

Proceedings of The Radio Club of America

Volume 39 No. 1

April, 1963



Founded 1909

THE TELEGLOBE PAY - TV SYSTEM

by

IRA KAMEN

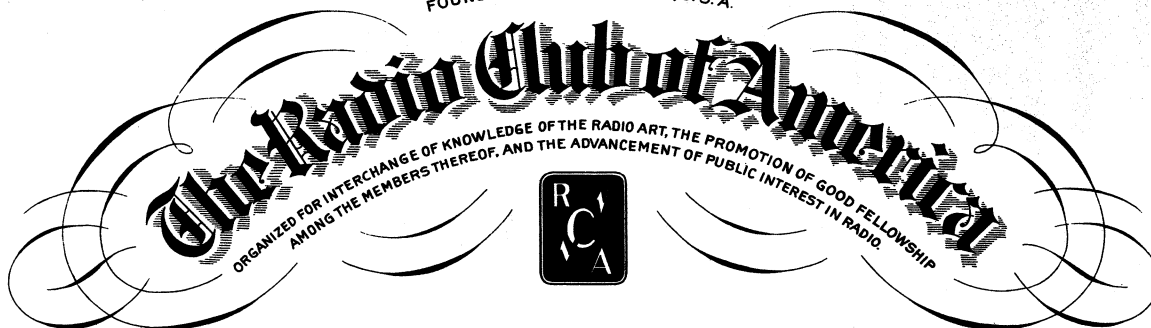
TECHNICAL DIRECTOR

TELEGLOBE PAY - TV SYSTEM, INC.

THE RADIO CLUB OF AMERICA, INC.

11 West 42nd Street ★ ★ ★ New York City

FOUNDED 1909 NEW YORK, U. S. A.



11 West 42nd Street, New York City

Telephone — LOngacre 5-6622

Officers for 1963

Vice President
Samuel N. Harmatuk

President
Ralph R. Batcher

Corresponding Secretary
James Morelock

Treasurer
Joseph J. Stantley

Recording Secretary
Albert F. Toth

Directors

Ernest V. Amy
John W. Arnold
John H. Bose
George E. Burghard
William L. Freseman
Robert Finlay

Norman W. Gaw
Frank A. Gunther
Harry W. Houck
Walter A. Knoop
Jerry B. Minter
Frank H. Shepard, Jr.

George Washington, Jr.

Committee Chairmen - 1963

Archives
Harry W. Houck

Armstrong Memorial
George E. Burghard

Budget
Joseph J. Stantley

Banquet & Entertainment
Renville H. McMann, Jr.

Legal Counsellor
George E. Burghard

Manuscript
George Washington, Jr.

Medals
John H. Bose

Membership
Robert Finlay

Objectives & Scopes
Frank H. Shepard, Jr.

Papers & Meetings
Samuel N. Harmatuk

Publicity
Lloyd Jacquet

PROCEEDINGS OF THE RADIO CLUB OF AMERICA PUBLICATIONS BOARD

Editorial Director
Lloyd Jacquet

Production Manager
James Morelock

Advertising Manager
George Washington, Jr.

Papers Procurement
George Washington, Jr.

THE TELEGLOBE PAY - TV SYSTEM

by

IRA KAMEN

TECHNICAL DIRECTOR

TELEGLOBE PAY - TV SYSTEM, INC.

INTRODUCTION

The Teleglobe Pay-TV System approved for test in Denver, Colorado, by the FCC over KTVR, Channel 2, is a radical departure in Pay-TV systems. The Teleglobe System is a unique audio security development in which a picture is transmitted without scrambling and with non-synchronous sound. The synchronous sound is transmitted over telephone wires using the services available through the public utility for audio distribution. Over this audio wired network, there is transmitted a high quality audio signal and secret scanning interrogation of the speakers in the Pay-TV subscribers' homes. A sophisticated scanning technique converts a perforated tape report into Centralized Metering and Billing data.

DISCUSSION

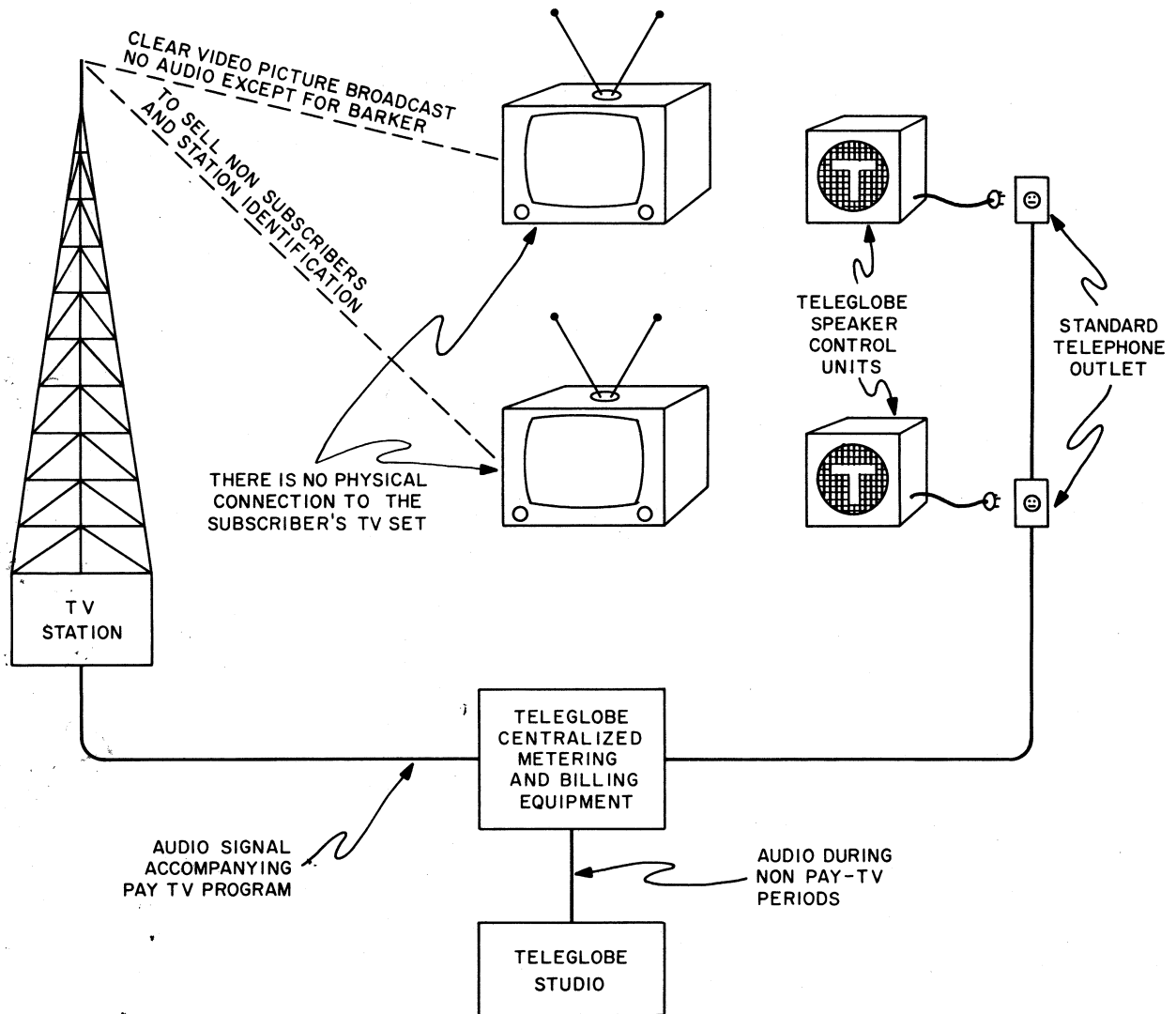
The Pay-TV System being installed in Denver, Colorado, in accordance with the FCC Third Report complies with the specifications which will require an unbreakable security, an accurate arrangement for recording the program purchased by the subscribers, and an effective procedure for converting the recording data into an integrated billing system.

