



## HOW CAN SPEECH BE COMPRESSED?

Speech may be compressed or expanded by first recording the speaker on a normal tape recorder operating at 15 inches/second. The tape is then threaded through the MARK II, and the MARK II's output is connected to both the input of any ordinary tape recorder and an amplifier-speaker combination for listening (This may be a part of the tape recorder being used). A simple turn of a knob and the original tape is running through the MARK II. The turn of another knob calibrated in "% of original time" changes the tape's linear speed over a wide range and with it the speed of reproduction of the recording.

## WHAT IS I.S.I.'S CONNECTION WITH COMPRESSED SPEECH?

INFOTRONIC SYSTEMS INC., the educational affiliate of Gotham Audio Corporation, has been connected with compressed speech for some ten years, having worked closely with the late Anton Springer, the inventor of the MARK II's forerunner. Ever since Mr. Springer's death in 1964, ISI has been one of the principal motivating forces in the continuing development of better and improved technology for speech compression. The research continues unabated at this time.

## WHAT SORT OF DEVICES ARE AVAILABLE FOR ACHIEVING SPEECH COMPRESSION?

At this time there is only one device manufactured and sold in the world capable of speech compression; it is the MARK II manufactured by Automation GmbH in Heidelberg, West Germany, and marketed in the USA and Canada by INFOTRONIC SYSTEMS INC. There are several other ways of compressing speech, notably by the intricate programming of a computer, but these methods have been restricted to individual laboratory efforts and are not available on the open market.

## HOW CAN WE PRODUCE A LARGE QUANTITY OF COMPRESSED MATERIAL USING THE MARK II?

This question seems to perplex a great many people, experts and laymen alike. The output of the MARK II, being the compressed form of the original recording, may be treated in exactly the same way as the output of any other tape recorder. That means you are free to make other tape copies, tape duplication, cut a disk, make thousands of pressings, etc., etc. These final "compressed tapes" and "compressed disks" will operate at standard tape and disk speeds and may then be played on any tape or disk playback machine. The material recorded on these copies, however, will be in compressed form.

## DO WE NEED HIGHLY SKILLED PERSONNEL TO OPERATE THE MARK II?

Not in the least. The MARK II is as easy to operate as any home tape recorder and will perform flawlessly for many years. It requires a bare minimum of cleaning and no oiling or other maintenance whatsoever.

## WHAT MUST WE SUPPLY IN THE WAY OF FACILITIES TO OPERATE OUR OWN SPEECH COMPRESSION LAB?

While the minimum requirements are modest, many such laboratories engage in such corrective facilities as limiters (keep level constant), equalizers (correct for room acoustics and other quality defects), and filters (cut out background noise, hum and hiss). The basic equipment needed is the MARK II Information Rate Changer and any domestic tape recorder to handle the winding and rewinding of the tape reels (We recommend the REVOX G-36). This will permit you to take tapes recorded at 15 ips and play them over a loudspeaker built into the tape recorder over a wide range of compression and expansion rates. A second domestic type recorder of your choice will expand the above facilities to permit producing compressed tape copies. A 15 ips recorder would be required to make original tapes for subsequent compression. The following table should be of help:

### SYSTEM A - PLAYBACK ONLY:

MARK II Information Rate Changer	\$ 3950
REVOX G-36 Tape Machine	<u>550</u>
	\$ 4500

### SYSTEM B - PRODUCTION OF COMPRESSED TAPES:

MARK II Information Rate Changer	\$ 3950
(2) REVOX G-36 Tape Machines	<u>1100</u>
	\$ 5050

### SYSTEM C - ORIGINAL RECORDING PLUS PRODUCTION OF COMPRESSED TAPES:

Equipment same as System B	\$ 5050
REVOX G-36, 7½/15 ips Tape Machine	<u>680</u>
	\$ 5730

NOTE: In System C, one REVOX machine may be saved (\$550) by using the 7½/15 ips recorder as the winding machine.

### ADDITIONAL OPTIONAL EQUIPMENT:

Teletronix LA-2A Limiter Amplifier	\$ 395
GOTHAM EQ-1000 Universal Equalizer	1495
Telefunken O-86 High Quality Speaker with built-in solid state power amplifier	520

WHAT OTHER USES DOES THE MARK II SERVE?

