FM AND TELEVISION

Price 25 Cents

Jan. 1948

★ ★ Edited by Milton B. Sleeper ★ ★

COMMUNICATIONS DIRECTORY—Part 2

PUBLIC UTILITIES
GEOPHYSICAL
TAXICABS
BUSES
TRUCKS
OIL PIPELINES
HIGHWAY MAINTENANCE

LISTINGS REVISED TO JANUARY 1, 1948

8th Year of Service to Management and Engineering

152-162 mc. Communication Equipment

With the *Power Saver* circuit

That means longer life for . . .

quick-heat tubes

Separate switches for transmitter filament and plate voltages mean less battery drain and greater tube life. This "Power Saver" circuit is only one of the examples of advanced engineering that makes Harvey 152–162 mc. equipment cost less for greater dependability.

RECEIVER MODEL 541

Characteristics:

Frequency Range — 152-162 mc.

Type — Crystal controlled, single conversion superheterodyne FM Receiver.

RF Stages — Two, insuring excellent sensitivity.

Single IF Amplifier — Latest design practices achieve high gain from a single IF without requiring double conversion.

Crystal Diodes — In discriminator and squelch circuits, reduce tube complement, size and weight of the unit.

Oscillator Control — Provision is made for plug-in oven-type crystal when required by operations of the equipment in extreme temperature variations.

Automatic Frequency Control — May be used where necessary for Fixed Central Stations.

Standby Drain — 6 amperes.

Power Supply — AC or DC "Plug-in" Type. No further electrical or mechanical changes required in receiver.

TRANSMITTER MODEL 542

Characteristics:

Frequency Range — 152-162 mc.

Exciter Stages — Latest miniature tubes used.

Tubes — All "Quick-heat" tubes except for Oscillator A.F. Amplifier and the single Phase Modulator.

Final Amplifier — Push-pull, shielded parallel-line tank circuit, with a series-resonant link coupling circuit to antenna gives simple, effective and flexible antenna matching to mobile or fixed antennas.

Frequency Multiplication — 48 times, using "Quick-heat" tubes.

Power Output — 30 watts from AC or DC input. Standard deviation and pre-emphasis characteristics incorporated in the transmitter.

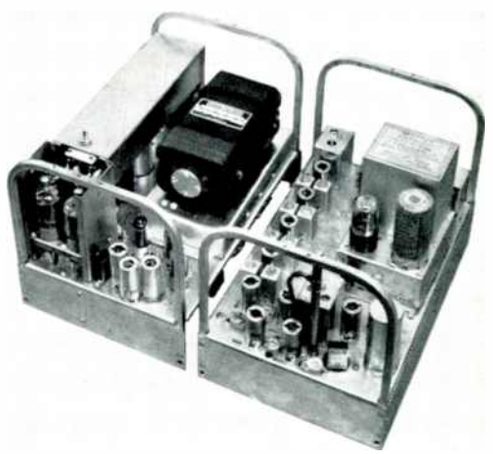
Standby Tube Drain — .45 amperes.

Power Supply — Change from AC to DC operation involves a simple tube change and "plug-in" of the DC power supply.

For detailed information and circuits, see FM and TELEVISION, Nov. 1947 issue: "152- to 162-Mc. Mobile Equipment."

HAR-CAM
HARVEY OF CAMBRIDGE

Transmitter (left) Receiver (right) shown with A.C. "plug-in" power supplies.



Transmitter (left) Receiver (right) shown with D.C. "plug-in" power supplies.

HARVEY RADIO LABORATORIES, Inc.
443 Concord Ave., Cambridge 38, Mass.
We want to know how HARVEY equipment will reduce battery costs.
Please send me catalogs and prices on:
☐ 30–44 mc. units ☐ 152–162 mc. units
☐ FM communications test equipment

Name.....

Address.....

.....*Station Call*.....

HARVEY RADIO LABORATORIES, INC.

443 CONCORD AVENUE • CAMBRIDGE 38, MASSACHUSETTS

More Results from Advertising
WITH A 30% CUT IN YOUR BUDGET

Here's the Proof: If you aren't advertising in *FM* and TELEVISION already, you might think you'd have to increase your budget to add this publication. But a sharp pencil and a little simple arithmetic will show that you can actually cut your budget by adding the only magazine devoted exclusively to FM, television, and facsimile — the fastest-growing radio markets.

Let's get down to figures. Not only have space rates increased greatly in most publications, but artwork and typography have gone skyhigh. Average costs for a 1-page plate are about $200, for a ⅔-page plate $150, or about $100 for ⅓-page.

Supposed, for example, you have been using one magazine 12 times a year. Then you not only have the cost of 12 plates a year, but you reach only one group.

If, however, you run 6 times in the paper you have been using, and 6 times in *FM* and TELEVISION, you will then lose very little in results from the other paper, and you will gain greatly by adding coverage among "The Men Who Set the Pace the Industry Follows." Here are actual figures on budget reduction, including plate costs given above, showing savings in dollars and in percentage:

	COST: 12 Times Magazine "A"	COST: 6 Times Each FM & TV and "A"	SAVING	SAVING
1 Page	$6600	$4450	$2745	33%
⅔ Pg.	4680	3172	1508	32%
⅓ Pg.	2680	1760	920	34%

	Magazine "B"[1]	FM & TV and "B"[2]	SAVING	SAVING
1 Page	$5720	$4320	$1400	24%

[1] 13 times [2] 7 times in "B", 6 times in FM & TV

	Magazine "C"	FM & TV and "C"	SAVING	SAVING
1 Page	$5400	$3855	$1545	29%
⅔ Pg.	3930	2732	1098	30%
⅓ Pg.	2280	1540	720	40%

	Magazine "D"	FM & TV and "D"	SAVING	SAVING
1 Page	$4800	$3540	$1260	26%
⅔ Pg.	3480	2550	930	28%
⅓ Pg.	2280	1500	780	35%

If these figures do not apply exactly to your advertising schedule, they still indicate that, by revising your old schedule for the coming 12 months, you can gain these three advantages:

1. Reduce your expenditures for trade paper space.

2. Reach the fastest-growing radio markets, namely, FM broadcasting and communications, television, and facsimile.

3. Reach the executives, engineers, upper-bracket retailers, and service organizations in these fields, for whom *FM* and TELEVISION is published.

For greater effectiveness from your trade paper advertising, at lower cost, see that your new schedule is adjusted to include:

FM AND TELEVISION
★ ★ Edited by Milton B. Sleeper ★ ★

Publication Office:
Great Barrington, Mass.
NEW YORK: 511 FIFTH AVENUE — VAnderbilt 6-2483

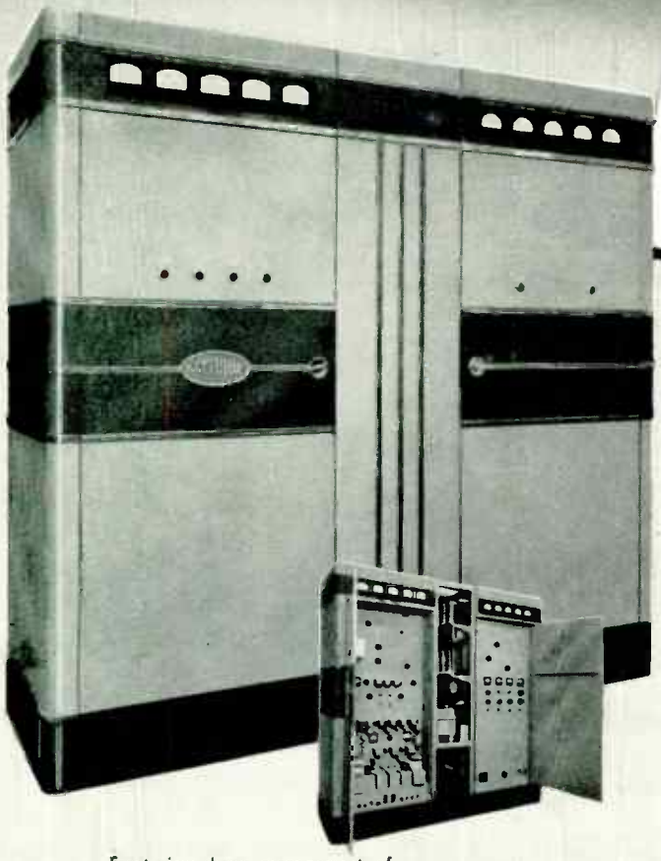
READY NOW

A New

3 KW-FM TRANSMITTER

by

RAYTHEON



Front view shows arrangement of controls for tuning driver and amplifier. Center lift-off panel has been removed to show accessibility of power supply.

Rear view showing accessibility of chassis, terminal boards, etc.

Ask WLAW-FM *about* RAYTHEON SERVICE

Marked "OK for shipment" at Raytheon, Waltham, on Thursday, equipment for WLAW's new FM transmitter began feeding programs into their antenna at Burlington, Mass., on Saturday. That's evidence of Raytheon super service made possible by dependable, easy-to-install Raytheon quality equipment.

You'll like its LOOKS

It's clean as a whistle, modern, streamlined — a handsome addition to any up-to-the-minute station. It's true, but hard to believe, that the new Raytheon 3KW-FM Transmitter is the lowest cost reliably made equipment of its class that you can buy.

You'll like its PERFORMANCE

It's easy and quick to tune — requires a minimum of special testing equipment . . . delivers a high quality, stable, hi-fidelity signal . . . operates at an inherently lower noise level. Features *Raytheon* direct crystal control and simplified Cascade Phase Shift Modulation.

You'll like its EASE OF MAINTENANCE

Simple, conservatively rated circuits . . . easy accessibility . . . *the use of standard, readily obtained, easily replaced parts* — make this Raytheon 3KW-FM Transmitter the easiest, most economical equipment to service and operate.

It's a RAYTHEON *Responsibility*

Backed by Raytheon's *complete* manufacturing and service facilities . . . when you specify *Raytheon* not only for FM or AM transmitters but for speech input and station equipment — you are teaming up with Raytheon's huge organization devoted to research and manufacture for the Broadcast Industry.

Look ahead with RAYTHEON

Raytheon's *Integrated Design* Policy lets your station grow with the industry. Start as low as 250 watts . . . step it up with the new 3KW-FM Amplifier and Transmitter . . . use it later as a driver for a 10 KW unit. You're set for the future with no fear of obsolescence.

Write today for complete information and technical details

RAYTHEON

Excellence in Electronics

RAYTHEON MANUFACTURING COMPANY

COMMERCIAL PRODUCTS DIVISION

WALTHAM 54, MASSACHUSETTS

Industrial and Commercial Electronic Equipment, Broadcast Equipment, Tubes and Accessories

Sales offices: Boston, Chattanooga, Chicago, Dallas, Los Angeles, New York, Seattle, Washington, D. C.

FM AND TELEVISION

★ ★ Edited by Milton B. Sleeper ★ ★

FORMERLY, FM MAGAZINE and FM RADIO-ELECTRONICS

VOL. 8 JANUARY, 1948 NO. 1

CONTENTS

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MILTON B. SLEEPER, *Editor and Publisher*

RICHARD H. LEE, *Advertising Manager*
STELLA DUGGAN, *Production Manager*
LILLIAN BENDROSS, *Circulation Manager*
Published by: FM COMPANY

Publication Office: 264 Main St., Great Barrington, Mass. Tel. Great Barrington 500
Advertising Department: 511 Fifth Avenue, New York 17, Tel. VA 6-2483

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Single copies 25¢ — Yearly subscription in the U. S. A. $3.00; foreign $4.00. Subscriptions should be sent to FM Company, Great Barrington, Mass., or 511 Fifth Avenue, New York 17, N. Y.

Contributions will be neither acknowledged nor returned unless accompanied by adequate postage, packing, and directions, nor will FM Magazine be responsible for their safe handling in its office or in transit. Payments are made upon acceptance of final manuscripts.

THIS MONTH'S COVER

The New Year's storms that tied up the central and eastern states, and did great damage in the south proved the worth of radio communications for public utility service and repair trucks. With power and telephone lines down, fire alarm systems out, and transportation stopped, 2-way FM paid dividends by speeding the restoration of service.

This month's cover shows a typical installation being made in a hurry on a Cambridge (Mass.) Electric light Company truck. The Harvey Radio Laboratories transmitter and receiver units, although mounted on the top of the body, are amply protected by a heavy steel case. Operation is in the 152- to 162-mc. band.

Entered as second-class matter, August 22, 1945, at the Post Office, Great Barrington, Mass., under the Act of March 3, 1879. Additional entry at the Post Office, Concord, N. H. Printed in the U. S. A.

WHAT'S NEW THIS MONTH

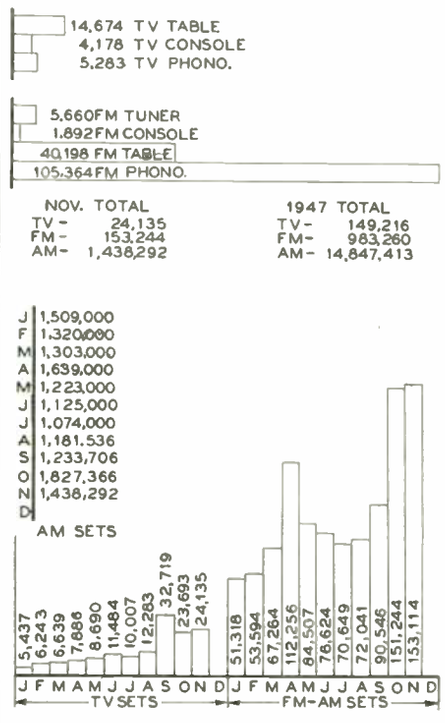
1. November Set Production
2. 15,000-Cycle Lines

1. An examination of the accompanying R.M.A. set-production barometer shows a sharp decline of AM sets in November, following an all-time peak the preceding month. This is probably the turning point in the transition from AM to FM. It seems certain that the November AM decline, compared with the steady increase registered by FM, indicates that the October AM record volume will never be reached again.

Probability is that AM production will hover around 1,000,000 sets per month in the first half of 1948, and may drop considerably below that figure in June and July.

FM production, on the other hand, will gain steadily, in step with the increasing number of new stations going on the air. It will be necessary to revise this estimate upward if, as generally expected, the way is opened for AM-FM program duplication, and unrestricted use of live talent on FM nets when, on January 31, the new AFM contract will probably go into effect.

Television set production, though not yet large in units, amounted to about $12,000,000, at retail prices, in November, and probably $75,000,000, for the first 11 months of 1947. This is remarkable, in view of the fact that television broadcasting was only making a start at the beginning of 1947, and that, as the end of the year approaches, 7 cities have only one television station, 2 cities have 2 stations, and 2 cities have 3 stations. Since these 11 sales territories have already proved to be such active markets for television sets, it's anyone's guess what will happen as more transmitters go on the air in 1948, and the availability of good programs is stepped up through the expansion of network facilities.



SET PRODUCTION BY RMA MEMBERS

2. On December 13, the FMA filed a petition with the FCC, asking that the Commission investigate the failure of the Bell System to make 15,000-cycle lines available within a reasonable time, and the apparent discrimination against FM networks in favor of television. On December 19, the FCC announced that a conference will be held by the Commission with the representatives of AT & T and FMA on January 13.

Following is the text of the petition filed by the FMA:

The Petition of the FM Association respectfully represents:

1. That it is a non-profit trade association organized under the laws of the District of Columbia for the purposes of promoting the development of frequency modulation broadcasting, and acting as liaison between its members, the Federal Communications Commission and other agencies and organizations on the continuing over-all problems affecting FM broadcasting.

2. That the FM Association has a membership of 238 consisting of organizations engaged in FM broadcasting, the manufacture of FM receiving and transmitting equipment and in business and professions directly related to FM broadcasting.

3. At the present time, the Petitioner's membership includes broadcasters who are interested in the development and establishment of FM networks on a regional as well as on a national basis.

4. For the purpose of effecting these networking arrangements these individuals and groups have discussed with representatives of the American Telephone and Telegraph Company the establishment of common carrier facilities between central and intermediate points for the proposed network. These requests have embraced the use of wire line facilities with high fidelity and low noise level characteristics which are essential for proper FM operation. More specifically, the American Telephone and Telegraph Company in conferences and correspondence has been requested to furnish infor-

(CONTINUED ON PAGE 14)

NEW SKYWAYS —FOR TELEVISION —FOR TELEPHONE

On November 13, the Bell System demonstrated its new experimental radio relay system between New York and Boston, bringing television within reach of vast new audiences.

The tower you see here is part of it. It's one of seven similar structures which relay microwaves between the two cities, carrying television programs with high fidelity. This new system will, of course, be used for the transmission of Long Distance telephone calls and radio programs.

Used in conjunction with the Bell System's coaxial cable, the new radio relay system now makes it possible to bring television to a potential audience of some 25,000,000 people along the eastern seaboard. And already work is under way on additional Bell System radio relay projects which will link New York and Philadelphia and extend west all the way to Chicago.

The Bell System may be relied upon to provide the most efficient, dependable facilities for the transmission of communications.

BELL TELEPHONE SYSTEM

TELENOTES

Cincinnati: Crosley station WLWT will have an effective radiated power of 50 kw. when the permanent 5-kw. television transmitter goes into operation with a 5-bay antenna 571 ft. above ground.

TV Demonstration: On December 17, CBS staged a demonstration in Boston at Filene's department store, bringing in WCBS-TV programs, originating in New York, over the AT & T relay system. Stores in Boston are already selling television kits, and taking orders for receivers.

Foreign Films: CBS has signed agreements with Film Polski, a Polish newsreel firm, and with the Australian News and Information Bureau, government film distributor, under which foreign films will be made available for telecasting here.

Jack Poppele: TBA president, discussing an industry code for television broadcasting: "As an art, television has barely got its feet wet. It would seem foolhardy to create a rigid set of standards based on the operation of only a handful of stations. Furthermore, among the broadcasters on the air, there has been a consciousness borne of public responsibility that has been ever-present in the minds of the operators."

Warning: If you use the flat, plastic-ribbon type of lead for your television or FM antenna, don't tape it against a metal mast. If you do, you'll lose most of your signals. Space it at least 3 ins. from any metal with wooden blocks. You can run coaxial cable against anything, however, without affecting the signals.

WBT: Jefferson Standard Broadcasting Company, Charlotte, N. C., has filed for a television transmitter to be installed at Spencer Mountain, site of their FM station. Directors have approved the investment of $500,000 in this new venture. Operation will be timed with AT & T's extension of network facilities.

TBA Awards: Honored by awards at the Television Broadcasters Association clinic, New York City, on December 10, were Dr. Frank G. Back, who developed the Zoomar lens for television cameras; William C. Eddy of WBKB for engineering the South Bend-Chicago relay; Paul M. Hahn for his skillful use of commercial techniques in American Tobacco programs; and Ben R. Donaldson for his experiments with commercial programs for the Ford Motor Company. Also cited was John H. Platt, Kraft Food shows.

ZENITH IS STILL THE HOTTEST LINE IN THE INDUSTRY

That's Because of the Value-Giving, Sales-Making Features Made Possible By Zenith's Policy of

RADIONICS EXCLUSIVELY

FIRST IN FEATURES Watch shoppers on any radio sales floor. What set catches the interest of the crowds?—a Zenith, of course! That's because *every* model in the Zenith line is packed with features that actually *mean* something—features that reflect the design and engineering "know-how" developed during Zenith's years in the industry—features that insure *value*.

FIRST IN DEMONSTRABILITY Zenith radios and radio-phonographs are *easy* to sell, because their features are the kind that you can actually *demonstrate*. The Cobra Tone Arm, for example, permits the most dramatic tone arm demonstration ever made. The Zenith "Radiorgan," the Silent-Speed Record Changer, the big, black dial, the Zenith Wavemagnet—all these are features you can show . . . features your customers will notice and want.

FIRST IN PERFORMANCE From the original engineering blueprint to the finished sets that come out of the final testing booth, every Zenith is built to *work* . . . built with all the skill, the knowledge, the *pride of achievement* that marks this organization. The final test of every radio is how it *performs* . . . and Zeniths are built to pass that test with flying colors. Hundreds of thousands of well-satisfied Zenith owners attest to *that*.

ZENITH RADIO CORPORATION
6001 W. DICKENS AVENUE • CHICAGO 39, ILL.

ONLY ZENITH OFFERS SALES FEATURES LIKE THESE

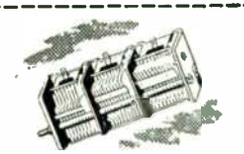

RADIONIC COBRA TONE ARM


ARMSTRONG F-M


WAVEMAGNET


RADIORGAN


SILENT-SPEED RECORD CHANGER


3-GANG CONDENSERS


NEW SUPER-SIX TUBE


80% MORE POWERFUL PHONOGRAPH MOTOR

PRODUCTS & LITERATURE

So many new instruments, components, and materials are being brought out that space does not permit us to publish illustrated descriptions of them all. Accordingly, rather than selecting a few each month, we have established this new department of Products & Literature so that a great number of brief descriptions can be published. From these, you can select items which interest you, and send for catalogs or bulletins. We'll appreciate it if you will mention FM and TELEVISION in your requests.

TV Frequency Monitor: For monitoring video frequency only. Low-pass filter eliminates picture line-frequency, and allows a maximum deviation of ± 12 kc. to be monitored. Designed for single-channel operation on 1.6 to 220 mc., with .001% accuracy. Type 1175-BT — Bulletin RE, General Radio Co., Cambridge 39, Mass.

Miniature Voltage Regulator: RCA types OA2 and OB2 are cold-cathode, glow discharge tubes, the former maintaining a DC operating voltage of approximately 150 volts, and the latter 108 volts. — Bulletin AB11, R. C. A. Tube Dept., Harrison, N. J.

Sweep Generator: Designed specifically for servicing FM receivers. Provides 88- to 110-mc. signal, unmodulated or amplitude-modulated, for aligning RF, mixer, and oscillator circuits, and frequency-modulated output on 8.3 to 10.8 mc. with adjustable sweep width for IF alignment. Contained in portable case. — Bulletin RF, RCA Victor Division, Camden, N. J.

Iconoscope Film Pickup: Complete system for televising film, comprising film pickup units and control consoles. Usual installation has two pickup units, and two console sections, each controlling one camera. — Bulletin AFB, A. B. DuMont Laboratories, Inc., 42 Harding Ave., Clifton, N. J.

Tube Manual: New edition of the RCA tube manual has been brought up to date and enlarged to include data on FM, television, and miniature tube circuits. Technical sections cover ratio detectors, discriminators, limiters, multivibrators, and resistance amplifiers. 256 pages, price 35¢. — Manual RC-15-FV, RCA Tube Dept., Harrison, N. J.

Omnidirectional Antenna: Provides for non-directional FM or TV reception. Folded dipole in the shape of an S gives increased reception in what are the null directions of a straight dipole. Constructed of ⅜-in. aluminum tubing, carried on a 5-ft. mast. — Bulletin AC, Technical Appl. Corp., Sherburne, N. Y.

Test Meter: High-sensitivity tester for tubes, sets, and batteries, with a 35-range meter for AC, DC, and resistance, described as a complete, portable test laboratory. — Bulletin HH, Precision Apparatus Co., Inc., 92-27 Horace Harding Blvd., Elmhurst, N. Y.

Antennas: Double-deck dipoles and reflectors for home FM or TV reception. Rated at 5 db. gain in line of reception, and 15 db. rejection of signals from rear. — Bulletin FMC, Camburn, Inc., 32-40 57th Street, Woodside, N. Y.

FM Tuner: For use with the audio system of an AM receiver, or with a high-quality amplifier and speaker. Audio output is rated flat within 2 db. from 50 to 15,000 cycles, with 3 volts RMS output at minimum usable signal input, up to 15 volts. Operates on 105-125 volts, 60 cycles. Tubes: two 6AG5, two 6BA6, two 6C4, one 6AL5, and one 6X5GT/G. Price $57.50. — Bulletin FMR, Meissner Mfg. Div., Maguire Industries, Mt. Carmel, Ill.

Crystals: New bulletin gives technical data and dimension drawings of 22 standard types of crystal mountings, both with and without temperature control. — Bulletin BC., Bliley Electric Co., Erie, Pa.

Heavy Duty Sockets: Three new types, designed to save space in equipment where tubes are mounted vertically on vertical panels. Two types are for medium 4-pin UX bases, and the third for super-jumbo and industrial 4-pin bases. Connections can be made at the rear of the panel. All three types have solderless screw terminals. Bulletin CPA, American Phenolic Corp., Chicago 50, Ill.

Aircraft Antennas: An 8-page booklet reviews research by the Army, Navy, and commercial airlines on the nature and elimination of precipitation static on aircraft antennas. A detailed description is given of the latest methods of overcoming this source of trouble. — Booklet DA, Dayton Aircraft Products, Inc., 342 Xenia, Dayton, Ohio.

FM Receiver for Schools: Table model FM receiver, with 2 short-wave bands, complete with 8-in. speaker, is designed for group-listening in schools. Overall construction is rugged, so that receiver can be moved frequently without being harmed. Price $189.95.— Electronics Dept., General Electric Co., Syracuse, N. Y.

Sound Pressure Measurement: Multipliers of non-discriminating frequency characteristics for extending the upper range of GA-1002 and GA-1004 sound pressure measurement systems. Thus measurements can be made with the former from 20 to 20,000 cycles, and with the latter up to 100,000 cycles. — Bulletin MM, Massa Laboratories, Inc., 3868 Carnegie Ave., Cleveland 15.

Recording Instruments: Sixteen-page booklet on recorders entitled "Operation Recorders — Their Selection and Use." A complete list of applications is included. — Bulletin 2470, Esterline-Angus Co., Inc., Box 596, Indianapolis 6.

Test Meters: A cabinet assembly of 6 meters, with bottom compartments for leads and accessories, described as a "complete electrical laboratory". Meters cover a wide range of AC and DC voltage and current measurements. Also furnished are a 50-microampere meter with 20,000 ohms per volt, and a rectifier type AC meter of 1,000 ohms per volt which can be used as a db meter from −10 to +55 db. Cabinet is 34 by 17 by 9 ins. — Bulletin EL, Simpson Electric Co., 5200 Kinzie St., Chicago.

TV Receiver: Console model has automatic phonograph, FM, AM, and short-wave reception, and direct-view television. Very neat trick is 60° swivel picture-tube mounting, called "Swing-a-view". Thus, if the most suitable place to put the console in a living room is not the best location for straight out televiewing, the tube can be swung to a convenient angle. Price $795. — Bulletin SA, Crosley Div., Avco Mfg. Corp., Cincinnati, Ohio.

Pocket Signal Tracer: About the size of a thick fountain pen, has multi-vibrator operated by a penlite dry battery. Current drain .15 amp. For setting BC padder, and checking RF, IF, and AF circuits, and opens in wiring. — Bulletin 12, Radex Corp., 2076 Elston Avenue, Chicago.

Television Test Pattern: AC-operated television receiver test unit, connected to TV receiver, generates a pattern on the picture tube of 12 horizontal lines and 16 vertical lines. Since this pattern can be used to adjust vertical and horizontal linearity, service work is made independent of broadcast station test-pattern transmission, and receiver can be checked on all channels at one time. Model 5072 Crosshatch Generator, $39.95. — Bulletin 4096, Philco Corporation, Philadelphia.

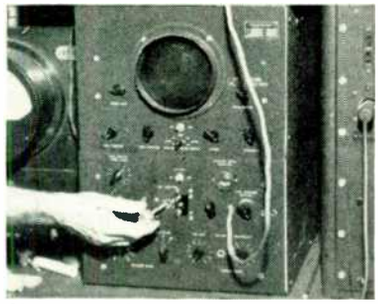
Cueing Attenuator: Features a switching mechanism to transfer attenuator input to a pair of separate output terminals for cueing purposes, facilitating program switching and fading in "on cue". No increase in diameter of attenuator, since switch is at the rear. Detent action can be furnished. — Bulletin HB, Shalleross Mfg. Co., Collingsdale, Pa.

Quiet as a Moonbeam Falling on Velvet

It's Impossible to Hear a Mallory Control Operate!

Ultra-sensitive sound testing meters built for the U. S. Navy prove that the noise level of the Mallory control in operation is so low as to be totally inaudible!

Contact with the talcum-fine carbon element is made by a special Mallory Alloy that passes over it smoothly and silently.



Meter used in the noise level test. Readings were taken on volume controls of all leading manufacturers. Mallory controls gave no audible sound, registered 22% below all others in inaudible sound vibrations.

The things you look for in a control are low noise level, long life, accurate resistance values and smooth, uniform tapers. Competitive tests prove that Mallory leads the field on all four points!

You can use Mallory Volume Controls, Capacitors and Vibrators with complete confidence. They are carefully built to assure ease of installation and complete customer satisfaction. Mallory's standardized range of sizes and types makes the Mallory line a profitable line to stock.

"Good Service for Good Business"

A Mallory plan to build business for radio-electronic service shops.

There's a unique customer follow-up system that will produce repeat business. There's a close tie-in with the Mallory trade mark. Ask your distributor about it!

P. R. MALLORY & CO. Inc.

MALLORY

CAPACITORS . . . CONTROLS . . . VIBRATORS . . .
SWITCHES . . . RESISTORS . . . RECTIFIERS . . .
VIBRAPACK* POWER SUPPLIES . . . FILTERS

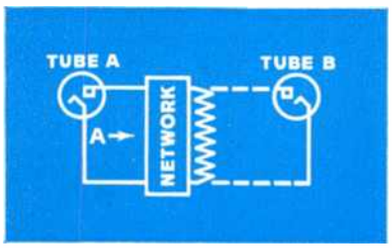
*Reg. U. S. Pat. Off.