The system in addition must be compatible with the economics of the nation's market. Further requirements insist that any proposed system function in a manner where it can grow in operation and be competitive to advertiser-sponsored TV, and should also anticipate the future requirements of color and UHF and be able to provide the Pay-TV service as these two advancements become common to the art. The unit in the subscribers' homes should comply with all electronic specifications and have underwriters' approval and should make all of its connections externally to the TV set so as not to conflict with the normal responsibility of the subscriber and the TV serviceman. Obviously, any system which requires an internal modification to the TV set upsets not only the underwriters' but the product insurance issued to the TV receiver prior to its being modified. Drawing "A" diagrammatically illustrates the principles involved in separating the picture from the audio signals.

The standard picture signals are transmitted unscrambled and the audio signal is carried into the home via telephone-type audio lines. The Speaker Amplifier device frequency compensates the line and provides an input which can be interrogated by the Central Office equipment. The installation of this system is simple and inexpensive since there are no decoders, coin boxes, or modification of home TV sets; and therefore, it complies with the requirements of not interfering with the TV set or the normal subscriber relationship with his TV serviceman.

The audio transmitted to the non-subscriber takes advantage of the teasing element of the silent picture which tempts the viewer to join the Pay-TV network or if he is a subscriber to tune in on the Pay-TV program. Tests have shown that the transmission of a silent program provides the strongest possible stimulus to the viewer. It is easy to test the efficacy of the Teleglobe System in Denver by turning off the sound on any TV channel and note the frustrating and tantalizing effect of viewing a silent play or movie.

During the Pay-TV test in Denver, the TV station KTVR will be transmitting continuous educational messages to invite comments from the public on all facets of the Pay-TV service specifically with regard to the delinquency of advertiser-sponsored programming in the area. During the FCC test, the station



Drawing "A"

is in control of the test as they must provide the supervisory approval and disapproval of all activities associated with the program material and the billing rates set for this plus entertainment service.

AUDIO DISTRIBUTING SYSTEM

The audio distribution system for Pay-television broadcasts receives its audio signals from the television station via a telephone wire line which will feed the amplifier and distribution network shown in Fig. 1. This amplifier increases the level of the signal to the distribution network so that it may be fed by means of isolation resistors to as many multiple subscriber telephone lines as may be necessary dependent upon the total number of subscribers connected to the system.

During the non-Pay-Television broadcast period, the audio amplifiers will be fed from audio program tape equipment which may play good music all day, every day, and have feeds from many other public service sources which will provide additional entertainment and educational values for Pay-Television subscribers during those periods when Teleglobe is not using the system for Pay-Television broadcasts.

THE TELEPHONE LINE SCANNER

The Telephone Line Scanner, Fig. 2, employs a standard five-channel teletype tape as shown in Fig. 3. Each of the subscribers shown connected to the audio line can be identified as a punched hole if they are operating, a blank, if they are not operating, in their proper lateral position on the tape. The audio

