td>
</tr>
<tr>
<td>(Four Unit Extension to C15)</td>
<td>474 DK</td>
<td>1</td>
<td>474 DK</td>
</tr>
</tbody>
</table>

Per Class: Total = 26,401 DK

= £2,640
= $5,280

For 3 classrooms = $15,840
For 4 classrooms (i.e. 1 complete set of spares) = $21,120

N.B. This is the maximum figure: one would expect a reduction for such a large purchase.

Ear Mould Laboratory (of which $500 is for consumable goods) = $3000
APPENDIX 2 cont.

A3. Audiometric Equipment

from P.C. Werth
17 Stratford Place
Oxford Street
London W1N OD11

(N.B. It would be worthwhile requesting Oticon to quote for these items in addition to their amplification equipment, and thus to receive all equipment from one source)

Items
1. Diagnostic Audiometer - Kamplax Model AD17 £ 1072
2. Tympanometer £ 2300
3. Acoustic Test Computer £ 2700

B6. Infant Screening Equipment

from A.P. Peters and Son,
Audiometric and Acoustic Equipment,
Wreakes Lane,
Dronfield,
Sheffield S18 6DH, England.

Item AP22 Peters Free Field Audiometer £ 500

B8. An Ear Mould Laboratory

from 'Oticon'
H.Fenger et al.
Denmark.

1 Ear Mould Laboratory complete £ 3000
(of which £ 500 is for consumable goods)

N.B. The Ear Mould Laboratory, The Tympanometer and the Acoustic Test Computer are the audiotechnologist's concern and would presumably be purchased by the Ministry of Health.
APPENDIX 3.

THE SELECTION OF RADIO LINK EQUIPMENT

It seems reasonable to discuss the question: "Why this radio link equipment?"

"Our concern is to create the best conditions for optimum language and speech development" 1

The radio link equipment selected permits conditions which approximate closely to the normal mobile characteristics of the age group (3-6) while, at the same time, provide amplification which is claimed to be almost equal to characteristics of the best (but sedentary) group hearing aids and speech training units.

E.g. LINCO Mk III :

<table>
<thead>
<tr>
<th>Frequency Response</th>
<th>Maximum Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-8000 Hz</td>
<td>135dB s.p.l.</td>
</tr>
<tr>
<td>70-10000 Hz</td>
<td>140 dB</td>
</tr>
<tr>
<td>225-6000 Hz</td>
<td>138 dB</td>
</tr>
<tr>
<td>160-6000 Hz</td>
<td>140 dB</td>
</tr>
</tbody>
</table>

It has the additional advantage of permitting a single, consistent amplification characteristic for the whole of the child's waking life. (Dr. K. Murphy, J.E.J.John et al long argued the value of consistent amplification).

It permits maximum integration into normal society.

I am basically arguing that the more natural the life style, the more natural are likely to be the speech, language, social and mental development of the child. Certainly, with this equipment, we appear to lose very little of the possible amplification.

The preference for the Oticon system over the Phonic Ear system is because it is cheaper, it is more flexible in use, it has a greater acoustic range and it is able to be used for the whole of the child's day.

APPENDIX 4.

THE ORGANISATION OF THE INFANT SCREENING PROGRAMME

A register of births is kept at each regional Health Centre. A Public Health Nurse is appointed to each family. If the Public Health Nurse is trained in distraction screening techniques (a relatively simple technique), this will be adequate.

All failed cases should be referred to the Primary Health Care Physician at the Regional Health Centre and where hearing impairment is confirmed, they should be referred on to the E.N.T. Consultant and to the Co-ordinator.

This will, of course, require that all Primary Health Care Physicians or E.N.T. Consultants, are trained in Infant Screening Techniques.

A register should be kept showing all test results as pass or fail responses.

It would be relatively simple and cheap to arrange for an expert to visit Bahrain and train all the medical staff. The responsibility for the ongoing training of new members of the service and periodic retraining of all personnel would then become the responsibility of one recognised authority on this island.

---

1 For example - Dr. Hasrah Ismail, Principal Physician in Child Health, Merton, Sutton and Wandsworth Area Health Authority, London, lectures in distraction technique audiometry to doctors and nurses. Her native language is Arabic.
AN EAR MOULD LABORATORY

Modern Ear Mould Laboratories permit production of a wide range of ear moulds. Complete Ear Mould Laboratories are produced by several manufacturers.

For example: P.C. Werth (England)
               Oticon (Denmark)

Because of the equipment recommended for the Centre for the Hearing Impaired, I would suggest that the Oticon Laboratory is purchased.

Total cost and transport say .. $3,000

N.B. As an indication of laboratory contents, an invoice for an order for Syria and a quotation from Oticon are attached. Oticon also organise training courses for audiotechnicians as standard procedure.
APPENDIX 6.

HEARING AID PROVISION IN BAHRAIN

For efficient Hearing Aid prescription, by the E.N.T. Department, at Salmaniya Hospital a complete range of hearing aids is essential. Oticon provide such a range and this equipment would accommodate to the Auditory Training Equipment already recommended.

I therefore recommend that if the Bahrain Government decides to extend and rationalise its provision of hearing aids, then Oticon should be contacted for quotations, advice and assistance.
British Society of Audiology

1 BIRDCAGE WALK LONDON SW1H 9JJ
Telephone: 01-839 1211

Dr. L. Fisch
Dr. T. J. Watson, M.C.
M. C. Martin
Dr. R. J. Bench
Dr. S. D. G. Stephens
P. Lea

MEETINGS 1976

<table>
<thead>
<tr>
<th>Date and Time</th>
<th>Topic</th>
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<tbody>
<tr>
<td>21 May</td>
<td>Technical Audiology</td>
</tr>
<tr>
<td>0930 hours</td>
<td>Organised by the Audiology Technicians Group of the Society</td>
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<tr>
<td>1930 hours</td>
<td>Annual Dinner and Dance at the Institute of Laryngology and Otology London</td>
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<tr>
<td>18 June</td>
<td>Room Acoustics</td>
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<tr>
<td>1400 hours</td>
<td>Jointly with the Institute of Acoustics</td>
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<tr>
<td>9 July</td>
<td>Meeting on Speech Therapy and Audiology</td>
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<td>1730 hours</td>
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<tr>
<td>24 September</td>
<td>Clinical Cases</td>
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<tr>
<td>1730 hours</td>
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<tr>
<td>22 October</td>
<td>Psycho-acoustics</td>
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<tr>
<td>1730 hours</td>
<td>Jointly with the Experimental Psychology Society</td>
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<tr>
<td>'19 November</td>
<td>Developments in the Education of the Deaf</td>
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<td>0930 hours</td>
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<tr>
<td>10 December</td>
<td>Tinnitus</td>
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</table>

There will be a second course on Hearing Aids, organised by M. C. Martin, Royal National Institute for the Deaf, at the Polytechnic of Central London. The date for this three day course will be announced later.

The venue and day of the week for all the above meetings will be the Institution of Mechanical Engineers, 1 Birdcage Walk, London SW1H 9JJ on Fridays.

All day and afternoon meetings are subject to a registration fee: evening meetings are free and tea is served prior to the meeting at 1700 hours.