APPROVED PRECISION PRODUCTS

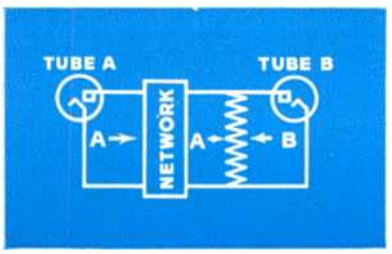
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

How the Doherty Circuit pays off for Broadcasters

DOHERTY CIRCUIT



CONDITION 1: **Nearly zero modulation, so amplifier has to handle carrier wave alone. Tube A is sufficient and—seeing just the right impedance in network—operates at maximum efficiency. Tube B, not needed, lies idle.**



CONDITION 2: **Carrier being modulated. Tube B, now needed, kicks in, adding its quota of power to handle the increased load and changing the impedance so that Tube A also steps up its output. Both tubes work to full capacity and at high efficiency.**

The Doherty Circuit for AM broadcast transmitters was the first to achieve *high efficiency and economy* and still retain the following important advantages of *linear* and *grid bias modulated* power amplifiers:

(1) A simple tube complement—no high-power audio tubes required

(2) No modulation transformer required—savings in space and apparatus

(3) Freedom from transient or overmodulation surges—can be heavily overmodulated at any audio frequency for long periods without damage

(4) Adaptability to large amounts of feedback derived from the final output envelope, resulting in low noise, low harmonic distortion, and low intermodulation distortion over wide variations in tube characteristics and circuit adjustment

(5) Negligible carrier shift, assuring full utilization of the assigned carrier power of the station

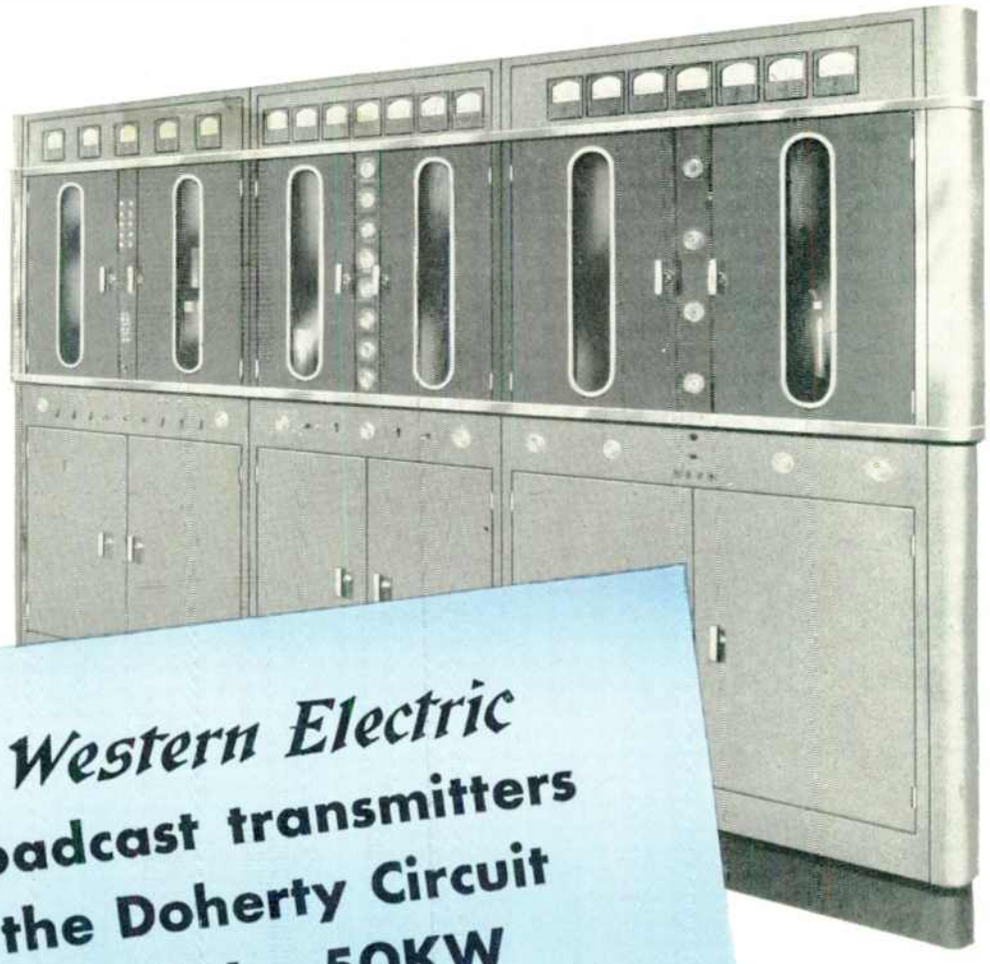
Gearing tubes to circuits

How a tube acts in a circuit depends, of course, upon the *impedances* which face it in the circuit. So getting the most out of tubes is a matter of getting the right impedances.

Like pre-Doherty linear amplifiers, the Doherty *High Efficiency* Amplifier Circuit has two tubes. *Unlike* them, it has a network which automatically changes impedances to best meet changing needs. Both tubes receive the signal, but—when the carrier alone is on—only *one* tube is operative. The second tube uses no power. Not until modulation is applied, raising the input voltages on both tubes, does the second tube start up. It then does two things: it contributes more power to meet the added load, and it automatically changes the impedance faced by the first tube so as to throttle it up to full output, too.

For the Broadcaster, this means that the Doherty Circuit consumes only *half the power* required by old style linear amplifiers—a real triumph in circuit engineering.

It is just one of many Bell Telephone Laboratories developments which have contributed to improved efficiency, greater economy and higher quality in communications.



The 5 KW AM transmitter, like the 1KW and 50 KW, has the famous Doherty Circuit. Eleven years of experience proves this *High Efficiency* amplifier operates continuously for long periods with no need for retuning.

ONLY Western Electric AM broadcast transmitters have the Doherty Circuit 1KW...5KW...50KW

Today the Doherty Circuit is being used by hundreds of broadcast stations—making possible the use of smaller circuit elements, saving space, giving increased stability and greater ease of adjustment, and reducing the outlay for auxiliary equipment.

Other features

In Western Electric 1, 5 and 50 KW AM transmitters, you also get two other famous Bell Laboratories developments—stabilized feedback and grid bias modulation. These, together with the Doherty Circuit, are your assurance of superlative performance at rock-bottom operating cost!

Get full details

If you're thinking about a new AM transmitter, remember this: *only* Western Electric has the Doherty *High Efficiency* Circuit—unmatched today in performance, dependability, and economy! For full details, call your local Graybar Broadcast Representative or write Graybar Electric Co., 420 Lexington Ave., New York 17. N. Y.

The 1 KW AM transmitter, with the Doherty Circuit, is extremely compact—requires floor space only 44" wide by 42" deep.

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MODEL 260
VOLT-OHM-MILLIAMMETER

20,000 Ohms per Volt D.C.
1,000 Ohms per Volt A.C.

Volts, A.C. and D.C.: 2.5, 10, 50, 250, 1000, 5000.

Milliamperes, D.C.: 10, 100, 500.

Microamperes, D.C.: 100.

Amperes, D.C.: 10.

Decibels (5 ranges): —10 to 52 D.B.

Ohms: 0-2000 (12 ohms center). 0-200,000 (1200 ohms center). 0-20 megohms (120,000 ohms center).

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*Both complete with test leads and 32-page Operator's Manual**

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For what it buys in sensitivity, precision, and useful ranges, the price of Model 260 has always purchased value far beyond that of even remotely similar test instruments. Today this famous volt-ohm-milliammeter is a finer instrument than ever, with added ranges and with a new sub-assembly construction unmatched anywhere in strength and functional design. The price is the same. That means, of course, that your investment today buys even more in utility and the *staying* accuracy that distinguish this most popular high-sensitivity set tester in the world.

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FIRST

SX-42

Model SX-42 offers the greatest continuous frequency coverage of any communications receiver . . . from 540 kc to 110 Mc. Combines in one superbly engineered unit a top-flight VHf and FM receiver, standard and short wave broadcast receiver and high fidelity phonograph amplifier. With six bands; band six covers from 55 to 110 Mc.

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FOREMOST

SX-43

Model SX-43 offers continuous coverage from 540 kc to 55 Mc and has an additional band from 88 to 108 Mc. AM reception is provided on all bands, CW on the four lower bands and FM on frequencies above 44 Mc. In the band of 44 to 55 Mc, wide bond FM, or narrow band AM (just right for narrow band reception) is provided. Here is an extraordinarily versatile, sensitive receiver at a price that will attract all discriminating FM listeners.

$169.50

in FM

BY EXPERIENCE and accomplishment, Hallicrafters can claim to be among the first and the foremost in FM advancement. More than six years ago Hallicrafters had developed very high frequency equipment capable of operation on the new FM bands of 88 to 108 Mc. The new Models SX-42 and SX-43, direct outgrowths of this pioneering continue to maintain Hallicrafters foremost position in this specialized field. FM engineers, technicians and all concerned with the progress of FM are invited to listen to these models, for a demonstration of a new, high quality in FM reception.

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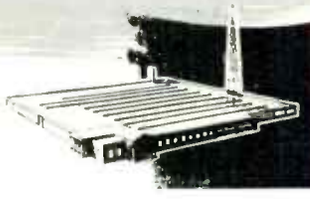

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WHAT'S NEW THIS MONTH

(CONTINUED FROM PAGE 4)

mation regarding (1) the establishment of facilities with 15,000-cycle fidelity and (2) the rates that would be charged for such service.

5. Despite frequent requests for information of this nature considerable delay has occurred in the furnishing of this data and in advising broadcasters regarding the plans of the American Telephone and Telegraph Company for the establishment of regional and national networking facilities for FM users. As a result of this delay the progress of FM broadcasting has been considerably retarded and the creation and development of new networks has been impeded.

6. Specifically, a recitation of the facts as they relate to the Continental Network will illustrate the delays incident to the establishment of this network service.

(a) In letters of February 14 and March 12, 1947 as well as in discussions between those intervals, representatives of the Continental Network advised American Telephone and Telegraph Company representatives (Long Lines Department) of their interest in the establishment of 15,000-cycle lines. In an acknowledgment of March 21, 1947 attached as *Exhibit A*, Mr. Harry Jeavons, Division Commercial Manager, advised in part: "— we are currently reviewing the entire situation involving the provision of 15-kc. program transmission service channels. Upon completion of this review we shall be glad to discuss the matter with you further."

Subsequently, in a letter of May 16, 1947, attached as *Exhibit B*, the same party advised: "Your inquiry concerning 15-kc. channel for the Continental Network is being reviewed and we shall advise you as promptly as possible as to the points which could be served and the costs involved."

It was not until August 13, 1947 that definite information on this subject was furnished, as set forth more definitely in *Exhibit C*.

7. Section 202 of the Communications Act of 1934 provides that

(a) "It shall be unlawful for any common carrier to make any unjust or unreasonable discrimination in charges, practices, classifications, regulations, facilities or services for or in connection with like communication service, directly, or indirectly, by any means or device, or to make or give any undue or unreasonable preference or advantage to any particular person, class of persons, or locality, or to subject any particular person, class of persons, or locality to any undue or unreasonable prejudice or disadvantage.

(b) Charges or services, whenever referred to in this Act, include charges for, or services in connection with, the use of wires in chain broadcasting or incidental to radio communication of any kind."

WHAT'S NEW THIS MONTH

(CONTINUED FROM PAGE 14)

It is Petitioner's contention that the American Telephone and Telegraph Company has discriminated against FM broadcasting and has preferred other broadcast services as will be shown hereafter.

8. At the time that the American Telephone and Telegraph Company officials were reviewing the establishment of 15,000-cycle facilities for FM networks (*Exhibit B*) there were 220 FM stations in operation and the Commission had authorized an additional 630 stations which were in various stages of construction. By comparison at or about that time 10 television stations were in operation and the Commission had authorized an additional 55 stations.

9. It can be seen from the above that actual and potential FM users of common carrier facilities outnumbered the same category of television users by a ratio of approximately 12 to 1. Nevertheless, no definite plan for the establishment of FM network lines had been formulated by American Telephone and Telegraph Company, but a specific and detailed plan had been announced for television networks at a public hearing held by the Commission on June 9, 1947.

10. At that informal hearing concerning intercity television program transmission, Mr. H. H. Nance, Long Lines engineer, testified in detail regarding the establishment of television networks. In his testimony he included plans for intercity connections as follows:

(1) NEW YORK AND WASHINGTON: "The two existing television circuits between New York and Washington, of course, will continue to be available."

(2) PHILADELPHIA AND BALTIMORE: "Television terminal equipment is scheduled to be added to these circuits at Philadelphia and Baltimore to permit either the reception or origination of programs at both of these points. This additional terminal equipment, which will expand the usefulness of the two New York-Washington television facilities, is expected to be available in time for the football season this fall."

(3) NEW YORK AND BOSTON-PROVIDENCE: "New York and Boston are expected to be interconnected this fall by means of an experimental radio relay system between the two cities. A branch to connect Providence to these circuits could be installed in 1948."

(4) NEW YORK AND ALBANY-SCHENECTADY: "A coaxial cable from New York to Albany is under construction and is scheduled for completion by about the end of this year. Using this cable, Schenectady may be added to the television network by the summer of 1948, if required. Thus, the major cities of the eastern seaboard area from Boston to Washington and Richmond may be provided with net-

(CONCLUDED ON PAGE 54)

THE MICROWAVE HANDBOOK

Chapter 1: The Importance of Microwaves—Basic Considerations and Characteristics

SAMUEL FREEDMAN*

INTRODUCTION

MORE and more engineering man-hours are being devoted to research in the radio spectrum from 300 to 30,000 mc., and an increasing number of project groups are at work on the development of equipment to utilize these frequencies.

While the radio industry as a whole has not yet felt the impact and significance of progress in the field of microwaves, it is none too soon for everyone in management, engineering, production, sales, and maintenance to become familiar with the fundamental techniques of microwaves.

The reason is obvious. Already, bands allocated to various services are crowded up to 300 mc. In this part of the spectrum, assuming that the average width of each channel is 100 kc., there is only room for 3,000 channels, while from 300 to 30,000 mc., there is room for 148,500 channels 200 kc. wide.

Give a little thoughtful consideration to these figures, and you will see why, in the not-distant future, radio communications will move rapidly into the new frontier above 300 mc.

At the end of World War 2, little had been accomplished in microwave application except in military uses, principally for radar. Now, with its conversion to peace hardly completed, commercial relay systems suitable for multiplex telephone, telegraph, printer, facsimile, aural broadcasting, and television are in operation. Moreover, they have proved so successful that they give promise of replacing many wire circuits used for such services.

Television broadcasting, to which the band from 480 to 920 mc. has been assigned already, will move up to these frequencies sooner than is generally realized. That this must be so is clear from the fact that the low-band channels now in use are not sufficient to accommodate the applications already filed in some cities. At the present rate of filing, it appears that the number of low-band channels may be exhausted long before commercial high-band equipment is available. Then, with removal of the 6-mc. limitation imposed by low-band television, we can expect a shift from 525-line definition to perhaps 1,000-line picture quality.

Aviation will also benefit from the development of microwave blind-landing systems, and means for safe flying.

These are but a few of the new services to be performed by microwaves. What will follow will represent a far greater degree of expansion that has come in the utilization of frequencies up to 300 mc., even going back to the days when the spark transmitter, now banned from the ether, was the farthest frontier of radio development.

FIG. 1. MICROWAVE TRANSMITTER FOR TRANSMITTING A TELEVISION PROGRAM FROM THE WALDORF TO WNBT

Of course, there are limitations in the use of microwaves. While high effective radiated power can be developed for beam transmission, it is obtained through the use of reflectors. So far, omnidirectional transmission is limited to a few watts. As frequencies increase, propagation approaches the characteristics of light. Until we learn to bend the waves, so they will follow the curvature of the earth, microwaves can not be used for long-distance communication.

Probably these and other limiting factors will be overcome as the industry makes increasing use of microwaves.

1.1 Microwave Spectrum ★ For reference purposes, the radio spectrum is divided as follows:

Wavelength	*Frequency*	*Official FCC Abbreviation*
VERY LONG WAVES		
inf. to 10,000 m.	0 to 30 kc.	VLF
LONG WAVES		
10,000 to 1,000 m.	30 to 300 kc.	LF
MEDIUM WAVES		
1,000 to 100 m.	.3 to 3 mc.	MF
SHORT WAVES		
100 to 10 m.	3 to 30 mc.	HF
VERY SHORT WAVES		
10 to 1 m.	30 to 300 mc.	VHF
ULTRA SHORT WAVES		
100 to 10 cm.	.3 to 3 kmc.	UHF
SUPER SHORT WAVES		
100 to 10 mm.	3 to 30 kmc.	SHF

The microwave band includes the ultra short and super short waves, from 1 m. down to .01 m., or 300 mc. up to 30,000 mc.

Because of the short wavelengths in the microwave region, it is customary to express wavelength in centimeters or millimeters, and because of the high frequencies, it is more convenient to express frequency in kilomegacycles. A kilomegacycle is 1,000,000,000 cycles, or 1,000 megacycles.

The total amount of channel space in the bands up to 300 mc. is only .1% of the region below the infra-red band, which starts at 300 kmc. The spectrum above radio frequencies is divided in this manner:

SPECTRUM FREQUENCY

Infra-Red: 300 to 375,000 kmc.
Light: 375,000 to 750,000 kmc.
Ultra-Violet: 750,000 to 22.5 million kmc.
X-Rays: 22.5 to 45,000 million kmc.
Radio Activity: 45,000 to 270,000 million kmc.
Cosmic Rays: Infinity

It is interesting to note that, although we generally refer to the lower bands in terms of frequency rather than wavelength, in the case of microwaves the use of wavelength designations is widely employed. The reason is that the mechanical dimensions of microwave plumbing are directly related to the length of the electrical waves it is designed to handle, whereas, below 300 mc., lumped inductances and capacitors do not bear a similar relationship to the resonant frequency of the circuits in which they are used.

1.2 Uses for Microwaves ★ Microwaves hold the key to the further expansion of radio communications and new types of remote-control devices. Among the advantages afforded by microwaves are:

* Microwave Engineer, DeMornay-Budd, 475 Grand Concourse, New York 51, N. Y.

1. An enormously wide band of frequencies available for new services.

2. Ability to accommodate the multiple use of any frequency channel, because of the limited range of transmission.

3. Adaptability to the use of sharply-focused antenna reflector systems, offering advantages in narrow-beam transmission and high energy concentration, minimum channel occupancy, and relative privacy.

4. Accommodation to high-definition black-and-white television or color television occupying 20-mc. channels.

5. Space for wide-band FM relays to handle multiplexed services. In this connection, it should be remembered that the relative advantage of FM over AM is considered to be equal to 1.73 times the deviation ratio squared. In all probability, when television moves into the 480- to 920-mc. band already assigned to it by the FCC, the video as well as audio signals will be transmitted by FM.

6. Also pulse types of communications can be used in the microwave band. These systems produce high peak power from transmitters of low average power. They also provide multiplex operation by employing variations of pulse rate and pulse interval timing.

7. Equipment does not require conventional inductances and capacitors, their equivalents being provided in the mechanical construction.

8. Miniature equipment can be employed, offering convenience advantages from reduced weight and physical size.

9. A large change in frequency or channel selection can be obtained from a given set of components, since they require only a slight adjustment for a wide frequency shift.

10. Extremely small and inconspicuous antennas can be used for many communications purposes.

The simplest microwave transmitter need comprise no more than a tube to generate oscillations, and a hollow pipe as a tuning circuit and to propagate the energy directly into space.

Perhaps the most promising field for microwave applications is in relay communications. This is the only means now available for transmitting and relaying intelligence requiring channels exceeding 6 to 10 mc. in width. In fact, except for the costly coaxial cable and wave-guide pipe line, there is no other method for handling intelligence on channels exceeding 15 kc. in width. That is about the present-day limit of good, open wire lines.

During the war, for reference purposes the microwave spectrum was divided into 5 bands, identified by letters. Since the practice will probably be continued, the designations are given below:

Band	*Frequency*	*Wavelength*
P	225 to 390 mc.	133.3 to 76.9 cm.
L	390 to 1,550 mc.	76.9 to 19.37 cm.
S	1,550 to 5,200 mc.	19.37 to 5.77 cm.
X	5,200 to 11,000 mc.	5.77 to 2.75 cm.
K	11,000 to 33,000 mc.	2.75 to .909 cm.

These are the designations used particularly in reference to radar equipment and tubes employed to generate microwaves.

1.3 Propagational Behavior ★ Basic calculations for microwave propagation must assume transmission in unobstructed space. In this respect, the propagation characteristics are similar to light under certain conditions.

Specifically, the range in miles over a smooth earth is

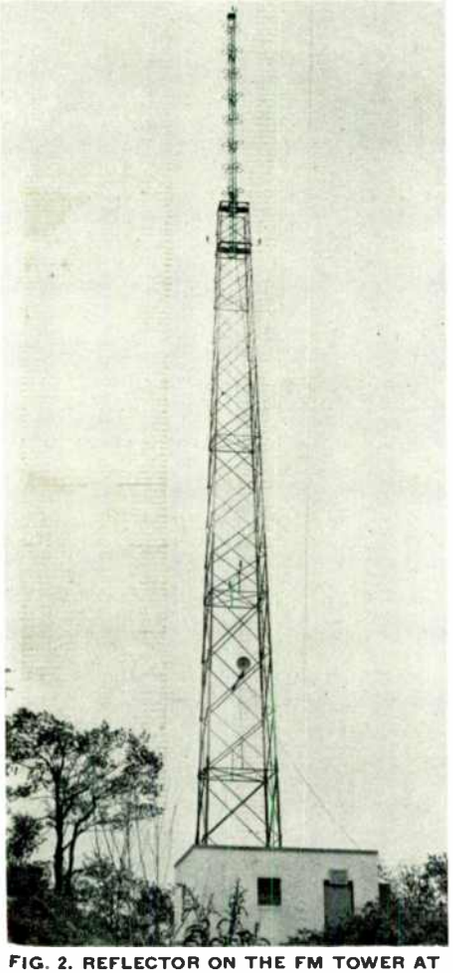

FIG. 2. REFLECTOR ON THE FM TOWER AT W1NC-FM, USED TO RECEIVE MICROWAVE RELAY TRANSMISSION FROM THE STUDIO

$$Distance, miles = 1.4\sqrt{Antenna\ Height, ft.}$$

When the horizon is obstructed, such as may be the case inside a room, elevator, interior of a subway train, or inside a tunnel, microwaves behave like light. They may then travel from such enclosures into others, or into open space, by reflection. Reflections take place from wall to wall as if the microwave energy were a beam of light, and every obstruction a mirror of that shape and relative dimensions.

The net result is that microwaves can provide communication under many conditions impossible for conventional radio frequencies alone, or for light alone.

When microwave signal energy strikes a physical barrier in its path, it is reflected by that object at angles depending on the contour of the obstruction. It will then continue in such useful or un-useful directions until it encounters another obstruction. Further reflections will take place in new directions. In practice, some of the energy (normally a useful amount) will continue onward to a distance greater than possible for straight-path communication on the VHF band.

Under unfavorable conditions, the energy may return to the source (basis of radar operation) or some degree of energy cancellation may take place at the receiving point because of the arrival of amplitudes and phases of the energy by paths of different lengths.

Microwaves are attenuated more rapidly than the lower radio frequencies. This is due to the fact that the shorter wavelengths approach the dimensions of particles in fog, rain, snow, and gases. This is increasingly pronounced as the frequency is increased. However, in practice, microwaves often make use of natural wave guide paths. Any two pronounced walls, such as the ionosphere and the earth, serve for sky-wave type of operation. For example, microwaves may be reflected forward by bouncing between two density zones caused by temperature or atmospheric stratification of any kind. They may even find an atmospheric duct or stratified layer and travel in it by reflecting back and forth on its diameter.

Generally, if microwaves do not reach their destination by direct path, they may conceivably get there by reflection. Maximum energy is reflected when the object encountered is of maximum conductivity. The least reflection takes place over flat uniform terrain of high ground resistance, with uniform atmospheric conditions.

1.4 Circuit Behavior ★ While the same fundamental laws apply to microwaves and the lower frequencies alike, certain seemingly contradictory effects are encountered.

1. Lumped inductance, such as a coil, cannot be used. Any inductance or conductor, however low its DC resistance, increases in reactance with increased frequency to the point where it becomes virtually an insulator.

This is in accordance with the formula for inductive reactance

$$X_L = 2\pi fL$$

where X_L = *resistance in ohms*
f = *frequency in cycles*
and L = *inductance in henries*

Thus, for example, a 1-millihenry coil would have an inductive reactance of 62,832 megohms at 10,000 mc.

2. Lumped capacity cannot be used. Any condenser, however high its DC resistance, decreases in reactance with increased frequency to the point where it becomes virtually a short circuit.

This is in accordance with the formula for capacitive reactance

$$X_C = \frac{1}{2\pi fC}$$

where X_C = *resistance in ohms*

FIG. 3, LEFT: MICROWAVE TEST EQUIPMENT SETUP AT PHILIPS LABORATORY. FIG. 4, RIGHT: MICROWAVE RELAY ANTENNA AT WBT-FM

and C = capacity in farads

Thus, for example, a .001-mfd. condenser would have a capacitive reactance of .016 ohm at 10,000 mc.

3. The total reactance due to lumped reactances in a microwave circuit would be of a very high order, as shown by the formula.

$$X = X_L - X_C$$

where X = total reactance in ohms.

That is because the inductive reactance is so extremely high, and the capacitive reactance is so extremely low.

4. Similarly, values of Q in microwave circuits are of a high order, since Q is the ratio of AC to DC resistance. Where a Q of 10 to 100 represents a high figure of merit in circuits operated at lower frequencies, microwave circuits may have a Q of 1,000 to 10,000. With careful design, the Q may be much higher at the upper end of the microwave band.

5. At microwave frequencies, the skin effect becomes pronounced to the point where the current is carried by only the first few millionths of a meter of the thickness of the conductor. A conductor with a cross-section large enough to present a very low resistance to DC behaves, therefore, as if it had a much smaller cross-section when carrying microwave frequencies. For this reason, microwave components are generally plated with silver or gold.

6. Quartz crystals used in circuits at the lower frequencies have a Q of about 2,000. Such an order of Q is much higher than can be developed by the circuitry. On microwaves, a simple hollow pipe, with both ends closed, can develop a Q many times higher than that of the crystal. Therefore, cavities make an ideal substitute for crystals. Moreover, they function without the need of multiplication stages.

7. Since it is inefficient and virtually impossible to send appreciable microwave energy over wires, a different technique is necessary. A hollow pipe or wave-guide of rectangular cross-section is used to carry energy between two points such as an antenna and its transmitter or receiver. In this case, energy travels down the wave-guide by reflection between opposite walls provided they are separated by a distance in excess of one-half a wavelength. For example, a pipe having a wall separation in excess of 2 ins. will carry energy at 3,000 mc. Since

1 meter = 39.37 in.,

the wavelength at 3,000 mc. is .1 meter or 3.9 ins. Thus 2 ins. is greater than one-half wavelength at 3,000 mc.

8. Energy can be focused by small reflectors, provided the dimensions of the reflector are substantially greater than 1 wavelength.

9. Low-power equipment can give the effect of much greater power at low frequencies, provided it is concentrated in a beam. This is due to the fact that the use of highly directional antennas is impractical at low frequencies, or long wavelengths, because of their physical dimensions.

For example, a 30-in. reflector at 10 cms. or 3,000 mc. can produce a beam about 8° wide, corresponding to an energy concentration of 400 times. If both transmitter and receiver employ such a reflector, the energy concentration or effective power gain is 400^2.

Thus a .1-watt transmitter with a gain of 160,000 times becomes, in effect, a 16-kw. transmitter.

The principal microwave problem has been that of designing vacuum tubes for generating and amplifying the extremely high frequencies required. The principal tubes which have been employed are the magnetron, where an external magnetic field is substituted for the grid; the klystron, where electrons from the cathode travel at different velocities to produce bunching effects; and the disc-seal or lighthouse tube, operating conventionally but with very small inter-electrode spacing and a special physical structure that reduces inter-electrode capacitance. Other alternatives have been the Barkhausen-Kurz method, where the grid is highly positive and the plate is slightly negative with respect to the cathode. A more recent development is the Fonda-Freedman electron grouping principle, where conventional tubes are used to generate microwaves by making the transit time from cathode to plate correspond to several even or odd half-periods of oscillation. These will be discussed later, in detail. Various research groups are constantly engaged in the development of more efficient vacuum tube structures to facilitate operations in the microwave region.

NEXT MONTH

Chapter 2 of the MICROWAVE HANDBOOK series will go a little more deeply into the characteristics of frequencies from 300 to 30,000 mc., discussing reactance effects, skin effects, displacement currents, and simulated components.

DIRECTORY OF TELEVISION STATIONS

Showing Stations on the Air, C.P's. Granted, and Applications Filed as of Jan. 1, 1948

ACCORDING to information released by the FCC there was, on December 15, a total of 6 licensed television broadcast stations in the United States. In addition, 11 stations were under temporary authority, construction permits had been granted to 54 others, and 72 applications were pending. Of those, 25 were in hearing.

In the accompanying list, the status of each station is indicated in the last column: L indicates license granted; TO indicates temporary operation under special authority; CP indicates construction permit granted; A indicates application filed; and IH indicates that the application is in hearing.

The total list includes 64 cities in 31 states. Following the name of each city is the number of stations assigned to it under the newly proposed allocations plan in which Channel 1 may be eliminated.

