



CS STRUMENTAZIONE ELETTRONICA Srl

CS STRUMENTAZIONE ELETTRONICA srl
20139 - MILANO - ITALY
Via Riva di Trento, 5
Tel.+39 02 569.10.10 - Fax +39 02 569.14.85
WEB: www.cs-strumentazione.com
Email: sales@cs-strumentazione.com



CS AC-3

Universal Test Head

Rel.1.2.0

AC-3

Universal Test Head for “Test System for Telephonometry - CS8030” and “Automatic F.F.T. Telephone Tester - CS8014”

1.0 Generals

AC-3 Test Head is composed by three sections¹ :

Artificial Ear	mod. AC-3002
Artificial Mouth	mod. AC-3003
Amplifier Unit	mod. AC-3005

put together in a solid **AC-3004** mechanical structure, which allows to perform, in a easy and repeatable way, Speech Equivalent measures on user telephone sets.

AC-3002 Artificial Ear section, allows performing Reception Equivalent Measures, that is the acoustic level the user receives when on the telephone line is sent an electrical signal.

Above said section is also used for side tone measures that are of the acoustic signal part sent to the microphone, which come back to the receiver.

AC-3003 Artificial Mouth Section allows instead, performing Sending measures; that is the electrical signal received on the line when the microphone under test is excited by an acoustic signal.

The correct handset positioning, in respect to the Test Head elements, is granted by a F adapter ring, placed around the Artificial Ear, which furthermore forms the reference plan². This adapter ring corresponds to the negative trace of the handset receiving part.