Further information on these meetings and the Hearing Aid Course is available from the Secretary, BSA 1 Birdcage Walk, London SW1H 9JJ.

Branch meetings are held for the Scottish and Northern Branches of which details are available from the Secretaries who are respectively Miss E. C. Knox, Myrtle Bank, Clarke Street, Airdrie, Lanarkshire and Dr. M. E. Bryan, Department of Electrical Engineering, The University, Salford, Greater Manchester.
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APPENDIX 9.

MODIFICATIONS TO THE CENTRE – DISCUSSION OF COSTING

While in Bahrain, I took the opportunity to discuss the proposed changes to the section for the hearing impaired, with the site architects. They have subsequently sent me their comments on my proposals. I will attach their letter and plans to this report.

I am somewhat surprised at the costing of these alterations but as they are not itemised I can not criticise in detail. I would simply state that I do still recommend all items in C except No.5 (which is now no longer required as I have made alternative provision) and all items in B.

About Section A, I had originally recommended that
   i. the staff will need a staff room and I had envisaged the room marked 'Office' (in the plans) as appropriate if rather on the small side.
   ii. that staff toilets and facilities will be required and that conversion of one of the showers in the existing toilets would be a possible solution.

It could be that my solutions are inappropriate in some way, but I do have reservations about the size and presumably expensive solution indicated.
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
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<th>UNIT PRICE D.KR.</th>
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</thead>
<tbody>
<tr>
<td>T15 - transmitter (incl. antenna and standard carrying strap)</td>
<td>195 xx xxx</td>
<td>1,985.00</td>
</tr>
<tr>
<td>R15 - receiver (incl. carrying strap)</td>
<td>190 xx xxx</td>
<td>1,590.00</td>
</tr>
<tr>
<td>P 15 P - hearing aid</td>
<td>100 04 040</td>
<td>see sect.2 *</td>
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<tr>
<td>CHARGERS</td>
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<tr>
<td>C15/2, 50 Hz (1 T 15 + 2 R 15)</td>
<td>180 09 512</td>
<td>1,222.00</td>
</tr>
<tr>
<td>C15/2, 60 Hz (1 T 15 + 2 R 15)</td>
<td>180 09 612</td>
<td>1,222.00</td>
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<tr>
<td>4 unit extension to C 15</td>
<td>180 09 004</td>
<td>474.00</td>
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<tr>
<td>MC 15, 220V for 2 acc. cells</td>
<td>180 08 522</td>
<td>370.00</td>
</tr>
<tr>
<td>MC 15, 110V for 2 acc. cells</td>
<td>180 08 612</td>
<td>370.00</td>
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</table>

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* No price provided; to avoid further delay I have used the English price for the P15P which should be directly comparable...
### ATE - ACCESSORIES 1.

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<tr>
<td><strong>BATTERIES AND ACCUMULATORS</strong></td>
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<tr>
<td>Battery 9V, Alkaline, 40 hours</td>
<td>373 11 027</td>
<td>12.70</td>
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<tr>
<td>Battery 9V, 20 hours</td>
<td>373 41 017</td>
<td>5.70</td>
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<tr>
<td>Accumulator cell 7/8, 9V</td>
<td>374 30 050</td>
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<td><strong>ACCESSORIES FOR T 15</strong></td>
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<tr>
<td>Aux. lock</td>
<td>549 10 026</td>
<td>0.20</td>
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<tr>
<td>Carrying strap, canvas</td>
<td>585 91 150</td>
<td>78.20</td>
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<tr>
<td>Antenna snap lock</td>
<td>589 45 010</td>
<td>14.60</td>
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<tr>
<td>Aux. input connector - open end</td>
<td>627 50 010</td>
<td>81.10</td>
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<td>Aux. input connector - DIN plug</td>
<td>627 50 011</td>
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<tr>
<td>Carrying strap, small</td>
<td>585 91 118</td>
<td>75.20</td>
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<td>Carrying strap, medium</td>
<td>585 91 128</td>
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<tr>
<td>Mini - loop amplifier TF 15</td>
<td>192 15 010</td>
<td>221.40</td>
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<tr>
<td>Large loop</td>
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<tr>
<td><strong>ML 15 MINI-LOOP</strong></td>
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<tr>
<td>ML 15 - with transformer</td>
<td>399 50 011</td>
<td>84.10</td>
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<tr>
<td><strong>LA 15 LOOP ADAPTOR</strong></td>
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<tr>
<td>LA 15 - with 220V power supply</td>
<td>869 11 010</td>
<td>498.70</td>
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<td>LA 15 - without power supply</td>
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JANUARY, 1979

PRICE LIST
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<tr>
<td>Colopor for R 15</td>
<td>585 40 020</td>
<td>1.60</td>
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<td>Colopor for T 15</td>
<td>585 40 030</td>
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<td>Carton for T 15</td>
<td>587 25 162</td>
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<td>587 25 164</td>
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<td>OTHER ACCESSORIES</td>
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<tr>
<td>Orange shell for P15 P</td>
<td>589 01 056</td>
<td>sect. 1</td>
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<td>Top cover for P 15 P</td>
<td>589 38 022</td>
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## OTHER EQUIPMENTS

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<tr>
<td>TELEMAGNETIC AMPLIFIER TF 30</td>
<td>143 11 030</td>
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<tr>
<td>WITH LOUDSPEAKER AMPLIFIER</td>
<td>143 11 031</td>
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<tr>
<td>WITHOUT LOUDSPEAKER AMPLIFIER</td>
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<td>MICROPHONE AKG D 190C</td>
<td>489 01 031</td>
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<td>TABLE MICROPHONE STAND ST 1</td>
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<td>MICROPHONE CABLE WITH PLUGS (6 metres)</td>
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<td>CABLE FOR LOOP (100 metres)</td>
<td>399 51 513</td>
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<td>EXTRA MICROPHONE CABLE (20 metres)</td>
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<td>LOOP - 50 METRES WITH PLUGS</td>
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<td><strong>TM 70</strong></td>
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<td>TELEMAGNETIC HANDLE TM 70</td>
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<td>MINI TELEMAGNETIC SET</td>
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PRICE LIST
## EAR MOULD MATERIALS

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<tr>
<td>AZ 6800 - IMPRESSION MATERIAL</td>
<td>794 60 061</td>
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<tr>
<td>AZ 6808 - EXTRA HARDENER FOR AZ 6800</td>
<td>792 55 010</td>
<td>4,90</td>
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<td>MATERIALS FOR HARD EAR MOULDS</td>
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<tr>
<td>AZ 6801 - ACRYLIC POWDER - 1½ kg</td>
<td>781 30 203</td>
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<td>AZ 6802 - ACRYLIC HARDENER - 1 ltr.</td>
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<td>MATERIALS FOR SOFT EAR MOULDS</td>
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<td>AZ 6809 - ACRYLIC POWDER - 3/4 kg</td>
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<td>AZ 6807 - Wax - 1 lb</td>
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<td>Glue</td>
<td>794 02 010</td>
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<td>AZ 6803 - INSULATING LACQUER - 1 ltr</td>
<td>795 91 031</td>
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JANUARY, 1979