ALABAMA

		CH.	KW.	
BIRMINGHAM—3				
	Birmingham Bcstg Co	4		A

CALIFORNIA

BAKERSFIELD				
	Pearl Lemert	10		A
HOLLYWOOD—see Los Angeles				
KTLA	Television Prod. Inc	5	30–15	TO
LOS ANGELES—7, including Hollywood				
KECA-TV	Amer. Bcstg Co	7	4.5–2.7	CP
KFI-TV	E. C. Anthony, Inc	9	16.1–17	CP
KNBH	Ntl. Bcstg Co	4	15–8	CP
KLAC-TV	Dorothy S. Thackrey	13	16–16	CP
	Don Lee Bcstg System	2		IH
OAKLAND—see San Francisco				
	KROW, Inc	11		A
RIVERSIDE—1				
KARO	Bcstg Corp of Amer	1	1–1	CP
SAN DIEGO—4				
	Bolboa Bcstg Co	6		A
	Jack Gross Bcstg	8		A
SAN FRANCISCO—6				
KGO-TV	Amer. Bcstg Co	7	5.4–2.7	CP
KWIS	Assoc. Bcstrs Inc	5	23.6–12.6	CP
KCPR	Chronicle Publishing Co	4		CP
	Don Lee Bcstg System	2		IH
	S. H. Patterson	9		A
STOCKTON—1				
KGDM—TV	E. F. Peffer	8	1.9–1.8	Cp

CONNECTICUT

HARTFORD—2				
	Connecticut Bcstg Co	10		IH
	New Britoin Bcstg Co	8		IH
	Travelers Bcstg Service	10		IH
	Yankee Network	8		IH
NEW HAVEN—1				
WNHC-TV	Elm City Bcstg Corp	6	1.8–9.6	CP
WATERBURY—1				
	Empire Coil Co	12		IH
	Fairfield Bcstg Co	12		IH
	Harold Thomas	12		IH

DELAWARE

WILMINGTON—1				
WDEL-TV	WDEL Inc	7	1–.5	CP

DISTRICT OF COLUMBIA

WASHINGTON—4				
WOIC	Bomberger Bcstg Serv.	9	30–24.5	CP
WTTG	A. B. DuMont Labs. Inc	5	6.25–2.5	TO
WMAL-TV	Evening Star Bcstg Co	7	27.7–13.9	TO
WNBW	Ntl. Bcstg Co	4	20.5–17	TO

FLORIDA

MIAMI—4				
WTVJ	Southern R. & T. Equip.	4	1.6–7.9	CP
	Miami Bcstg Co	5		A
	Isle of Dreams Bcstg	5		A
	Fort Industry Co	5		A

GEORGIA

ATLANTA—4				
	Liberty Bcstg Corp	5		A
	Atlonto Journol Co	8		A
	Constitution Pub Co	2		A
	Liberty Bcstg Corp	5		A

ILLINOIS

CHICAGO—6				
WENR-TV	Amer. Bcstg Co	7	30–15	CP
WBKB	Balaban & Katz Corp	4	1.8–1.8	L
WNBY	Ntl. Bcstg Co	5	21.8–21.8	CP
WGNA	WGN, Inc	9	18.4–9.4	TO
	Sun & Times Ca	13		A
	Columbia Bcstg System	11		A
	Johnson-Kennedy Radia	2		A

INDIANA

BLOOMINGTON—1				
WTTV	Sarkes Tarzian	10	1–1	CP
INDIANAPOLIS—4				
WWHB	Wm. H. Block Co	3	14.5–7.6	CP
	WFBM, Inc	6		A
SOUTH BEND—1				
	South Bend Tribune	13		A

IOWA

AMES—1				
WOI-TV	Iowa State College	4	13–10	CP

KENTUCKY

LOUISVILLE—2				
WHAS-TV	Courier-Journal	9	9.6–7.2	CP
	WAVE, Inc	5		A

LOUISIANA

NEW ORLEANS—5				
WRTV	Maisan Blanche Co	4	13.6–7.2	CP
	Stephens Bcstg Co	6		A
	Times Picayune	7		A

MARYLAND

BALTIMORE—3				
WMAR	A. S. Abell Co	2	17.1–17.1	TO
WBAL-TV	Hearst Radio, Inc	11	32.6–17.2	CP
WAAM	Radio-Telev. of Balt.	13	31.7–20	CP

MASSACHUSETTS

BOSTON—5, including Waltham				
WBZ-TV	Westinghouse Radio Sta.	4	14.3–7.2	CP
WNAC-TV	Yankee Network, Inc	7	32.7–32.7	CP
	Boston Metro. Tele. Co	9		IH
	E. Anthony & Sons Inc	9		A
	Columbia Bcstg Sys	9		A
	Empire Coil Co	9		IH
	Mass. Bcstg Corp	9		IH
	Mathesan Radio Ca	13		A
	New England Tele. Ca	13		IH
	N. E. Theatres, Inc	13		IH
FALL RIVER—see New Bedford				
	New England Tele. Co	8		A
NEW BEDFORD—1, including Fall River				
	E. Anthony & Sons Inc	1		A
WALTHAM—see Boston				
WRTB	Raytheon Mfg Co	2		CP

MICHIGAN

DETROIT—4				
WWJ-TV	Evening News Assn.	4	17.1–17.1	TO
WTVO	Fort Industry Co	2	14.3–7.5	CP
WDLT	King-Trendle Bcstg Corp	7	32.1–16.7	CP
	United Detroit Theatres	5		IH
	WJR Inc	5		IH

MINNESOTA

MINNEAPOLIS—see St. Paul				
WTCN-TV	Minn. Bcstg Corp	4	17.9–9.2	CP
SAINT PAUL—5, including Minneopolis				
KSTP-TV	KSTP, Inc	5	13.7–6.5	CP

MISSOURI

KANSAS CITY—4				
	Konsos City Star	4		A
ST. LOUIS—5				
KSD-TV	Pulitzer Pub. Co	5	18.2–18.7	TO

NEW JERSEY

NEWARK—see New York				
WATV	Bremer Bcstg Corp	13	17–8.3	CP
TRENTON				
	Trent Bcstg Corp	1		A

NEW MEXICO

ALBUQUERQUE				
KOB-TV	Albuquerque Bcstg Co	4	4.5–4.5	CP

NEW YORK

BUFFALO—4				
WBEN-TV	WBEN, Inc	4	15–8	CP
	Courier Express	7		A
NEW YORK—7, including N. E. New Jersey				
WJZ-TV	Amer. Bcstg Co	7	16.3–8.3	CP
WOR-TV	Bamberger Bcstg Serv.	9	16.3–8.3	CP
WCBS-TV	Columbia Bcstg System	2	1.7–1.7	L
WABD	A. B. DuMont Labs.	5	14.3–9.5	L
WNBT	Ntl. Bcstg Co	4	7–5.8	L
NIAGARA FALLS—See Buffolo				
	Empire Coil Co	13		A
ROCHESTER—3				
	Stramberg-Carlson Co	6		A
SCHENECTADY—5, including Albany and Tray				
WRGB	General Electric Ca	4	40–21.3	L

NORTH CAROLINA

CHARLOTTE—3				
	Jeffersan Standard Bcstg	3		A

OHIO

AKRON—1				
	A. T. Simmons	11		A
CINCINNATI—4				
WLWT	Crosley Bcstg Corp	4	23.9–19.5	CP
	A. B. DuMont Labs.	2		IH
	Cincinnati Times-Star	11		A
CLEVELAND—4				
WXEL	Empire Coil Ca	9	21–13	CP
WNBK	Ntl. Bcstg Ca	4	18.8–9.6	CP
WEWS	Scripps-Howard Radio, Inc	5	18.2–9.1	TO
	A. B. DuMont Labs.	2		IH
	WGAR	7		IH
	United Bcstg Co	7		IH
	WWJ, Inc	2		A
COLUMBUS—3				
WLWL	Crosley Bcstg Corp	3	15.5–5.3	CP
DAYTON—2				
WLWD	Crosley Bcstg Corp	5	30–25	CP
	Miami Valley Bcstg	13		A
TOLEDO—1				
WTVT	Fort Industry Co	13	27.4–14.4	CP

OREGON

PORTLAND—5				
KGWG	Oregonian Pub. Co	6	10–11.2	CP

PENNSYLVANIA

ALLENTOWN—1, Includes Allentown, Bethlehem				
	Lehigh Valley Bcstg	8		A
ERIE—1				
	Dispatch Inc	12		A
HARRISBURG—1				
	Harold O. Bishop	8		IH
	WHP, Inc	8		IH
JOHNSTOWN—1				
WJAC-TV	WJAC. Inc	13	6.5–7	CP
LANCASTER—1				
	WGAL Inc	4		A
PHILADELPHIA—4				
WPEN-TV	Wm. Penn Bcstg Co	10	25–26.5	CP
WFIL-TV	Philadelphia Inquirer	6	18.1–9.3	TO
WPTZ	Philco Telev Bcstg Corp	3	2.7–2.8	L
	Daily News Telev Co	12		IH
	Penn. Bcstg Co	12		IH
PITTSBURGH—4				
WDVT	A. B. DuMont Labs.	3	14.6–7.3	CP
	Allegheny Bcstg Corp	8		A
	Empire Coil Co	10		A
	WPIT, Inc	10		A
	WWSW, Inc	10		A
	Westinghouse Rodio Sto	6		A
WILKES-BARRE—2, including Scronton				
	Louis G. Baltimore	11		A
	Wyoming Valley Bcstg	11		A

RHODE ISLAND

PROVIDENCE—1				
WJAR-TV	The Outlet Co	11	50–50	CP
	Cherry & Webb Bcstg	13		A

TENNESSEE

MEMPHIS—5				
	Bluff City Bcstg Co	5		A
	Memphis Pub. Co	4	13.6–7 1	CP

TEXAS

DALLAS—3				
KRLD-TV	KRLD Radio Corp	4		CP
KBTV	Lacy-Potter Telev Bcstg	8	35–18.5	CP
	Interstate Circuits, Inc	3		IH
	Texas Television	10		A
	A. H. Belo	10		A
FORT WORTH—3				
KCPN	CARTER Publications, Inc	5	17.6–8.2	CP
HOUSTON—4				
	W. Albert Lee	2		A

UTAH

SALT LAKE CITY—5				
KDYL-TV	Intermountain Bcstg Corp	2	13.2–7	CP

VIRGINIA

RICHMOND—4				
WTVR	Havens & Mortin, Inc	6	12.2–6.4	CP

WASHINGTON

SEATTLE—4				
KRSC/TV	Radio Sales Corp	6	18.9–9.8	CP

WISCONSIN

MILWAUKEE—4				
WTMJ-TV	The Journol Co	3	16.1–17	TO

DISCUSSION OF FM PROPAGATION TESTS

Text of a Supplementary Brief Concerning Norton-Allen Testimony before the FCC

BY MAJOR EDWIN H. ARMSTRONG*

THIS supplemental brief, like the brief dated October 7, 1947,[1] and filed by me in this proceeding, is directed to the question specified in the Commission's Order of September 19, 1947, viz., as to which category of radio service should be assigned the band of frequencies from 44 to 50 mc.

The specific purpose of this brief is to reply to certain testimony presented at the hearing by Edward W. Allen, Jr., Chief of the Technical Information Section of the Commission, and Kenneth A. Norton, formerly employed in the same Section of the Commission.

This brief is concerned with an observed and now well-demonstrated physical fact, namely, that at distances beyond the horizon a phenomenon known as fading appears, which affects the frequencies around 100 mc. much more seriously than it affects the frequencies around 50 mc.

As a result of that physical fact, various stations on the Continental Network at distances above 75 miles from Alpine, are unable to receive the 92.1 mc. transmissions from Alpine with sufficient reliability to rebroadcast them, but do receive the Alpine signals on the 44.1-mc. channel with sufficient reliability and do rebroadcast them. Station WBCA at Schenectady is an example. It is located some 120 miles from Alpine and has been rebroadcasting the low band programs from Alpine for upwards of 5 years.

The same physical fact was observed by me as early as 1938, when I had experimental transmitters operating on the 117-mc. band and on the 42-mc. band, and my observations were reported to the Commission at the allocation hearings in 1944 and 1945.

For the purpose of getting an accurate comparison of the effects of fadings on the two bands, I have been conducting tests at Westhampton Beach since July, 1947, making recordings of the two Alpine signals, one on 92.1 mc. and the other on 44.1 mc. Each of the stations has approximately 100 kw. power, which is enough to permit highly accurate measurements to be made. The two antennas are located on the same tower and are of the same height, so that the signals travel over the same path. Westhampton Beach is 70 miles from the Alpine station, and the conditions of reception there are ideal for checking the accuracy of theoretical predictions, since there is a clear path across Moriches Bay, no hills of any consequence between the transmitter and receiver, and little or no local interference. Specially designed crystal-controlled receivers are used, and the recorder armatures are driven directly by current obtained from crystal rectifiers. I do not believe that the accuracy and reliability of the apparatus used in the Westhampton Beach tests will be questioned by anyone.

All the recordings taken during the period from September 7 to November 3, 1947, were presented to the Commission at the hearing. They show that for approximately 50% of the days in that period the signals on 92.1 mc. suffered severely from fading, whereas the 44.1-mc. signals were not substantially affected by fading.

Mr. Allen's Curves ★ Against this background of observation and tests, Mr. Allen has prepared 6 charts designed to show that the physical fact so observed and demonstrated does not actually exist. At the hearing, Mr. Allen presented a report dated November 18, 1947, entitled "Preliminary Report on East Coast Tropospheric and Sporadic E Field Intensity Measurements on 47.1 and 106.5 Mc." (Exhibit 52). The charts, which are contained in the report, are designed to show the relative performance of low and high band signals (47.1 mc. and 106.5 mc.) at distances of 45, 68 and 185 miles from the transmitters — the important distance, for present purposes, being the intermediate distance of 68 miles.

These charts present graphically Mr. Allen's conclusions, which are directly opposite to the conclusions arrived at in the Westhampton Beach tests and corroborated by other observations made at many points. Specifically, they purport to show that at Southampton, Pa., where signals on 47.1 mc. and 106 mc. were received from 2 stations located in New York on top of the same building, at a distance 68 miles, the transmission on 106 mc. was very much better than on 47.1 mc.; that, in fact, the field strength which was exceeded for 99% of the time on the high band was 3½ times the field strength so exceeded on the low band.

The shortest and perhaps the most satisfactory answer to a series of curves purporting to demonstrate that an observed physical fact does not exist is the answer that would be given to a similar demonstration that the earth was flat. By whatever means the conclusions may have been arrived at, and whatever errors may have been involved, the inescapable fact is that the conclusion is wrong.

Mr. Allen did not present to the Commission the underlying recordings on which his analysis was based, but those I have now examined pursuant to permission given to me at the hearing (Tr. 774), and it is my conclusion that there were fundamental errors in both the tests made and the methods of analysis that Mr. Allen applied to them.

Failure to Measure Transmitter Power ★ Mr. Allen was comparing stations with widely different amounts of power — the 47.1-mc. transmitter having an assumed power of 10 kw. and the 106.5-mc. transmitter an assumed power of 725 watts.[2] It was necessary for him, therefore, to convert his results into a common denominator, *i.e.*, field strength per kilowatt. His comparison would necessarily be affected by any variation of the radiated transmitter power from the assumed power. Hence the first requirement in any such test is to get an accurate check on the radiated power of each transmitter by making field strength measurements at a suitable location within line of sight. That Mr. Allen failed to do; and for this reason alone his results are unreliable.

The first explanation that would occur to anyone who inquired why the Commission's tests showed results so widely different from the practical experience of broadcasters and listeners is that the effective transmitter power on the low band was nothing like the 10 kw. that Mr. Allen assumed it was; and that conclusion is strongly supported by Fig. 5 of the Allen Report (Exhibit 52), which compares actual and theoretical field intensities at the various points of reception. There it is shown that at Princeton, 45 miles from the transmitter, the highband signal was approximately equal to the theoretical field strength (as per the Norton Curves), while for the low band signal there was a wide discrepancy — an actual figure of only 22 for the median field as compared with a theoretical figure of 56.

In other words, the actual field intensities of the low band station, measured at Princeton, fell 60% short of those called for by the Norton Curves.

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[1] Text of the original brief was published in *FM* and TELEVISION, Nov. 1947.

[2] From October 10, to the end of the Southampton tests on November 20, the transmitter was equipped with a radar antenna, and for that period it may be assumed that the effective power was above 50 kw. (Exh. 52, p. 1 of Preliminary Report).

In all the controversy about the Norton Curves, no one has disputed that they are fairly reliable for distances up to 40 or 50 miles over smooth earth. A discrepancy of 60% at Princeton, therefore, should have alerted Mr. Allen to the fact that something was radically wrong[3]; and the first thing that should have occurred to him was that he should check the effective transmitter power on the low band. But that he did not do; and in his report (on p. 5) he calmly disposes of the 60% discrepancy in his observations by the simple statement that: "It is observed in Fig. 5 that the median field on 106.5 mc. at Princeton is nearly equal to the theoretical field, while the 47.1-mc. field is below [*sic*] the theoretical field at this distance." If Mr. Allen had said "60% below," it would have been disclosed on the face of the report that the low band station was giving him only 40% of the performance that so firm a believer in the Norton Curves should have expected.

At the hearing (Tr. 766–67) Mr. Allen reaffirmed his earlier statement that: "I know of no case where, when all the factors are taken into account, you cannot reconcile your measured result with what is predicted by using Mr. Norton's theoretical calculated methods of estimating distance ranges." The difficulty in this particular instance was not only that Mr. Allen did not take "all the factors . . . into account," but that he failed to verify the most important factor of all, namely, the power of the transmitters.

He did make inquiry 2 months after the Southampton tests had been discontinued, as shown by a letter of January 15, 1947, from Slowie to Poppole. That letter, which makes clear that up to that time the Commission had very little information — even from the station which was doing the broadcasting — as to the power or probable power or either transmitter, reads in part:

"The Commission's records indicate that station WBAM has been operating with a power of 10 kw. on 47.1 mc., and with either 0.8 or 1.0 kw. power on 106.5 mc. It is not clear whether these values of power represent estimates of radiated power, or whether the values include losses in the transmission lines.

"Any information you are able to furnish regarding the following items will be helpful in the analysis of recorder charts made at Southampton and Laurel:

"(1) Effective radiated power on 47.1 mc.

"(2) Effective radiated power on 106.5 mc.

"(3) If 106.5 mc. transmitted power was increased, date change was made.

"(4) Estimated or measured gain of radar antenna installation over the horizontal dipole previously used."

Poppole's answer gave various figures (including the manufacturer's estimate of transmitter efficiency as 60%) which, if correct,[4] would result in a computation of transmitter power for the low band at about 10 kw. For the high band transmitter, however, during the period when it had a radar antenna, the reply admitted that "unfortunately" no proper determination of the radiated power of the transmitter had been made.

Since there is no way at this late date of checking what the transmitter power was at various times during the test, and therefore no way of determining how much of an error entered into the underlying recordings, those recordings cannot serve any useful purpose.

Use of Two Methods of Analysis ★ The recordings taken at Southampton, Pa., were analyzed by Mr. Allen by two different methods, explained in his report at page 5, (a) "by determining the number of minutes in each hour during which the various levels of field intensity were exceeded," and (b) "by taking hourly median values," *i.e.*, by determining for each hour the field intensity that was exceeded during 50% of the hour.

The instantaneous or minute-by-minute method of analysis, if properly used, gives a good representation of the effects of fading. It shows the percentage of the time during which the signal intensity exceeded various levels — some high point, some intermediate points, and some low points. It therefore shows where the signal intensity dropped off to levels at which service would be unsatisfactory.

The hourly median value, however, has no significance in an analysis designed to show the effects of fading. All that it presents is a kind of average of the high and low points. It does not help the radio listener, if over an hour, the signal becomes inaudible 15 or 20 times, to be told that the *hourly median* was well above the level required for good reception. The peak signals offset the drop-outs on Mr. Allen's charts, but cannot offset them in the radio set or in the ears of the listener. The drop-outs are there and the signal is no good. Thus, in a study intended to present the effects of fading, the hourly median is an absurdity. It is as if one who is asked to determine the number of days of freezing in a year should present his observations in the form of a graph showing average monthly temperatures. In either case the low points — which are the significant facts to be brought out — are concealed.

This point was made during the cross-examination of Mr. Allen, when I showed him a recording made at Westhampton Beach on October 4, when there was a considerable variation in signal strength on the high band and the signal dropped to a small fraction of its value at frequent intervals. I pointed out to Mr. Allen that from the standpoint of the radio listener the signal represented on the chart was a bad signal; but that on the basis of the hourly median value it was an excellent signal, since for 50% of the time the strength of the signal was well above that required for good reception. Mr. Allen agreed with me, and his admission completely refutes the statement in his report, page 5, that "Comparisons were made in several instances with distribution curves for instantaneous values, and the difference between the two types of curves are not significant."[5]

Of course, when the signal is not fluctuating widely the analysis by hourly median values and the analysis by minute-by-minute values may give the same or similar results; and doubtless, there were many "instances" during the tests where that was the case. But those are not the "instances" that are significant to the problem at hand. The significant instances are those where the two methods of analysis *do not* give the same result — the days when the signal is fluctuating widely and there are many drop-outs. On those days, the median value between the highest and lowest signal strengths is of no importance whatever.

Application of the Two Methods ★ The minute-by-minute method of analysis, then, discloses the presence of drop-outs caused by fading, while the hourly median method averages out the fades with the peaks and conceals the presence of the drop-outs. The latter method, therefore, should not have been used at all in Mr. Allen's analysis. It was not used in his studies of the recordings made at the other 3 points of reception — Princeton, N. J., Laurel, Md., and Powder Springs, Ga. It is difficult to understand why it was used in analyzing the Southampton recordings.

But worse than the mere use of the method was the manner in which it was used, so as to distort the comparison between the two bands.

The concluding text of the Armstrong brief will be published next month.

[3] A prior report of simultaneous field strength recordings on 46.7, 83.75 and 107 mc., made in 1945 by Carlson of RCA Laboratories and furnished to the Commission, had showed a close correlation between the measured normal and theoretical field strengths on 46.7 and 83.75 mc. at Princeton for transmissions received from New York City stations 45 miles distant. RCA Laboratories Technical Report PTR-31, November 9, 1945. Carlson, who also made the recordings at Princeton for the Commission on 47.1 and 106.5 mc., realized that something was wrong and wrote the Commission on August 15, 1946, as follows: ". . . We are somewhat concerned about the accuracy of our field strength measurements here at Princeton. Does Mr. E. W. Allen intend to make a field strength measurement on 700 mc. at Princeton as was planned last spring? If this is to be done it would also be desirable to bring along equipment for measuring the field strength on 47.1 and 106.5 mc."

[4] The Technical Information Section neither had then nor has now any information by which it could determine whether the figures were correct.

[5] Allen's testimony indicates that the comparisons were not made anywhere except at Princeton (Tr. 763). The distance from the transmitter to Princeton being only 45 miles, a wide difference between the two types of curves would not be expected at that point.

SPOT NEWS NOTES

Items and comments, personal and otherwise, about manufacturing, broadcasting, communications, and television activities

Wayne Coy: Appointed FCC Chairman by President Truman on December 26. Chairman Coy was born on November 23, 1903, in Shelby County, Ind. Following an early newspaper career, he held several important Government posts from 1933 to 1944. Since then, he has operated the *Washington Post's* local independent station WINX. Thus, he is the first experienced broadcaster appointed to the FCC. As of January 1, the Commissioners are: Democrats, Chairman Coy, Indiana; Walker, Oklahoma; and Durr, Alabama; Republicans, Hyde, Idaho; Jones, Ohio; and Sterling of Maine; Independent, Webster, D. C. Chairman Coy's term will end June 30, 1951.

George E. Sterling: Appointed by President Truman on December 26 to fill the vacancy resulting from the resignation of FCC Commissioner Jett. Commissioner Sterling, born in Maine in 1894, has been in government service since 1923. After his appointment as Chief of the National Defense Operations Section of the FCC Field Division, he rose rapidly to his present post. Previously, he was FCC Chief Engineer, succeeding George P. Adair, who resigned last May. His term expires June 30, 1950.

E. K. Jett: After 37 years in Government radio service, resigned his commissionership in the FCC as of December 31, to become vice president and director of radio for *Baltimore Sunpapers*. He will head the operation of WMAR-TV, and FM and AM stations for which grants have been issued. In accepting Commissioner Jett's resignation, President Truman commended him highly for his past work, concluding: "You carry with you, as you return to private life, my best wishes for your success."

Looking Ahead: Many strange decisions and puzzling actions have come from the FCC. In retrospect, the record shows a net balance of constructive service, but it carries many red ink entries of decisions and conduct by its members that do not represent the service of public interest, convenience, and necessity. We are sorry to see Mr. Jett leave the Commission. Even when we disagreed with his opinions, we never questioned his sincerity and his practical point of view. We are not as well acquainted with Chairman Coy, but we are glad to see a business executive in the Chairman's post, rather than an out-and-out lawyer such as Mr. Fly, or a political opportunist such as Mr. Porter. As for Commissioner Sterling, we welcome him as a fellow New Englander who, we believe, will prove an able successor to Mr. Jett.

WBEN-TV: Buffalo station expects to start regular television broadcasting on April 1st. J. Woodrow Magnuson will be in charge as television supervisor. Studios are under construction at Hotel Statler.

Facsimile Installation: First G.E.-built Hogan facsimile equipment is being installed by the *Miami Herald*. Regular facsimile schedule will be transmitted over WQAM-FM. (See FM & TV, Apr. 1947 for details of initial tests.)

Lancaster, Pa.: RCA will spend over $1,000,000 to build and equip a 40,000-sq. ft. addition to their Lancaster tube factory, where 1,600 are now employed. New building will be devoted to cathode-ray tube production.

WGHF: Finch station in New York City is off the air temporarily while new equipment is being installed to bring the station up to authorized power. Full schedule will be resumed early in January. This station has been doing an excellent job of live-talent broadcasting, with notable dramatic presentations and well-balanced musical programs.

TBA Officers: J. R. Poppele has been re-elected president of Television Broadcasters Association, and John F. Royal was elected vice president. Also reelected were secretary-treasurer Will Baltin, assistant secretary-treasurer Paul Raibourn, and directors Dr. Allen B. DuMont, Curtis W. Mason, and F. J. Bingley.

Requiem: *Frequency Modulation Business* has ceased publication, and the company has been liquidated. We are sorry to hear of the passing of this magazine only 18 months after it started. The publishers' practice of shortening the name to FM *Journal* caused much confusion with *FM* AND TELEVISION which, when it was established in 1940, was called *FM* MAGAZINE. At least we are glad to have that confusion ended because many readers and even our own staff still call this publication *FM* Magazine.

New Address: Antenna & Tower Equipment Company, handling the erection of Wincharger towers and Andrews antenna equipment, has moved from Albany, N. Y., to 500 Cove Road, Stamford, Conn.

Audio Quality on FM: We've heard it said that, as soon as several FM stations get on the air in any area, those with inferior audio equipment are not going to hold listeners. There's no question about that. Now that we can hear 10 to 12 FM stations at Great Barrington, we've weeded out those whose audio quality is substandard, and we just skip past them on the dial!

Rehearing: FCC's decision on New York City FM grants has been set aside because two Commissioners who voted were not sitting at the oral argument. No reference was made to then-Chairman Denny's preparations, at that time, to join NBC. So the largest city in the U.S.A. is still without its quota of FM service. And another mark is chalked up against the Commission for prejudging a situation on the basis of star-chamber idiology, rather than on the facts of the case.

Max F. Balcom: RMA president, discussing 1948 set production: "The outlook for the radio industry is most encouraging. Television and FM broadcasting are injecting new blood into the industry."

Rochester: Stromberg-Carlson plans for erecting a television station are temporarily stymied by opposition of residents in the Pinnacle Hill section which, unfortunately, is the ideal location for a TV antenna. S-C will now undertake persuasion, building their campaign around a report being prepared for the City administration by an expert from University of Rochester.

H. William Koster: Former program director at APRO Providence, and manager of WAAB Worcester, has been engaged as manager of the new FM station WPJB, under construction by the Providence (R. I.) Journal Bulletin. WPJB will have 20kw. on 105.1 mc.

FM Station Score: There are now 376 FM broadcast stations on the air, 634 construction permits and conditional grants issued, and 117 applications pending: total 1,127.

Research Center: First building of Sylvania's research center will be started early next spring at Bayside, Long Island. Contract has been let for 2-story brick structure of 38,000 sq. ft. Campus-type project will eventually cover 28 acres of 57-acre plot facing the Sound, and 5 laboratories now occupying temporary quarters will be moved to this location. The first building, to house Sylvania's physics laboratory, will cost nearly $1,000,000 when fully equipped.

Bernard G. Peter: Assistant State's Attorney for Baltimore has resigned to become manager of WMCP, the first exclusively FM station in Baltimore, Md. WMCP will go on the air in February with 20kw. at 94.7 mc.

1: SPECTRORADIOMETER TESTS LUMINOUS MATERIALS FOR CATHODE-RAY TUBES 2: GLASS CURTAIN ADJUSTS STUDIO ACOUSTICS

NEWS PICTURES

1. The Spectroradiometer shown here is a new instrument used at RCA's Lancaster plant to analyze test samples of luminescent materials for coating cathode-ray tube screens. Operating the instrument is Austin E. Hardy, head of the physical testing laboratory, and designer of the Spectroradiometer.

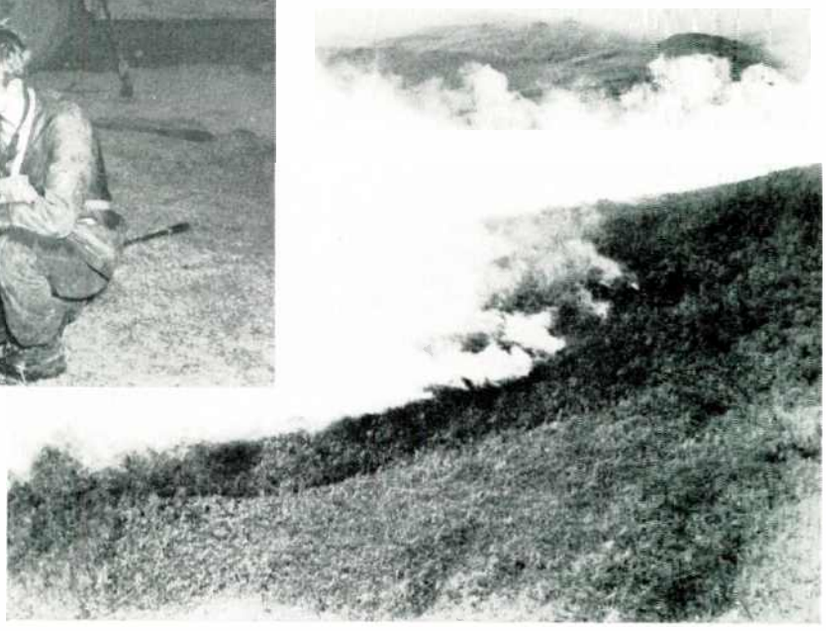
2. At FM station WCLT Newark, Ohio, the main studio is equipped with an adjustable acoustic curtain, by means of which the acoustical dimensions of the room can be controlled to suit the number and type of musical instruments and the number of people taking part in any program. The curtain is woven of non-combustible Fiber glassyarn, backed by an absorbing blanket of extremely fine glass fibres.

3. Dr. Frank G. Back, right, of Jerry Fairbanks Productions, received the TBA's highest award on December 10, in recognition for his work in developing the Zoomar lens for television cameras. Paul Raibourn made the presentation.

4. National Bureau of Standards has set up two of these giant radar mirrors to observe and analyze radio noise generated by the sun. The plan is to correlate solar noise with other solar, interstellar, and terrestrial phenomena. Radar reflectors will follow the sun continuously.

5. F. M. Flynn, seated, president and general manager of the *New York Daily News*, plans to have WLTV on the air late this spring. Original plan was to install FM and television equipment at the same time. Now, with their FM application still in hearing, the *News* will go ahead with the TV permit already granted. Standing, right, is Cliff Denton, chief engineer in charge of all *News* radio facilities, and Howard Mandernach.

3: TBA AWARD TO DR. FRANK BACK. 4: M.B.S. INVESTIGATES SOLAR RADIO NOISE 5: F.M. FLYNN AND CLIFF DENTON PLAN FOR TV



ABOVE: MUCH OF THE FIRE-FIGHTING WAS DONE BY MEN EQUIPPED WITH GAS MASKS AND WATER TANKS CARRIED ON THEIR BACKS. GASOLINE AND OIL TRUCKS, DISPATCHED BY RADIO, SUPPLIED THE WATER

BELOW: THE WIND SPREAD THE FIRES UNTIL WE WERE FIGHTING ALONG LINES MANY MILES WIDE. TYPICAL CONDITIONS ARE SHOWN IN THIS AIRPLANE VIEW OF THE MT. SUNAPEE AREA

HOW FM FOUGHT FOREST FIRES

Report on Experiences During Forest Fires in New Hampshire

BY LIEUT. BASIL CUTTING*

THE series of forest fires that broke out during the extremely dry period last October, burning thousands of acres in New Hampshire, Maine, and Massachusetts, gave us our first experience in handling large area conflagrations with the aid of radio communications.