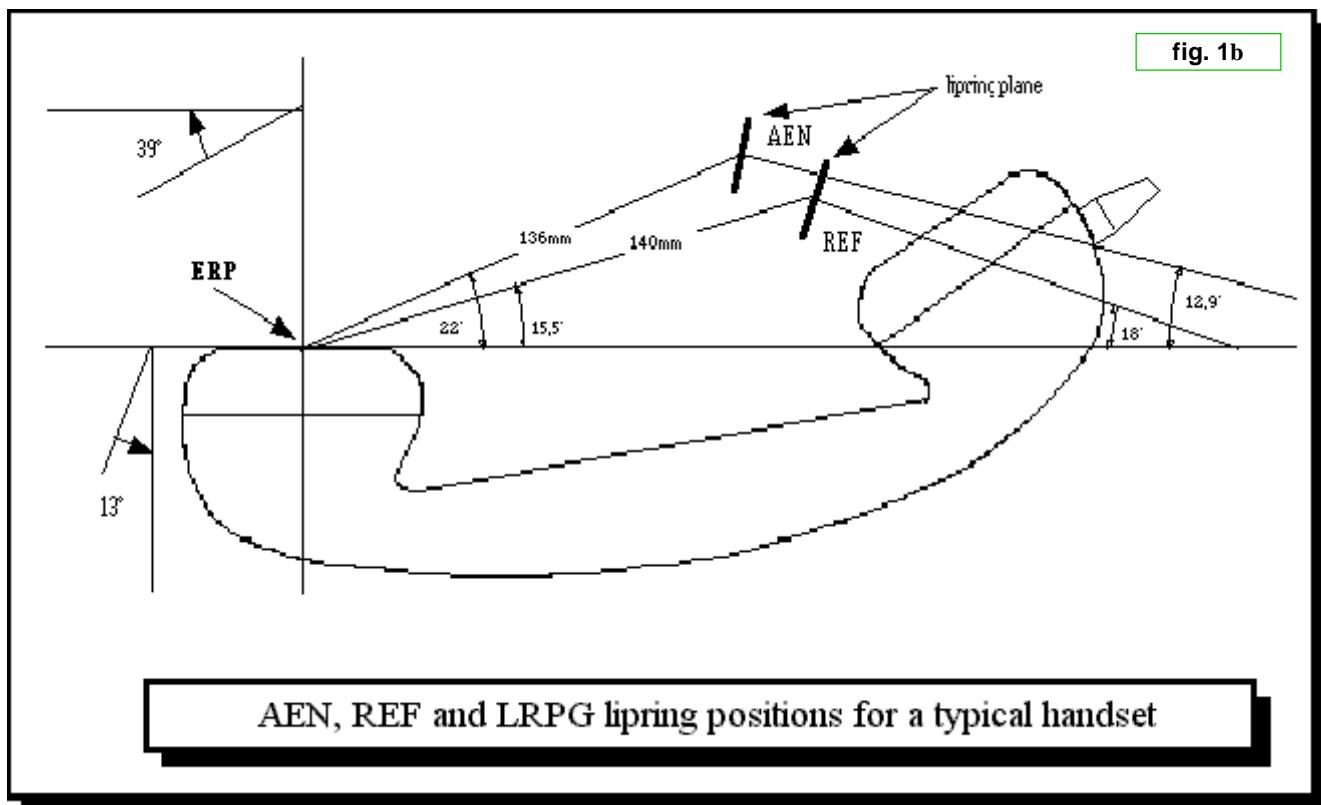
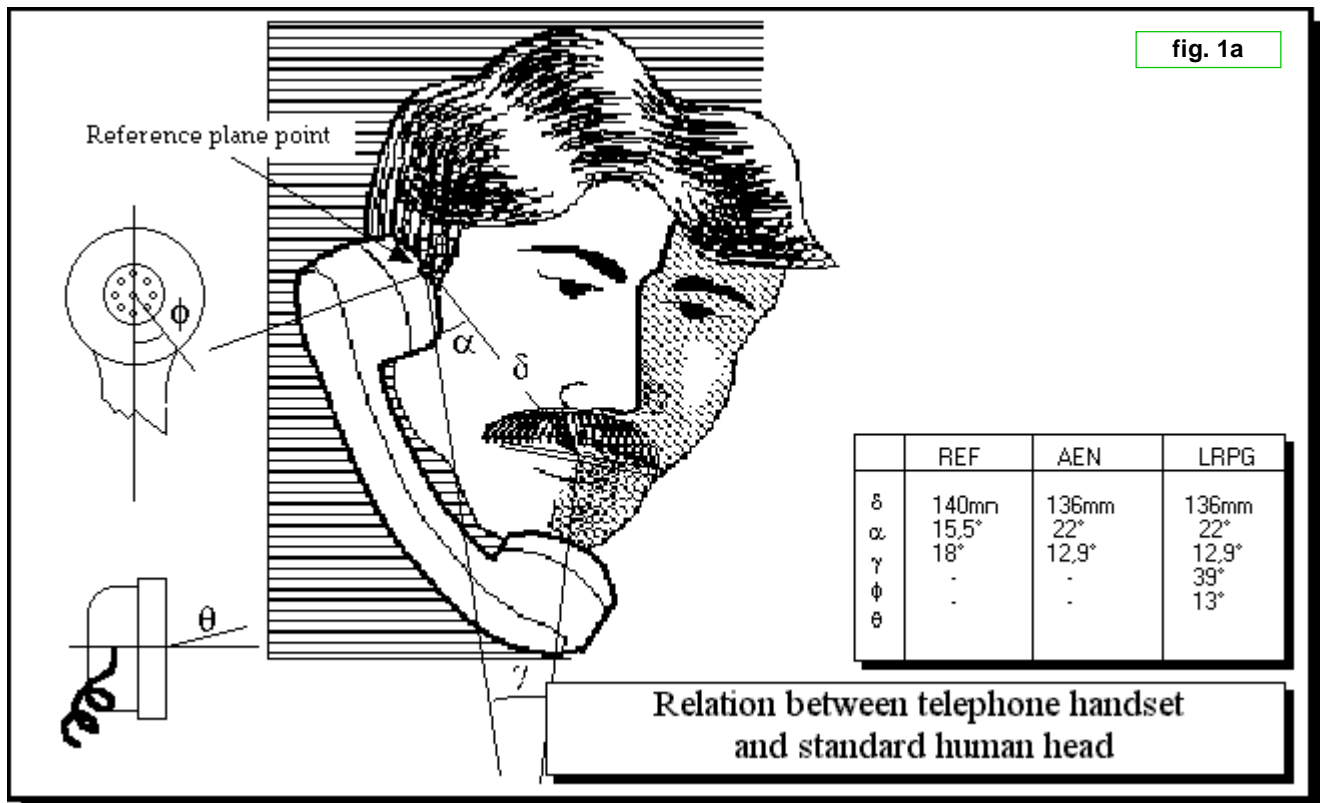
With reference to **ERP** point (Ear Reference Point, fig.1) of the Reference Plane, the Artificial Mouth can assume three positions exactly defined:

REF	(for OREM-A and OREM-B measures)
AEN	(for IEEE 661 measures)
LRGP	(for ITU, BSI and other Loudness Rating measures)

On **fig.1** is reported the diagram of the modal Mouth positions in respect of the Ear.