PRICE LIST
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<td>Frequency converter 220V</td>
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<td>(also in 110V = code 848 00 011)</td>
<td>815 12 010</td>
<td>2,279.00</td>
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<td>Connection cable</td>
<td>843 16 015</td>
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<tr>
<td>Handle</td>
<td>848 21 010</td>
<td>198.00</td>
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<td>Holder</td>
<td>730 60 243</td>
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<td>Cellophane - 250 pieces</td>
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<td>Powdered pumice - 2½ kos.</td>
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<td>34.70</td>
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<td>Silicone spray</td>
<td>820 03 124</td>
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<td>Drill 2,4 mm</td>
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<td>17.10</td>
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<tr>
<td>Drill 4,0 mm</td>
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<td></td>
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<tr>
<td>Milling tool - special</td>
<td>820 15 010</td>
<td>43.00</td>
</tr>
<tr>
<td>Burr drill</td>
<td>820 15 031</td>
<td>22.00</td>
</tr>
<tr>
<td>Burr drill</td>
<td>820 15 035</td>
<td>82.50</td>
</tr>
<tr>
<td>Burr drill</td>
<td>820 15 036</td>
<td>82.50</td>
</tr>
<tr>
<td>Burr drill</td>
<td>820 15 037</td>
<td>82.50</td>
</tr>
<tr>
<td>Polishing wheel</td>
<td>820 40 010</td>
<td>9.60</td>
</tr>
<tr>
<td>Burnishing stone</td>
<td>820 45 010</td>
<td>7.00</td>
</tr>
<tr>
<td>Spatula</td>
<td>824 02 010</td>
<td>61.30</td>
</tr>
<tr>
<td>Surgical blades - no.3 (10 pcs.)</td>
<td>824 27 013</td>
<td>14.30</td>
</tr>
<tr>
<td>Handle for surgical blades no.3</td>
<td>825 20 013</td>
<td>16.90</td>
</tr>
<tr>
<td>Weller soldering iron</td>
<td>825 60 010</td>
<td>191.00</td>
</tr>
<tr>
<td>Pump</td>
<td>830 01 010</td>
<td>82.00</td>
</tr>
<tr>
<td>Pan</td>
<td>830 08 010</td>
<td>57.60</td>
</tr>
<tr>
<td>Cuvette</td>
<td>830 09 010</td>
<td>1,458.00</td>
</tr>
</tbody>
</table>

JANUARY, 1979

PRICE LIST
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CODE NUMBERS</th>
<th>UNIT PRICE D. KR.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burner</td>
<td>831 01 010 1</td>
<td>25.70</td>
</tr>
<tr>
<td>Heating plate (for wax AZ 6807)</td>
<td>831 20 010 1</td>
<td>110.00</td>
</tr>
<tr>
<td>Measuring glass</td>
<td>838 01 010 1</td>
<td>6.70</td>
</tr>
<tr>
<td>Bowl</td>
<td>838 03 010 1</td>
<td>21.90</td>
</tr>
<tr>
<td>Bowl</td>
<td>838 03 011 1</td>
<td>30.00</td>
</tr>
<tr>
<td>Tripod</td>
<td>838 20 010 1</td>
<td>22.70</td>
</tr>
<tr>
<td>Glass spatula</td>
<td>838 40 010 1</td>
<td>1.10</td>
</tr>
<tr>
<td>Protection screen</td>
<td>838 50 011 1</td>
<td>248.00</td>
</tr>
<tr>
<td>Transformer for Weller soldering iron</td>
<td>848 01 010 1</td>
<td>154.00</td>
</tr>
<tr>
<td>Insert for soldering iron</td>
<td>849 01 030 1</td>
<td>18.20</td>
</tr>
</tbody>
</table>

Recommended units for complete earmould laboratory amounting to D. KR. 12,456.00

x) **DANGER!**

Use only tools meant for high speed (up to 48,000 rpm).
Use protection screen.

JANUARY, 1979
<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CODE NUMBERS</th>
<th>UNIT PRICE D.KR.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts for previous milling machine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handle</td>
<td>842 10 020</td>
<td>599.00</td>
</tr>
<tr>
<td>Suspension</td>
<td>843 16 010</td>
<td>149.00</td>
</tr>
<tr>
<td>Bowden-draw</td>
<td>842 10 010</td>
<td>486.00</td>
</tr>
<tr>
<td>Burr drill 6H</td>
<td>820 02 106</td>
<td>1.40</td>
</tr>
<tr>
<td>Burr drill 8H</td>
<td>820 02 108</td>
<td>1.40</td>
</tr>
<tr>
<td>Burr drill 12H</td>
<td>820 02 112</td>
<td>2.90</td>
</tr>
<tr>
<td>Milling tool - 79/16</td>
<td>820 15 020</td>
<td>9.30</td>
</tr>
<tr>
<td>Milling tool - 75/24</td>
<td>820 15 021</td>
<td>12.40</td>
</tr>
<tr>
<td>Other parts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collet (for 815 12 010)</td>
<td>820 50 010</td>
<td>24.20</td>
</tr>
<tr>
<td>Manometer for cuvette</td>
<td>835 01 010</td>
<td>51.60</td>
</tr>
<tr>
<td>Glass for protection screen</td>
<td>838 50 020</td>
<td>37.40</td>
</tr>
<tr>
<td>Membrane for cuvette</td>
<td>846 01 010</td>
<td>12.10</td>
</tr>
</tbody>
</table>

JANUARY, 1979  PRICE LIST
**Ear Mould Service**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CODE NUMBERS</th>
<th>UNIT PRICE D.KR.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Custom Made Ear Moulds</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ear moulds produced individually based on impressions made from Oticon impression material AZ 6800</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>With Spring Ring:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard, clear acrylic</td>
<td>570 40 010</td>
<td>50.00</td>
</tr>
<tr>
<td>Hard, clear acrylic, sandblasted</td>
<td>570 40 015</td>
<td>55.00</td>
</tr>
<tr>
<td>Soft, clear acrylic</td>
<td>570 40 020</td>
<td>55.00</td>
</tr>
<tr>
<td><strong>With Ear mould Insert:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard, clear acrylic, silhouette</td>
<td>570 40 030</td>
<td>55.00</td>
</tr>
<tr>
<td>Soft, clear acrylic, silhouette</td>
<td>570 40 040</td>
<td>60.00</td>
</tr>
</tbody>
</table>

January, 1979

**Price List**
Auditory Training Equipment
Oral-auditive communication
Speech development and training
Sound perception and speech intelligibility

Any educational situation involving a teacher and a student will encompass the abstract concepts headed above. It is natural to presume that the teacher is qualified to supply a basis for the student to receive the educational information: the objective of teaching is to make available the educational information needed by the student.

A major part of all educational information is presented by the teacher to the student in verbal form. Depending on the educational stage and on the material to be presented the teacher may use supplementary media, but the spoken language will always have a dominating priority in all education.

Contrary to the teacher, who will be qualified to fulfill his role in the educational situation some students may have reduced possibilities to achieve optimal benefit from the verbal presentation of the educational information: the hearing impaired student.

These systems, however, are to a certain extent inadequate in one or more respects. Advantages and disadvantages of the wired systems and of the magnetic loop systems have been investigated and discussed by the educators and specialists, and a variety of reports may be studied to conclude this debate.