The list of applications of the MARK II is growing daily. Here are a few: Pitch change for music teaching, allows music to be shifted in key without change in tempo; Pitch correction of helium speech as found in deep sea diving; Dictation speed testing for typing and steno; Transcribing of material directly to typewriter by adjusting speed of speech to typing ability; Medical teaching of heart sounds, breathing sounds, etc. by slow playback of these rapid occurrences; and many others.

WHAT IS THE DELIVERY OF THE MARK II AND ASSOCIATED EQUIPMENT?

The MARK II Information Rate Changer is normally carried in stock in New York for immediate delivery. All of the other equipment listed, both necessary and optional, is available from stock and is sold by ISI.

WHERE CAN I HEAR A DEMONSTRATION OF THE MARK II INFORMATION RATE CHANGER?

There are many ways in which you can become familiar with compressed speech. First, there is a kit of material containing a record explaining compressed speech and demonstrating a longer passage of compressed speech. You may visit our offices in New York at any time between 9:30 - 5:30 weekdays and listen to the MARK II in operation. You may bring your own 15 ips recorded tape or we can play you some of ours. Lastly, we have a telephone number which will play for you a one minute segment of "Tale of Two Cities" in real time followed by two rates of compression. Total playing time is under three minutes so that you may call after 8:00 PM for no more than one dollar anywhere in the USA. The number is (212)265-4144. The answering device operates 24 hours a day.

WHO IS PRESENTLY USING THE MARK II INFORMATION RATE CHANGER?

2 units -- U.S. Government Classified Use

UNIVERSITIES:

- |                            |                     |
|----------------------------|---------------------|
| George Washington Univ.    | Washington, D.C.    |
| University of Illinois     | Urbana, Ill.        |
| Murray State Univ.         | Murray, Ky.         |
| Union Theological Seminary | Richmond, Va.       |
| York University            | Toronto, Ont.       |
| University of Laval        | Quebec, Canada      |
| Univ. of Michigan          | Ann Arbor, Mich.    |
| Univ. of Wisconsin         | Madison, Wisc.      |
| California State College   | San Diego, Cal.     |
| Univ. of California        | San Diego, Cal.     |
| Univ. of California        | Santa Barbara, Cal. |
| Univ. of Louisville        | Louisville, Ky.     |
| Northeastern Univ.         | Boston, Mass.       |

RESEARCH AND INSTITUTIONS FOR THE BLIND:

- |                            |                 |
|----------------------------|-----------------|
| School for the Blind       | Columbus, Ohio  |
| Amer. Foundation for Blind | New York, N.Y.  |
| Amer. Printing House for   |                 |
| Blind                      | Louisville, Ky. |
| Virginia Hospital          | Syracuse, N.Y.  |
| Amer. Inst. for Research   | Silver Sp., Md. |
| Electronic Futures Inc.    | No.Haven, Conn. |

RECORDING AND PRODUCTION:

- |                           |                 |
|---------------------------|-----------------|
| Leacock-Pennebaker Inc.   | Ochoa Recording |
| Cinema Sound Inc.         | KIMN            |
| Gotham Recording Corp.    | Filmsounds      |
| Universal Recording Corp. | Hitsville, USA  |
| Ross-Gaffney              | CBS TV Network  |

WHAT IS THE ULTIMATE AIM OF SPEECH COMPRESSION TECHNOLOGY?

It is conceded by most experts in the field that it would be desirable to produce a speech compression device in a price class which will make it possible to equip entire classrooms as well as study carrels with individual units for each student. This will permit the student to set his own pace and to learn more nearly at his maximum speed capability, while allowing him to slow down for sections which are difficult for him, and to speed up for material which is easy for him.

HOW DOES THE FUTURE LOOK FOR SPEECH COMPRESSION?

We are only at the threshold of the world of speech compression. More and more research is being done in this field and the results are highly encouraging. With the "knowledge explosion" upon us, compressed speech offers an unprecedented opportunity for saving valuable time without giving up anything in comprehension and retention.

IF WE WANTED TO ORDER THE MARK II, WHAT ARE THE ENGINEERING SPECIFICATIONS FOR BID PURPOSES?