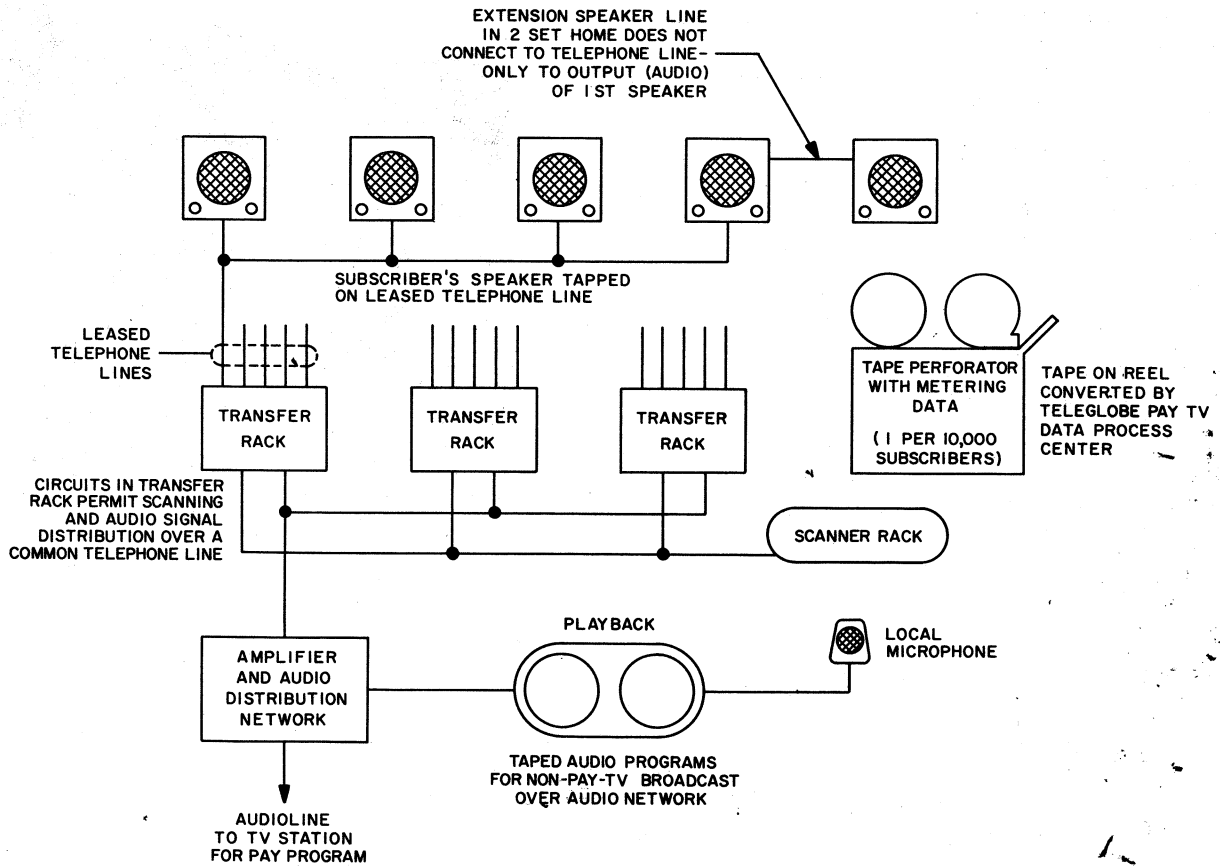


Figure 1

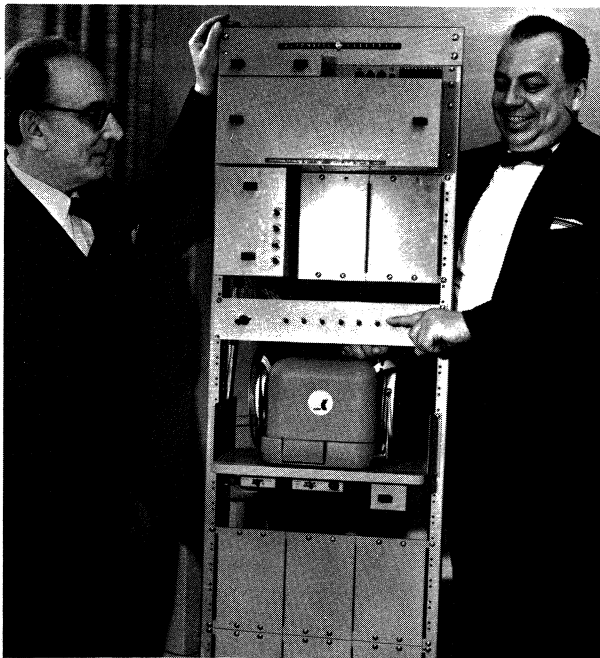
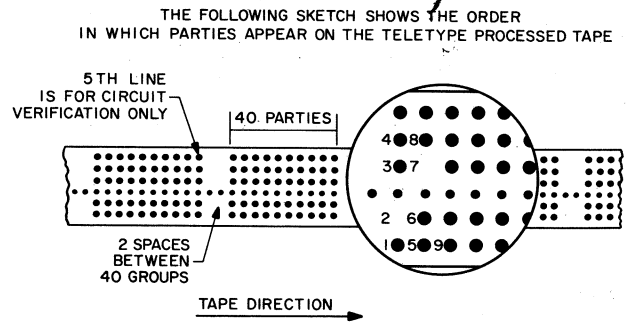


Figure 2 - Teleglobe Automatic Scanning Device for identifying on/off condition of speakers on telephone lines including tape readout device which subsequently converts into IBM card billing.



- NOTES:
1. IF A PARTY IS CONNECTED TO A LINE, A PUNCH INDICATES THAT THE SET IS TURNED "ON" AND NO PUNCH INDICATES HIS SET TURNED "OFF".
 2. SUBSCRIBER NO. 2 AND NO. 7 WERE NOT CONNECTED AS THERE IS NO HOLE PUNCH.

Figure 3

line number can be determined by the longitudinal location of the scanner sequence on the tape; therefore, as marked in Figure 3, forty subscribers can be recorded in about one inch of tape.

It should be noted that in the teletype tape only four of the five holes in the lateral position represent subscribers - as the fifth hole will always record to indicate proof of operation of the computer by the examination of each lateral line whether a customer is using the Pay-Television service or not. Each all-subscriber line scan will be the record for that scanning time only and can be repeated as often as desired to make a full evaluation of usage during the Pay-Television period.

CENTRALIZED METERING AND BILLING SYSTEM

Individual programs will have a complete data tape which will show the condition of the subscriber at the start of the program and somewhere before the completion of the program, which means that there will be not less than two scans per Pay-Television program. These program data tapes which are prepared by the scanning equipment and located at the Teleglobe Central Office in Denver will be processed by the Teleglobe Pay-Television Data System Processing Center.

As previously stated, these specially treated paper tapes will have recorded the "on - off" condition of the loud speakers of all Teleglobe subscribers. A special IBM converter developed by IBM for Teleglobe converts the information on the paper tapes to punch cards. A card is created for each speaker control unit on each line; i. e., one card for each customer.

SPEAKER CONTROL UNIT

The Speaker Control Unit, Fig. 4, is so designed that it has a high signal to noise ratio and has filter circuits which preclude the scanning from being perceptible to the audio transmission or the Speaker Control Units. The input of the Speaker Control Unit has aligned components which shall allow its identification on the line in accordance with integrated functions of the scanning equipment.