¹ For the comprehension of the organ descriptions, refer to fig.1a

² For reference plane, it is understood the passing plane for the support points at the ear, of the handset under test. See fig.1b



Points **REF**, **AEN** and **LRGP** lying on the "lips" plane of the Artificial Mouth and they form the **MRP**³. They are spatial points where the acoustical pressure assumes a particular value.

These three positions are obtained, shifting the Mouth side blocks on the wished previously defined position.

AC-3005 Amplifier Unit contains the electronic part pertinent to the two previous sections.

We can see in detail the three sections that compose **AC-3**.

1.1 AC-3002 Artificial Ear

Above said section is composed by an acoustic-to-electric transducer on which can be assembled an auricular cavity D, mod. **AJ-034**, **AJ-035** and **AJ-036**, respectively the IEC-R318, 6cm³ (NBS-9A) and 4cm³ (BRAUN) as requested by various standard rules.

The auricular cavity mod. **AJ-034** meets the IEC-R318 and ITU-P57–Type 1 ear requirements.

This ring finishes with a toroidal gasket E that grants the coupling and the perfect pneumatic seal with the receiving part plane of the handset under test.

The signal produced by the measuring microphone, subjected to the acoustic pressure, is sent to the input of the Amplifier Unit **AC-3005**.

The total transfer constant is 266mV/Pa⁴ for the telephone frequency range; its variation is obtained by means of "e" potentiometer, accessible from AC-3005 high panel.

Artificial Ear Group is assembled inside a metallic cylinder and it is flowing in an axial sense, for having the possibility to adapt it easily at the handset receiving planes with different concavities.

When the correct position of the handset under test has been found, it is possible to block the group with an appropriate locking knob Q.

The group, also blocked, maintains a certain axial mobility, opposed by a spring, for compensating little dimension differences and for assuring a certain pressure, which can grant the hearing cavity closure.

1±1.5 mm is the correct preloading to give to the group.

The 1/4" measure microphone is foldaway for calibration procedure.

A bistable pressure arm forces the handset under test into the housing created on the adapter ring, supporting it during the measurement, and reacting to the Artificial Ear group preloading.