One main thought is presented in almost all such reports: the preferred amplification system to solve the problems in the oral-auditive communication between a normal hearing teacher and a hearing impaired student should at least incorporate the following basic features:

1. Optimal signal-to-noise ratio
2. Optimal acoustic characteristics
3. Total mobility for both teacher and student
4. Easy to operate
5. Great reliability and
6. Lightweight and small sized equipment

Many more demands may be listed; the above are only the major demands that must be made available in an auditory training equipment.

Traditional measures to overcome the student’s handicap

Since the 1920’s, educators in cooperation with technicians and specialists in a number of fields have supplied to students with hearing disorders the possibility to take part in the oral-auditive education by means of amplifying devices.

The history of the hardware (the wired amplification classroom systems and the magnetic loop systems) is well-known today. Such amplification systems are commercially available and have satisfactory acoustic properties.

Oticon Auditory Training Equipment
Development concept

When Oticon decided to enter the special field of helping hearing impaired students the basis for the development project was made partly on published scientific literature and partly on field research made by Oticon’s international staff.

The research period prior to the actual development unveiled certain factors that should be kept in mind when designing the auditory training equipment, it should
it was found necessary to write down a detailed and specified objective for the development phase. The objective had to respect a number of demands that at once seemed to be in conflict with each other. On one hand, it would be preferable if the entire equipment could incorporate all the acoustical and technical features wanted by the consumer side. On the other hand, the fulfillment of such demands would not only make the equipment expensive in purchase, but would also introduce higher operating costs, less reliability and complicated servicing.

The written objective made for the development thus had to take these parameters into consideration.

Development objective

The final development objective had the following wording:

To develop and produce a wireless RF auditory training equipment based upon frequency modulation, which enables the severely hearing impaired student to perceive the teacher's voice with a signal-to-noise ratio better than 40 dB over distances of at least 30 meters. The equipment shall be based upon a personal, powerful hearing aid, a radio receiver, and a radio transmitter, where the latter shall be fitted with a sensitive microphone close to the teacher's mouth. The student's personal hearing aid in the system shall allow the student to monitor his own speech production via the hearing aid microphone, while the teacher's voice is perceived simultaneously via the FM receiver unit.

All parts of the equipment shall be lightweight and small-sized, and shall be designed with high quality parts and components to give great reliability and reduce service demands.

The text following this primary development objective specified the details of the equipment based upon the experience and know-how collected during the initial research period.

The Research and Development Departments were given full instructions to every topic in the development plan, and the skilled staff of the Oticon Laboratories set to work on the new project.

Development philosophy

Oticon's Research and Development Department studied the various systems available on the market. Meetings and discussions with leading Scandinavian school educators inspired the designers in their initial work — and very soon the basic design for the new equipment could be demonstrated and tested in practical school environments.

All such demonstrations and tests meant alterations and adoptions to special needs and demands. It was clearly understood that many of the theoretical wishes expressed at a very early stage of the development phase could not be fullfilled without creating negative features in the entire system.

In order to arrive at a practical solution which would embrace as many positive features and render optimal use to the teachers and students...
The results

The actual development work stretched over a long period, where several prototypes were handmade and tested in comprehensive field tests in Denmark and abroad.

The new system has been designated "Oticon Auditory Training Equipment" and consists of four separate parts:

1. T 15 which is the teacher's unit – a combined microphone and FM radio transmitter,
2. R 15 which is part of the student's unit – a small sized radio receiver,
3. P 15P a push-pull pocket hearing aid, and
4. C 15 an automated charger for the accumulator cells used to power the T 15 and R 15.

A study of the data and specifications of these Oticon products and a practical test in an educational situation is convincing.

Detailed information about the Oticon Auditory Training Equipment including all data, operating instructions, and system build-up should be studied carefully – and a practical test is offered without any obligations for a trial period.
Information

Auxiliary Input (T15) Connector for Auditory Training Equipment

Principle diagram

As demonstrated in the principle diagram the teacher is able to mix the signal from the external signal source with his own voice through the T15 microphone, and he is also able to control the level of the external signal with his own voice level by means of the volume control built-in on the wire.

Data and specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum input voltage</td>
<td>10V</td>
</tr>
<tr>
<td>Volume control range</td>
<td>&gt; 70 dB</td>
</tr>
<tr>
<td>Input impedance</td>
<td>&gt; 60k Ω</td>
</tr>
</tbody>
</table>

Order No.

- 627 50 011 with DIN plug
- 627 50 010 without plug

To connect the auxiliary input socket on the T15 microphone/transmitter with an external signal source (radio, tape, recorder, record player, TV set, movie projector, etc.) Oticon has made available a special connector.

The connector is a wire with a built-in volume control to attenuate the signal from the external signal source. The connector is available in two versions. Both types have a standard plug for the T15 auxiliary input socket in one end. In the opposite end the wire has either a standard DIN 3-pin plug or open leads for other types of sockets in the external signal source that do not comply with the DIN standard.

Please consult your Oticon representative if you should wish to receive more information about the auxiliary input connector for the T15 and its operation.

OTICON INTERNATIONAL A/S
9, Klaedemalet - DK-2100 Copenhagen - Denmark
Information

Transmitter T.15
FM receiver R.15
Hearing aid P.15P
Charger C.15

A high quality education system based on frequency modulation to secure optimal oral-auditive communication between teacher and severely hearing impaired students.

Total mobility for both teacher and students.

Better than 50 db signal-to-noise ratio in the acoustic output of the student's unit.

Teacher's unit T.15:
FM Transmitter with microphone

- The top part is a standard electromagnetic microphone, exclusively for teachers and other adults.
- The receiver is a compact, lightweight, and comfortable to wear.
- The transmitter is a high-quality device, suitable for oral-auditive communication.

By pressing two small buttons on the back of the transmitter, the microphone can be turned on or off by the teacher. Contact with the student is maintained.

A high-level protection of the electrical part, to prevent damage and ensure safety.

The headphone connection is in the bottom of the microphone, allowing for smooth communication.

A compact design with a sturdy, durable construction, allowing for long-term usability.

The information is based on the specification from the OXICON Research and Development Department.
Student's unit R 15/P 15P
FM radio receiver and push-pull pocket aid

The student's unit has been designed as a two-component unit, where radio and hearing aid are locked together firmly without any cord connections. The signal from the radio to the hearing aid is transmitted through electric terminals in the bottom of the hearing aid. The combined unit is carried on the chest in a strap designed for optimal comfort to the student.

The student's unit in Oticson's auditory training equipment is small and lightweight (204 g/2.20 oz., total weight). The strap holds the unit firmly in place on the chest and can be used for the combined unit as well as for the hearing aid alone.

The receiver is very sensitive with a distortion below 3% and a max. signal-to-noise ratio better than 60 dB. It is powered by either a NiCadmium storage battery (DEAC 7A) or a 9V battery (type E92P22). The battery compartment is firm closed by a spring loaded lid under the strap. It is not necessary to remove the storage battery when recharging in the O-15 charger.