This was not a matter of fighting one big fire, but a great number of separate fires, all starting at about the same time. Fortunately, the New Hampshire State Police has a well-organized communications system,[1] closely coördinated with the municipal police and the Fish and Game Department. Thus our State Police headquarters at Concord was prepared to act as a central point for clearing all fire message traffic. In addition, we supplied the broadcast stations with information on the locations and spread of the fires, to serve as warnings to the public.

As soon as the situation developed to emergency proportions, the Yankee Network station WKXL, Concord, furnished a 4-place plane in which we quickly installed a modified cruiser transmitter, so that we could fly over the fire areas, appraise the conditions accurately and give a prompt report. That was on Wednesday, October 22. Norm Bailey of WKXL handled the microphone, Keith Rand was pilot, and the writer directed the flight operation. On the ground, WKXL chief engineer Norman Partridge and Trooper Bellerose set up a Brush recorder so that a transcription of our report could be broadcast.

In a period of 2 hours, we spotted 14 separate forest fires. At 65 miles, where we were farthest from State Police headquarters, our mobile transmitter on 37.38 mc. still delivered ample signals for recording. The transcriptions were broadcast over WKXL, and repeated later over all Yankee Network AM and FM stations.

Meanwhile, our observations from the air supplied information for setting up fire-fighting activities on the ground. As the situation grew worse, Governor Dale was notified. He immediately closed all woodland to hunters and campers.

By the end of the afternoon, traffic to cruiser cars and municipal police departments increased to an average of a message a minute. We dispatched cars from the State Police and Fish and Game Department to critical points where they could maintain contact with the forest fire wardens.

In New Hampshire, Fish and Game Department cars use the State Police frequencies (AM out and FM back) and operate with our main station WRPT. This emergency certainly proved the wisdom of having both law enforcement agencies coördinated in one radio system.

On Thursday, the 23rd, the wind increased to a velocity of 25 to 35 miles per hour, and the fires were spreading rapidly. All cruisers not in fire areas were put on 24-hour duty. Messages were coming in fast and furiously from all parts of the State, over distances up to 70 miles. Considering that a range of mountains runs the length of New Hampshire this was a real test of our FM talk-back system. Privately, the writer congratulated himself for the efficiency of our maintenance work on the mobile units, for cars at fixed points had no periods of cruising to recharge their batteries!

Fire outside Rochester threatened that town on Friday. In the meantime, 150 oil and gasoline trucks in the State had been mobilized for water-carrying service. By radio, we contacted 65 of these trucks, and rushed them into the Rochester area with a police escort. They supplied water to portable pumpers where hose could not be run from water holes or hydrants.

Perhaps the best way to give a picture of the services performed by our radio system is to quote some of the messages:

No. 26 to WRPT: send us 3 more tankers fast.

No. 20 to WRPT: 2,000 ft. of hose needed at East Rochester.

No. 25 to WRPT: want all the men you can send to Farmington.

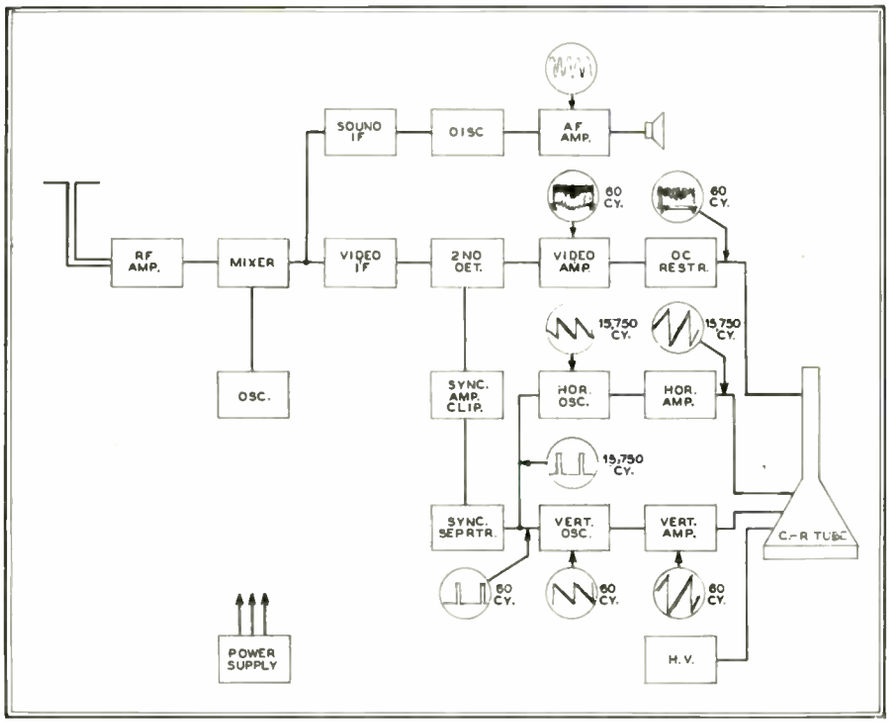
No. 207 to WRPT: more portable pumpers needed at the Tom More farm.

No. 54 to WRPT: move 2 more bulldozers this way on route No. 25.

(CONCLUDED ON PAGE 34)

*Chief Radio Engineer, Department of State Police, Concord, N. H.

[1] See "N. H. State Police System" by Lieut. Basil Cutting, *FM* AND TELEVISION, Jan. 1945 and "Dual Diversity Transmission on 75 Mc." by Lieut. Basil Cutting, *FM* AND TELEVISION, Feb. 1947.



BLOCK DIAGRAM OF A TYPICAL SET SHOWING THE NORMAL PATTERNS AT VARIOUS POINTS

FASTER TV TROUBLE-SHOOTING

How the Oscilloscope Speeds the Work of Locating Trouble

BY WALTER H. BUCHSBAUM*

NOW that television receivers are being sold in appreciable quantities, radio service men must meet a new challenge to their skill and knowledge of trouble-shooting. This calls for meeting a host of new problems. The time honored service methods, such as signal tracing or signal injection, have only very limited applications in the television field.

The first requirement is a knowledge of the basic functions of the various circuits in a television receiver. But once this is learned, a definite and sure method of procedure is necessary.

Old Methods Inadequate ★ Checking tubes is not such a good approach because of the time it takes to check the 20 to 30 tubes of a modern television set. Voltage measurements are always useful, but once it is established that all DC voltages are correct, the usefulness of this is also exhausted.

Signal tracing, of course, is a very positive and certain method, but for television we have to modify it a little, since a loudspeaker cannot give us a clear picture of the complex television signal. That is why the oscilloscope is such a well suited instrument for televison work. It permits us to observe the actual waveform, see exactly what goes on the grid of a certain tube, and then what appears on the plate. It is the most practical test instrument for checking all circuits containing non-sinusoidal waves and signals of different shapes and frequencies.

Oscilloscope Is a Visual Aide ★ The ideal oscilloscope for television work would have a vertical input amplifier with a response flat to 4 mc., a Z-axis, and a screen large enough to observe large and very small waves at the same setting of the vertical gain control. For service work, however, this is not at all necessary, and almost any 'scope with a sweep frequency up to 15 kc. and a vertical input amplifier flat to 100 kc. will do. A third or Z axis is nice to have, but not essential. Many servicemen already have 'scopes which they used occasionally for their radio work, and most of these will also be usable for television trouble-shooting. It is very important to be thoroughly familiar with the 'scope, and to know all its possibilities.

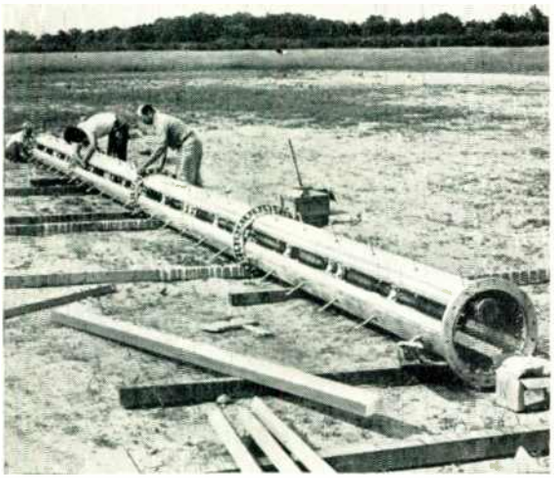
Measuring Peak Voltage ★ For instance, do you know an easy way of measuring peak voltages with the oscilloscope? Well, here it is. Put your vertical input lead on a 6.3-volt AC filament source, such as is used in all television sets. You will see a 60-cycle sine wave on the tube. Next, adjust your horizontal gain control to have only a vertical line on the screen. If you have a raster over the face of the 'scope, adjust your vertical gain so that the line covers 18 small vertical squares. If you have no raster, mark the face of the cathode ray tube with a grease pencil approximately. You are now measuring a peak voltage of 18 volts. We know that 6.3 volts RMS gives roughly 18 volts peak-to-peak, and if you now want to measure the peak voltage of any kind of signal, just put your vertical 'scope lead on the point in question and count the number of squares covered vertically. The number of squares will correspond exactly to the number of peak volts of the signal in question. Once the raster is calibrated, all sorts of voltage waves can be measured as long as the vertical gain control is not moved. Many oscilloscopes have a vertical range control, usually marked ×100, ×10, ×1. By making the calibration with the range set at ×1, it is possible to read accurately not only from 0 to 18 volts or so, but up to 1,800 volts, depending on the setting of the range control, if the vertical gain control is not disturbed.

Checking Frequency ★ Another good use for the 'scope is to check frequencies. If, for instance, you are trying to determine whether the horizontal sweep control in the television set really changes the sweep frequencies over a sufficiently wide range, set the sweep frequency of the 'scope to approximately 15,750 cycles, put the vertical input lead on a point in the television set where you can get the horizontal sawtooth signal, as in Fig. 1, and try to get it to stand still on the screen by working the horizontal hold control in the television set. Then change the setting of the frequency on the 'scope a little, and try to synchronize the frequencies.

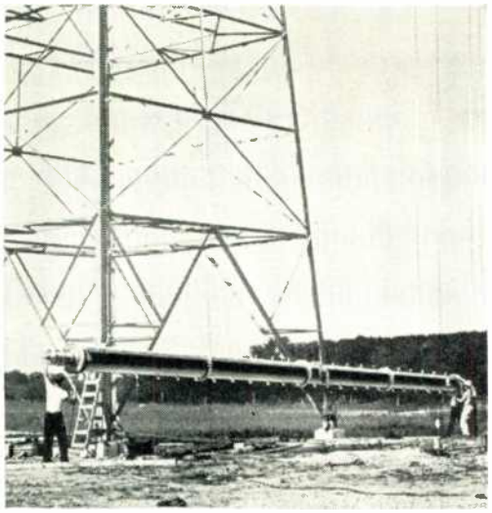
This will give you a rough check whether the horizontal hold control of the set is functioning properly. For an exact check, an audio signal generator is required, and the principle of Lissajou's figures used.

Probe and Lead ★ Most oscilloscopes come with a probe of some sort, usually one containing a series resistor and condenser. If this probe is not available, it is easy to make one up. For most purposes, it is sufficient to connect a .1-mfd. condenser and a 1-megohm resistor in series with the vertical output lead, and cover this combination with tape. The condenser is just a blocking condenser to keep DC off the grid of the amplifier tube, in case no blocking condenser is provided internally. The 1-megohm resistor serves to limit any surges, and also minimizes the loading effect of the 'scope.

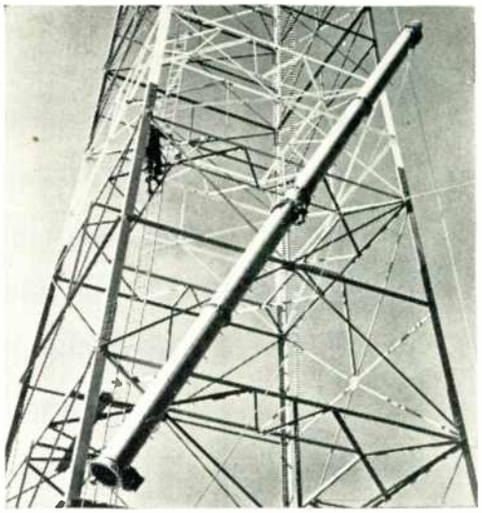
*Engineering Department, Garod Radio Corp., 70 Washington St., Brooklyn 1, N. Y.



Assembling the sections into one unit



Ready to hoist



Going up

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"Photos, courtesy of WJPG-FM, Green Bay, Wis."

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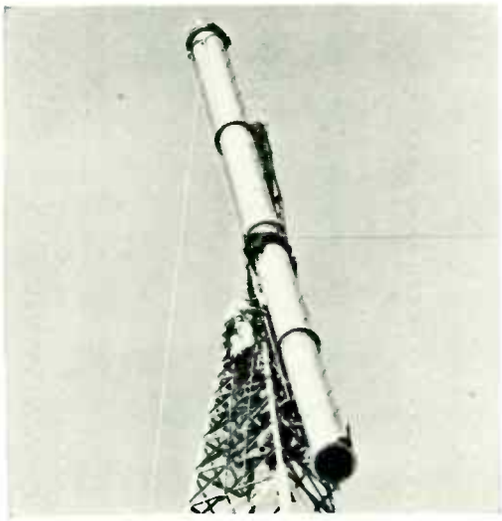
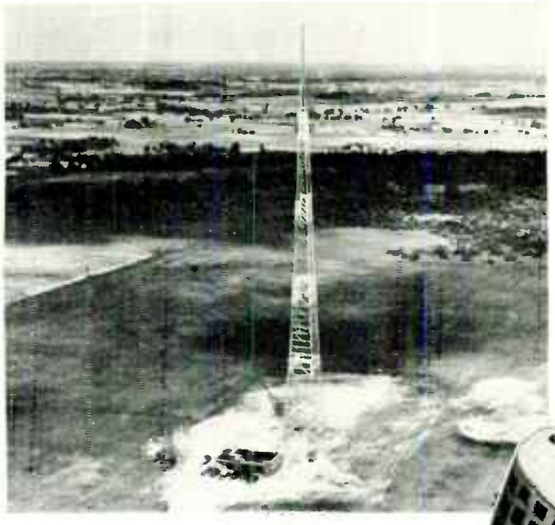


Ready for mounting



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STANDARD PYLONS

Type No.	Nominol Power Goin	Sections	Overoll Height (ft.)	Weight (lbs.)
BF-11A/B	1.5	1	13.5	350
BF-12A/B	3.0	2	27	700
BF-14A/B	6.0	4	54	2000
BF-18A/B	12.0	8	108	12497

HEAVY-DUTY PYLONS

BF-12E/F	3.0	2	27	4322
BF-14C/D	6.0	4	54	10497

LOW-POWER PYLONS

BF-21A/B	1.5	1	13.9	376

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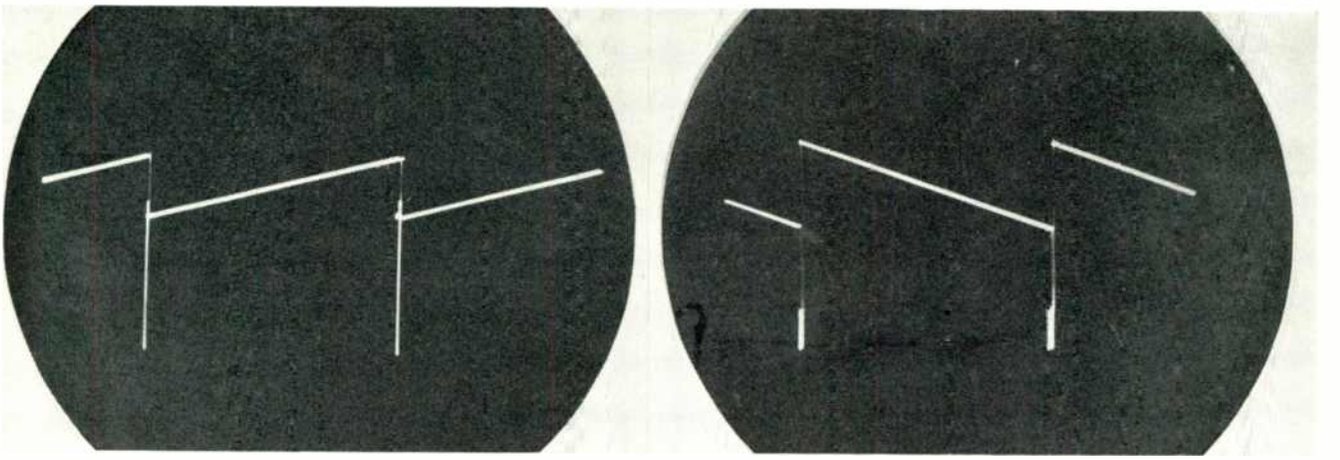


FIG. 1, LEFT: OSCILLOSCOPE PATTERN OF A SAWTOOTH WAVE PRODUCED BY THE SWEEP FREQUENCY UNDER NORMAL OPERATING CONDITIONS. FIG. 2, RIGHT: CHANGING THE PROBE FROM GRID TO PLATE REVERSES THE PATTERN ON THE TUBE

With this type of probe, connections can be made safely to all except the high voltage points in the television receiver. When working in the RF or IF section it is advisable to use a shielded lead and to ground the shield on the 'scope as well as at a point on the television chassis preferably near the hot point being observed. The points where connections are usually made are the grid and plate pins of the various tubes. For this purpose either a clip of some kind or a hook may be used. It is good practice to make one good ground connection and then move only the hot lead.

Before trying to analyze any waveform, it must always be kept in mind that the 'scope shows only voltage and not current waves, unless it is connected across a pure resistance, when voltage and current are in phase. Peak current must then be calculated by Ohm's Law.

Trouble-Shooting ★ The first steps to be taken when trouble-shooting a television receiver is to observe the symptoms and to get a rough idea in which section the defect might be located. Eliminating the obvious power supply failures, look to the picture tube for some indication.

If only a vertical line appears, the trouble is most likely in the horizontal sweep section. A horizontal line, on the other hand, points to the vertical sweep section. A good raster but no picture might indicate trouble in the video amplifier, IF, or RF stages. Or, if the sound signal can be tuned in but no picture can be seen, that would limit the area under suspicion to the video and IF stages. And that is the point when you start to use the oscilloscope for tracing.

Sweep Circuits ★ Assuming that either of the sweep circuits does not function properly, set the 'scope sweep frequency to either 60 cycles or 15,750 cycles, depending on the frequency of the circuit under observation. Next, put the vertical output lead, with the probe mentioned previously, on the plate pin of the last sweep amplifier tube. If you see no sawtooth wave there, as Fig. 1, move to the grid of that tube. If you still do not get the expected pattern on the 'scope, continue to check preceding grids and plates.

Finally, you come to the oscillator, which will be either of the blocking type or a multivibrator. If the 'scope shows no output there, you can be sure that the trouble is in that circuit, and voltage and resistance analysis will quickly locate the defective part.

In tracing a voltage wave through a circuit, it should always be remembered that an amplifier will invert the wave shape. For instance if you see a pattern as in Fig. 1 from the grid of an amplifier, you should get the upside down picture, Fig. 2, at the following plate.

Raster but No Picture ★ If the television screen shows a raster, but is unable to hold the picture, you must assume a defect in the synchronizing circuits. If the picture moves up or down, the vertical or 60-cycle sync pulse may be missing. Otherwise, you would check on the horizontal or 15,750-cycle pulse. These pulses should appear on the grid of the multivibrator or blocking oscillator as shown in Fig. 3 or 4. Traced back through the sync amplifiers, they will be inverted between grid and plate.

Should the inversion be missing, chances are that particular tube is not operating properly and, again, a voltage check or new tube will take care of this trouble.

It is also possible, by calibrating the 'scope as shown previously, to measure the gain of each stage quite accurately. After working with the 'scope for a while, it will become very easy to visualize just what takes place in each circuit and what must be defective to produce the particular trouble.

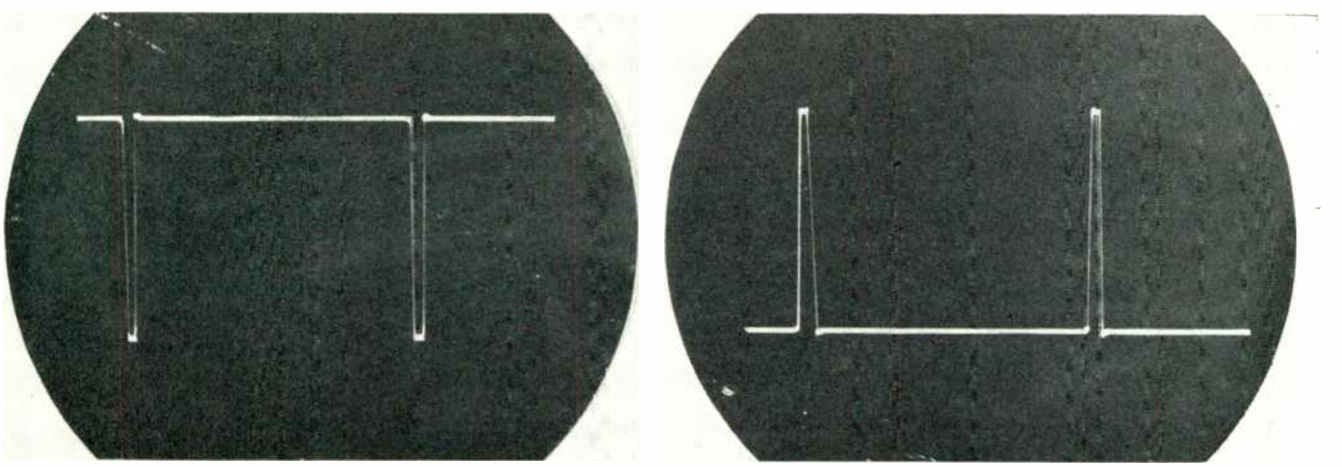


FIG. 3, LEFT: PATTERN OF THE SYNCHRONIZING PULSES GENERATED AT THE GRID OF THE MULTIVIBRATOR OR BLOCKING CONDENSER. SUCH PULSES MAINTAIN THE VERTICAL AND HORIZONTAL PICTURE SYNCHRONIZATION. FIG. 4, RIGHT: INVERSION AT PLATE

Especially when dealing with difficult circuits, such as the automatic frequency control systems used to keep the horizontal sweep in synchronism, the 'scope is often the only way trouble can be spotted. For instance, most automatic frequency control systems are based on a principle using a feedback sawtooth voltage which is changed into a square wave by an *R-C* network. If one of the condensers is open, the change will not take place, and although the feedback signal is still applied to the frequency discriminator, it does not have the proper shape. Thus the automatic frequency control will not work or will be only partially effective. Signal tracing these circuits with the 'scope will show up such a defect quickly.

When a raster, but no picture appears, although the sound can be heard, then the trouble must be in the video amplifier or IF sections. Putting the probe on the grid of the cathode ray tube, you will probably find no signal. It is best to trace the signal back through the DC restorer, last video amplifier, and first video amplifier until you come to the output of the second detector. If the loss of signal occurs in the video stages, there should be something on the 'scope before you reach the detector. The 'scope pattern will look like Fig. 5 or 6, depending on whether the scope is set to 60 or 15,750 cycles. At 60 cycles, you will be able to see small vertical lines, representing the horizontal sync pulses, but sometimes these small pulses may appear only as two parallel horizontal lines as in Fig. 6. These horizontal lines represent the many small dots caused by the sync pips shown in Fig. 5. The irregular pattern between sync pulses is the picture signal. On the 'scope it will appear like steam clouds shaped by a brisk wind, in some places dense, and light in others.

If the circuit is functioning properly, it should be possible to vary the height of the picture signal by varying the contrast control. The picture signal should stand perfectly still with respect to the sync pulses, and any small vertical wiggle indicates oscillation or a transient, and will probably be visible also on the television picture. Naturally the picture signal can only stand still when a fixed pattern is being transmitted.

It is also possible, by use of the 'scope, to check the action of the DC restorer. To obtain the proper television picture, it is necessary that the signal going on the grid of the cathode ray tube have a DC component, and that all pedestals or pips be lined up as in Fig. 6. Since a coupling condenser always blocks off the DC component, a diode is frequently used to reinsert the proper DC level. If the 'scope pattern, with the lead on the picture grid of the cathode ray tube, does not show straight lines as in Fig. 6, then DC restoration is not taking place. A voltmeter or ohmmeter check will usually be enough to locate the defective component.

Hum Detection ★ Another application for the 'scope is in the detection of hum, interference, and leakage. It may happen, for instance, that the television picture has a dark, broad band running through its center. Placing the 'scope lead on the grid of the cathode ray tube, you may find that instead of the proper straight lines you have a picture signal apparently riding on a sine wave.

Probably, this will be a 120-cycle wave, coming from the B supply and caused by bad filtering, an open decoupling condenser, or some other circuit failure. Or the sides of the picture may have a sine wave shape instead of being straight lines. Looking at all the grids and plates of the vertical sweep circuits you will encounter one point that does not show a large 120-cycle sine wave component. That indicates the source of this trouble.

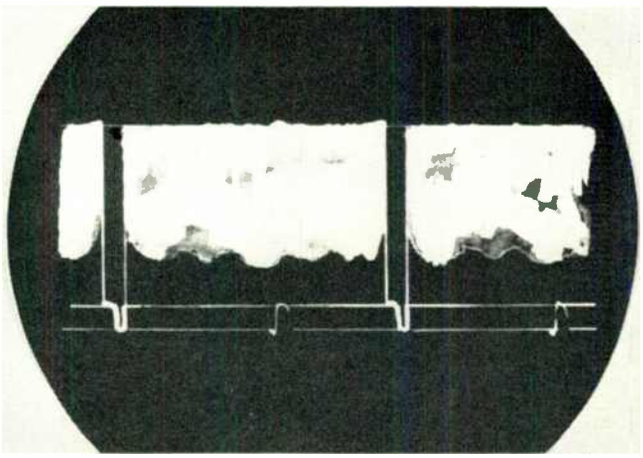
Sometimes the vertical sync pulses or sawtooth voltages interfere with the horizontal and vice versa, and there again the 'scope is the only reliable test instrument.

Some television receivers use an RF oscillator to provide the high voltage for the second anode. Those oscillators usually operate at about 200 kc. They are well shielded and thoroughly decoupled to prevent any RF from interfering, but if the decoupling condensers open up, or chokes short, RF interference may become really objectionable.

It will show up as a net-like pattern moving back and forth over the regular television picture. Putting the 'scope lead on the B supply, you can easily see if any RF is present that might be coupled into the video section. If the B supply appears clean, try the filament voltage. Next, fashion a small loop of 4 or 5 turns out of regular hook-up wire and clip the 'scope lead to one end. Move this around the RF supply shield can and see if the 'scope shows any RF being picked up.

Sometimes poor grounding of the shield can causes leakage through the air. Many small electrostatic-type television sets use a 60-cycle high-voltage supply and a high-voltage condenser from the output of the sweep amplifier to the deflection plates which are at a high DC potential. If that condenser develops leakage, it will introduce 60-cycle modulation on the plate of the amplifier. Therefore, if that is suspected, a quick check with the 'scope on the plate of that output amplifier will determine the amount of 60 cycle AC.

Constant use of the 'scope will result in not only faster and more accurate servicing, but it will enable the serviceman to find many more applications and uses for this instrument than could possibly be listed here. To use the 'scope to the very best advantage, it is necessary to have a diagram of the particular set and also the manufacturer's notes with instructions for special circuits. Most of these service notes for television sets contain a number of 'scope patterns which should appear at certain points. This makes trouble-shooting much easier, but it is still true that practice and still more practice is required to master the problems of servicing modern television receivers.



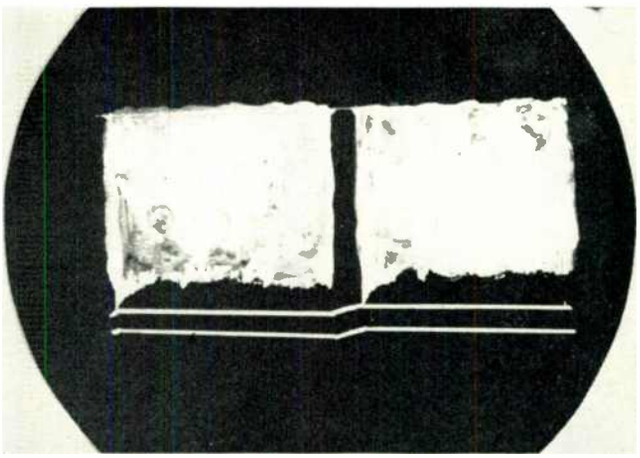


FIG. 5, LEFT: OSCILLOSCOPE PATTERN AT THE OUTPUT OF THE SECOND DETECTOR. IN THIS CASE THE 'SCOPE IS SET AT 60 CYCLES. FIG. 6, RIGHT: RESULTS WHEN 'SCOPE IS SET AT 15,750 CYCLES. STEAM-LIKE CLOUDS ARE CAUSED BY PICTURE SIGNAL

SELECTIVE CALLING FOR MOBILE TELEPHONE SERVICE

How the Automatic Selector Responds to the Dialing of Its Number at the Central Station

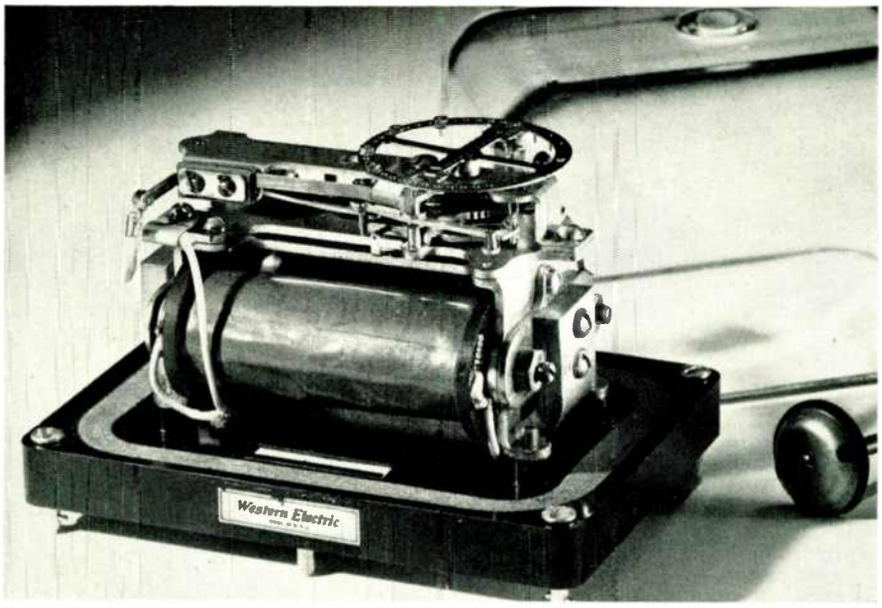
BY B. P. COTTRELL*

WHEN 2-way mobile communications were first employed between headquarters transmitters and their associated groups of cars, as in police radio systems, the operator in each car heard all the messages transmitted from his station, both those that were intended for him, and those that were not.