The speaker amplifier of the Control Unit has a power transformer input and has Fire Underwriters' approval by Teleglobe's supplier. The amplifier will have both a volume and tone control in which the tone control shall be able to extend either the logarithmic range of high or low frequency audio transmission in accordance with the Bell Telephone Lab Fletcher curves. The speaker is six inches and is superior in quality to speakers in the average table model television sets. Where necessary for hotel ball rooms and other type commercial establishments, where larger speakers and higher gains are required, larger

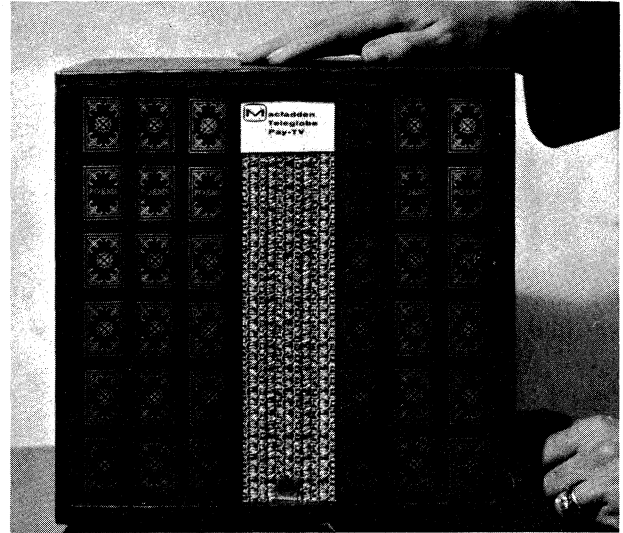


Figure 4 - Macfadden Teleglobe Pay-TV Speaker Amplifier Control Unit with volume and tone control on right side of case.

speaker units are furnished with the same filter and interrogating circuits.

OPERATIONS

The following technical functions take place when the subscriber decides to view specific Pay-Television program:

A. The subscriber first positions the channel selector of his television set to the station broadcasting the Teleglobe Pay-Television program and tunes the channel for best picture reception.

B. The subscriber then turns the switch marked "on - off" on the Teleglobe Speaker Control Unit to the "on" position and adjusts the volume and tone control to a desired quality of audible transmission, considered satisfactory for his premises. This provides the subscriber with both the video and audio signals of the Pay-Television broadcast.

This simple A and B operation will be common for monochrome or color broadcasts on VHF or UHF.

C. During the early part of the program and at the end of the program, there will be secret and silent scans of the Speaker Control Units "on - off" condition. This "on - off" status will be recorded at the Teleglobe Pay-Television System Data Processing Center on special processed teletype-type paper tapes shown in Figure 3.

The tape data is then converted to program rating operations (See Fig. 5) in which the following steps take place so that the Central Office can

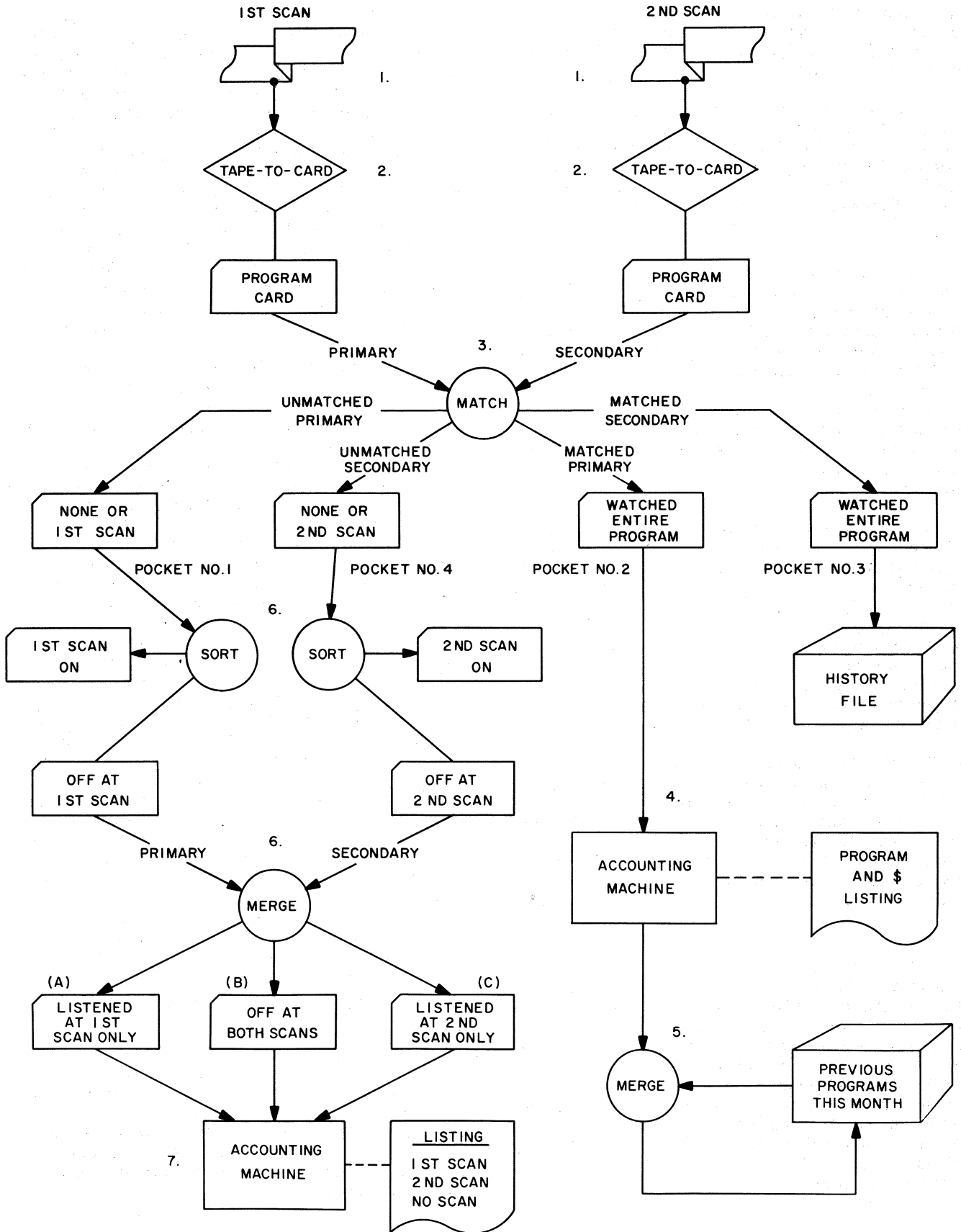


Figure 5

immediately provide information which will be a statistical measurement of the popularity of each program as well as prepare the data for the monthly billing cycle operations.

1. Program tapes, prepared by scanning equipment located at telephone company central offices, arrive at the Teleglobe Pay-Television System Data Processing Center. These paper tapes have recorded on them the "on - off" condition of the loudspeakers of all Teleglobe subscribers.