The E-15P hearing aid is a powerful push-pull pocket aid with fully built-in Oticon quality features. A permanently connected AGC compression circuit capable of limiting the maximum output sound pressure level to the most comfortable listening level for the student. The signal at the two sockets for the receiver cords (Phone 1 and Phone 2) are continuously adjustable by means of two small controls below the sockets. One of these controls (Output Phone 1) is adjustable to maximum output sound pressure level of 105 dB. The second control (Output Phone 2) makes it possible to change the output sound pressure level from 75 to 115 dB by the additional 15 dB.

The student's unit is highly susceptible to electromagnetic interference when worn by the student, but it is possible to prevent interference by removing the student from the area, or by using an external antenna in a different location with the radio receiver connected to the external antenna with the audio signal from the radio through the appropriate audio output. The second control on the back of the radio can be used to adjust the sensitivity of the unit under varying conditions in a very high magnetic field.
In operation:
Oticon auditory training equipment: T 15/R 15/P 15P/C 15

Scientific research and clinical experiments in the field of auditory training of school children have resulted in some basic demands that must be met by amplification systems to be used for the oral-auditive education of hearing-impaired students. Oticon's auditory training equipment is made to meet such demands fully.

Charger C 15

The T 15 and the R 15 can use 9V storage batteries. It is not necessary to remove the storage batteries from the battery compartment when they are recharged if Oticon's automated charger, C 15, is used.
Auditory training equipment

Disturbance-free transmission of signal from teacher to students with a signal-to-noise ratio better than 50 dB.
Total mobility for teacher and students - in the classroom as well as outside.
Use of a separate, personal hearing aid gives uniform and unchanged frequency response for all student waking hours.
Maximum utilisation of the frequency band, under national authority approval.
Flexible fitting possibilities for extremely severe hearing disorders - also for asymmetric bilateral losses with individual adjustment of maximum output sound pressure level for both ears.

Teacher's unit R15
1. Microphone
2. Auxiliary input
3. Switch: auxiliary/microphone
4. Power control
5. Carrying strap
6. Antenna
7. On/off switch (in bottom of the transmitter)

Student's unit
Radio R15
1. Snap lock for hearing aid
2. Power control
3. Terminal for connecting hearing aid
4. Battery compartment

Headset R15
1. Talk switch
2. Microphone
3. Post speaker
4. Control panel
5. Receiver switch
6. On/off trigger
7. Antenna terminals
8. RF terminals
9. Battery compartment
10. Microphone
11. Power control
for the identification of middle ear effusions

- self-starting
- easy to use
- 3 seconds per ear
- completely automatic
- prints permanent record
- economical
Johnny passed the hearing test but...

There appears to be little relationship between the level of hearing loss and ear disease. An ear with a normally appearing tympanic membrane may harbor middle ear pathology. More than 50% of children with significant middle ear pathology pass the standard hearing screening tests.

We must turn our attention to methods which will detect ear pathology. Tympanometry can identify the presence of middle ear effusions independent of hearing loss. The method is simple to use, and minimally dependent upon the child’s cooperation.

Tympanometry can precisely identify middle ear disease for prompt referral. It can easily be performed by paramedical personnel in seconds. Children tolerate the procedure extremely well, and the method is rapid and extremely accurate.

Tympanograms created in 3 seconds as easy as A-B-C with American’s new TYMPANOMETER™
Apply the probe to the ear and the TYPMANOMETER™ does the rest.

Green light on—Test starts automatically. Signifies that the probe is seated properly in the ear. The test starts automatically and the tympanogram is completed in 3 seconds.

Red light on—Test will not start. The probe is against the canal wall. Re-orient the probe.

Red light blinks—Test will not start. Seal is not present. Seat the probe more firmly.

Avoiding discomfort
Standard procedure for conducting tympanometry requires a starting pressure of +200 mm H₂O in the outer canal. It is then changed from +200 mm H₂O to −200 mm H₂O. Normal ears characterized by a tympanogram peak may be subject to discomfort and even pain at pressures below −200 mm H₂O. The Tympanometer automatically stops at −200 mm H₂O when a peak occurs. In the presence of a pathologic middle ear not characterized by a peak the pressure automatically reduces to −400 mm H₂O providing additional diagnostic information. In this way the same level of automation is achieved whether the instrument is used for screening or diagnostics...and with no discomfort to the patient.

"Rock" eartips
The hermetic seal is formed by closure about the conchamatal junction. Thus the handheld probe tip enters the inside of the ear canal only minimally. It has been found to offer an effective and comfortable canal seal with no danger of dislodging the tip into the ear canal, or damaging the PE tube.

Cost of Tympanometry pennies per test. Write for economic analysis.
One Year Warranty on instrument, covering parts and service.

Tympanometry: the most significant middle ear test in the conduct of Impedance Audiometry
Tympanometry is an objective measurement of ear-drum compliance changes as air pressure is altered in the outer canal. The Tympanometer is designed to accomplish all of the tympanometric tests essential to the diagnostic needs of the clinician. Nonetheless, because of its simple operation, it is easy and safe for use with minimal training.

The built-in recorder automatically produces a tympanogram which is a graphic presentation of the result of tympanometry. The tympanogram is shown on either a basic parameter grid or against a predetermined pattern based on derived pass/fail criteria for routine screening functions. The simplicity of operation and interpretation of the tympanogram lends itself to easy comparison with pre-established norms for a variety of pathologies. The easily inserted paper roll allows tympanograms to be created, torn off and pasted on the patient's progress chart, medical record or screening record.

Many studies in the United States and Europe have shown the efficacy of this technique for routine screening of children for ear disease. The Tympanometer provides accuracy, objectivity, freedom from background noise interference and the simplicity necessary for routine screening.
# Specifications

<table>
<thead>
<tr>
<th><strong>POWER SUPPLY</strong></th>
<th>110 Volts, 60 Hz. Less than 50 watts. Available for 220 Volts, 50 Hz.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DIMENSIONS</strong></td>
<td>10½&quot;W x 6½&quot;H x 12&quot;d</td>
</tr>
<tr>
<td><strong>WEIGHT</strong></td>
<td>19 lbs.</td>
</tr>
<tr>
<td><strong>PROBE TONE</strong></td>
<td>Frequency - 220 Hz±1%, Distortion - less than 1%, Reference SPL-85dB, SPL automatically adjusted to tympanometry starting conditions at +200 mm H₂O pressure.</td>
</tr>
<tr>
<td><strong>MEASUREMENT RANGE:</strong></td>
<td>Automatically accommodates ear cavity volume from 0.2 to 50 cc.</td>
</tr>
<tr>
<td><strong>EAR SEAL TEST</strong></td>
<td>Automatically tests for ear seal and probe position as a precondition for automatically starting the test.</td>
</tr>
<tr>
<td><strong>TYMPANOMETRY SENSITIVITY</strong></td>
<td>±0.7 cc referenced to 2 cc cavity for full deflection of recorder stylus.</td>
</tr>
<tr>
<td><strong>REFLEX SENSITIVITY</strong></td>
<td>±0.125 cc referenced to 2 cc cavity for full deflection of recorder stylus.</td>
</tr>
<tr>
<td><strong>TYMPANOMETRY AIR PRESSURE</strong></td>
<td>Automatic air pump pressure range (mm H₂O) +200 to -200. Range automatically extended to -400 in the absence of a tympanogram peak. Accuracy ±5%, of full range.</td>
</tr>
<tr>
<td><strong>AUTOMATIC AMBIENT PRESSURE COMPENSATION</strong></td>
<td>Automatically adjusts to ambient environmental pressure conditions.</td>
</tr>
<tr>
<td><strong>REFLEX AIR PRESSURE</strong></td>
<td>Air pressure automatically adjusts to pressure at maximum tympanogram amplitude of reflex position.</td>
</tr>
<tr>
<td><strong>READOUT</strong></td>
<td>Strip chart recorder, chart width ~50 mm, chart speed ~25 mm/sec, thermally sensitive paper, heated stylus.</td>
</tr>
<tr>
<td><strong>OPTIONAL ACCESSORIES</strong></td>
<td>Carrying Case, Pressure Seal Headband.</td>
</tr>
</tbody>
</table>