Over a period of years, the use of 2-way radio has spread to many new kinds of services. In some systems, it is still considered advantageous for all car operators to hear all messages. In others, there are reasons which make it desirable to limit the response of a car installation to messages intended for the driver of that car.

This is particularly true of urban and highway systems operated in conjunction with the Bell Telephone System. It also applies to installations serving different kinds of subscribers in given areas.

To meet this need, the Western Electric 106A selector set has been developed. This selector is built into Western Electric type 38 mobile radiotelephone equipment Fig. 1, and is also available as a separate unit for use with any make of 2-way units.



THE SELECTOR RELAY IS AMAZINGLY RUGGED, DESPITE ITS DELICATE CONSTRUCTION

Use of the Selector ★ The selector set is installed in conjunction with the 41A control unit, Fig. 2. The control, mounted on the dashboard of a car or truck, provides a hang-up for the handset, a control switch actuated when the handset is removed or put in place, a power switch to turn the radio equipment on or off, a signal light to show when the power is on, and a light which flashes when the car is being called. A call bell can be furnished, also. The function of the selector is to operate the light or bell when, and only when the code number of the car is dialed by the central station operator.

If the driver of the car wants to place a call, he picks up the handset and listens to make sure that no one else is talking. Then he presses the push-to-talk button on the handset, and gives the operator the number he wants to reach. Pushing the button switches on the car transmitter and keeps it in operation until it is released.

Operation Selector Unit ★ Fig. 3 shows the separate 106A selector set, while Fig. 4 illustrates the method of mounting the selector in the mobile receiver chassis.

The heart of the system is a glass-enclosed, polarized relay, Figs. 3 and 4. The armature, drawn alternately to one pole and then the other by impulses picked up by the radio receiver, causes a light brass wheel to be ratcheted around. If the relay-actuating pulses turn the wheel to the proper point, the light on the dashboard control box signals the driver that there is a call coming in for him. Of course, the system is not quite that sim-

* Mobile Radio Sales engineer, Radio Division, Western Electric Company, 120 Broadway, New York 5, N. Y.

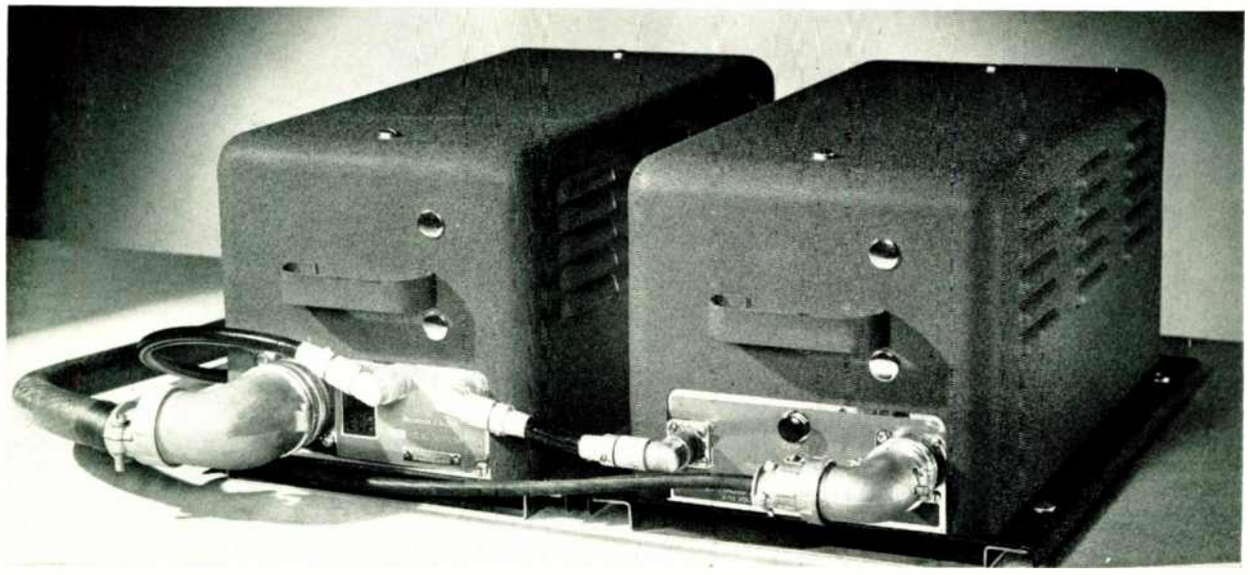


FIG. 1. FM TRANSMITTER, LEFT, AND THE RECEIVER USED IN WESTERN ELECTRIC MOBILE COMMUNICATIONS INSTALLATIONS

ple. Here are the details of the equipment, and the method of operation:

Each car is assigned a code number comprised of five digits, such as 26753. The digits in each code number must add up to 23. Code impulses are transmitted by dialling at the central station. The impulses for each digit of the code are 600- and 1,500-cycle tones, transmitted alternately.

The selector device, Figs. 3 and 4, is driven by a 2-core relay whose pivoted armature is drawn alternately toward one core, and then the other. This armature action, resulting from the alternate transmission of the two audio frequencies when each digit is dialed at the central office, rotates a ratchet wheel mounted on the same shaft with a code wheel. The code wheel carries 4 small stop pins which correspond in position to the code number of the car. These are set in their proper holes when the mobile equipment is installed. In addition, there is a fixed pin representing, in its position, the 23rd impulse of the code number, and an additional fixed pin used under special conditions with a 25-impulse code.

When the first digit of the code has been dialed, the code wheel will return to normal (under the action of a spiral spring) unless the code wheel has been advanced to the exact position of the first stop pin. In this case, the first stop pin is caught by the half cylindrical end of a light holding spring. As soon as the next digit is dialed, the selector relay is again operated and the stepping of the code wheel is resumed. If, at the end of the second digit, the second stop pin is not reached, the code wheel will then return all the way to its normal or starting position. If the second stop pin is reached, the code wheel will be held until the next digit is dialed. This action continues with the dialing of the third, fourth, and fifth digits.

Only the selector set for the number dialed will be advanced to the fifth pin. Then a spring contact mounted on the code wheel, will hold the fifth pin, and keep the wheel from returning to its starting position. The local electrical circuit is then completed from selector terminal 5, Fig. 5, to selector terminal 6 and the corresponding local circuit.

The selector is designed to operate on dial speeds of from 8 to 11 pulses per second which, in this application, results in from 8 to 11 tone frequency interchanges per second.

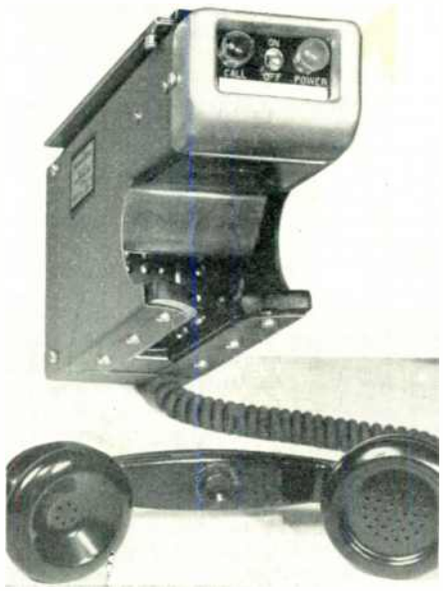


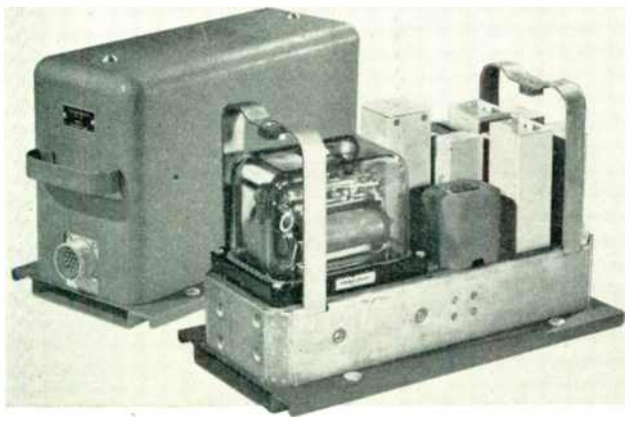
FIG. 2. DASHBOARD CONTROL UNIT

At the end of the transmission of a call signal, the contact wheel in only one selector will have moved the full 23 stops, but others may be holding in various positions of advancement between 2 and 21 stops. In order to insure proper selection of the next call it is necessary that all selectors be reset to the normal position. A single pulse, when received by the selector, acts as a clearing out signal and resets all selectors to starting position. The control terminal equipment is arranged to send automatically a single pulse preceding each transmission of a signalling number. Use of the digit 1 for clearing the selectors precludes its use as a part of the signalling number. These numbers are therefore limited to permutations of the digit 2 through 0, the sum of the five digits always equaling 23.

Circuit Functions ★ Fig. 5 shows a diagram of the complete system. The input circuit from the radio receiver is applied to transformer T1 under control of the auxiliary relay S4. The transformer output is fed through capacitor C1 and resistor R6 to the two selective circuits L1-C2 and L2-C3-C4 in series. The first selective circuit passes each 600-cycle pulse to the full-wave rectifying varistor RV1; and the second, passes each 1500-cycle pulse to the full-wave rectifying varistor RV2.

The DC outputs of the varistors alternately energize the opposed windings 3–6 and 2–7 of the polarized relay S1 as the alternate 600- and 1500-cycle pulses are received. The direction of current in the bias winding 1–8 is reversed at each operation of the relay so that this winding tends to maintain the armature in the last position to which it was drawn. The 80-volt power source for this bias winding is taken from a voltage divider R4-R5 through resistor R2 or R3 under the control of the relay contacts. The operation of relay S1 alternately applies 160 volts to capacitor C5 to charge it, or connects it to ground to discharge it. These two conditions cause current to flow alternately in opposite directions through the windings of the stepping relay of selector S2, the armature of which is drawn first to one side and then to the other, stepping the selector code wheel around at a rate corresponding to the dial speed of 8 to 11 pulses per second.

At the completion of the proper 5-digit code totalling 23 pulses, the code wheel contact rests on terminal 6, and the 6-volt supply is applied to operate the subscriber's bell and the relay S3 controlling the call lamp. The stepping relay armature returns to its neutral position as soon as the capacitor C5 is fully charged or fully discharged. The code wheel, however, is held mechanically in its final position until the stepping relay armature is again operated as will be described later. The bell will ring as long as the code wheel remains in its final position. This is normally 3 to 4 seconds as governed by an automatic timing circuit at the point where the selective signalling oscillator is lo-



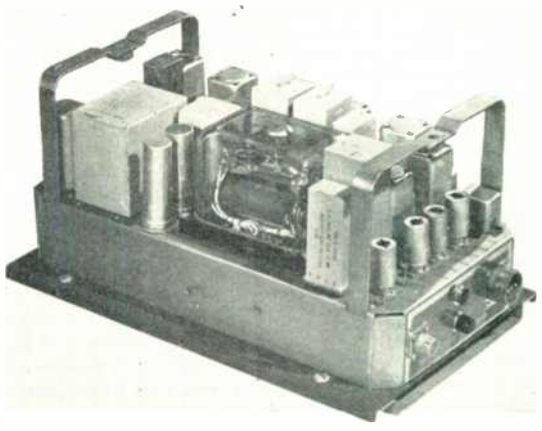


FIG. 3. LEFT: SELECTOR SET FOR USE WITH ANY MAKE OF EQUIPMENT. FIG. 4, RIGHT: SELECTOR SET ON A W.E. RECEIVER

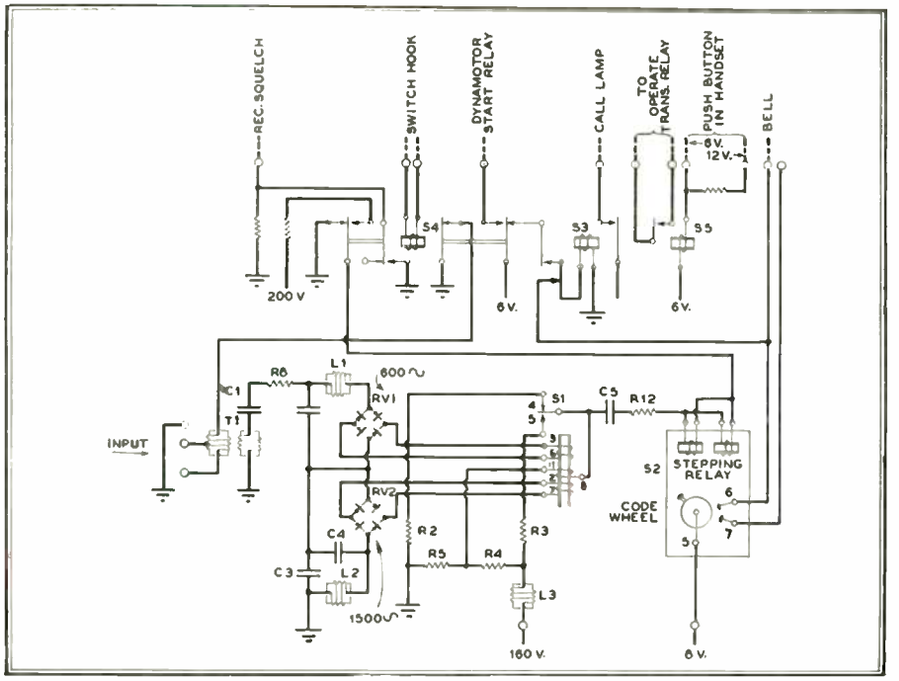


FIG. 5. SCHEMATIC DIAGRAM OF THE MOBILE SELECTOR AND ASSOCIATED CIRCUITS

cated. The lamp remains lighted until relay S4 is operated by the removal of the handset from the switchhook. This operation will also shut off the bell if it has not already stopped ringing.

From the standpoint of the selector set, the detailed action is as follows:

1. The number 1 is always transmitted first, on 1,500 cycles, by the land station selective signalling equipment as a clearing signal. This is not considered a part of the code. This is done so that every selector code wheel is advanced one step and then released to return to its normal position. This step is necessary before the code number proper is transmitted. When the initial 1,500-cycle tone is received, it is rectified by varistor RV2 whose output energizes winding 2–7 of relay S1.

The armature of this relay is drawn to its contact 5 and held there by the action of the biasing winding 1–8. In this position of the armature, which is the same whenever the 1,500-cycle tone is being received, the capacitor C5 is charged by current flowing from the 160-volt DC source through the retard coil L3, resistor R5, the capacitor, and the windings of the stepping relay of the selector S-2. This charging current causes the armature of the stepping relay to be drawn toward one pole and to step its code wheel one step. As soon as the condenser has become charged and the charging current ceases, the armature of the stepping relay returns to its normal position. The code wheel also returns to its normal position unless it is stepped again in a minimum time by a reversal of the armature, or unless it contacts a stop pin. There is never any stop pin in a code wheel position 1, or in adjacent pin position, by which the code wheel may be held.

2. The first impulse transmitted in the 5-digit code from the distant telephone exchange office at the start of transmission is always the 600-cycle tone. The armature of relay S1 is drawn to its contact 4 and held there by the action of the biasing winding 1–8. In this position of the armature, which is the same whenever the 600-cycle tone is being received, ground is applied to discharge capacitor C5, in series with the winding of the stepping relay, and connected to ground over the contacts of the unoperated relay S1.

3. The selector set is now ready to respond to its particular code by having its stop pins caught in succession by its holding spring as the digits of its code are dialed. The code wheels of other selector sets will be stepped up from their normal positions as each digit is dialed, but will be returned to their normal positions at some time during the transmission of the digit code. Only the wheel coded for the number dialed will reach the final stop pin.

The choke coil L3 tends to prevent disturbance on the 160-volt DC source when relay S1 operates.

The auxiliary relay S3 is operated when the code wheel reaches the final position of a 23 pulse code and locks up over contacts of auxiliary relay S4 so as to keep the call lamp lighted in the control unit until the subscriber's handset is lifted from the switchhook.

When relay S4 is operated it connects a 160-volt DC supply to the windings of the stepping relay of selector S2 to return the code wheel to normal, if it has not already been returned. This relay can also be used to perform other functions. In some mobile sets, for example, it is used to connect a 6-volt DC supply to a radio transmitter power relay that starts the dynamotor in the transmitter, to open the incoming circuit from the radio receiver to the selector set, and to short-circuit a resistor in the grid bias supply of the squelch circuit in the radio receiver so as to make the squelch circuit less sensitive to noise during the talking and listening interval.

The S5 relay is provided to permit the use of a lighter and more flexible cord to the handset than would be required if the DC supply to the transmitter were carried through the cord.

FM FOUGHT FOREST FIRES

(CONTINUED FROM PAGE 26)

WRPT to all cars and police departments: be on the lookout for a New York car, license – – – –. Driver reported acting very suspicious. Just came across Maine border, may be setting fires along Route No. 302.

No. 50 to WRPT: horse and wagon just came down the road with man badly burned and wagon on fire. Have administered first aid, and taken subject to doctor, but don't think he will live.

WRPT to WHIL Rochester police and fire departments: Concord fire department is sending engine No. 4 to give you assistance.

No. 201 to WRPT: fire on Route No. 11 has crossed the road, and is endangering farm buildings.

These typical messages, numbering over 4,000 in a week's time, indicate the part played by our radio system in that great battle against forest fires. Through it all, the equipment performed without the loss of a single message. Our one weakness was lack of portable units for use at the fire fronts. This was pointed out in an editorial in *The Granite State News*, Wolfeboro.

". . . The need for better communications on the fire line was proved over and over again. Looking through the smoke and darkness for a Fire Warden, pump foreman, or Fire Chief wasted much valuable time. When a fire can be measured in feet or yards, then word of mouth will serve. But when a fire front is measured in miles, then there is a real need for efficient radio communication. The ideal setup would be for each Fire Warden, Fire Chief, and pump crew to have one man doing nothing but standing by with a walkie-talkie radio. A man standing by with a radio would not seem to be doing much, but when he did work, his efforts would save hundreds of man-hours of wasted work. Every man directing the fight should have a communications man at his elbow all the time."

Our experience in getting water, equipment, and manpower to the separate fire-fighting groups, and in coördinating their activities confirms this opinion. We plan to explore the possibilities of portable radio units for use by the State Police, and we shall present the information to municipal police and fire departments, with a view to perfecting our communications in New Hampshire to this last detail.

U. S. COMMUNICATIONS SYSTEMS, PART 2

Systems Operated by Utilities, Trucks, Buses, Taxis, and Special Services, Revised to Dec. 1, 1947

PUBLIC UTILITIES

Adams Elec Lt Co 34 Spring St				
Adams NY	3	WJSO	39.66	Mf
Adams-Marquette Elec				
Friendship Wis	8		39.66	Mf
Aiken Elec Coop				
Aiken SC	10			Gf
Alabama Elec Coop River Falls Dam				
Andalusia Ala	5	WEOT	31.46	Mf
Alabama Pr Co 111 Dexter Av				
Montgomery Ala	50	WGHA	37.86	Mf
Alcorn Cty Elec Pr Cruise & Jackson				
Corinth Miss	3	WNVT	30.86	Gf
Allamankee-Clayton Elec Coop				
Postsville Ia	7	KSWX	39.66	Mf
Altamaha Elec Membership Corp				
Lyons Ga		WUAB	30.86	Gf
Mobile	6	WUAC	37.62	Gf
Anoka Cty Coop L & P Assn				
Anoka Minn	6	KGVV	33.34	Mf
Appalachian Elec Pr Co				
Mobile & Portable	104	WMOD	39 86	f
Logan WVa		WATI	31.46	Mf
Bluefield WVa		WCQL	31.46	Gf
1002 3rd Av Huntington WVa		WHTY	31 46	Lf
Cabin Creek Junction WVa		WKJL	39 66	Lf
301 Virginia Charleston WVa		WMOF	31 46	Lf
306 S Kanawha Beckley WVa		WNPF	31 46	Lf
328 Walnut Av Roanoke Va		WRIS	31 46	Lf
State Rt 57 nr Fieldale Va		WEVX	39.86	Lf
523 Main Lynchburg Va		WEVZ	31 46	Lf
Main St Stuart Va		WMRH	39.86	Lf
Arkansas P & L Co 600 Garland Av				
Little Rock Ark		KHQL	31 46	Mf
Pine Bluff Ark		KHQV		f
Stuttgart Ark		KSJT		f
Atlanta Gas Lt Co 220 2nd St				
Macon Ga	50	WKAE	33 02	Mf
1240 Caroline St Atlanta Ga		WKAG	33 02	Mf
235 W 1st St Rome Ga		WKAH	33 02	Mf
Atlantic City Elec Co Cohansey St				
Bridgeton NJ	44	WDEH	39.86	Mf
Mo Av Atlantic City NJ		WMWQ	39 86	Mf
Spicer & NJ Avs Wildwood NJ		WDKR	39.86	Mf
Atlantic Seaboard Corp US Rt 240				
Westmore Md	3	WNKI	39 98	Lf
Barron Cty Elec Coop Office Bldg				
Barron Wis	6	WIAD	39 66	Mf
Bartholomew Cty Rural Elec Mem Corp				
Columbus Ind	1	WKQA		
Barton Cty Elec Coop				
Lamar Mo	12	KIWY	153.59	Mf
City of Beaumont Tex Louisiana & Pine				
Beaumont Tex	35	KETX	31 46	Gf
Wiess Bluff Tex		KSEB	31.46	Gf
Belmont Elec Coop Inc St Rt 40				
Clairsville Ohio	3	WOZD	33.82	Mf
Benton Cty Pub Util Dist 211 Kennewick Av				
Kennewick Wash	8	KRPV	30.86	Gf
1209 Mead St Prosser Wash		KRPX	30.86	Gf
Birmingham Gas Co 2501 N 29 St				
Birmingham Ala	1	WBXH	31 46	Ma
1200 6th Av Birmingham Ala		WBXI	31 46	Ma
B-K Elec Coop Inc Car Wash & Pecan				
Seymour Tex	7	KAVT	37.74	Gf
Blackstone Valley G & E Co Jenks Lane St				
Pawtucket RI	19	WQHG	39 66	Gf
Villa Nova St Woonsocket RI		WQHI	39 66	Gf
Blue Ridge Elec Memb Corp				
Blowing Rock NC	25	WUAL	37 70	Gf
Nr Boone NC		WIAR	37 70	Gf
Clifton NC		WIAS	37 70	Gf
Elkin NC		WIAI	37 70	Gf
Mulberry St Lenoir NC		WICB	37 70	Gf
Sparta NC		WICC	37 70	Gf
West Jefferson NC		WICT	37 70	Gf
Boone Cty Rn Elec Memb Corp				
Lebanon Ind	5	WQBW	39 66	Mf
Boston Cons Gas Co 144 McBride St				
Boston Mass	16	WDDE	39 86	Mf
Boston Edison Co 175 Alford St				
Boston Mass	25	WAAE	39 66	Lf
87 Bridge St Weymouth Mass		WAZB	39 66	Lf
1205 Commonwith Av Boston		WAZC	39 66	Lf
776 Summer St Boston		WAZD	39 66	Lf
669 South St Boston		WAZE	39 66	Lf
182 Tremont St Boston		WAZI	39 66	Lf
325 Cambridge St Boston		WAZK	39 66	Lf
19 South St Framingham Mass		WLDT	39 66	Lf
Cove St Woburn Mass		WQWP	39 66	Lf
1165 Mass Ave Boston		WRIU	153.59	Mf
Brazos R Trans Elec Coop Inc Highway 377				
Granbury Tex	10	KBRT	2.726	Wa
Brockton Edison Co 150 Sumner St				
Brockton Mass	30	WEKS	31 46	Gf
Grove St Brockton Mass	20	WKXH	33 22	Gf
The Brooklyn Union Gas Co 8322 Ditmas Av				
Brooklyn NY	100	WNVG	39.98	Lf
City of Buffalo NY Water Intake Crib				
Buffalo NY		WBQH	39 66	Ca
Filtr Plant Jersey St Buffalo		WBQO	39 66	Ca
Buffalo Niagara Elec Corp 93 Dewey Av				
Buffalo NY	10	WALI	31 46	Aa
Calif Elec Pr Co Contr Sta				
Nr Bishop Calif	1	KABM	31 46	Mf
Sub-sta Leevining Calif		KAEJ	31 46	Mf
Calipatria Calif		KGJD	31 46	Mf
Blythe Calif		KGJF	31 46	Mf
TonopahNev		KGYB	31 46	f
Cont Sta Bishop Calif		KGYF	31 46	Mf
Calif Ore Pr Co 209 N 6th St				
Grants Pass Ore	71	KCVY	39 86	Mf
270 I St Crescent City Calif		KCVZ	39 86	Mf
N End Mills St Klamath F Ore		KKLB	39 86	Mf
ES Main St Alturas Calif		KKLE	39 86	Mf
Lakeview Ore		KKLH	39 86	Mf
Dixonville Ore		KKUC		
Roseburg Ore		KKUF	37 58	Mf
Callaway Elec Co 10 E 4th St				
Fulton Mo	4	KAWR	153 65	Mf
Cambridge Elec Lt Co 351 3rd St				
Cambridge Mass	20	WUER	158 25	Hf
Canadian R Gas Co Cor Polk & 3rd S				
Amarillo Tex	1	KCRP	39 98	Gf
Dalhart Camp Dalhart Tex		KCRX	39 98	Gf
Elvins Camp Amarillo Tex		KCRY	39 98	Gf
Caprock Elec Coop Inc 409 St Peters St				
Stanton Tex	5	KWEP	37 74	Mf

SPECIAL INFORMATION

1. Addresses are for the headquarters operating points, except for a few cases where such mailing addresses were not available from FCC records. Then, address given is for the company which owns the station.

2. The number following the oddress is for the total number of mobile transmitters in the system. In some instances, FCC records did not list mobile units. Hence, there is no number shown here.

3. Call letters, for the most part, are for the main stations. In most cases, the same letters are assigned to fixed and mobile transmitters. Some systems have different call letters assigned to groups of mobile transmitters. To conserve space, these extra call letters are not shown unless different frequencies are assigned.