The equipment shall be capable of reproducing a 15 ips recorded tape at any speed between 50% and 180% of normal recorded speed without any change in recorded pitch or tonal level. The unit shall work in conjunction with any tape recorder capable of handling the two reels (supply and takeup) needed in playback. It shall have an output level of approximately 0 dBm at an impedance of 600Ω balanced, capable of feeding any line level input of any other tape recorder or monitoring amplifier. The unit shall operate on 117 Volt 60 Hz line voltage and be of the continuous duty cycle type. Frequency response shall be within ±3 dB from 30 - 15,000 Hz of the NAB standard reproducing characteristic. Flutter shall not exceed 1% rms.

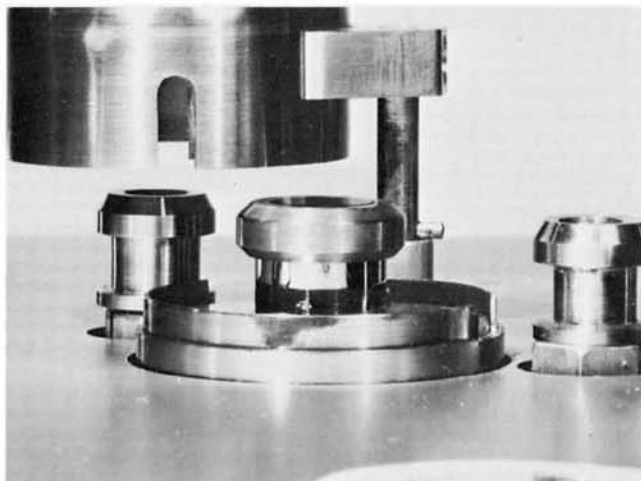
HOW ABOUT AN EXPLANATION OF HOW THE MARK II WORKS FOR THE MORE TECHNICALLY INCLINED AMONG US?

The MARK II is basically a pitch changer, the speed change being one step beyond the pitch change stage. We will therefore begin with an explanation of the PITCH CHANGE function. The MARK II's most critical component is its rotating head assembly. This consists of a single magnetic head coil with four separate playback head gaps spaced exactly 90 degrees apart on its perimeter. All four gaps must match perfectly with respect to three important attributes: 1) the angular spacing must be exactly 90 degrees; 2) the four gaps must be perfectly parallel; and 3) the output level from all four gaps must be within 1 dB for the entire frequency range from 30 - 15,000 Hz. The head coil is connected to two coin silver rings at the bottom of the head which, in turn, are contacted by silver-graphite brushes on the machine itself. The tape is so threaded around this rotating head as to make a 90 degree wrap (or contact arc) on the head. It can be seen then that the rotating head will give a continuous playback scan of the tape; one gap of the head just leaving the tape as the next one takes over. This provides continuous reproduction of the tape regardless of the linear tape speed or the rotational speed of the head.

Consider now what determines the pitch of a recording. It actually depends on the rela-

tive speed of head gap to tape coating. Let us now so thread the MARK II and its associated tape playback deck as to drive the tape from the normal 15 ips capstan on the playback deck. This will assure constant speed or, in other terms, constant "tempo." For a motionless rotary head we will get normal tape playback at normal tempo and normal pitch. Now let us rotate the head so that the head gaps move in a direction opposite to the tape travel. The result will be an increase in the relative head gap to magnetic coating speed and with it, a raising of the pitch. Rotate the head in the opposite direction, i.e., so the gaps travel in the same direction as the tape and the relative gap to coating speed drops, and with it the pitch drops.

TEMPO CHANGE: Suppose you have raised the pitch an octave. Now change the capstan speed of your playback deck to  $7\frac{1}{2}$  ips speed. The result: The pitch is back to its original level while the tempo has been cut in half; i.e., reproduction at half the speed with normal pitch. Now imagine a linking of the rotational speed of the head with the rotational speed of the capstan (i.e., linear speed of the tape) in such a way as to maintain the pitch constant over a wide range of speeds. It is this function which has been cleverly combined in the Information Rate Changer. The MARK II has both a variable speed rotating head and capstan drive.



CLOSE-UP OF ROTATING HEAD ASSEMBLY WITH SHIELDING CAN SWUNG OPEN