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*The School for Tympanometry* (½-day) encompasses the principles of tympanometry and utilizes actual Tympanometers in demonstrating practical applications for pediatric situations.

- **Textbooks** designed to foster increased understanding of the implications and applications of Tympanometry.
- **Consultation** for special technical and diagnostic Tympanometry applications.
- **Complete service**—worldwide representation.

"the impedance people" is a service mark of American Electromedics Corporation

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manufacturers and suppliers, in the interests of progressive development and/or to meet the introduction of additional standards, vary the specifications outlined in this literature.
Product Data
Diagnostic Audiometer  Model AD17

Features
➢ Advanced diagnostic audiometer with clinical functions
➢ 11 pure tone frequencies
➢ Intensity range - 10 to 120 dB
➢ Automatic pulsing
➢ Narrow Band Masking
➢ Fowler and Stenger tests
➢ Calibrated speech audiometry
➢ Connection for free field audiometry
➢ Mains/Battery powered with carrying case

The AD 17 Diagnostic Audiometer is a compact inexpensive instrument with pure tone and speech facilities, designed for routine diagnostic testing.

It can be used as a mains powered desk audiometer or as a transportable mains or battery powered unit. It is supplied complete with protective/carrying case.

Pure Tone Audiometry
The air conduction threshold can be established at 11 frequencies from 125 to 8000 Hz, and bone conduction threshold at 8 frequencies from 250 to 4000 Hz.

The normal intensity range can be extended to 120dB for air conduction from 500 - 6000 Hz.

Fowler’s Loudness Balance Test
Fowler's test of unilateral recruitment can be carried out by using the masking attenuator for the opposite ear. The tone is shifted between the two ears using two special balance positions on the function switch.

Automatic Pulsing
Automatic or manual pulses can be used. Pulses are indicated by the built-in VU Meter and can easily be compared with the indicating lamp showing the patients signal.

Stenger’s Speech and Tone Tests
Stenger's tests of non-organic hearing loss can be carried out in the same way.

Tone as well as speech can be used for the test.

Narrow Band Masking
The narrow band noise masking is automatically adjusted by the frequency control. The attenuator is calibrated in effective masking indicating the tone intensity which can normally be masked. Masking is automatically applied to the opposite earphone from the tone. An insert earphone can also be used.

Speech Audiometry
Recorded speech from a tape can be connected directly to the AD 17. The zero level of speech is calibrated by the use of the built-in VU Meter. Speech intensities can therefore be read directly from the normal attenuator. When used for speech, narrow band masking automatically changes to white noise.
Speech Audiometry
A speech circuit TASS can be built-in for connection to a microphone for live voice speech audiometry.

Free Field Audiometry
The audiometer can also be used for free field audiometry when connected to a power amplifier with one or more loudspeaker units, such as the Free Field Amplifier (AP2) and the Loudspeaker (GDM Mk. 2).

Carrying Case ACC17
The AD 17 is supplied complete with a carrying case into which all the accessories can be fitted. The case is also invaluable for security and protection when unit is used as a static desk audiometer.

Battery Supply
A battery pack is supplied so that the audiometer can be operated without mains supply. Standard batteries are used.

Technical Specifications

Test Frequencies:
- air conduction: 125, 250, 500, 750, 1000, 1500, 2000, 3000, 4000, 6000 and 8000 Hz.
- bone conduction: 250, 500 750, 1000, 1500, 2000, 3000 and 4000 Hz.

Hearing Loss Range:
- air conduction: -10dB to 120dB (with +20dB) in 5dB steps for frequencies 500 - 6000 Hz.

NOTE: +20dB does not function for 125, 250 or 8000 Hz.

125 Hz - max. 70dB
250 Hz - max. 90dB
8000 Hz - max. 100dB

bone conduction: -10dB to 60dB from 1000 to 4000 Hz except:
- 250 - 30dB
- 500 - 50dB

Masking range: 10 to 100dB in 10dB steps, ipsilateral effective calibration (tone or speech +10dB).

Automatic Pulsing: 0.5 second pulse and interval.

Function Selector:

Output Selector:
- Stenger, Left, Right, Bone (Masking Right), Free Field.

Consumption:
- 220 Volt AC, 10 Watt.

Batteries:
- 8 pieces standard SP2 or equivalent (in AC817 battery pack).

Dimensions:
- 38 x 15 x 21 cm.
- 2.5 kg. - 4 kg. with carrying case.

Calibration:
- air conduction: ISO 389 1975
- bone conduction: BS 2497 1972
- speech audiometry: ANSI 53.6 1969 or DIN 45635.

Accessories included:
- TDH 39 Earphones
- Radio Ear Bone Conductor
- Patient's Signal Button
- 200 Audiogram Forms
- Red, Blue and Green Pen Set

Accessories obtainable:
- ADS5 Microphone Circuit with MD611 Microphone
- Insert Earphone Set
- Noise Excluding Headset
- Insert Masking Phone

The manufacturers and suppliers, in the interests of progressive development and/or to meet the introduction of additional standards, may vary the specifications outlined in this literature.

P. C. Werth Ltd.
17 Stratford Place,
Oxford St. London, W1N ODH
(01)-629 5559
The **Phonic Ear® HC 1000** Acoustic Test Computer is designed to allow accurate and fast testing of most hearing instruments, auditory trainers and earphones.

Push buttons select five acoustic input intensities from 60 to 100 dB SPL and six acoustic input frequencies from 250 to 5000 Hz. Two push-buttons select percent of second or third harmonic distortion. Signal-to-noise measurements can also be made. The dual digital display simultaneously depicts acoustic output sound pressure level and percent of second or third harmonic distortion. All common earphones can be tested for sufficient output and low distortion using the Earphone Selector Switch and one of the four earphone test cords supplied.

The Artificial Ear consists of a standard 2 cm³ coupler and a high dynamic Telelectret™ microphone. The anechoic chamber with its built-in speaker has a chamber attenuation of 45 dB at 1000 Hz. The cabinet and counter-balanced lid are constructed of seam-welded steel with baked enamel finish for durability.

Testing Body Instruments

Testing Post-Auricular and Eyeglass Instruments

The earphone is connected to the 2 cm³ coupler and placed in the bracket outside the chamber. The hearing instrument is directly connected with the 2 cm³ coupler in the chamber.