4. Frequencies are given in megacycles.

5. The capital letter at the right shows the make of equipment used. If two or more makes of equipment are used at a stotion, the name of the principal supplier is shown. These are:

A: Radio Corp.	K: Kaar
B: Bendix	L: Link
C: Collins	M: Motorola
D: Doolittle	R: Raytheon-Belmont
F: Federal	T: Temca
G: General Electric	W: Western Electric
H: Harvey Radio Labs	

6. The smoll letter at the right indicates frequency or amplitude modulation.

Cape & Vineyard Elec Co 396 Main S				
Hyannis Mass	19	WJKN	39 66	Lf
Capital Elec Pr Assn				
EPA Office Clinton Miss	12	WMQB	33 34	Mf
Carolina Pr & Lt Co 3 Manning Av				
Sumter SC	8	WJSQ	37 62	Lf
Portable	2	WIGL	39.66	La
Asheville NC		WIGA		
Florence SC		WIGH		
Greeleyville SC		WIGI		
Carroll Cty Rn Elec Memb Corp 109 E Franklin				
Delphi Ind	6	WCIQ	39 98	Mf
S Lisbon St Carrollton Ohio		WGOH	37.54	Mf
Mobile	10	WGOJ	36.54	Mf
Central Ariz Lt & Pr Co Service Bldg				
Phoenix Ariz	60	KIOT	153.59	Af
Steam-Elec Sta Phoenix Ariz		KIOY	153.59	Af
2nd Av & Buchanan S Phoenix		KSKE	153 59	Af
Central Elec Coop Inc				
Parker's Landing Pa	10	WBUB	37 62	Gf
Central Hudson G&E Corp 4th Av				
Catskill NY	161	WAUN	75 66	Lf
26 E O'Reilly St Kingston NY		WAUZ	75 66	Lf
284 So Av Poughkeepsie NY		WAVS	75 66	Lf
256 Bway Newburgh NY		WAVV	75 66	Lf
Central La Elec Co Inc Main St				
Villa Platte La	4	KCOQ	39 98	Mf
Main St St Landry La		KCOT	39 98	Mf
Main St Bunkie La		KCOU	39 98	Mf
Main St Colfax La		KCOV	39 98	Mf
Main St Mansura La		KCOX	39 98	Mf
Shamrock St Pineville La		KCOZ	39 98	Mf
Oakdale La		KCPV	39.98	Mf
Central Mass Elec Co 465 N Main St				
Palmer Mass	16	WHPU	31 46	Gf
Central NY Pr Corp				
Otisco NY	11	WIMD	31 46	Gf
725 Oswego Blvd Syracuse NY		WPAE	31 46	Gf
Central P&L Co LaPalma Pr Plant				
San Benito Tex	53	KCPI	39 66	Gf
Corpus Christi Tex		KIBQ	39 66	Gf
1307 Van Loan St Corpus Chr		KRMV	39 66	Gf
Central Valley Elec Coop Inc 1109 W Merchant				
Artesia N Mex	3	KVQB	39 98	Gf
Central Vt Pub Serv Corp 19 Cleveland Av				
Sherburne (Rutland) Vt	27	WJEO	39 66	Gf
CVPSC Hydro sta Royalton Vt		WJEU	39 66	Gf
Hogback Rd Cavendish Vt		WJEV	39 66	Gf
CVPSC Hydro Sta Bradford Vt		WJEX	39 66	Gf
Lafayette St Claremont NH		WJEY	39 66	Gf
CVPSC Substa Bennington Vt		WKTE	39 66	Gf
City of Chattanooga Tenn Oak & Greenwood Sts				
Chattanooga Tenn	17	WBMM	31.46	Lf
Oak St & Greenwood Av Chatta		WBPY	31.46	Lf
City of Chicopee Mass 725 Front St				
Chicopee Mass	10	WJPI	30 86	Gf
Choptank Elec Coop Inc 5th & Gay Sts				
Denton Md	1	WGHP	39 98	Gf
Claiborne Elec Coop Inc Ruston Highway				
Homer La	6	KBNE	31 46	Gf
Farmerville La		KBNF	31 46	Gf
Clark Elec Coop				
Greenwood Wis		WOAA		Gf
Clay Cty Elec Coop Corp City Water Tower				
Corning Ark	10	KAXE	47.58	Mf
Clay Elec Coop Inc Thrush St				
Keystone Hts Fla	15	WKRA	37 86	Gf
Clay-Union Elec Corp 119 E Main St				
Vermillion SD	6	KTHF	37 66	Gf
Cleveland Elec Illum Co 75 Public Sq				
Cleveland Ohio	150	WTJT	35 14	Lf
4737 Main St Ashtabula Ohio		WTJW	35 14	Lf
Coast Ctys G&E Co End of Blaine St				
Santa Cruz Calif	11	KAEY	39 66	Gf
Walker St Watsonville Calif		KAFA	39 66	Gf
RR Av Gilroy Calif		KFIB	39 66	Gf
7th & E Sts Hollister Calif		KFIL	39 66	Gf
Colo Central Pr Co 3470 S Bway				
Englewood Colo	20	KRYD	33 30	Gf
Colo Interstate Gas Co Natl Bank Bldg				
Colorado Springs Colo	10	KHGF	39 98	Gf
Canyon Comp Station		KHGI	39 98	Gf
Devine Comp Station Pueblo		KHHF	39 98	Gf
Gimarron Comp Sta Guy NMex		KHHG	39.98	Gf
Clayton Comp Sta Clayton NM		KHIJ	39.98	Gf
Nr Lakin Kans		KPMD		
City of Columbia Tenn 212 W 7th St				
Columbia Tenn		WDDW	37.54	Lf
City of Columbus Ohio 589 Dublin Av				
Columbus Ohio	20	WKOR	158.13	Ff
Columbus & So Ohio Elec Co 100 Hickory St				
Columbus Ohio	22	WJGK	31.46	Gf
N Colum Quad Madison Tn O		WJGN	31.46	Gf
E Colum Quad Harrison Tn O		WJGR	31.46	Gf
Commonwealth Edison Co				
Mobile	48	WDVY	158.13	Mf
US Rt 4 Kewanee Ill		WBHH	39.66	Mf
St Aid Rt 10 Pekin Ill		WBIA	39.66	Mf
72 W Adams St Chicago Ill		WBYU	39.66	Mf
3400 N Calif Av Chicago Ill		WKGQ	39.66	Mf
US Rt 51 Oglesby Ill		WALS	39 66	Mf
2413 W Thomas St Chicago Ill		WKGR	39 66	Mf
3501 S Pulaski Rd Chicago		WKGS	39.66	Mf
1111 Cermak Rd Chicago Ill		WKGT	39 66	Mf
6141 S Prairie Av Chicago		WKGU	39.66	Mf
3200 E 100th St Chicago		WKGV	39.66	Mf
Conn Lt & Pr Co Clough Rd				
Waterbury Conn	8	WAVT	39.86	Lf
US Rt 7 Milford Conn		WAWK	39.86	Lf
Conn St Hwy Rt 31 Stevenson		WAWN	39.86	Lf
Montville Conn		WAVY	39.86	Lf
Naugatuck Av Devon Conn		WAWF	39.86	Lf
250 Freight St Waterbury Con		WAVX	39 86	Lf
Belleview Av Southington Con		WKMC	39.86	Lf
Consolidated Edison Co of N Y Inc 4 Irving Pl N Y				
Mobile	2	WBHJ	31.74	Wa
Consolidated Elec Coop 217 W Jackson S				
Mexico Mo	9	KSHD	37.86	Gf
Cons Gas Elec Lt & Pr 501 E Madison				
Baltimore Md		WAQI	39.86	Lf
Mobile	—	WLBO	—	—
Ridout St B&A RR Annapolis		WCPK	39.86	Lf
114 S Main St Bel Air Md		WNBL	39.86	Lf
Locust & Winters Westminster		WSTT	39.86	Lf
Coop Elec Co Pleasant & 4th Sts				
St Ansgar Iowa	3	KRKT	39.66	Mf
Corn Belt Elec Coop 315 E Front St				
Bloomington Ill	20	WKXN	37.62	Mf
Cumberland Elec Memb Corp				
Springfield Mo	28	WFGH	39 66	Mf
Cumberland Dr Clarksville T		WJPX	39.66	Mf
Dairyland Pr Coop Eagle Point Tn				
Chippewa Falls Wis	8	WDPD	39.66	Mf
Baldwin Tn Baldwin Wis		WKWG	39.66	Mf
DPC Power Plant Genoa Wis		WKXB	39.66	Mf
Alma Wis		WETV	39.66	Mf
Dallas Pr & Lt Co 515 Park Av				
Dallas Tex	1	KJTB	39.98	Mf
Dayton Pr & Lt Co E River Rd				
Dayton Ohio	75	WAMZ	39.86	Lf
503 N Columbus St Wilmington		WBNH	39 86	Lf
101 E St Washington CH Ohio		WBNJ	39 86	Lf
215 Sycamore St Xenia Ohio		WBNK	39.86	Lf
12 S Main St W Alexandria O		WBNI	39.86	Lf
409 E. Monument Av Dayton O		WOBR	39.86	Lf
115-117 S Wayne St Piqua O		WPDJ	39.86	Lf
US Hwy 36 W Urbana Ohio		WJTO	39 86	Lf
Campbell Rd Sidney Ohio		WJTQ	39.86	Lf
State Rt 219 Coldwater Ohio		WJTX	39 86	Lf
113 S Main St Marysville O		WJTY	39 86	Lf
Orchard Isl Rd Russells Pt O		WJTZ	39 86	Lf
Delaware Pr & Lt Co SE Read & S Madison Sts				
Wilmington Del	16	WQHT	39.86	Gf
Detroit Edison Co 220 E Herrill St				
Birmingham Mich		WCGZ	39.66	Lf
Portable and Mobile	7	WEQQ	153.59	Mf
2000 2nd Av Detroit Mich		WDAX	3.190	Gf
600 Gd River Av Pt Huron		WEBO	39.66	Lf
308 E Huron St Bad Axe Mich		WGYF	39 66	Lf
315 Cedar St Lapeer Mich		WGYH	39 66	Lf
19 S Elk St Sandusky Mich		WGYK	39 66	Lf
Gratiot Rd Marysville Mich		WMAV	3.190	Gf
2000 2nd Av Detroit Mich		WQJL	39.86	Lf
Mobile	21	WQQK	39 34	Lf
401 S Main St Superior Mich		WRQV	39.66	Gf
401 S Main St Superior Mich		WSUP	3.190	Gf
Dixie Elec Memb Corp				
Baton Rouge La	6	WDWR	37.62	Mf
Douglas Co Coop Lt & Pr Assn				
Alexandria Minn	3	KRGD	31 46	Gf
Church & Pray Douglasville Ga		WUEX	37.62	Gf
Duquesne Lt Co				
Springdale Pa	17	WCBV	31.46	Lf
435 6th Av Pittsburgh Pa		WETC	31 46	Lf
Brunot Island Pittsburgh Pa		WETD	31.46	Lf
435 6th Av Pittsburgh Pa		WETI	31.46	Lf
Wireton Pa		WFOL	31.46	Lf
W Mifflin Borough Pa		WQHO	31.46	Mf
Rochester Tn Pa		WQHR	31.46	Mf
Eastern Iowa Lt & Pr Corp Wash & US Rt 61				
Wapello Iowa	10	KOCX	33.34	Mf
5th & Sycamore Wilton Jct Ia		KOFV	33.34	Mf
1505 6th Av DeWitt Iowa		KOGV	33.34	Mf
Egyptian Elec Coop Intersec Hway 3 & Mo P RR				
Steeleville Ill	23	WCYH	37.62	Gf
N Ill Av Carbondale Ill		WCYN	37.62	Gf
Empire Dist Elec Co Church & Elliott Sts				
Aurora Mo	45	KCKJ	39.66	Gf
925 E 4th St Joplin Mo		KFLC	39.66	Gf
144 N Main St Gravette Ark		KTWN	39.66	Gf
Nichols St Springfield Mo		KVTF	39.66	Gf
Pierce City Mo		KWOJ	39.66	Gf
522 College St Greenfield Mo		KWOV	39 66	Gf
City of Eugene Ore City Hall				
Eugene Ore	20	KEPI	75.62	Lf
Rt 2 Leaburg Ore		KEPJ	75.62	Lf
City of Everett Wash 3102 Cedar St				
Everett Wash	8	KFQB	31.46	Mf
Lake Chaplain Wash		KHGN	31.46	Mf
Panther Creek Wash		KHGP	31.46	Mf
Excelsior Elec Memb Corp 30 S Broad St				
Metter Ga	6	WKWE	39.98	Gf
Exeter & Hampton Elec Co South St				
Exeter NH	10	WAXA	31.46	Gf
Fitchburg Gas & Elec Lt Co Sawyer Passway				
Fitchburg Mass	4	WFZR	31.46	Gf
Fleming-Mason Rn Elec Coop Corp 225 Water St				
Flemingsburg Ky	6	WRXI	37.62	Gf
US Rt 60 Grayson Ky		WKJA	37.62	Gf
Stanton Ky		WRYA	37.62	Gf
City of Florence Ala Pine & Tenn Sts				
Florence Ala	6	WFLE	37.62	Gf

PUBLIC UTILITIES — Continued

Florida Pr Corp 16th St Sub-sta
St Petersburg Fla 66 WJTL 31.46 Mf
331 13th Av So St Petersburg WJTR 31.46 Mf
Fla Pr & Lt Co Orange Av & 18th St
Sarasota Fla 130 WNF 39.66 Gf
Charlotte Av W, Palm Bch Fla WNG 39.66 Gf
314 SW 1st Ct Miami Fla WNH 39.66 Mf
Greenleaf & Twigg Palatka Fla WNP 39.66 Gf
Broward Rd Ft Lauderdale Fla WNQ 39.66 Gf
Nesbitt St Punta Gorda Fla WNS 39.66 Gf
Factory St Cocoa Fla WNV 39.66 Gf
Seagrave St Ft Pierce Fla WNX 39.66 Gf
Orange Av Ft Pierce Fla WNZ 39.66 Gf
318 NW 3rd Av Ft Lauderdale WAYK 39.66 Gf
8 Bacon Pt Rd Pahokee Fla WDOX 39.66 Gf
Hotel Anale Macclenny Fla WKTL 39.66 Mf
US Hwy 17 Lk Monroe Fla WKTO 39.66 Mf
118 Ribera St Augustine WKTQ 39.66 Mf
9th St & W 2nd Hialeah Fla WQUG 39.66 Mf
523 NW 11th St Miami Fla WQUH 39.66 Mf
St Clair St Lake City Fla WTUB 39.66 Mf
2010 Lee St Ft Myers Fla WUBA 39.66 Mf
Fontana Union Water Co 160 E Spring St
Fontana Calif 4 KSPM 31.98 Kf
Forked Deer Elec Coop Inc 111 S Front St
Halls Tenn 6 WUAJ 37.70 Gf
Freeborn-Mower Coop Lt & Pr Assn 437 Bridge
Albert Lea Minn 5 KIAQ 39.66 Mf
Fulton Cty Ru Elec Mem Corp 513 Main St
Rochester Ind 6 WHMX 37.54 Mf
Georgia Power Co Tallulah Falls Hydro Pl
Tallulah Falls Ga 3 WCKJ 31.46 Lf
409 Oak St Gainesville Ga WCKN 31.46 Lf
Ga Pr Substation Lindale Ga WKEM 31.46 Gf
849 Main St Thomson Ga WKFP 31.46 Mf
15th & Greene Sts Augusta Ga WKGA 31.46 Mf
1301 N Blvd NE Atlanta Ga WRXQ 31.46 Lf
1004 Blvd Athens Ga WRXR 31.46 Lf
Gibson Cty Elec Mem Corp Bway
Obion Tenn 10 WUDY 33.34 Gf
Hiway 45 W Trenton Tenn WUEC 33.34 Gf
Godfrey L Cabot Inc Bradley Comp Sta
Brier Cr Baileysville WVa 2 WDDJ 39.66 Mf
Pineville WVa WDDK 39.66 Mf
224½ Main St Beckley WVa WDDO 39.66 Mf
723 Kanawha Blvd Charleston WKJI 39.66 Mf
Grand River Dam Authority
Langley Okla 8 KCHP 31.46 Mf
Pryor Okla KCHX 31.46 Mf
RR 10 Box 135 Tulsa Okla KTUS 31.46 Mf
Grand Valley Ru Pr Lines 120 N 7th St
Grand Junction Colo 6 KOAQ 37.70 Gf
Grant Elec Coop 103 N Madison
Lancaster Wis 1 WBXU 39.66 Mf
Guernsey Muskingum Elec 27 E Main St
New Concord Ohio 4 WCSY 31.98 Mf
Gulf Pr Co Harrison Ave
Panama City Fla 25 WJPM 153.59 Mf
Jackson St Pensacola Fla WJPZ 153.59 Mf
Gulf Sts Utilities Co 1563 Govt St
Baton Rouge La 103 WBRG 39.86 Gf
GSU Office Bldg Navasota Tex KCFA 39.86 Gf
15th St & Av I Huntsville Tex KCFB 39.86 Gf
129 S Chambers Conroe Tex KCFC 39.86 Gf
Main St Calvert Tex KCFD 39.86 Gf
GSU CO Sub Lafayette La KGKO 39.66 Gf
336½ Liberty Beaumont Tex KGSI 39.86 Gf
Houston Av Pt Arthur Tex KGTB 39.86 Gf
Front & 1st Sts Pt Arthur Tex KGTK 39.86 Gf
Neches Pr Pl Beaumont Tex KGTT 39.86 Gf
Hancock-Wood Elec Coop Inc
N Baltimore Ohio WLCJ — —
Harrison Cty Ru Elec Coop Corp
Cynthiana Ky WFAC — —
Hart Cty Elec Mem Corp Depot & Carolina Sts
Hartwell Ga 8 WKLE 37.70 Gf
Hartford Elec Lt Co 266 Pearl St
Hartford Conn 12 WHDD 39.66 Gf
Henderson-Union Ru Elec Coop Corp US Hwy 41 & 60
Henderson Ky WKVO 33.58 Gf
Hickman-Fulton Ru Elec Coop Corp 220 S Clinton
Hickman Ky 8 WOGI 30.86 Gf
Hill Cty Elec Corp 212 Main St
Itasca Tex 2 KTIB 31.46 Gf
Holston Elec Coop 108 S Church St
Rogersville Tenn 10 WLFQ 158.07 Gf
Holyoke Water Pr Co Water St
Holyoke Mass 7 WBXV 39.66 Lf
Home Gas & Elec Co 810 9th St
Greeley Colo 6 KHUG 37.86 Gf
Mobile 2 WFDU 39.34 Lf
Hope Natural Gas Co
Chelyan WVa 60 WDGP 37.86 Lf
Marianna WVa WDGU 37.86 Lf
Nr Corton WVa WKXM 37.86 Lf
445 W Main St Clarksburg WVa WUEN 37.86 Lf
Kopperston WVa WWHJ 37.86 Lf
Houston Ltng & Pr Co 2114 Church St
Galveston Tex 15 KALH 39.66 Gf
644 5th St Rosenberg Tex KALI 39.66 Gf
214 W Park Freeport Tex KALP 39.66 Gf
301 Texas Goose Creek Tex KALQ 39.66 Gf
1016 Walker St Goose Cr Tex KALU 39.66 Gf
6200 Canal St Houston Tex KXAD 39.66 Gf
Substa LaMarque Tex KXAF 39.66 Gf
4200 Richmond Rd Bellaire Tex KXAG 39.66 Gf
Elec Bldg Houston Tex KXAH 39.66 Gf
Huntington Cty Ru Elec Mem Corp 419 Poplar
Huntington Ind 4 WKHF 39.66 Mf
Idaho Pr Co 621 So 17th St
Boise Idaho 50 KVWE 153.59 Mf
Ill Elec & Gas Co 111 N 16th St
Herrin Ill 8 WBQB 39.86 Mf
Gas Pl Du Quoin Ill WBQN 39.86 Cf
1015 Chestnut St Murphysboro WBQZ 39.86 Cf
St Rt 37 Marion Ill WNWX 39.86 Cf
Ind & Mich Elec Co RR 2 Leo Rd
Allen Cty Ind 141 WAJX 39.86 Lf
159 W Main St Benton Harbor WAKS 39.86 Lf
110 W Lex Av Elkhart Ind WAKU 39.86 Lf
Twin Br Pr Pl Mishawaka Ind WAMN 39.86 Lf
401 E Colfax Av So Bend Ind WAUG 39.86 Lf
112 Days Av So Bend Ind WIGX 39.86 Lf
600 E Water Montpelier Ind WKOG 39.86 Lf
N A & 14th Sts Elwood Ind WKOH 39.86 Lf
238 S Bway Butler Ind WREG 39.86 Mf
419 N Walnut Muncie Ind WSAF 39.86 Lf
120 Branson Marion Ind WSAO 39.86 Lf
Indiana Service Corp Horton & Johnson Sts
Bluffton Ind 37 WCBR 37.62 Mf
1704 S Webster St Ft Wayne WDDF 37.62 Mf
2101 Spy Run Av Ft Wayne Ind WFIA 37.62 Mf
Indianapolis P & L Co 1230 W Norris St
Indianapolis Ind 26 WDBP 31.46 Gf
Inter-Cty Ru Elec Coop Inc 135 S High St
Hillsboro Ohio 18 WULG 37.54 Gf
102 S Walnut Chillicothe O WULI 37.54 Gf
Interstate Power Co Service Bldg E of 8th St
Dubuque Iowa 20 KTFU 37.50 Af
Iowa Elec Lt & Pr Co 213 2nd St NE
Cedar Rapids Iowa 50 KTFO 37.62 Gf
803 Main Adel Iowa 105 KYBA 39.66 Mf
1105 Main Knoxville Ia KYBB 39.66 Mf
S Walnut St Colfax Ia KYBC 39.66 Mf
118 SE 5th St Des Moines Ia KYBD 39.66 Mf
1st Av & A St Oskaloosa Ia KYBO 39.66 Mf
15th Clarinda Ia KGTQ 37.74 Mf
Chestnut St Avoca Iowa KGUM 37.74 Mf
Sheridan St Shenandoah Ia KGUV 37.74 Mf
2nd Av & 5th Malvern Ia KGVB 37.74 Mf
Iroquois Gas Corp 249 W Genesee St
Buffalo NY 35 WTHN 39.98 Gf
338 Bailey Av Buffalo NY WTHR 39.98 Gf
301 Union St Hamburg NY WTHV 39.98 Gf
Disp Sta Gowanda Village NY WTHX 39.98 Gf
38 Main St Salamanca NY WTIO 39.98 Gf
Jackson Cty Ru Elec Mem Corp 101 W Walnut
Brownstown Ind 3 WCGO 39.66 Gf
City of Jacksonville Fla 1050 Laura St
Jacksonville Fla 73 WMGQ 31.46 Mf
Jefferson Davis Elec Coop Inc Peterson Bldg
Jennings La 10 KPGG 37.62 Gf
Jersey Centr Pr & Lt Co 521–5 Main St
Allenhurst NJ 68 WMRJ 153.71 Lf
Jump River Elec Coop Inc Vosz Bldg
Ladysmith Wis 3 WJRW 39.66 Mf
Kankakee Valley REMC
Wanatah Ind 10 WKAV 33.58 Mf
Kansas City Pr & Lt Co 117 S Miller St
Sweet Springs Mo KAWX 39.66 Mf
Mobile 144 KCGK 39.34 Mf
Jackson & Bway Brunswick Mo KAWY 39.66 Mf
24th & Main Higginsville Mo KAXH 39.66 Mf
410 S Main St Ottawa Kan KBVX 39.66 Mf
1330 Baltimore Av Kans Cty M KQIG 153.71 Mf
Kansas G & E Co 1900 E Grand Av
Wichita Kan 82 KAOC 31.46 Ca
Portable 10 KXIW 37.54 Af
900 N 2nd Independence Kan KQXO 37.82 Af
Kans-Neb Natural Gas Co 300 N St Joseph St
Hastings Neb 16 KCNS 37.74 Mf
Scott Cty Kan KICU 37.74 Mf
332 State St Phillipsburg Kan KICV 37.74 Mf
Deerfield Kan KRXO 37.74 Mf
Palco Kan KRXP 37.74 Mf
Deerfield Kan KRXQ 37.74 Mf
Holdredge Neb KSGH 37.74 Mf
Otis Kan KVPW 37.74 Mf
Kay Elec Coop Inc 201 E
Blackwell Okla 3 KRZF 75.42 Lf
Ky & WVa Pr Co Inc
Lothair Ky 7 WAOF 39.86 Lf
Ky Utilities Co Limestone & Short Sts
Lexington Ky 6 WCLI 31.46 Gf
City of Knoxville Tenn Wash & 6th Av
Knoxville Tenn 26 WAWS 31.46 Mf
Kootenai Rural Elec Assn Inc 117 Coeur d'Alene
Coeur d'Alene Idaho 5 KIGN 39.66 Gf
City of LaFollette Tenn 102 E Central
LaFollette Tenn 10 WDRT 158.25 Gf
City of Lamar Colo 106 W Elm St
Lamar Colo 5 KRJY 31.46 Gf
Lamar Cty El Coop 224 Lamar Av
Paris Tex 10 KXRD 37.50 Mf
Lawrence G&E Co 173 Methuen St
Lawrence Mass 16 WMVU 31.46 Mf
Lincoln El Coop Inc 10th & Jefferson
Davenport Wash 4 KCMA 39.66 Gf
Linn Cty Ru El Coop Assn 1138 7th Av
Marian Iowa 10 KAIP 37.82 Af
The Little Ocmulgee El Mem Corp 323 RR Av
Alamo Ga 10 WEXF 158.13 Mf
Little Rock Ark Mun Wtr Wks Mun Filter Pl
Little Rock Ark KQCK 39.86 Cf
Saline Ark KQCJ 39.86 Cf
L I Lighting Co Woodbine Av
Northport NY 57 WQGY 39.86 Lf
Grove St Glenwood Landing NY WQGZ 39.86 Lf
River Rd Riverhead NY WQHB 39.86 Lf
90 Main St Bay Shore NY WQHC 39.86 Lf
94 Power House Rd Roslyn NY WQHD 39.86 Lf
Lorain-Medina Ru El Coop 224 N Main
Wellington Ohio 15 WKYG 158.13 Mf
City of Los Angeles Calif 246 W Market
Independence Calif 2 KOS 3.190 Ca
316 W 2nd St Los Angeles 23 KFMQ 39.66 Lf
207 S Bway Los Angeles KQT 3.190 Ca
Victorville Calif KHE 3.190 Ca
Silver Lk Camp Calif KHG 3.190 Ca
600 Nevada Hway Bldr Cty Nev KHH 2.726 Ga
Louisiana Power & Lt Co Monroe & Kepler
Gretna La 96 KIAI 39.66 Mf
Highway 51 Amite La KIAL 39.66 Mf
433 Metairie Rd Metairie La KICB 39.66 Mf
Main St Hammond La KICC 39.66 Mf
Main St Ponchatoula La KICE 39.66 Mf
Main St Lockport La KICF 39.66 Mf
Miss St Donaldsonville KICH 39.66 Mf
Hwy 80 & 16 Delhi La KICL 39.66 Mf
Pine & Main Winnsboro La KICX 39.60 Mf
613 N Front Olla La KICZ 39.66 Mf
500–2 E Green Tallulah La KIDP 39.66 Mf
514 2nd St Ferriday La KIDY 39.66 Mf
703 S 1st St Gibsland La KIEI 39.66 Mf
225 E Jefferson Gibsland La KIEJ 39.66 Mf
Louisville G&E Co 731 Ormsby St
Louisville Ky 2 WRHD 31.46 Lf
Lower Colo River El Coop
Giddings Tex 69 KCMD 39.98 Gf
College Wtr Tnk San Marcos KHMD 39.98 Gf
Marshall Ford Dam, Tex KWNU 39.98 Gf
Peters Tex KWNX 39.98 Gf
Lynn Gas & El Co 788 Broad St
Lynn Mass 25 WUAQ 158.13 Gf
Lyntegar El Coop Inc City Wtr Twr
Tahoka Tex 10 KRSM 37.82 Mf
Macon El Coop Martin Bldg
Macon Mo 10 KHZS 153.59 Mf
Magic Valley El Coop Inc 638 S Tex Av
Mercedes Tex KMAJ 31.46 Gf
Mobile 12 KMHO 39.86 Gf
Magnolia El Pr Assn 213 Canal St
McComb Miss 15 WMFK 31.46 Mf
City of Marshfield Wis 112 E 2nd St
Marshfield Wis 4 WBZQ 39.66 Mf
McLeod Coop Pr Assn 808 Franklin St
Glencoe Minn 5 KRTG 39.66 Gf
City of Memphis Tenn 179 Madison Av
Memphis Tenn 90 WMJV 39.86 Lf
Met Edison Co 141 S 7th St
Reading Pa 9 WFAZ 37.18 Gf
Michigan Consol Gas Co
Freeman Tn Mich WDIL 37.78 Lf
Austin Tn Mich 9 WDJR 39.98 Lf
Middle Tenn El Mem Corp
Franklin Tenn 14 WAHH 31.46 Gf
220 E Main Lebanon Tenn WAIA 31.46 Gf
225 N Walnut St Murfreesboro WJSI 31.46 Gf
Midwest El Co E Spring St
St Marys Ohio 10 WNHH 158.13 Lf
Greenlawn Av Elida Ohio WNHJ 158.13 Lf
Mid-Yellowstone El Coop Inc
Hysham Montana 4 KSRK 37.70 Gf
Minneapolis Gas Lt Co 700 Linden Av
Minneapolis Minn 43 KIDJ 31.46 Gf
Minnkota Pr Coop Inc US Highway 81
Harwood ND 20 KUKC 37.82 Af
Grand Forks ND KUKG 37.66 Af
Minnesota Pr & Lt Co 30 W Superior St
Duluth Minn 30 KSKH 37.54 Gf
Mississippi Pr Co 327 Delmas Av
Pascagoula Miss 30 WKMS 158.13 Mf
Hwy 49 Gulfport Miss WKMQ 158.13 Mf
Legion Bldg Poplarville Miss WGRQ 158.13 Mf
721 Main Columbia Miss WGSQ 158.13 Mf
Waynesboro Miss WGSU 158.13 Mf
Mississippi Pr & Lt Co 414 S Commerce
Jackson Miss 10 WAPG 39.86 Lf
Modesto Irrigation Dist Ensien Av
Modesto Calif KQBZ 2.726 Ca
Mobile 13 KQCV 31.74 Ca
Monongahela Pr Co 314 Jefferson St
Fairmont WVa 5 WJBQ 37.18 Lf
5th & RR Elkins WVa WJBU 37.18 Lf
Substation Howesville WVa WJBX 37.18 Lf
Ct Sq Webster Sprs WVa WJBZ 37.18 Lf
Montana Pr Co Higgins & Bank
Missoula Mont KOBH 158.13 Mf
Montant Pr Co
Cut Bank Mont 16 KOBQ 158.13 Mf
Morgan County Rural El Mem Corp 159 Main
Martinsville Ind 5 WEPG 39.66 Mf
Mountain Fuel Supply Co 615 Conn Av
Rock Springs Wyo 1 KAYG 2.726 Wa
Coalville Utah KQVK 2.726 Wa
Narragansett Elec Co 280 Melrose St
Providence RI 45 WMVW 39.66 Gf
New Bedford Gas & Edison Lt Co 5 Cannon St
New Bedford Mass 12 WHUA 39.66 Lf
Carver Rd Wareham Mass WHUD 39.66 Lf
NE Power Co Grafton St
Millbury Mass WAOJ 2.726 Ga
45 Conway St Buckland Mass WAOK 2.726 Ga
NJ Power & Lt Co
Phillipsburg NJ 200 WUBC 75.50 Lf
105 E McFarlen Dover NJ WUBD 75.42 Lf
217 Spring St Newton NJ WUBE 75.50 Lf
38 Main St Flemington NJ WUBF 75.50 Lf
179 Main St Hackettstown NJ WUBL 75.50 Lf
New Orleans Pub Ser Inc 527 Magnolia St
New Orleans La 35 WXPY 158.13 Mf
3734 Tulane Av New Orleans WNOM 31.46 Mf
Market St New Orleans La WOOL 39.66 Mf
Dwyer Rd New Orleans La WWBD 153.59 Mf
3734 Tulane New Orleans La WWBE 153.59 Mf
Valence St New Orleans La WWBG 153.59 Mf
Polymnia St New Orleans La WWBH 153.59 Mf
Dryades St New Orleans La WWBJ 153.59 Mf
Iberville St New Orleans WWBK 153.59 Mf
Elysian Flds New Orleans WWBO 153.59 Mf
NY State Elec & Gas Corp 15 Eldredge St
Binghamton NY 8 WPIH 31.98 Lf
NY State Natural Gas Co
Nr Genesee Pa 14 WBKK 37.86 Lf
168 S Main St Wellsville NY WBKM 37.86 Lf
Caledonia NY WBKU 37.86 Lf
Otisco NY WKOF 37.86 Lf
Lawrence Tn Pa WKRJ 37.86 Lf
Taylor Farm Waynesburg Pa WSTZ 37.86 Lf
Noble Cty Ru Elec Mem Corp
Albion Ind 5 WNZF 37.54 Mf
No Indiana Pub Ser Co W Wash St
Goshen Ind 96 WDBV 39.86 Mf
Wash St Valparaiso Ind WIKF 39.86 Mf
701 Wash St LaPorte Ind WKYO 39.86 Mf
Angola Ind Substation WMRB 39.86 Mf
340 N Buffalo Warsaw Ind WMRG 39.86 Mf
Lake Av Plymouth Ind WMRM 39.86 Mf
Hanswalt St Monticello Ind WSRA 39.86 Mf
W 108 Goss Kentland Ind WSRB 39.86 Mf
8th St Fowler Ind WSRG 39.86 Mf
4621 Elm Av Hammond Ind WUDK 39.86 Gf
Northern Natural Gas Co
Ogden Iowa 190 KAXG 33.18 f
Paullina Iowa KAXI 33.18 f
Welcome Minn KCFR 33.18 f
Beaver Okla KTOP 33.18 Mf
Skellytown Tex KTQZ 33.18 Mf
So Sioux City Nebr KWSR 33.18 f
Hooper Nebr KXRC 33.18 f
Blk 2–8 V Buren Hugoton Kan KXWT 33.18 Mf
Sublette Kan KYDH 33.18 f
Millinville Kan KYDI 33.18 f
Bushton Kan KYDL 33.18 f
Clifton Kan KYDN 33.18 f
Beatrice Nebr KYDP 33.18 f
Palmyra Nebr KYDQ 33.18 f
Oakland Iowa KYDR 33.18 f
Minneapolis Minn KYDT 33.18 f
Omaha Nebr KYGL 33.18 f
Ventura Iowa KIVX 33.18 Mf
Northern Piedmont El Coop 175 E Davis St
Culpeper Va 5 WGDO 153.59 a
Northern States Power Co
St Croix Falls Wis WPL 3.190 Ca
15 S 5th Minneapolis Minn WLP 3.190 Ca
Nueces El Coop Inc 526 Main
Robstown Tex 4 KBMM 39.86 Gf
Oakdale Coop El Assn US Hwy 12–16
Oakdale Wis 5 WNPE 39.86 Mf
Ohio Edison Co 325 E North St
Akron Ohio 46 WOEA 39.86 Lf
25 E Boardman St Youngstown WQUM 31.46 Lf
121 E High Springfield O WRPS 39.66 Lf
Sugar Grove Ohio WNTQ 33.34 Lf
Ohio Fuel Gas Co So Pt Comp Station
S Point Ohio 25 WNXY 33.34 Lf
Ohio-Midland Lt & Pr Co 10 S High St
Canal Winchester Ohio 6 WEUX 37.54 Mf
Ohio Power Co. St Rt 214
Bellaire Ohio 221 WABO 39.86 Lf
Portable 4 WOIW 2.726 Ma
St Rt 61 Vernon Jct Ohio WAFJ 39.86 Lf
Walnut St Kenton Ohio WAGS 39.86 Lf
North St Zanesville Ohio WAJN 39.86 Lf
W Main St Crooksville O WAOA 39.86 Mf
Sunnyside Sub Waco O WCEG 39.86 Lf
216 N Elizabeth St Lima O WCLL 39.86 Lf
111 N Wash St Van Wert O WCLS 39.86 Mf
Defiance St Leipsic O WCRE 39.86 Mf
45 N Monroe Tiffin O WDBN 39.86 Lf
132 Kv Sub Newcomerstown O WKXP 39.86 Lf
65 E Main Newark O WMGZ 39.86 Lf
214 E High Hicksville O WOPG 39.86 Mf
120 N 4th St Boscoe O WOIM 39.86 Lf
Ohio Pub Serv Co Oyster Rd
Bluebell Substa Alliance O WAHI 39.66 Lf
128 E Liberty Vermilion O WAWM 39.66 Lf
Garden Cty Pk Marion O WEBW 39.66 Lf
200 Oberlin Av Lorain O WIYQ 39.66 La
Middle Rowsburg Rd Ashland O WJPH 39.66 Lf
Harkness St Bellevue O WKBJ 39.66 Lf
W Main St Loudonville O WKPO 39.66 Lf