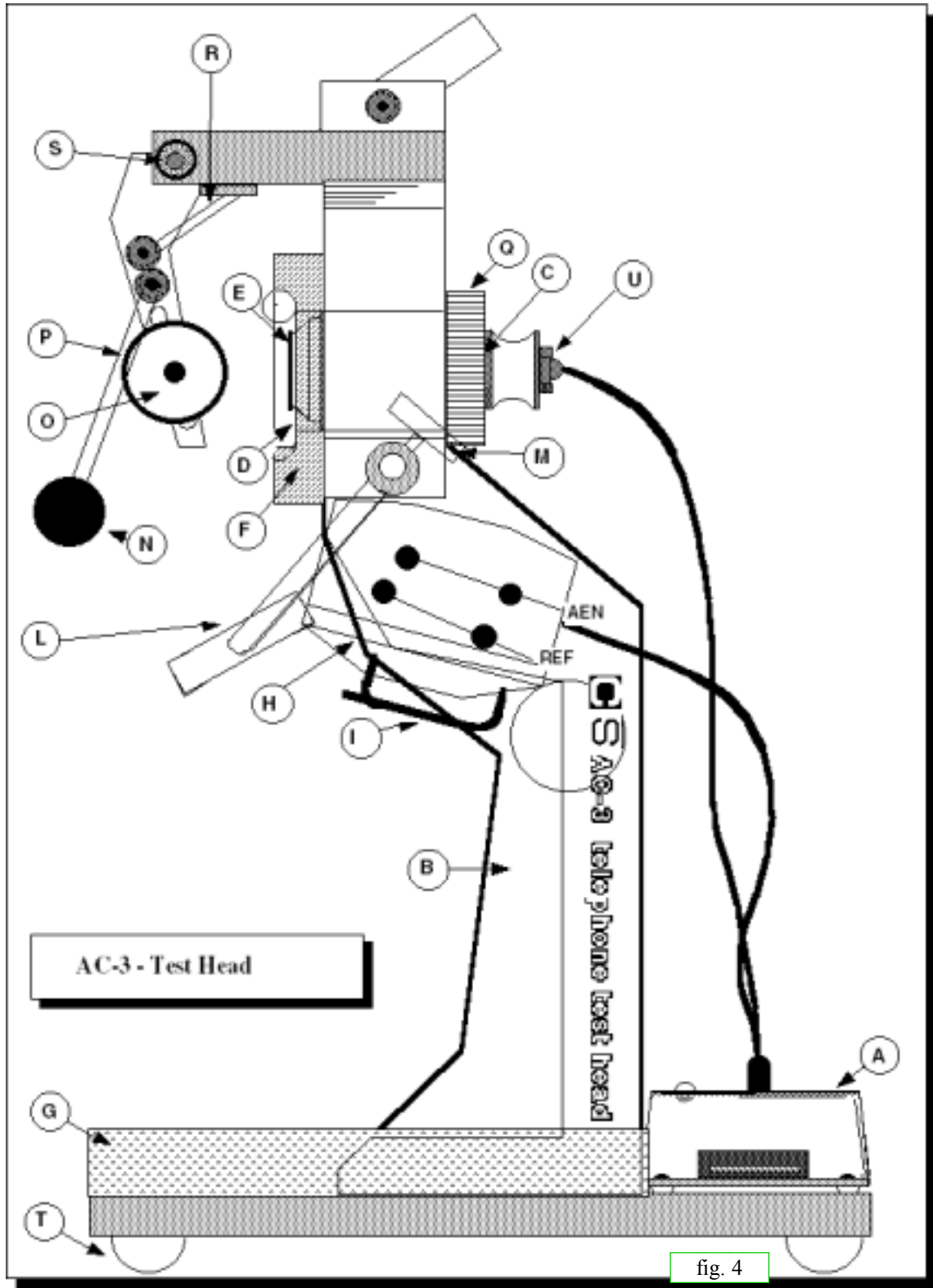
fig.2



fig.3

³ MRP=Mouth Reference Point

⁴ Transducer constant is equal to -11.5dBv/Pa



A	AC-3005	Amplification and equalization Unit.
B	AC-3004	Support for Artificial Mouth/Ear
C	AC-3002	Artificial ear/microphone
D	AJ-034	Auricular cavity (AJ-034 or AJ-035 or AJ-036)
E	AC-3 OR	Sealer for ear cavity
F	FLNG	adapter ring for handset under test. Manufactured on handset sample supplied by the user.
G		Little mattress to avoid reflections.
H	AC-3003	Artificial Mouth
I	AJ-040	Support for SFERT reflector - used for calibration
L		Handset centering arms
M		Locking screws for L arms
N		Pressing arm opening lever
O	AC-3 PR	Handset pressing disk
P		Absorber rings for pressing disks
Q		Locking knob for the Artificial Ear group
R		Pressure springs double arms
S		Pressing arm join
T		Support absorbing foots
U		Lubrication point for Ear group

1.2 AC-3003 Artificial Mouth

The Artificial Mouth is formed by a electroacoustic transducer which reproduces exactly the acoustic field of a human mouth.

It meets the ITU P51 requirements.

A loudspeaker, with intrinsic good quality, having plastic membrane for being not influenced by the environment humidity and ageing, generates the signal.

This loudspeaker is arranged in an anechoic environment that has on the front an aperture with acoustic filter, which acts as mouth opening.



Electric input signal is sent to a controlled gain amplifier (contained in the **AC-3005** Amplifier Unit), which drives the loudspeaker with very low output impedance (nearly 0 Ω), which helps to increase the already high system pneumatic damping.