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Operating Instructions

Connect the power cord on the back of the HC 1000 to a 220/240 V ~ wall socket.

ON: Press POWER push-button. A red indicator light will turn on in upper left corner of the display, or a green light above the push-button.

OFF: Release POWER push-button.

TESTING HEARING INSTRUMENTS

The hearing instrument microphone must be pointing down and located in center of the white circle in the chamber.

Testing Body Instruments
Place the hearing instrument so the microphone is in the center of the test circle facing down. Switch on the hearing instrument and turn volume control to maximum position. Connect the earphone to the 2 cm² coupler and place it in the holder outside the chamber of the HC 1000.

Testing Post-Auricular and Eyeglass Instruments
Prepare the 2 cm² coupler by attaching the plastic tube to the metal adaptor and assembling below the rubber washer inside the coupler. Tighten the nut on the coupler. Place coupler and hearing instrument in the test circle with the microphone centered and pointing down. Switch on the hearing instrument and turn volume control to maximum position.

MEASURING ACOUSTIC GAIN

Input Setting
Press the 60 dB Acoustic Input push-button.

Frequency Selection
Press the desired Acoustic Input Frequency push-button.

Harmonic Distortion Selection
Press second or third Harmonics push-button. Digital display shows distortion in percent.

Example of Gain
Acoustic Output dB Sound Pressure Level digital display reading: 120 dB Gain = 120 dB output minus 60 dB input = 60 dB.

Acoustic Test Chart
All measurements taken can be easily plotted on the PHONIC EAR® Acoustic Test Chart. For example, use 'O' for gain measurements (dB scale right side of chart) and 'X' for maximum output measurements (dB scale left side of chart).

MAXIMUM ACOUSTIC OUTPUT MEASUREMENT

Frequency Selection
Press the 1000 Hz Acoustic Input Frequency push-button.

Input Setting
Starting at 60 dB, press each of the Acoustic Input push-buttons until the Acoustic Output dB Sound Pressure Level digital display reading stops increasing. The highest reading achieved is the maximum acoustic output, re 20 μPa.

Harmonic Distortion Selection
Set Input level to 60 dB, and press second or third Harmonics push-button. Digital display shows distortion in percent.

SIGNAL-TO-NOISE MEASUREMENT

TESTING EARPHONES
Check the socket on the earphone to determine type of plug to be used. Select and plug in the proper test cord. Plug test cord in the jack plug on the front panel marked Receiver Impedance. Check the earphone impedance and other data in suppliers catalogue. Place the Receiver Impedance switch in correct Ohm impedance position. Connect earphone to the 2 cm³ coupler.

ACOUSTIC OUTPUT MEASUREMENT

Frequency Selection
Press the 1000 Hz Acoustic Input Frequency push-button. Press TEST push-button. The digital display shows Acoustic Output, re 20 μPa/1 mW.

Harmonic Distortion Selection
Press second or third Harmonics push-button. Digital display shows distortion in percent.

MAXIMUM ACOUSTIC OUTPUT MEASUREMENT
By changing the position of the Receiver Impedance Ohms switch (increasing or decreasing the impedance setting), it can be determined how input signals greater or less than 1 mW are handled by the earphones.

Calibration

The Phonic Ear HC Acoustic Computer is easy to calibrate. With a B&K type 4230 sound level calibrator and a type DB0011 microphone gril, the Phonic Ear HC 1000 can be calibrated to ensure that test results are correct within the given tolerances.

Microphone calibration must take place before chamber calibration.

MICROPHONE CALIBRATION

Remove the 2 cm³ coupler from microphone. Turn counter-clockwise. Place microphone grill on the test microphone. Make sure no damage is done to the fine threads of the microphone section. Place microphone with grill into the sound level calibrator.

Frequency Selection
Press the 1000 Hz Acoustic Input Frequency push-button.

Input Setting
Press the Acoustic Input Off push-button.

Calibration Adjustment
Press push-button switch on the sound level calibrator. Keep switch depressed or signal from the calibrator will last only about 20 seconds. Adjust Mic Calibrate screw with a screwdriver until Acoustic Output dB Sound Pressure Level digital display reads 94 dB. Repeat adjustment procedure until correct reading of 94 dB is maintained.
**CHAMBER CALIBRATION**

Place microphone with grill exactly in center of the white circle in the chamber. Use the holder which comes with the HC 1000. **Microphone grill must face down in the center of the circle.** Close chamber gently. Make sure that microphone is still in the correct position before chamber is completely closed and latched.

**Frequency Selection**
Press the 1000 Hz Acoustic Input Frequency push-button.

**Input Setting**
Press the 70 dB Acoustic Input push-button.

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**Technical Specifications**

**PHONIC EAR® HC 1000 ACOUSTIC COMPUTER:**

ACOUSTIC INPUT FREQUENCIES: 250, 500, 1000, 2000, 4000, 5000 Hz (± 2 %)
ACOUSTIC INPUT INTENSITY: 60, 70, 80, 90, 100 dB SPL* (± 2 dB)
SIGNAL-TO-NOISE: Measure with acoustic input oscillator OFF
CHAMBER ATTENUATION: 35 dB at 1000 Hz
ACOUSTIC DISTORTION OF CHAMBER: <2% at 90 dB SPL*

TEST MICROPHONE: Electret mic. (1% distortion at <145 dB SPL*)
ACOUSTIC COUPLER: B&K Type DB-0138 2 cm³ coupler with high dynamic Eelectret™ mic
CALIBRATION: 94 dB SPL* at 1000 Hz using B&K Type 4230 Sound Level Calibrator or other 1" calibrator
POWER REQUIREMENT: 220 V ~, 50 Hz
CABINET: Seam-welded steel construction, baked enamel finish, counter-balanced chamber lid
SIZE: 340 mm x 400 mm x 440 mm
TEST CHAMBER: 75 mm x 178 mm x 220 mm
WEIGHT: 21 kg

* SPL = 20 µN/m² = 20 µPa,

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**DUAL DIGITAL DISPLAY:**

ACOUSTIC OUTPUT: 50 to 149 dB SPL* (Resolution 1 dB) (Accuracy ± 1 dB ± 1 digit)
ACOUSTIC DISTORTION: 0 to 99 % of 2nd and 3rd Harmonics at input frequencies (Accuracy ± 5 % of reading ± 1 digit)

EARPHONE TEST: Acoustic Output and Distortion (specifications as listed above) At 1 mW/1000 Hz drive for 15, 68, 100, 120, 200, 1000 Ohm earphones.

**ACCESSORIES**

AT 31 Screwdriver ▲
AT 52 Test Cord Set ▲
AT 53 Acoustic Test Charts (one pad of 100) ▲
AT 56 Hearing Aid Support Clamp ▲
AT 56 SP Post Auricular H/A Support Clamp
AT 57 Plastic Tubing (3 pcs.) ▲
AT 60 Bulb Tip ▲
HA-1 Coupler for all-in-the-ear
AT 70 Test/Display Stand
AT 92 Protecting Grid ▲
AT 116 6 cm³ Coupler
AT 120 Induction Coil Tester
DB-0138 2 cm³ Coupler, B & K type ▲
Dustcover ▲

▲ Included

**WARRANTY: 1 year on electronics, 90 days on cords, mic and coupler.**

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**P. C. Werth Ltd.**

17 Stratford Place, Oxford St, London, W1N ODH (01)-629 5559
It is easy to obtain a pure-tone audiogram from most children of a mental age of 3 years or above, but with those of a mental age of less or if unco-operative or hyperactive, it has been often impossible.