PUBLIC UTILITIES — Continued

19 N Main Rittman O WKVU 39.66 Lf
150 S Olive St Elyria O WMLW 39.66 Lf
S Main Ext Warren O WMLX 39.66 Lf
Harber Rd Pt Clinton O WMLY 39.66 Lf
9th St Massillon O WRQW 39.66 Lf
Ollvesburg Rd Mansfield O WQWX 39.66 Lf
Perkins Av Sandusky O WRRA 39.66 Lf

City of Okla-Water Dept
Pump Station KSNX — —
Filter Plant KSNY — —

Okla Gas & Elec Co 301 S Cherokee st
Muskogee Okla 32 KAMO 39.66 Lf
4th St Enid Okla KENA 3.190 Ca
Kelley St Ft Smith Ark KEXD 3.190 Ca
301 S Cherokee Muskogee Okl KEXS 3.190 Ca
2500 Midland Ft Smith Ark KQMO 39.66 Lf
Harrah Okl Generating Plt KRMI 39.66 Lf

Owen Cty Ru El Coop Corp Court Sq
Owenton Ky 12 WRFJ 37.62 Gf

Ozarks Ru El Coop Corp 17 N Block St
Fayetteville Ark 10 KCLM 39.98 Mf

Northwestern Elec Co E Lewis & Loring
Portland Ore 38 KBPB 39.86 Ma
Portable 3 KAGX 35.14 Ca

Pacific Pr & Lt Co 6th & Rose
Walla Walla Wash 24 KSXE 153.59 Mf
Union Gap Wash KTLU 153.59 Mf

Panhandle Eastern Pipe Line Co 307 Kansas
Liberal Kan 206 KCKN 39.86 Mf
Olpe Kan KFOH 39.86 Mf
Sunray Tex KHCG 39.86 Mf
Houstonia Mo KLAH 39.86 Mf
Louisburg Kan KLAY 39.86 Mf
Boonville Mo KNHJ 39.86 Mf
1221 Baltimore Av Kan City Mo KPHD 39.86 Mf
Arkalon Kan KPHE 39.86 Mf
Centralia Mo KPHF 39.86 Mf
Greensburg Kan KPHG 39.86 Mf
Dumas Tex KPHK 39.86 Mf
Hardesty Tex KPHL 39.86 Mf
Haven Kan KPHP 39.86 Mf
Hugoton Kan KTSQ 39.86 Mf
Satanta Kan KUBQ 39.86 Mf
451 E Prospect Jackson Mich WIHK 39.86 Mf
Montezuma Ind WPHW 39.86 Mf
Pleasant Hill Ill WPIB 39.86 Mf
Edgerton Ind WPYB 39.86 Mf
Glenarm Ill WPZY 39.86 Mf
Tuscola Ill WPZZ 39.86 Mf
Zionsville Ind WQEB 39.86 Mf
Indiana Rd Maumee Ohio WQGF 39.86 Mf

Pedernales El Coop Inc
Bertram Tex 32 KPEF 39.98 Gf
Fredericksburg Tex KPED — —
Llano Tex KPEE — —
Johnson C Tex KPEG 39.98 Gf

Pemiscot-Dunklin El Coop
Hayti Mo KAMY — —

Pennsylvania El Co 535 Vine
Johnstown Pa 138 WIUT 39.86 Lf
French Rd Erie Pa Substa WMYV 39 86 Lf

Pennsylvania Pr & Lt Co Ashland Rd
Fraekville Pa WBI 3.190 Ca
117 E Broad Hazleton Pa WCJ 3.190 Ca
Main St Mt Pocono Pa WFAD 39.86 Lf
9th St Allentown Pa WFAE 39.86 Lf
10th St Harrisburg Pa WFAF 39.86 Lf
Griest Bldg Lancaster Pa EHTO 39.86 Lf
Wallenpaupack Hyd Hawley Pa WHTP 39.86 Lf
West St Williamsport Pa WPII 3.190 Ca
901 Hamilton St Allentown Pa WPPF 3.190 Ca
324 West St Williamsport Pa WKQN 39.86 Lf
Bloomsburg Pa Hydro Sta WKQY 39.86 Lf
135 N Wash St Wilkes-Barre WHLX 39.86 Lf

Pennyrile Ru El Coop Corp Hway 100
Russellville Ky 28 WUEE 37.86 Gf
Pension St Cadiz Ky WUEM 37.86 Gf

Peoples Coop Pr Assn 11 3rd St SE
Rochester Minn 8 KIICH 37.76 Gf

Peoples Natural Gas Co 545 Wm Penn Pl
Pittsburgh Pa 40 WCZI 37.86 Lf
Versailles Tn Pa WJHE 37.86 Lf
128 E Main St Monongahela P WJHF 37.86 Lf
Brave Pa WJHT 37.86 Lf
Comp Sta Crates West Pa WUEA 37.86 Lf

Phila Elec Co
Mobile 98 WQLZ 37.54 Mf
2301 Market St Phila Pa WQLP 39.66 Ga
Penn St Norristown Pa WQRL 37.70 Mf

Phillips Gas & Oil Co Grant Av
Kittanning Pa 20 WJAU 33.58 Lf
Marion Ctr Pa WJAZ 33.58 Lf
Punxsutawney Pa WJDG — —
Glen Campbell Pa WJDW 33.58 Lf
212 4th Av Tarentum Pa WJDY 33.58 Lf
Sprankle Hills Pa WJEA 33.58 Lf
Widnoon Pa WJEB 33.58 Lf
Curllsville Pa WJEG 33.58 Lf
Dime Pa WJGT 33.58 Lf
Renton Pa WJGU 33.58 Lf
Home Pa WJGV 33.58 Lf
Legis Rt 10031 Marwood Pa WJGX 33.58 Lf

Pickwick El Memb Corp Houston & Third St
Selmer Tenn WDYJ 153.71 Gf

Piedmont El Mem Corp So Churton St
Hillsboro NC 6 WHMV 37.86 Mf

Pierce-Pepin El Coop
Ellsworth Wis WJQV — —

Pioneer Ru El Coop Inc
Piqua Ohio WATC — —
Urbana Ohio WKMI — —

Planters El Mem Corp 413 Cotton Av
Millen Ga 8 WUEG 37 62 Gf

Plymouth Cty El Co Water & Leyden Sts
Plymouth Mass 16 WHTH 39.66 Lf
Main St Wareham Mass WHTR 39.66 Lf

Plymouth El Coop Assn
LaMars Iowa KXOJ — —
Mobile KXON — —

Pointe Coupee El Mem Coop
New Roads La 2 KRPQ 32.58 Gf

Polk-Burnett El Coop 4th & Mich Sts
Centuria Wis WDJU 39.66 Mf
Mobile WDJZ — —

Portland Gas & Coke Co
Portland Ore 2 KGFT 31.74 Ma

Portland Gen El Co
Mobile 133 KGEN 31.74 Lf
Portland Ore KAZJ 31.46 Lf
621 SW Alder St Portland Or KQEB 2.292 Ca
Three Lynx Ore KRKX 31.46 La

Potomac El Pr Co 10th & E Sts NW
Washington DC 174 WSIB 2.726 Wa

Provincetown Lt & Pr Co 104 Bradford St
Provincetown Mass 4 WJPN 39.66 Hf

Public Serv Co of Colo 1123 W 3rd Av
Denver Colo 50 KPSE 37.62 Gf

Public Serv Co of Ind Inc
Kokomo Ind 111 WEQP 37.82 Lf
Marion Cty Ind WKKI 31.46 Lf
Dresser Pr Sta Terre Haute WNVV 37 82 Lf

Public Serv Co of NH 1087 Elm St
Manchester NH 20 WFNA 158.25 Mf
600 S Main St Tulsa Okla KGNS 39.86 Gf

Public Serv Co of Okla
1 Newman S Hackensack NJ WCHC 37.18 Lf
Mobile 17 KRPG 39 86 Gf
900 W Grand S Elizabeth NJ WCIA 37.18 Lf

Pub Serv & Gas Co 31 Van Houten St
Paterson NJ 154 WCID 37 18 Lf
225 N Warren St Trenton NJ WCIE 37 18 Lf
17th St Camden NJ WCIH 37 18 Lf
938 Clinton Av Irvington NJ WCIK 37.18 Lf
Princeton NJ WEPI — —
268 Baldwin Jersey C NJ WMQV 37.18 Lf
268 Baldwin Jersey C NJ WNPF 37.18 Lf

Pub Util Dist 1-Lewis Cty Wash 981 Pacific
Chehalis Wash 4 KAAU 39.66 Rf
Morton Wash KAAY 39 66 Rf

Pub Util Dist 1-Clark Cty Wash 814 Wash St
Vancouver Wash 40 KACH 153 59 Mf

Pub Util Dist 1-Cowlitz Cty Wash
Longview Wash 20 KRDS 37 66 Gf

PR Water Res Authority Santurce Pr Plt
San Juan Pr 17 WFNT 39 66 Mf
Mobile 10 WTLG 37 54 Mf
Hostos Av Ponce PR KAOM 2 726 Ca
Guayama Plt WAJU 2 726 a
Mayaguez PR WAWY 2 726 Ta
Dos Bocas H-E Pl Arecibo PR WQUL 2 726 Ca

Puget Snd Pr & Lt Co 7th Av & Olive St
Seattle Wash 55 KXIO 75 42 Lf

Queens Borough G&E Co Brunswick Av
Far Rockaway NY 9 WRDI 39 86 Lf
24th St Far Rockaway NY WRDJ 39 86 Lf

Rochester Elec Dept
Rochester Minn KXIP — —

City of Rochester El Dept
Rochester Minn Mobile KXIQ — —

Rochester G&E Corp 174 Front St
Rochester NY 35 WGAE 39 86 Gf

Rockland Lt & Pr Co Bway & Ivy Sts
Central Nyack NY 8 WCWP 31 46 Mf
48 Genung St Middleton NY WCWQ 31 46 Mf

Roosevelt Elec Coop Inc 202 SE Main
Portales NMex 10 KXDL 37.70 Mf

Rosslyn Gas Co 2700 Shirley Memorial Hwy
Arlington Va 5 WIKA 33 06 Lf

Rural Coop Pr Assn
Pine City Minn 12 KGXS 33 34 Mf
Milaca Minn KGXT 33 34 Mf
REA Pl Hawick Minn KQWY 33 34 Mf
REA Pl Cambridge Minn KQWZ 33.34 Mf

Rush Cty Ru El Mem Coop 119 East 3rd St
Rushville Ind 3 WDGH 31 46 Lf

Rutherford El Mem Corp 1 Main St
Forest City NC 7 WSXT 37 78 Gf

Sacramento Munic Util Dist Calif 59th & R
Sacramento Calif 9 KHRF 153 59 Ff

Safe Harbor Wtr Pr Corp Safe Harbor Pr Hs
Manor Tn Pa 5 WNJF 30.86 Lf

St Joseph Lt & Pr Co
St Joseph Mo 2 KRMK 39 98 Gf

City of St Petersburg Fla Mirror Lk Drive
St Petersburg Fla 3 WPOB 39.86 Mf

City of San Antonio Tex 201 Mission Rd
San Antonio Tex 73 KANX 31 46 Gf
326 Jones Av San Antonio T KRMW 31 46 Gf

San Diego G&E Co 114 10th Av
San Diego Calif 43 KROA 31.46 Gf
311 N Tremont Oceanside Cal KSKL 153.71 Gf

San Patricio El Coop Inc
Sinton Tex 8 KSRE 39.98 Gf

Satilla El Mem Corp PO Box H
Alma Ga 8 WOHF 37.70 Gf

Scott-New Madrid-Miss El Coop US Hwy 60
Sikeston Mo 15 KOVF 37 62 Gf

Scranton El Co Scranton El Bldg
Scranton Pa 20 WGEE 33.26 Mf

City of Seattle Wash 7th & Yesler Sts
Seattle Wash 58 KFEC 39.66 Mf
Diablo Wash Pr Hs KFED 39.66 Mf

Gorge Pr Hs Newhalem Wash KFEE 39.66 Mf
Pr Hs Cedar Falls Wash KFEJ 39.66 Mf
Rt 1 Bothell Wash KRTB 39.66 Mf
C Lt Pat Res Hazel Wash KRTE 39.66 Mf
C Lt Pat Res Rockport Wash KRTO 39.66 Mf
7th & Yesler Seattle Wash KSMH 39.66 Mf
Ross Dam Wash KUKM 39 66 Mf

Shelby Ru El Coop Corp 2nd & Clay Sts
Shelbyville Ky 12 WSDV 37.62 Gf

Singing River El Pr Assn
Lucedale Miss 10 WAXR 33.34 f

Sioux Valley Empire El Assn Inc
Coleman S Dak KXAK — —

S Atlantic Gas Co 656 E Broughton St
Savannah Ga 50 KFPW 153.59 Mf

S Carolina El & Gas Co W Bridge St
St Matthews SC WBCB 31 46 Mf

S Carolina El & Gas Co RR Ave
Batesburg SC 4 WBCN 31 46 Mf
Parr Sheals SC WBCY 31 46 Mf
301 Gervais Columbia SC WQGH 31 46 Mf

S Carolina Pr Co 141 Neeting St
Charleston SC 26 WKPV 39 66 Mf

S Central Ru El Coop Inc 160 W Main St
Lancaster Ohio 14 WEVB 37.54 Mf
St Rt 188 Lancaster Ohio WEEO 37.54 Mf

SE Colo Power Assn Inc 19 W 4th St
La Junta Colo 15 KQAY 37.62 Gf
1st & Wash Sts Lamar Colo KQBB 37.62 Gf
Springfield Colo KQCW 37.62 Gf
14th St Eads Colo KQCZ 37.62 Gf

Southeastern Indiana Pr Co 306 E 3rd St
Rushville Ind 12 WWDP 39.86 Lf
Pike St Shelbyville Ind WWDQ 39.86 Lf

Southeastern Ind Ru El Mem Corp 101 N Walnut
Osgood Ind 6 WEPD 39.66 Gf

Southern Calif Edison Co 401 S Marengo Av
Alhambra Calif 22 KAMB 2.292 Ca
Eagle Rock Sub Glendale Cal KAMC 2.292 Ca
Katella Sub Anaheim Calif KQDZ 2.292 Ga
Edison Av Chino Calif KQER 2.292 Ga
515 W State Long Beach Cal KQES 2.292 Ga
Redondo Av Torrance Calif KQET 2.292 Ga
Foothill Rd Saticoy Calif KQEU 2.292 Ga
Vernon Calif KQEV 2.292 Ga
1435 Marine Santa Monica C KQEW 2.292 Ga
Nr Exeter Calif W6NTM 75.50 Ma
Nr Alpine Calif W6NTQ 75.50 Ma

Southern Calif Edison Co
Mt Vernon St Colton Calif KNHT 158.13 Mf
Dalton Calif KNHV — —
Vestal Substa Visalia Calif KNHW 158.13 Mf
Rector Substa Visalia Calif KNHX 158.13 Mf
Gutierrez St Santa Barbara KNHY 158.13 Mf
Whittier Calif KNHZ — —
8th & Fern Lancaster Calif KNNB 158.13 Mf
Nr Saugus Calif KOAI — —

Southern Colo Pr Co 100 S Victoria St
Pueblo Colo 5 KIKB 33.74 Gf

Southern Ill El Coop Illinois Rt 145
Metropolis Ill 23 WSEN 37.70 Gf
200 Charles St Dongola Ill WSFO 37.70 Gf

Southern Natural Gas Co Montgomery Hway
Wetumpka Ala 46 WBVO 39.66 Mf
2008 3rd Av N Birmingham Al WKHT 39.66 Mf
Sewell Rd Atlanta Ga WKHU 39.66 Mf
RFD 1 Perryville Ala WQVY 39.66 Mf
Holton Rd Macon Ga WWNA 39.66 Mf

Southside El Coop Inc Rt 460
Crewe Va 24 WBUP 37.78 Lf
Rt 460 Crewe Va WKPQ 37.78 Mf

Southwest Central Ru El Coop Corp 21 N 5th
Indiana Pa 10 WWBX 39.98 Mf

Southwest La El Mem Corp 203 N College Av
5 KBYF 33.58 Gf

Southwestern G&E Co 815 E Cotton St
Longview Tex 19 KAKU 39.86 Gf

Southwestern Pub Serv Co 2nd & Fillmore
Amarillo Tex 57 KFOZ 31.46 Gf
417 E 6th Borger Tex KCTQ 31.46 Mf
1005 Av K Lubbock Tex KCTS 31.46 Gf
Tuco Gen sta Abernathy Tex KQBC 31.46 Gf

Stearns Coop El Assn
Melrose Minn 6 KSLV 30.86 Gf

Stevens Cty El Coop Inc 344 N Main St
Colville Wash 4 KCVQ 39.86 Gf

Suburban Natural Gas Corp 400 E 8th St
Dewey Okla 30 KSNE 158.25 Mf

Sumter El Coop Inc
Sumterville Fla 8 WSUW 33.26 Gf

City of Tacoma Wash Tidelats Sub
1171 E Taylor Way Tacoma 60 KBOJ 158.25 Mf
Alder Pwr Hs Alder Wash KHCD 158.25 Mf
LaGrande Wash KHCE 158.25 Mf
Potlatch Wash KHCF 158.25 Mf

Tallahatchie Valley El Pr Assn REA Office
Batesville Miss 12 WNKP 33.34 Gf

Tampa Elec Co Pwr Plt Parker St
Tampa Fla WTWC 153.59 Mf

Tampa Elec Co Ice Plant Bldg E Haines
Plant City Fla 50 WTWD 153.59 Mf
Winter Haven Fla WTWE 153.59 Mf
Seaboard RR Mulberry Fla WTWL 153.59 Mf
11th Av Substa Tampa Fla WTWB 153.59 Mf

Taylor El Coop Inc 304 Front St
Merkel Tex KKLW 37.62 Mf
Mobile KKLX 37.62 Mf

Texas El Serv Co 6th & Calhoun Sts
Ft Worth Tex 10 KTES 39.66 Gf
Burnett St Wichita Falls Tx KUKR 39.66 Gf

Texas Pr & Lt Co 1001 W Erwin St
Tyler Tex 8 KRZL 33.02 Gf
Gainesville Tex KRXS — —
Sherman Tex KRXV — —
El Gen Sta Palestine Tex KRZO 33.02 Gf
El substa Athens Tex KRZP 33.02 Gf
Gen sta Trinidad Tex KRZR 33 02 Gf

Tipmont Ru El Mem Corp Linden St Bnk Bldg
Linden Ind 7 WTQH 39.66 Gf

City of Toledo Ohio Intake Crib
Toledo Ohio WBOV 31.46 Gf
Low Ser Pump Sta Toledo O WBOU 31.46 Gf
Collins Pk Toledo Ohio WJKY 31.46 Gf

Toledo Edison Co 1001 W Delaware St
Toledo Ohio 39 WBYT 39.86 Gf
134 S 5th St Fremont Ohio WCOJ 39.86 Gf
Power Dam Rd Defiance Ohio WKJO 39.86 Gf
134 N Fulton St Wauseon O WKJP 39.86 Gf

Trompealeau Elec Coop 702 E Main
Arcadia Wis 4 WBZM 39.66 Mf

Tri-Cty Elec Mem Corp Walnut St
Lafayette Tenn 12 WAXD 75.50 Lf
1st St Tompkinsville Ky WAXX 75.50 Lf
215 E Main Scottsville Ky WAYM 75.50 Lf

Tri-Cty Elec Coop Mich
Vestaburg Mich 5 WSCZ 31.46 Gf
Co Off Bldg Rushford Minn 7 KHFU 39.66 Mf
Gr River Av Portland Mich WKNH 31.46 Gf

City of Tulsa Okla Water Dept Office
Spavinaw Okla 15 KNHN 37.86 Mf
405 E 4th Tulsa Okla KNHR 37.86 Mf

Uncompahgre Valley Wtr Users' Assn
Taylor Pk Dam Colo KGDH 2.292 a
601 N Park Av Montrose Colo KGDN 2.292 a

Union El Pwr Co 315 N 12th St
St Louis Mo 55 KUEC 39.66 Gf

Union Gas System Inc 1513 W Maple St
Independence Kans 41 KBYO 39.86 Mf

United Illuminating Co 80 Temple St
New Haven Conn 26 WBXW 39.66 Lf
165 E Main St Bridgeport C WCBY 39.66 Gf

United Natural Gas Co
Lewis Run Pa 25 WITB 33.02 Lf
338 Bailey Av Buffalo NY WITD 33.02 Lf
Raymilton Pa WITI 33.02 Lf
Sigel Pa WITO 33.02 Lf
Halsey Pa WITU 33.02 Lf
308 Seneca Oil City Pa WIUE 33.02 Lf

Upper Cumberland El Mem Coop 113 S College
Carthage Tenn 20 WFQR 75 66 Lf
117 S Church Livingston Tn WFQV 75 66 Lf

Utilities Dist of Western Ind REA Office
37 S Franklin Bloomfld In 5 WIAU 39.66 Gf

Vernon Elec Coop State St
Westby Wis 8 WWVC 39.66 Mf

Virginia Gas Transmission Corp
Standardville Va WOAG — —
Mobile WOAH — —

Wash Elec Coop Inc 185 Front St
Marietta Ohio 10 WULJ 37.54 Mf

Wash Gas Lt Co 25th & H Sts NW
Washington DC 14 WGLL 33.06 Lf
12th & N Sts SE Wash DC WGLV 33.06 Lf
1100 29th St NW Wash DC WGLW 33.06 Lf
Chillum Rd Chillum Md WGLY 33.06 Lf
US Rt 240 Westmore Md WGLZ 33.06 Lf
Edmonston Md WAWW — —
Mobile WAYR — —

Wash St Tammany El Coop Inc
Franklinton La 3 WAUO 31.46 Gf

Wash Suburban Gas Co 4601 Tanglewood Dr
Edmonston Md 3 WAWW 33.06 Lf

Wash Water Pwr Co
Mobile 24 KBZN 31.74 a
825 W Trent Spokane Wash KQJD 2.726 a

Wayne Cty Ru El Mem Corp 17 S 10th St
Richmond Ind WDNL 39 98 Lf

Western Mass El Co 210 Alden St
Springfield Mass 4 WSYA 39 86 Wa

W Kentucky Ru Elec Coop Corp 305 E Bway
Mayfield Ky 8 WKMU 37 62 Gf

W Oregon El Coop Inc 622 Bridge St
Vernonia Ore 10 KPLG 37 86 Gf
Scroggins Vly Rd Gaston Ore KPLL 37 86 Gf
Elsie Rd Jewell Ore KPLR 37.86 Gf

W Penn Power Co. Charleroi Substation
Hazelkirk Rd Charleroi Pa 15 WNAA 37.18 Lf

Westwood Water Utility Co
Phoenix Ariz 5 KCTU 30.86 Cf

Wheeling Elec Co
Mobile 12 WMOK 31.46 Lf

PUBLIC UTILITIES — Continued

White Cty Ru Elec Mem Corp Obenchain Bldg				
Monticello Ind	4	WPQG	39.66	Mf
Whitley Cty Ru Elec Mem Corp 115 S Line				
Columbia City Ind	6	WIAL	39 66	Gf
Wild Rice Elec Coop Inc				
Mahnomen Minn	2	KWRG	37 82	f
Winnebago Ru Elec Coop Assn				
Thompson Iowa		KXCV	—	—
Mobile		KXCW	—	—
Wisconsin Elec Pwr Co 231 W Mich Av				
Milwaukee Wis	59	WQHL	39.86	Gf
Wisconsin G&E Co Milwaukee Av				
Ft Atkinson Wis	42	WBQM	39 86	Gf
Hill St W Bend Wis		WQHK	39.86	Gf
Wisconsin Michigan Pwr Co 137 W Mill St				
Appleton Wis	16	WIMN	39.86	Gf
1st Av Iron River Mich		WIUI	39 86	Gf
1223 S Milwaukee Av		WMPA	39.86	Gf
Oconto Falls Wis		WQMR	39.86	Gf
Worcester Cty Elec Co				
Mobile	20	WNQV	31.46	Gf
Wright-Hennepin Coop Elec Assn				
Maple Lake Minn	25	KRZB	33.34	Mf

TRANSIT UTILITY SERVICE

Alex Barcroft & Wash Transit Cameron Mills Rd				
Alexandria Va	8	WAVR	39 86	Gf
Baltimore Transit 10 N Calvert St				
Baltimore Md	50	WBTS	35 02	Lf
Boston Elev Ry Co				
Boston Mass	16	WDEA	35 15	Gf
Capital Transit Co 3222 M St NW				
Washington DC	30	WQHA	31 46	Gf
Chicago Surface Lines 231 S LaSalle St				
Chicago Ill	55	WAYH	39 86	Mf
Cincinnati St Ry Co Dixie Terminal Bldg				
Cincinnati Ohio	24	WAQF	31 46	Mf
City of Cleveland 1022 Carnegie Av				
Cleveland Ohio		WDCZ	31.46	Gf
Delaware Coach Co 1300 Edgmont Av				
Chester Pa	10	WBYC	39.02	Gf
Denver Tramway Corp 14th & Arapahoe Sts				
Denver Colo	25	KRYF	72.26	Mf
St of Detroit Mich 3702 Barlum Tower				
Detroit Mich	60	WALJ	31 46	Af
Fitchburg & Leom St Ry 1427 Water St				
Fitchburg Mass	5	WCQE	39 66	Gf
Fort Worth Transit Co 1528 E Lancaster				
Fort Worth Tex	15	KIJB	39.02	Gf
Houston Transit Co 800 Texas St				
Houston Tex	20	KWBX	72 50	Mf
Motor Transit Co 112 W Adams St				
Jacksonville Fla	11	WCHK	39.86	Mf
Kansas City Pub Serv Co 728 Delaware St				
Kansas City Mo	26	KISL	31.46	Gf
Key System 1106 Bway				
Oakland Calif	31	KYSN	39 66	Gf
L A Transit Lines 962 W 12th Pl				
Los Angeles Calif	47	KITF	31 46	Gf
Louisville Ry Co 29th & Bway				
Louisville Ky	20	WTVU	39 02	Mf
Motor Transit Co 36 Riverside Av				
Jacksonville Fla	11	WCHK	39 86	Mf
New Orleans Pub Ser 317 Baronne St				
New Orleans La	5	WNOO	39 86	Mf
Oklahoma Railway Co 1206 Exchange Av				
Oklahoma City Okla	5	KWNA	72 62	Lf
Phila Trans Co 1405 Locust St				
Philadelphia Pa	58	WIVN	31 14	Gf
Pittsburgh Ry Co 435 6th Av				
Pittsburgh Pa	18	WDRO	31 46	Gf
St Louis Pub Ser Co				
St Louis Mo	2	KEHG	31 46	Mf
Salt Lake City Lines 602 E 5th South St				
Salt Lake City Utah	8	KKPM	39 66	Mf
San Antonio Transit Co 310 So St Mary's St				
San Antonio Tex	15	KSAE	39.86	Mf
City & Co of S F 901 Presidio Av				
San Francisco Calif	30	KCRJ	31 46	Mf
San Diego Elec Ry 241 Bway				
San Diego Calif	10	KSDR	39 86	Mf
Spokane City Lines W 1229 Boone Av				
Spokane Wash	10	KSCK	33 98	Mf
Union St Ry Co 1959 Purchase St				
New Bedford Mass	8	WJGZ	39 02	Gf
United Elec Ry Co 24 Exchange Pl				
Providence RI	12	WJWF	31 46	Gf
Wash Marlboro & Annap Motor Lines 1510 S Av				
Bradbury Hts Md	5	WMNA	35 14	Gf
Wash Va & Md Coach Co 707 N Randolph St				
Arlington Va	7	WMVC	39 66	Gf
Worcester St Ry 287 Grove St				
Worcester Mass	8	WMOS	31.46	Gf