Transducer constant is of 1Pa/266mV⁵ for the telephonic frequency range and its adjustment is obtained through the "m" potentiometer fitted in the higher panel of **AC-3005**.

Near the Artificial Mouth are situated two centering arms L that suitably adjusted; provide to improve the placement repeatability of the handset under test.

For moving the Artificial Mouth position from **REF** to **AEN** and **LRGP** remove the two blocking screws and position it again in according to the serigraphed words.

⁵ Transfer constant is equal to -11.5dBv/Pa

1.3 AC-3005 Amplifier Unit

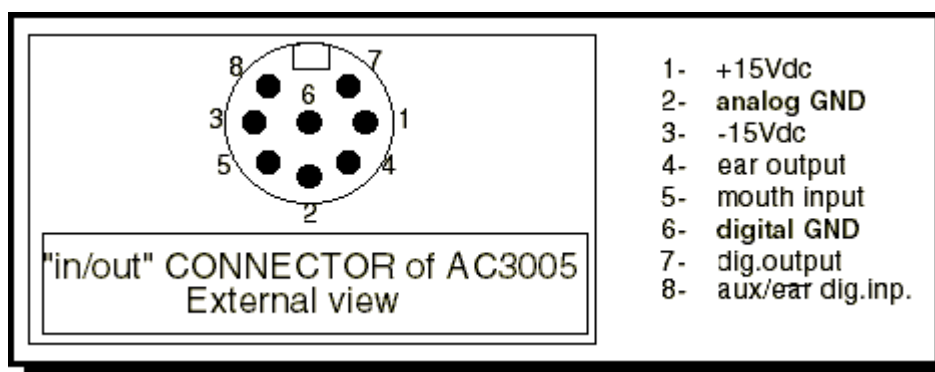


fig.2

AC-3005 contains the equalization chain for the Artificial Ear, the power amplifier for the Artificial Mouth and besides an EEPROM memory.

Memory is one of the main elements of the Test Head, because inside it are registered the individual calibration parameters.

These parameters are:

- response curve of the microphone and its sensitivity
- signals to drive the Artificial Mouth to generate the spectrums LINEAR, SPEECH and SFERT and both type of noises, LINEAR and SPEECH.

Calibrations are made in the factory or by the user and calibration data are stored in the local memory⁶.

Inserted data are used during the speech tests to make level measurements as using an ideal transducer and for generating a correct acoustic pressure in all frequency spectrums for the 1/3-octave tests.

AC-3005 has an input connector aux to connect auxiliary devices as **HA** Magnetic detector for Hearing Aids and **PH-18** Sound Level Meter.

By a logic command is selected which of the two inputs must be measured; by logical level 0 input from ear, by logical level 1 input from auxiliary.

⁶ Data store is made during a complete calibration procedure

1.4 Characteristics

Main characteristics

Size	W = 150 mm D = 290 mm H = 435 mm.
Weight	10.5 Kg.
Supply	±15Vcc ±115mA @ max output level

Artificial Ear (connected to AC-3005)

Input	
cavity volume: AJ-034	2.5cm ³ (IEC-R318 ÷ ITU P57 – Type 1)
AJ-035	6cm ³ (NBS-9A)
AJ-036	4cm ³ (BRAUN)
frequency range 200 ÷ 4000Hz	
frequency response intrinsic	+1/-2,5dB max ± 0,6dB typical
frequency response calibrated	± 0,2dB ⁹
influence at relative humidity	± 0,2dB @1KHz 45 ÷ 75% RH
max sound pressure	115 dBspl
Output	
level	266mV/Pa ⁸
impedance	600Ω ±1%

Artificial Mouth (connected to AC-3005)

Input	
impedance	600Ω ±1%
Output	meets ITU P51
frequency range 200 ÷ 4000Hz	
frequency response intrinsic	± 5dB typical
frequency response calibrated	± 0,5dB ⁹
max sound pressure	105.5 dBspl
distorsion@100dBspl	<3% THD
mouth opening	20 mm
labial plane	10 mm from mouth opening

⁸ Pa (Pascal) measure unit of the acoustic pressure; equal to 94 dBspl

⁹ Value after calibration procedure made with **CS8014** as indicated at chapt.16 of Technical Documentation and using data stored in the memory of **AC-3005**