2. The tape to card converter converts the information on the paper tapes to punched cards. A card is created for each loudspeaker on each line, that is, one card for each customer. At the conclusion of this tape-to-card conversion, each card contains three classes of information.

A. Duplicated into each card are certain pre-punched program data such as name, date, price, etc. Thus, this operation rates each program card as well as supplying all needed indicative information.

B. Punched into each card by the tape to card converter and the sequencing converter is a four-digit customer number. Customer numbers will be assigned to reflect their positions on the paper tape. The counter increments by one each time a card is punched by the tape to card converter. Thus, before any card operations, the converter has introduced each customer's number. No longer is the sequence of holes on tape or of cards necessary to determine the subscriber. Each card contains a punched customer number.

C. Punched into each card by the tape to card converter is an indicative punch reflecting the On and Off condition of the subscriber's loudspeaker. The On punch and Off punch are positive identifications of each loudspeaker's status. These punches will control the later selection of those subscribers who listened and those who did not listen to a particular program.

3. The collator matches the program deck produced by the first Scan to the program deck produced by the second Scan. Each program deck enters the collator in customer number sequence. The collator compares the two cards for each subscriber (one in the primary feed and one in the secondary feed). If the subscriber only watched a portion of the program (loudspeaker Off for either the first or second Scan), the cards will fall into pockets #1 and #4. If the subscriber did not watch the program at all (loudspeaker off for both scans), his cards will also fall into pockets #1 and #4.

4. The cards that represent all the subscribers who watched the entire program (pocket #2) become the input to the accounting machine. These cards are the only ones to be billed. The accounting machine accumulates the total number of listening subscribers and the total dollar billing. These figures can then be used to apportion revenue to the supplier of the program. The program totals can be balanced at the end of the month to invoiced program totals to insure that all rated programs have been billed. As well, the accounting machine can give an immediate detailed listing of all the subscribers to be billed at the end of the month. Information needed by the FCC can be prepared by the accounting machine during this listing operation. The totals mentioned above and any other sub-totals desired can be indicated on this detailed report.

5. As the billable program cards leave the accounting machine, they enter the collator. It merges these cards with the deck of previous program cards for the current month. This deck is in customer number sequence. At the end of the month, all the program cards to be billed are in chronological sequence within customer number. At any time, this deck can be run through the accounting machine to determine the total number and total dollar amount of program to be billed at the end of the month. These totals can be balanced with those accumulated at step 4 as a running check. At the conclusion of step 5, the billable program cards need no further processing until end-of-month invoice preparation.

6. The program cards representing those subscribers who watched only a portion of the program or did not watch the program at all (pocket #1 and #4) enter the sorter and the collator. The sorter and collator will distribute these program cards into three decks. The first deck (A) contains all those program cards of subscribers who listened only to the first portion of the program. The second deck (B) represents all those subscribers who listened only to the later portion of the program. The third deck (C) contains all those program cards of subscribers who did not listen to the program at all.

7. These three decks are the input to the alphabetical accounting machine. The accounting machine prints a detailed listing and accumulates various totals of the three decks. Information on this report is a statistical measure of the popularity of each program.

The foregoing and Figure 3 is the work flow format which provides a picture of the program rating operations. In addition to the statistical measurement of program popularity, by-products of this routine will permit accurate division of program revenues and supply reliable data for the preparation of reports for the FCC.

PRESIDENT'S MESSAGE

On the inside front cover, a list of the recently-elected officers and Directors is to be noted. Newly appointed committee chairmen are included. The Board is particularly concerned about the future of the Club, and ways whereby it can avoid just drifting along. The environmental conditions the Club encounters each year become more complex, with the ever-increasing number of meetings held in the New York area each month by the several contemporary associations in our common fields (more than a score). Therefore, to instigate a comprehensive study aimed at finding ways of helping members and up-dating our sights, a SCOPES and OBJECTIVES Committee, under the guidance of Frank Shepard, is being set up. It is hoped that a score or more members will accept appointment here, each prepared to contribute ideas. Work at the start will be done mostly by mail. Attention will be given toward the serving of members who are too far outside the New York area to attend meetings.

Another committee, the ARCHIVES Committee, has been given new objectives. It is under the guidance of Harry Houck. We want to discover the best means for preserving some of the relics of earlier era in this radio art, both equipment items and possibly important documentary items. There are a considerable amount of early apparatus around now, although it seems that quite a bit of

this apparatus is already lost by being tossed out. Recent editorials in our PROCEEDINGS mentioned collections and museums and brought out a number of suggestions. These, along with some other ideas, will be processed. Especial attention should be given to individual pieces that have a history of their own, having served in some important happening or event, where authentication is possible by those "who were there."

Another important committee, MEETINGS and PAPERS, has been charged with the additional duty of soliciting papers, especially from those of our members who are associated with interesting projects, for publication in the PROCEEDINGS, even when not presented at a meeting. Our PROCEEDINGS' files are replete with published data on some of the most important developments. We expect that we are missing out on others. Captain Harnatuk (N. Y. Fire Department), our new Vice-President, will chairman this committee.

Most of the work of the Club is handled by the stated committees, and to get a wider base of operations each chairman is endeavoring to augment the committee with new blood. A forthcoming issue will include a complete listing of all our committee personnel, and we hope you will accept invitations when received promptly. (Ss-h -- if you have ideas and would like to help on a particular committee, drop a hint to the undersigned.)

Ralph R. Batcher
President

* * * * *

NEW MEMBERS

Much activity appears among some of the current committees of the Club, to discover ways and means for enlarging our objectives, and revitalizing our scope of operations. These pages will carry reports on these studies in future issues. Their suggestions will surely carry interesting

ideas for members. Most of your friends are probably not members now, but if you send in their names and addresses, we will see that they get a copy of the issue that will disclose some of these progressive activities. You will then be able to follow up to better advantage in getting new members.

ARMSTRONG MEMORIAL MEDAL
PRESENTATION

Those of you that attended our Annual Banquet at the Columbia University Club on December 7th, 1962 know that the Radio Club Award of the Armstrong Medal was made to Paul Ware, who unfortunately could not come up from his Florida home to receive it. The medal was accepted by Bob Akin who agreed to deliver it in person. This letter and photograph were received a few days ago by the Secretary of the Club:

"I delivered the Armstrong Memorial Medal to Paul Ware on February 28th, 1963, at his office at 6763 S. W. 81st Street, Miami 43, Florida.