This small loudspeaker audiometer is of great assistance in testing the hearing of very young and backward children. Increased flexibility is provided by the addition of a socket close to the loudspeaker grille into which an earphone on a lead can be connected. In use the earphone gives 20 db higher maxima, when held against the ear, than the loudspeaker at two feet, and also greater accuracy. The audiometer is easy to operate and light to hold.

The tone is presented when the button in the handle is pressed.

Power is provided by a built-in rechargeable cell. A battery charger is supplied with the instrument.

- 250, 500, 1000, 2000 and 4000 Hz.
- Maximum of 80 dB, apart from 250 Hz which is 70 dB, two feet from front.
- Attenuation in 10 dB steps plus 5 dB button.
- Rechargeable battery.
- Size 6¾” x 8” x 5¼” (150 x 204 x 133 mm).
- Weight 4½ lbs. (2 Kg.).
The T15 microphone/radio transmitter is designed as a Lavalier type to be carried in a strap around the neck. An antenna of approximately 80 cms. in length hangs vertically down from the bottom of the T15. The antenna should be allowed to hang freely to give optimal transmission.

The microphone is placed in a separate unit on top of the transmitter. The microphone unit can be removed by pressing two small buttons (4) on each side of the T15. At the same time, you should apply a slight pressure on the microphone top towards the transmitter permitting the locks to open. Then pull the two units apart. Assembly of the two units is done simply by pressing them together until the locks click in position.

An auxiliary input socket (2) on one side of the microphone unit allows transmission of signals from external sound sources (see page 2). A small switch on the microphone (3) makes it possible to mix the microphone signal with the external sound source or transmission of the external sound source alone.

When the microphone unit has been removed from the transmitter you have access to the battery compartment in the top of the transmitter. The lid is spring loaded when a battery or accumulator cell is inserted. When the battery compartment is empty you should open the lid by pressing a nail under its edge. The T15 may be used with a 9V battery of the international IEC 6F22 size or an accumulator cell of type DEAC Tr 7/8. If accumulator cells are used you may charge the cell without removing it from the compartment by using the Oticon charger C15.
The teacher's unit, T15, has an auxiliary socket for external sound sources. This makes it possible to transmit the audio signal from a movie projector, a television set, a radio, tape recorder or record player as a frequency modulated radio signal to all student units tuned to the same frequency band as the teacher's unit.

The external sound source is connected to the T15 by means of a special connector cord, which is supplied with either a standard DIN plug (order no. 607 50 011 08) or without any plug (order no. 607 50 010 07) in the end opposite to the T15.

You have to select the appropriate connector according to the sockets in your external sound sources.

Both types of connectors are equipped with a small volume control on the wire enabling you to adjust the output signal of the external sound source to the most comfortable level of your students.

The small switch on one side of the microphone unit in T15 allows a mix of your own voice (through the T15 microphone) with the sound from the film, TV-set, radio, tape recorder or record player. In this case the switch is set in position "AUX O". If you want to transmit only the signal from the external sound source the switch is set in position "AUX.".

The signal transmitted by the T15 to the students may be adjusted by a small control on one side of the T15. This means that you are able to adjust the level of your own voice - either alone or mixed with the signal from an external sound source - to the most comfortable level for your student and according to the speech level of your voice.
The radio receiver unit R15 and the student's personal P15 hearing aid snaps easily together when a light pressure is applied on the top edge of the hearing aid pressing the hearing aid into the snap lock on the R15. When the P15 is removed the lock is released by the button on one side of the radio (2).

A 9V battery (type IEC 6F22) or accumulator cell (DEAC Tr 7/8) is used to power the R15, and the P15 hearing aid is powered by a 1.5V Penlight battery (type IEC R6). The accumulator cell in the R15 may be recharged without being removed from the radio when an Oticon charger C15 is being used.

The battery compartment in the R15 opens easily when the spring loaded sliding lock is pressed downwards. The terminal plate in the R15 prevents wrong insertion of the battery/accumulator cell, but a clearly marked red cross in the compartment gives a visual indication of, how the battery/accumulator cell should be placed.

The battery compartment in the P15 hearing aid swings open when the wedged edge of the lid is pressed lightly. Also in this case a clearly marked cross indicates how the Penlight battery should be placed in the compartment.

The student's unit is carried on the chest in a strap specially designed to give optimal comfort and protection of the unit. The R15/P15 unit is assembled and placed in the "pocket" in the strap, and the R15 is snap-locked to the strap by the small button on the back of the R15. The size of the strap (both the neck band and the waist band) is adjusted to fit the student, and the special nylon locks on the two bands allows easy use of the carrying strap.
April 17, 1979.

Mr. J. M. Ashton,
117 Down Road,
Windbourne Down,
BRISTOL, UK.

Handicapped Centre, Isa Town, Bahrain.

Dear Mr. Ashton,

We enclose 2 copies of our drawing made following our recent meeting together with a photocopy of our letter to the Ministry of Labour and Social Affairs.

Yours sincerely,

C. Woodhead
for Makiya Associates.

encl.
Ministry of Labour and Social Affairs,  
State of Bahrain.  

For the attention of Miss Hanan.  

Dear Sirs,  

Handicapped centre, Isa Town  

We refer to our meeting at site on 9th April 1979 with Mr. J. M. Ashton, and officials of the Ministry, to discuss the section of the building allocated for education of deaf children.

We understand that Mr. Ashton will be reporting back in the light of the discussion with his recommendations.

The attached plan shows our interpretation of his initial proposals with the following features:

A. Staff accommodation  
1. Provision of additional room for teaching staff.  
2. Provision of additional toilet for teaching staff.

B. Children's toilet  
1. Lowering of one hand basin to 55cm. above floor level.  
2. Replacement of standard WC with infant size unit (or alternatively raising floor level of the western type WC cubicle 10cm. and tiling the raised floor).

C. Classrooms - providing in each  
1. a lower window panel incorporating a door to outside  
2. an extended paved area for outdoor activities in a walled enclosure.  
3. a "wet" area with tiled floor raised 15cm. above existing floor level and a second sink at 55cm. fixing height for children's use.  
4. Extra 13 Amp switched socket outlets for special electrical equipment.  
5. Horizontal conduit at 90cm. above floor level for an induction loop.  

We recommend that repainting of the original walls of this section of the building, inside and out, is allowed for in the budget, in view of the time elapsed since the main contract painting took place, and in view of the preference for using lighter colours in the smaller rooms made by partitioning the original space.

cont. ..2
Our estimate for the work described above and in the attached drawing, exclusive of all furnishing is BD. 30,000 (Thirty Thousand Dinars only).

After Mr. Ashton reports back we will await your further instructions with a view to obtaining competitive prices in tender for the work.

Yours faithfully,

C. Woodhead

for Makiya Associates.