Paul's health is excellent and doing a wonderful job with the Automatic Pilot, the same that I have on my boat, the Nika. I am proud to say, it is more accurate on a set course than humans are (even sober).

He was thrilled to be nominated and his remarks were, 'I am highly honored and wish to thank all the members of the Radio Club of America as a recipient of the Armstrong Award.'

Sincerely,

Robert M. Akin, Jr."



SENSITIVE **TRUE-RMS** RF MILLIVOLTMETER – MODEL 340

Voltage range: 300 μ V to 3V
Frequency range: 0.1 Mc to >1,000 Mc

FEATURES

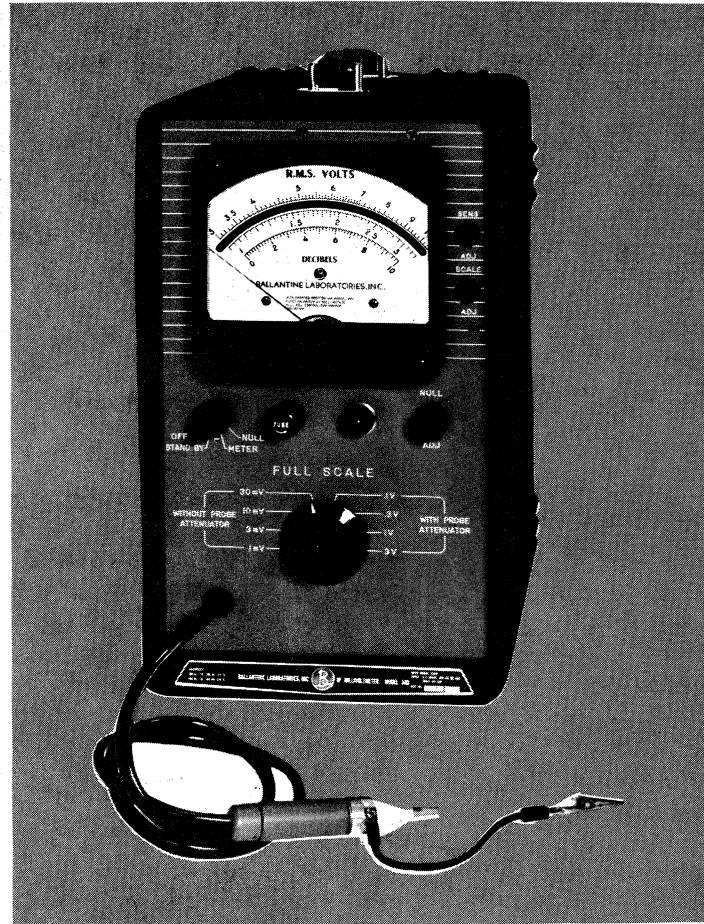
- **TRUE-RMS VOLTAGE MEASUREMENTS ON A WIDE RANGE OF WAVEFORMS**
- **MAY BE CALIBRATED USING DISTORTED SINUSOIDAL SIGNALS**
- **HIGH, UNIFORM ACCURACY OVER ENTIRE FIVE INCH LOGARITHMIC SCALES**
- **UNIFORMLY HIGH RESOLUTION OF APPROXIMATELY 1% PER MM OF ARC WHETHER AT FULL SCALE OR DOWN SCALE**

GENERAL DESCRIPTION

Model 340 RF Millivoltmeter is a sensitive, wide-band, *true-rms* voltmeter for measurements from 300 microvolts to 3 volts at frequencies from 0.1 Mc to higher than 1000 Mc. Use of two hand-calibrated logarithmic voltage scales, each five inches in length, results in uniform accuracy in % of reading anywhere on either scale. This also results in uniformly high resolution over the entire scale, e. g. 1% of reading per mm of arc whether at full scale or bottom scale. Stability of the voltmeter as a function of line voltage and temperature, together with the unusually high accuracy and resolution, and the independence of the waveform of the signal being measured, make the Model 340 a truly important advance in RF instrumentation.

The true-rms feature of Model 340 is particularly important in that the user may make measurements on either sinusoidal or badly distorted signals, and be assured of a true-rms result. Such results cannot be obtained using a peak or average-responding instrument. Model 340 will produce results that can be specified without regard to purity of signal and can thus be more useful in setting standards for procedures that can be used at other locations. Another advantage is that during calibration procedures, purity of waveform of the signal generator output will not affect the results.

Signal voltages are measured in the Model 340 by a probe which is connected to the voltmeter by 3 feet of



Price \$760
including all standard accessories

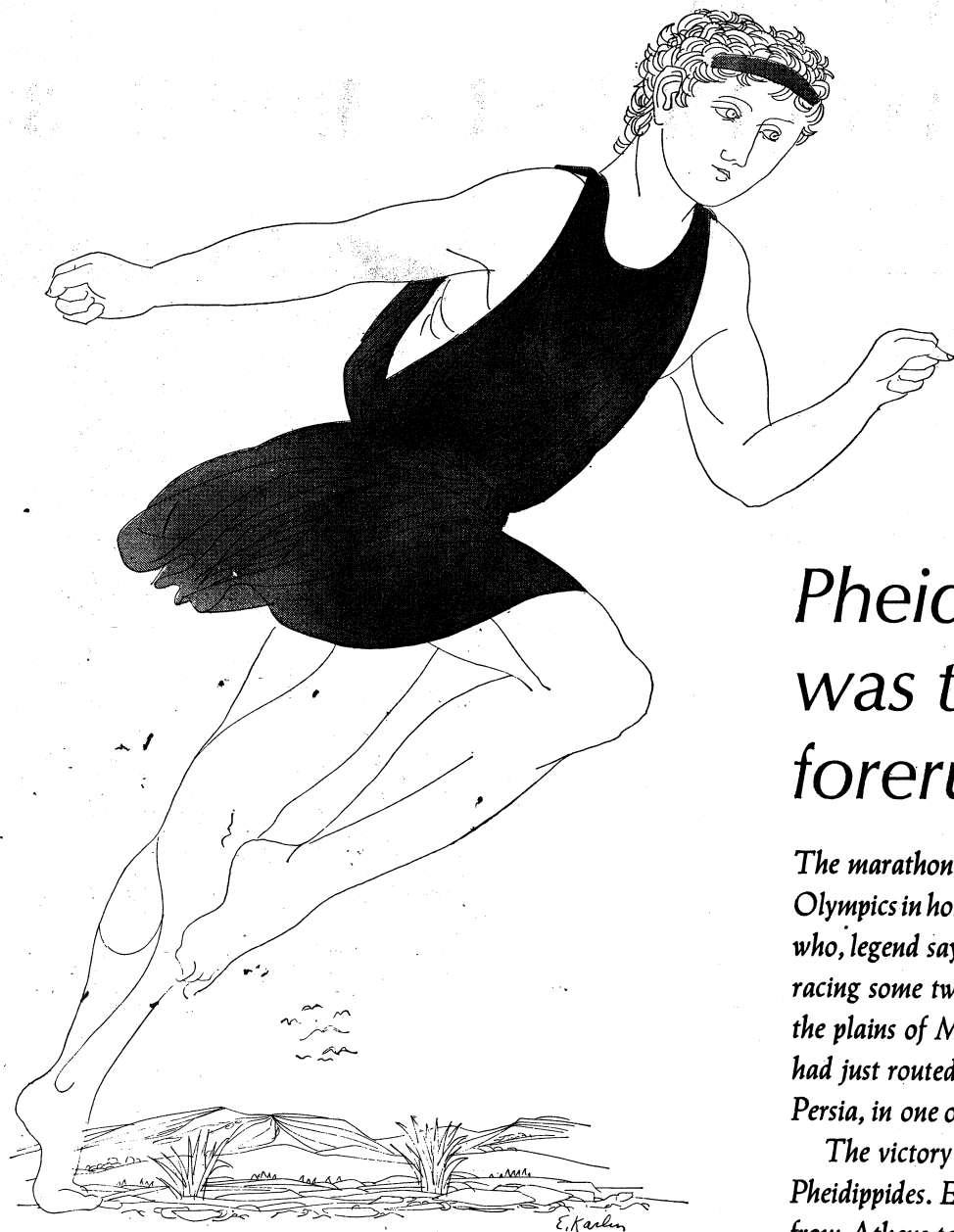
cable. This allows positioning of the probe exactly at the point at which the voltage is to be measured, thus minimizing errors due to transmission line effects.

Accessory units and Adapters are standard equipment and are described under "Specifications" following. These have been designed to (1) facilitate in-circuit measurements, (2) to make measurements on a 50 ohm line, and (3) to connect the voltmeter into a co-axial line of the Type N or BNC variety. A 40 db Attenuator Model 1340 may be used with any of the accessories. It is supplied to insure true-rms measurements from 30 millivolts to 3 volts.

Calibration: Model 340 accuracy is specified and guaranteed from 0.1 Mc to 700 Mc. The instrument may be used qualitatively to frequencies above 1000 Mc.



BALLANTINE LABORATORIES - BOONTON - N. J.



Pheidippides was the forerunner

The marathon was included in our modern Olympics in honor of Pheidippides (or Philippides) who, legend says, died about 490 B. C. after racing some twenty-three miles to Athens from the plains of Marathon. There, the Athenians had just routed the forces of Darius, king of Persia, in one of the decisive battles of the world.

The victory itself was in large part due to Pheidippides. Earlier, he had raced the 150 miles from Athens to Sparta in forty-eight hours to enlist Spartan aid, thereby becoming forever a part of "the glory that was Greece."

Today's defenses require that communication be a matter of seconds rather than days. That's why so many early warning systems depend upon REL tropospheric scatter radio which—with the speed of light—leaps oceans, desert sands, and Arctic wastes. That's why you can depend upon REL to solve your telecommunication problems.



Radio Engineering Laboratories • Inc

A subsidiary of Dynamics Corporation of America

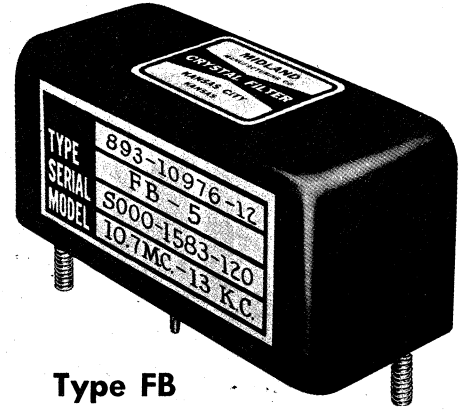
Dept G • 29-01 Borden Ave • Long Island City 1, NY

**Creative careers at REL await a few exceptional engineers.
Address résumés to James W. Kelly, Personnel Director.**

Delivered In Quantity...

MINIATURE Narrow Band-Pass Crystal Filters

The Midland Type FB Series is a group of hermetically sealed, eight-crystal, narrow-band filters that provide bandwidths in the range of 2 KC to 30 KC @ 6 db, with a center frequency of 10.7 MC. They are designed to operate in the environmental temperature range of -55°C to $+90^{\circ}\text{C}$ with an insertion loss of 4 db max. and an inband ripple of .8 db max. The Type FB narrow-band crystal filter is ideally suited for design in two-way communication systems, telemetry systems, electronic instrumentation equipment and other 10.7 megacycle applications where small fractional bandwidth filtering plus a high degree of selectivity and temperature stability is required. It can be used to best advantage in designing single-signal RF stages to give greater adjacent channel separation and performance reliability, in addition to conserving space and reducing material and manufacturing costs. Midland invites inquiries in assisting with any engineering problem where the use of crystals and crystal filters is proposed.

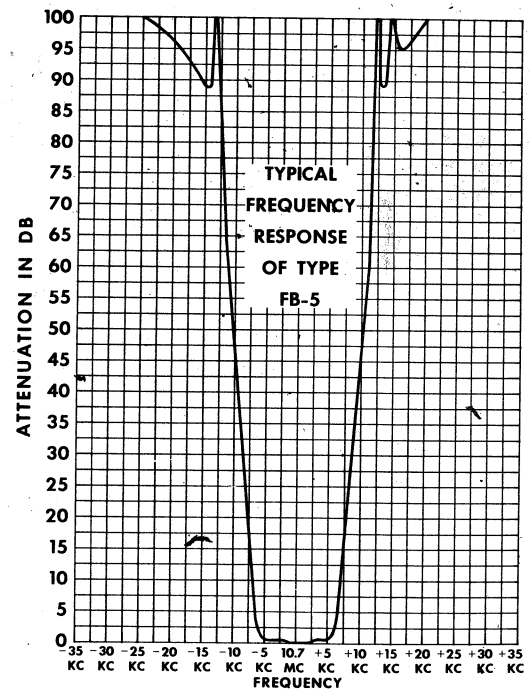


Type FB

Specifications

	FB-5
Center Freq.*	10.7 ± 375 CPS
BW @ 6 db Min.	13 KC
BW @ 60 db Max.	23 KC
60 db/6 db BWR Max.	1.8
BW @ 80 db Max.	26 KC
Ultimate Rejection Min.	105 db
Req. Source/Load Resistance (R _o) . .	1 K ohms
Inband Ripple Max.8 db
Insertion Loss Max.	4 db
BW @ 1 db Min.	10 KC

*Center freq is the arithmetic mean of the frequencies at 6 db.



Operating Temp. Range: -55°C to $+90^{\circ}\text{C}$
Shock: 200 g
Vibration: 15 g to 2 KC
Max. Input Level: +10 dbm



MANUFACTURING COMPANY, Kansas City 15, Kansas

WORLD'S LARGEST PRODUCERS OF QUARTZ CRYSTALS
DIVISION PACIFIC INDUSTRIES INCORPORATED

Robert Finlay

SALES COMPANY
MANUFACTURERS REPRESENTATIVE

RIDGEWOOD NEW JERSEY

HALLICRAFTERS SALUTES THE RADIO AMATEURS OF AMERICA
ON THE OCCASION OF THE 50TH ANNIVERSARY OF AMATEUR
RADIO LICENSING

HALLICRAFTERS MANAGEMENT:

"Can we build a **quality** receiver, capable of all important coverage from **85 kc through 30 mc**, with at least **3-step variable selectivity**, including a transmitter-type V.F.O. that can be **locked on frequency**, with sensitivity **under 1 μ v** on the high frequency range, a high order of **mechanical and electrical stability**, that weighs under 20 lb., is extremely compact . . . and will sell for about **\$400** ■ "

?

HALLICRAFTERS ENGINEERING:

"Yes."



SPECIFICATIONS

Exceptionally versatile and compact triple-conversion, super-heterodyne communication-type receiver. V.F.O. can be used as crystal locked oscillator; **Selectivity:** Variable in 3 steps, 0.5—2.5—5.0 kc. Crystal-controlled 1st and 3rd oscillators. Selectable sidebands, constant tuning rate. **Sensitivity:** less than 1 μ v on AM, less than 1/2 μ v on SSB/CW. T-notch for up to 50 db. attenuation to unwanted heterodyne in I. F. pass band. I. F. type noise limiter. Audio inverse feedback. Crystals provided for 3.5—4.0, 7.0—7.5, 14.0—14.5, 21.0—21.5, 28.5—29 mc. Four add'l. crystal pos. for 500 kc. segments between 85 kc. and 30 mc. 100 kc. crystal calibrator included. Size: 15" x 7 1/8" x 13". Net wt. 18 lb. Amateur net price: \$379.95. HA-10 Low freq. tuner adapts SX-117 for 85 kc.—3 mc. \$24.95

Additional searching questions and exciting answers will be coming your way from Hallicrafters soon.



new **SX-117** Triple-conversion communication receiver by **hallicrafters**

5th & Kostner Aves., Chicago 24, Ill.

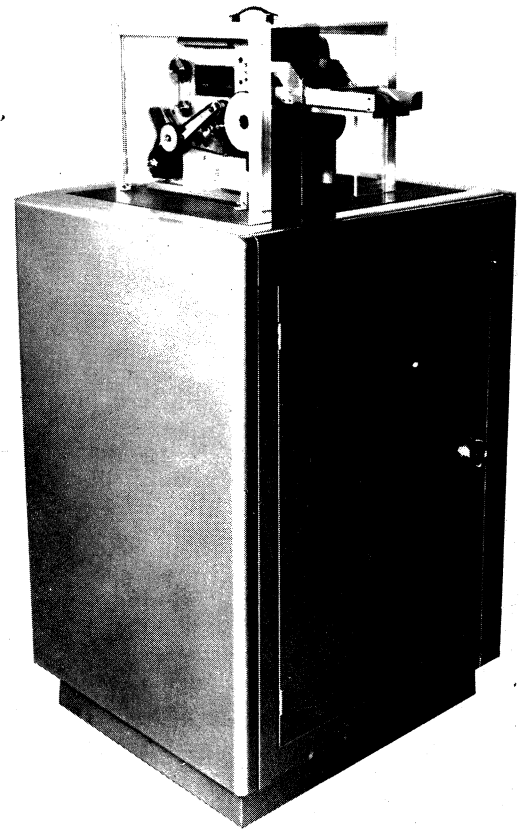
Export: Hallicrafters, International Dept., Commercial Div., Canada: Gould Sales Co., Montreal, P.Q.

*Shepard
Laboratories,
Inc.*

SUMMIT, NEW JERSEY



SHEPARD  ELECTRONIC HIGH SPEED MINI-TYPER



Minitypers

Minitypers handle single copy unsprocketed adding-machine paper for either pressure-sensitive or the ink-ribbon printing. Minitypers are also available with tractors for handling sprocketed fan-fold paper with up to 6 copies. They can be equipped with cutting and stacking mechanisms for special forms such as the one shown.


Shepard Laboratories of Summit, N. J. make a variety of electronic on-the-fly Typers ranging from specialized Mini-Typers capable of speeds exceeding 3,600 lines per minute (numeric only) to conventional alphanumeric Typers with speeds exceeding 1,000 lines per minute. Printers are available with up to 64 characters of any choice of font -- up to 50 columns for the Mini-Typer and up to 190 columns for the larger units.

Decoders are available to permit operation of Shepard "Typers" on line, from computer drums, core memories, etc. or off line from tape signals, also communication circuits.

Shepard Typers are in use at commercial, industrial, scientific, navigational and military installations such as the Army (OTAC) (MOBIDIC), the Navy (Polaris), the Atomic Energy Commission, RCA (BIZMAC), Bank of America (ERMA), Hughes (VATE), Universities, Sperry Rand, Sylvania, National Cash, and are in current use in England, France, Italy, Germany and the Far East.

Further information is available upon application to Shepard Laboratories, Inc.,
480 Morris Avenue, Summit, N. J. CRestview 3-5255



Laboratory  *Standards*

MEASUREMENTS

A McGraw-Edison Division

Boonton, New Jersey