PETROLEUM PIPE LINE

Ark Western Gas Co Ark Western Wrehse				
Ozark Ark		W5XAY	33 18	Mf
California Co				
Waterproof La	12	W5XCG	33 18	Gf
C R King Drilling Co Eastham Bldg				
Midland Tex	35	W5XCI	33.26	Gf
Continental Pipe Line Co Tank Farm				
Brownsville Tex	3	KCRB	39 66	Mf
Pump Sta Mercedes Texas		KCRD	39.66	Mf
Pump Sta McAllen Texas		KCRE	39.66	Mf
Rincon Camp Rio Grande City		KCRF	39.66	Mf
Jackson Sta Sullivan City Tex		KSCW	39.66	Mf
Humble Pipe Line Co				
San Patricio Co Tex		KABO	37 46	Lf
San Patricio Co (Ingleside)		KADD	37 46	Lf
Office Humble PL Co St Bee Tex		KBQK	37 46	Lf
Interst Oil Pipe Line Co Hewitt Pump Sta				
Hewitt Okla	50	KAJR	156 99	Mf
Nr Okla City Okla		KXDS	156 99	Mf
J M Huber Corp 200 Block 1st St				
Borger Tex	50	KGTG	37 74	Mf
Pan American Pipe Line Co Hway 259				
Kilgore Tex	15	KHIL	31 98	Lf
Nr Quitman Tex		KHIM	31 98	Lf
MP Railway Pt Isabel Tex		KTJA	33 26	Lf
Raymondville Tex		KTJB	33.26	Lf
Rogers Lacy Inc 227 Tyler St				
Longview Tex		W5XQR	33.18	Kf
Mobile		W5XQS	33 18	Kf
Shamrock Oil & Gas Corp McKee Pl				
Sunray Tex	30	KRYV	37.50	Mf
Sinclair Prairie Oil Co Pl 19				
Arp Tex	33	W5XAL	158.01	Mf
Stanolind Pipe Line Co				
Paula Valley Okla		KQWF	2.292	a
N Miss St Ada Okla		KQWG	2.292	a
Hamilton Dome PS Kirby Wyo		KGRS	153.71	Mf
Stanoline PL Pump Sta Kirby		KGRU	153.71	Mf
Tenn Gas & Trans Co				
Campbellsville Ky	100	WIAW	33.26	Mf
S of Catlettsburg Ky		WKMJ	33 26	Mf
Clendenin WVa		WKNF	33.26	Mf
Texoma Natural Gas Co				
Nr Fritch Tex	30	KQWK	33 26	Mf
Warren Petroleum Corp Federal Row				
Norsworthy Tex	12	KIBV	33 34	Mf
Lamarque Rd Texas City Tex		KIBX	33.34	Mf

LIMITED COMMON CARRIER — EXPERIMENTAL

Am Radiotelephone Co 1407 Central				
Kansas City Mo	50	WOXMD	152 03	f
Sherman Amsden 224 E 38th St				
New York NY	1	W2XLP	152 03	Rf
Radio Dispatch Service 365 Lafayette St				
Baton Rouge La	25	W5XBR	152 03	Mf
R C Crabb 1021 W 6th St				
Los Angeles Cal	11	W6XYM	152 03	Bf
H Earl Daniels 884 Lucas Drive				
Beaumont Tex	10	W5XIB	152 03	Mf
T E Daniels 2303 Bridlepath				
Austin Tex	10	W5XAS	152 03	Mf
Austin Tex		W5XAH	152.03	Mf
1721 Ky St San Antonio T	20	W5XD	152 03	Mf
4333 Southwestern Dallas	10	W5XDC	152.03	Mf
L J DeLamarter Jr 614 Mich Natl Bk Bldg				
Grand Rapids Mich	100	W8XQI	152 03	Mf
M Forsyth 4600 Broadview Av				
Cleveland Ohio	10	W8XQO	152 03	Mf
Freeport Commun Radio Assn 17A W Sunrise Hwy				
Freeport NY	56	W2XYV	152 03	Ff
J J Freke-Hayes 595 5th Av				
New York NY	65	W2XJJ	152 03	Mf
Ralph Hicks 120 E 9th St				
Tulsa Okla	100	W5XLA	152 03	Mf
Indianapolis Transp Disp 320 N Meridian St				
Indianapolis Ind	80	W9XTJ	152 03	Lf
L M Kelley 519 White Bldg				
Seattle Wash	100	W7XNY	152 03	Gf
Longview Radio Disp Ser 332 W Tyler St				
Longview Tex	25	W5XM	152.03	Mf
H V Lowe 10910 Kinross Av				
Los Angeles Calif		W6XZO	152 03	a
Madison Mobile Disp Radio Ser 643½ E Wilson				
Madison Wis	12	W9XDQ	152 03	Mf
Marine Radio Co 526 St Paul Pl				
Baltimore Md	2	W3XBB	152.03	Mf
Mobile Disp Ser 1520 Fidelity Trust Bldg				
Baltimore Md	50	W3XNV	152 03	Lf
Mobile Radio Tel Co 1707 H St NW				
Washington DC	50	WØXMG	157.29	Mf
Mobile Radiophone Ser 1549 Pratt St				
Philadelphia Pa	20	W3XH	152 03	Mf
Mobile Radio Tel Co 66 Monroe Av				
Memphis Tenn	50	W4XCJ	152 03	Mf
914 S Gay St Knoxville	50	W4XCL	152 03	Mf
517 Commerce St	50	W4XCN	152.03	Mf
332 W Bway Louisville Ky	50	W4XCR	152.03	Mf
Mobile Radio Inc 712 8th St				
Greeley Colo	10	WØXEP	152.03	Ff
Mobile Radio Tel Co 1700 Glenarm Pl				
Denver Colo		WOXMF	152.03	Mf
5 W 4th Cincinnati O	50	W8XAT	152.03	Mf
8 E Broad St Columbus O	50	W8XBG	152.03	Mf
420 Jefferson Av Toledo O	50	W8XBI	152 03	Mf
1249 Wash Blvd Detroit	50	W8XQR	152 03	Mf
715 Market Chattanooga	50	W4XDB	152.03	Mf
Humphrey's Radio Disp Ser 613 Poydras St				
New Orleans La	100	W5XHF	152.03	Mf
Natl Elec Labs Inc 200 King St				
Alexandria Va	25	W4XNE	30.66	f
N Chicago Mobile Radio Ser 1742 Sheridan Rd				
N Chicago Ill	25	W9XNY	152.03	Mf
Odessa Radio Disp Ser 210 N Hancock St				
Odessa Tex	25	W5XWW	152 03	Mf
G A O'Reilly 31 N Knoxville				
Tulsa Okla	10	W5XCR	152 03	Mf
Radio Disp Inc 1619 E Republican				
Seattle Wash	100	W7XNW	152 03	Mf
Radio Disp Inc 1005 Peachtree Rd				
Augusta Ga	62	W4XAR	152 03	Mf
Radio Disp Inc 132 N Winter St				
Adrian Mich	15	W8XEJ	152 03	Bf
22 W Jackson Battle Cr	50	W8XRW	152 03	Mf
Radiomarine Corp of Amer				
New York NY	10	W2XGG	152 03	f
Radiotrone Inc 523 W Markham St				
Little Rock Ark	25	W5XVX	152 03	Mf
Richmond Radio Disp Ser Friends Sta PO B65				
Richmond Ind	60	W9XAV	152 03	Lf
Rockford Radio Disp 217 S Church St				
Rockford Ill		W9XCD	152 03	Mf
W C Rogers 55 E Washington St				
Chicago Ill	10	W9XCM	152.03	Mf
Royal Radio Disp Ser 1914 3rd Av				
Rock Island Ill	40	W9XEI	152.03	Mf
Solomon Schiller 66 Willoughby St				
Brooklyn NY	100	W2XTJ	152.03	Mf
Shreveport Radio Disp Ser PO Box 1676				
New Orleans La	25	W5XO	152.03	Mf
Tanner Radio & Elect Sup 109 W 9th St				
Little Rock Ark	10	W5XZB	152.03	Gf
Tel Answering Exch 410 Main St				
Peoria Ill	20	W9XCK	152.03	Mf
Tel Message Exch 312 E Wisconsin St				
Milwaukee Wis	50	W9XCO	152.03	Mf
Transp Commun Ser Inc 224 N Wrenn St				
High Point NC	50	W4XLA	152 03	Bf
Twin City Garage 5124 E Imperial St				
Lynwood Calif	2	W6XAI	152 15	Lf
Twin City Radio Disp 206 Lumber Exch Bldg				
Minneapolis Minn	20	WØXNC	152.03	Mf
U-Dryvit Auto Rental Co 4 Liberty Sq				
Boston Mass	100	W1XZX	152.03	Mf
Wash Radio Disp Message Ser 4419 Ga Av NW				
Washington DC	20	W3XWS	157.29	Mf
N Z Wolpert 225 S 5th St				
Minneapolis 2 Minn	100	WØXMI	152.03	Mf

HIGHWAY MAINTENANCE

State of Calif Donner Summit Maint Sta				
Norden Calif		KAON	2 726	a
Mobile	7	KQGV	37 98	Mf
1657 Riverside Redding Cal		KASN	2 726	a
St Hwy Maint Quincy Cal		KATQ	2.726	Ka
US Hwy 99 Mt Shasta Cal		KATR	2.726	Ka
S H 29 Hwy Maint Susanville		KATS	2.726	Ka
Maint Yard on US 99 Yreka		KATT	2.726	Ka
S H 29 Mineral Calif		KATU	2 726	Ka
Pulga Cal		KATV	2 726	Ka
US 395 Alturas Cal		KATW	2.726	Ka
US 299 Burney Cal		KATX	2.726	Ka
US 395 Conway Summit Cal		KBTC	2.726	Ka
US 395 Sonora Junct Cal		KBTD	2.726	Ka
Div Hwys 703B St Marysville		KQGC	2 726	a
Maint St US 40 Truckee Cal		KQGD	2 726	a
Maint Sta St Rt 18 Lk Arrowhd		KQGI	2.726	Ka
Maint Sta San Bernardino C		KQJG	2 726	Ka
247 3rd St San Bernardino		KQGN	2 726	a
US 395 Crestview Cal		KQGK	2 726	Ka
Hwy Dist US 395 Bishop Cal		KQGM	2 726	a
Maint Sta US 50 Bade Calif		KRMA	2 726	a
301 Pub Works Bldg Sacrameto		KRNF	2.726	Ha

HIGHWAY MAINTENANCE — EXPERIMENTAL

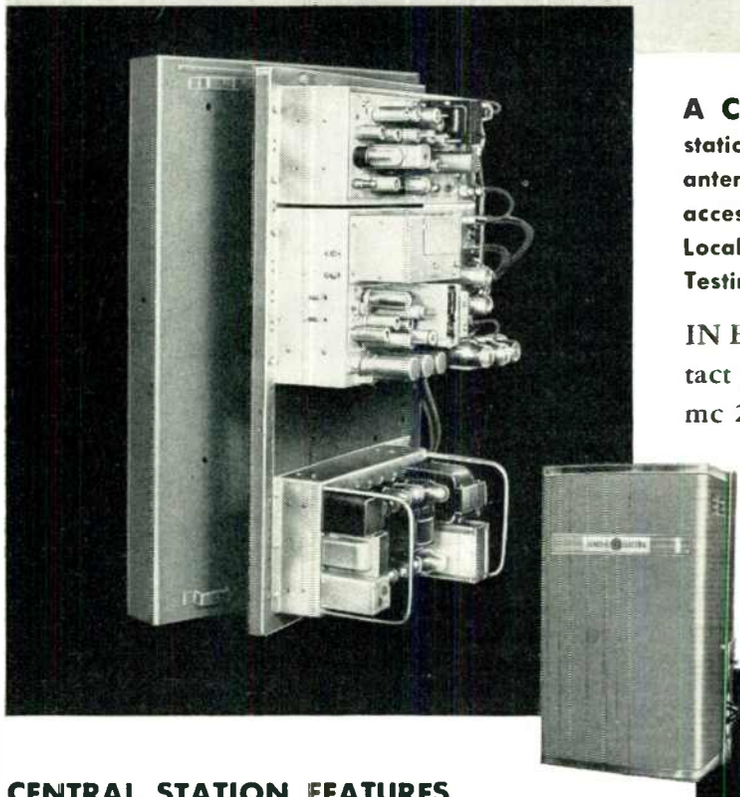
Dist of Columbia 201 Bryant St NW				
Washington DC	10	W3XOE	37.98	Lf
St of Mississippi				
Jackson Miss	1	W5XWG	2.461	a
St of Ohio 511 W 51 St				
Ashtabula Ohio	1000	W8XJA	31 54	Lf
Oakwood St Ravenna Ohio		W8XJB	31 54	Lf
Onondaga Cty NY Hwy Dept Shops				
Jamesville NY	10	W2XOT	37.98	Gf
Common of Pa No PO Bldg				
Harrisburg Pa	15	WPGE	37 98	Mf
Edensburg Pa		WPHY	37 98	Mf
Glenwood Pk Av Erie Pa		WPGC	37 98	Rf
W Portal BM Tunnel Blue Mtn		W3XRC	37 98	Gf
W Port BM Tun Shippensburg		W3XRD	78 82	Af
W Port LH Tun Laurel Hill		W8XXD	37 98	Gf
E Port SH Tun Wells Tannery		W8XXK	78 38	Aa
W Port Stony Crk Pa		W8XXF	37 98	Gf
E Port Dublin Tn Pa		W8XXG	77 06	Aa
W Port LH Tun Somerset Pa		W8XXH	77 94	Aa
W Port Stony Creek Tn Pa		W8XXI	79 26	Aa
W Port Brush Creek Tn Pa		W8XXJ	77 50	Aa
E Port Wells Tannery Wells		W8XXE	37 98	Gf
St of Washington Summit Snoqualmie Pass				
Snoqualmie Wash	212	W7XJO	37 98	Mf
Smt Blewett P Chelan Cty		W7XJN	39 14	Mf
W City Lim PSH3 Ellensburg		W7XJP	37 98	Mf
Trans Bldg Olympia Wash		W7XJQ	37 98	Mf
N Clty Lim PSH3 Union Gap		W7XJR	37 98	Mf
Summit Stevens P Chelan Cty		W7XJS	37 98	Mf
N Clty Lim PSH2 Wenatchee		W7XJT	37 98	Mf
N Clty Lim PSH3 Union Gap		W7XJR	37 98	Mf
4200 Main St Vancouver Wash		W7XOS	37 98	Mf
St Hwy Comm Wisconsin 1 W Wilson St				
Madison Wis	6	W9XUB	37 98	Mf
Madison Wis	3	W1XYQ	2.451	a
City of Worcester 166 Salem St				
Worcester Mass	12	W1XJN	37.98	Gf

TRUCKS, BUSES, TAXIS — EXPERIMENTAL

Ambulance & Oxygen Serv 970 Sutter Av				
Brooklyn 8 NY	3	W2XQZ	157.41	Bf
AA Cab Co 238½ Main St				
Oshkosh Wis	8	W9XCT	157.53	Mf
AA Radio Taxi 603 S 6th Av				
Mt Vernon NY	10	W2XKD	157.53	Lf
A-1 Cabs 403 W Lexington St				
Independence Mo	10	WØXKW	157.53	Bf
A-1 Taxi Co 39 E Prospect Av				
Mt Vernon NY	8	W2XCW	157.53	Mf
Ace Cab Co 128 1st St				
Bremerton Wash	11	W7XLZ	157 53	Bf
Ace Cab Co 13 W State St				
Calumet City Ill	8	W9XTD	157 53	Gf
Ace Cab Co Northern Hotel				
Ft Collins Col	6	WØXKM	147.53	f
Ace Taxi Co PO Box 424				
Port Hueneme Calif	6	W6XUL	152.27	a
Acky's Hack 503 Hayes St				
S Beloit Ill	6	W9XCX	157.53	Mf
Acme Ambulance Service 2528 Holmes St				
Kansas City Mo	25	WØXLW	157 41	Bf
Acme Cab 122 W Bridge St				
Blackwell Okla	10	W5XVW	157.53	Mf
Acme Cab Co 211 S Cincinnati				
Tulsa 3 Okla	10	W5XAR	157.53	Rf
Acme Taxi Co 100 1st St				
W Palm Beach Fla	6	W4XMG	157.53	Mf
Aero Cab Co 911 Sycamore St				
Waterloo Iowa	10	WØXEN	157.53	Mf
Aero Service Corp 236 E Shurtland St				
Philadelphia Pa	6	WIØXAV	27.46	f
Airline Cab Co 105 Durango St				
San Antonio Tex	30	W5XDP	157.53	Mf
Alexandria Independent Taxi Onrs 1900 King				
Alexandria Va	25	W4XXQ	157.53	Ba
Allen Butane Gas & Equip Co So Side of Sq				
Denton Tex	3	W5XOI	157.41	Kf
Allen's Taxi 385 E Main St				
Bartow Fla	8	W4XWZ	157.53	Lf
Allied Cab Co 323 E Wash St				
Springfield Ill	50	W9XOX	157.53	Bf
Al's Taxi 319 "J" St SE				
Auburn Wash	5	W7XQP	157.53	Rf
Altoona Cab Co 1717 12th Av				
Altoona Pa	5	W3XFI	157.53	Lf
Altoona Yellow Cab Co Penn RR Sta				
Altoona Pa	10	W3XLE	157.53	Mf
American Cab Co 1304 E Bway				
Alton Ill	8	W9XWS	152.27	Mf
American Cab Co 1029 Troost Av				
Kansas City Mo	50	WØXKT	157.53	Bf
American Cab Drivers' Assn 5154 E Clark				
Chicago Ill	400	W9XLI	157.53	Lf
Andrews Taxi 527 Broad St				
Rome Ga	20	W4XDV	157.53	Mf
Drs G R Anderson & F N Pansch 107 N Commercial				
Neenah Wis	3	W9XYV	152.15	Ba
Anderson Taxicabs 35 South Main St				
Sharon Pa	8	W3XZV	157.53	Mf
Andy's Taxi 200 E Price St				
Linden NJ	4	W2XOF	157.53	Lf
Annapolis Yellow Cab 37½ West St				
Annapolis Md	15	W2XFG	157 53	Bf
Antioch Cab Co 3rd & H Sts				
Antioch Calif	6	W6XYM	157.53	Mf
Appleton Yellow Cab Co 212 N Appleton St				
Appleton Wis	20	W9XWZ	157.53	Mf
A R Blossman Inc 314 Fla St				
Covington La	35	W5XSH	152.15	Mf
Arcade Taxi 100 First St				
W Palm Beach Fla	8	W4XPM	157.53	Mf
Ardmore Cab Co 310 W Main St				
Ardmore Okla	4	W5XNX	157.53	Gf
Arra Cab Co 753 E Green St				
Pasadena 1 Calif	10	W6XYP	157.53	a
Arrow Cab Co 140 Saratoga Av				
Kirkwood 22 Mo	10	WØXJR	157.53	Mf
Assn of Independent Taxi Oper 2825 Greenmount				
Baltimore Md	302	W3XCI	157.53	Mf
Astor Cab Co 129 S Mechanic St				
Cumberland Md	23	W3XBK	157.53	Lf
Atlanta Vet's Trans Inc 238 Courtland NE				
Atlanta Ga	50	W4XYQ	157 53	Rf
Atomic Cab Co				
Savanna Ill	3	W9XWD	157.53	Mf

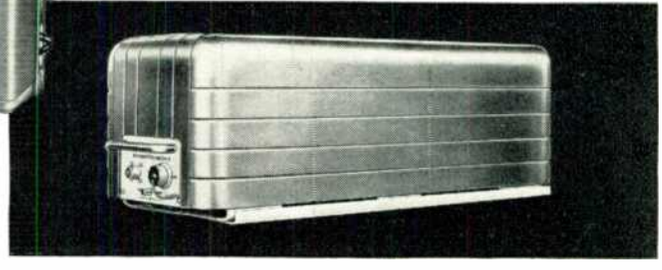
Depend upon it

152-162 mc 2-WAY RADIO EQUIPMENT GETS *Action!*



A COMPLETE LINE . . . Headquarters and mobile stations (2-way operation) · Standard and high-gain antennas · Wide variety of transmission line and accessories · Choice of special dispatching microphones Local and remote control units · Selective calling (optional) Testing and frequency measuring equipment.

IN EVERY operation where instant, reliable contact is required, General Electric's new 152-162 mc 2-way communications equipment can be depended upon. Here is a *complete* system that aids in systematizing and coordinating operations. It is filled with features that mean better performance, longer life, greater dependability.



CENTRAL STATION FEATURES

1. Hinged rack construction provides maximum accessibility.
2. Wall-mounted cabinet—zero floor space required.
3. Rack-mounted selective dialing unit (optional).
4. Full 50 watts output—tubes and components operated well under ratings.
5. Meets proposed RMA standards—high attenuation of spurious receiver response and spurious transmitter and receiver radiation.
6. SYNCHRO-CYCLE circuit insures continuous peak receiver performance.

Be sure of results—let General Electric handle the complete job from microphone to antenna. General Electric engineers are located in principal cities. For complete information and assistance in planning your radio system, call or write your nearest General Electric office or the General Electric Company, Electronics Department, Syracuse 1, New York.

MOBILE STATION FEATURES

1. Single-unit chassis—plug-in, draw-out construction.
2. Plug-in receiver, transmitter, and selective receiving (optional) sub-chassis—no maintenance delays—no extra boxes.
3. SYNCHRO-CYCLE receiver tuning with crystal control.
4. Meets proposed RMA standards.
5. Temperature-controlled transmitter crystal—the reliable General Electric Thermocell Crystal.
6. Alnico V 6½ inch speakers.
7. Accessories to fit the basic units to your requirements.

FIRST AND GREATEST NAME IN ELECTRONICS

GENERAL ELECTRIC

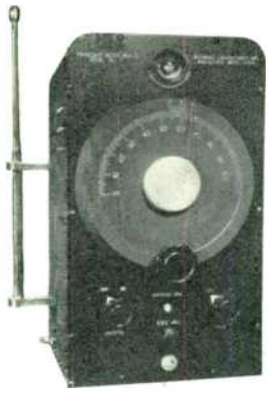
163-F1-6010

TRUCKS, BUSES, TAXIS — Continued

Atomic Taxi Co 1 16th Av
Paterson NJ 10 W2XZH 157.53 Lf
Auburn Yellow Cab Co 1827 Cleveland Av NW
Canton Ohio 2 W8XAP 157.53 Mf
Automobile Club of Buffalo SE Wash & Clinton
Buffalo NY 50 W2XTI 157.41 Mf
Automobile Club of NY 28 E 78th St
New York 21 NY 50 W2XCY 157.41 Mf
Automobile Club of Mich 139 Bagley
Detroit Mich 6 W8XRY 157.41 Mf
Automobile Club of S Calif 2601 S Figueroa
Los Angeles Calif 12 W6XSP 157.53 Mf
Badger Cab Co 16 S Bedford St
Madison Wis 26 W9XFH 157.53 Mf
L S Bambauer MD RFD Round Valley
Bishop Calif 1 W6XRK 152.15 Ba
Barberton Cab Co 313 6th St
Barberton Ohio 10 W8XKG 157.53 Ba
Barnes-Dwire Co 120 N Main St
Eldorado Kans 4 WØXET 157.53 Mf
Barnes Taxi 123 N Salt Pond St
Marshall Mo 15 WØXKO 157.53 Mf
Barnette & Barnette 112 N Bway
Minden La 15 W5XQJ 157.53 Mf
Beach Taxi Inc 253 Wash Av
Winthrop Mass 4 W1XMP 157.53 Rf
Beaumont Hotel Co 201 Main St
Green Bay Wis 14 W9XVF 157.53 Gf
Bell Cab Co 1320–27 Av
Gulfport Miss 10 W5XKV 157.53 Mf
Bell Cab 16 E 6th St
Chester Pa 7 W3XHR 157.53 Mf
Bell Cab Co 14 Fairview Av
Trenton NJ 10 W2XAU 157.53 Lf
Bell Taxi 948 Ontario Av
Niagara Falls NY 3 W2XPD 157.53 f
Bell Taxi Co 113 S 1st St
Temple Tex 15 W5XTB 157.53 Ff
Bellingham City Taxi 210 W Chestnut St
Bellingham Wash 8 W7XPN 157.53 Mf
Baltimore Taxi Service 215 S Front St
Marquette Mich 8 W8XFH 157.53 Mf
Belleville Cab Co 102 N Illinois
Belleville Ill 8 W9XQU 157.53 Mf
Peter Edward Bender 217 S Wash Av
Saginaw Mich 5 W8XJX 157.53 Af
Bennie's Cab Co 28 N Main St
Helena Montana 3 W7XKM 157.53 Gf
Benwood Taxi Co Benwood Hotel
Effingham Ill 3 W9XTZ 152.27 Mf
J B Berkebile MD 15 W 6th St
Peru Ind 2 W9XCZ 152.15 Lf
Berry Cab Co 140 N Elsworth Av
Salem Ohio 4 W8XNM 157.53 Mf
Bert & Steve Cab Co 1030 Burnet St
Ft Worth Texas 75 W5XCP 157.53 f
Beverly Taxi Co 9 Enon St
Beverly Mass 8 W1XKB 157.53 Mf
Sam Bigham 423 Oak St
Graham Tex 10 W5XDR 157.53 Rf
Bill's Cab 1508 Weiston St
Denver Colo 50 WØXIN 157.53 Gf
Bill's Taxi 40 E Steuben St
Bath NY 6 W2XSH 157.53 Mf
Bill's Taxi 515 S Main
Moscow Idaho 6 W7XQD 152.27 Mf
Bill's City Taxi 1510 High St
Boulder Colo 6 WØXIL 152.27 Ff
Bill's Towing Service 2421 5th Av
Seattle Wash 12 W7XNR 152.15 Mf
Billy's Cab Co 10th & Main
Lexington Mo 10 WØXKI 157.53 Mf
Birmingham Vets Cab Co 1351 Buffner St,
Birmingham Mich 8 WBXRU 157.53 Mf
BKW Coach Line 24 S 4th St
Sunbury Pa 10 W3XJS 157.53 Mf
Black & White Duluth Cab Co 14 E 1st St
Duluth Minn 17 WØXFD 157.53 Bf
Black & White Cab Co 124 Gordon St
Dalton Ga 16 W4XCV 157.53 Ff
Black & White Cab 317 Main
Texarkana Tex 15 W5XJC 157.53 Mf
Black & White Cab Co 23 No 9th St
Fort Smith Ark 27 W5XLD 157.53 Ff
Black & White Inc 113 N Main St
Little Rock Ark 20 W5XPK 157.53 Bf
Black & White Cab Co 319 W "B" Street
Russelville Ark 12 W5XST 157.53 Bf
Black & White Cab Co W 304 Sprague Av
Spokane Wash 51 W7XJF 157.53 Mf
Black & White Cab Co Hotel Boise Bldg
Boise Idaho 20 W7XLX 157.53 Kf
Black & White Cab Co 328 7th St
Parkersburg WVa 10 W8XIH 157.53 Gf
Black & White Cab Co 313 Waukegan Av
Highwood Ill 5 W9XQN 157.53 Lf
Black & White Taxi Service 321–329 Main
Utica NY 10 W2XTC 157.53 Gf
Blair Taxi Co 119 Allegheny St
Hollidaysburg Pa 3 W3XMI 157.53 Lf
B-Line Taxi 41 Chestnut St
Oneonta NY 7 W2XXD 157.53 Bf
Bloomfield Cab Co Inc 535 Bloomfield Av
Bloomfield NJ 15 W2XQI 157.53 Bf
Blue & Gold Cab Co 1754 Shattuck Av
Berkeley Calif 2 W6XUX 157.53 Bf
Blue Bird Cab Co 115 W Wash St
Greenville SC 23 W4XMM 157.53 Mf
Blue Bird Cab Co 115 W Wash St
Greenville SC 10 W2XYB 157.53 Bf
Blue Bird Cab Co 225 N Trade St
Winston-Salem NC 50 W4XRS 157.53 Bf
Blue Bird Cab Co 402 Victoria Av
Lynchburg Va 38 W4XVM 157.53 Bf
Blue Bird Taxi Co 64 S Lexington Av
Asheville NC 30 W4XQL 152.27 Gf
Blue Bird Taxi 229 E Sycamore St
Greensboro NC 30 W4XQZ 157.53 Bf
Blue Line Cab Service 920 W Grand Av
Wisconsin Rapids Wis 7 W9XTR 157.53 Mf
Blue Line Taxicab Co 126 S Center St
Casper Wyo 5 W7XPC 157.53 f
Blue Taxi Co 824 E 4th St
Alton Ill 4 W9XQD 157.53 Mf
Blue & White Cab Co 2001 N Water St
Corpus Christi Tex 55 W5XIS 157.53 Mf
Bob's Auto Rental Inc 450 Richmond Terr
New Brighton NY 10 W2XCE 157.53 Mf
Boss Taxi Service 97 E Main St
Gowanda NY 4 W2XDS 157.53 Bf
Boston Cab Co 51 Symphony Rd
Boston Mass 90 W1XDH 157.53 Mf
M J Bowen 160 Lake St
Newport Vt 3 W1XEP 157.53 Mf
Boynton Cab Co 1232 N Edison St
Milwaukee 2 Wis 275 W9XNB 157.53 Mf
Bragal's Taxi Service 96 3rd St
Troy NY 4 W2XNB 157.53 Mf
Brand's Cab Service 206 Sheldon Av
Houghton Mich 6 W8XIC 157.53 Mf
Brentwood Cab Co 4131 Brownsville Rd
Pittsburgh 27 Pa 20 W3XOJ 157.53 Mf
Brighton Taxi Co 46 Village Lane Brighton Sta
Rochester 10 NY 4 W2XUE 157.53 Rf
Broadway Deluxe Cab Co 115 NW Bway
Portland Ore 100 W7XID 157.53 Mf
Broadway Yellow Cab Co 2713 1st Av N
Billings Montana 14 W7XLD 157.53 Mf
Brooks Suburban Inc 11 Halstead St
E Orange NJ 15 W2XIA 157.53 Lf
Brown & White Cab Assn 22–26 Sussex Av
Newark NJ 10 W2XMJ 157.53 Ff
Brown & White Cab Co 171 Univ Av
St Paul Minn 48 WØXSQ 157.53 Mf
Brown's Cab 924 Av G
Fort Madison, Iowa 5 WØXEL 157.53 f
Bruces Red Top Taxi 312 N 16th St
Wattoon Ill 6 W9XOZ 157 53 Mf
Bryant's Taxi 1206 13th St
Lubbock Tex 10 W5XRS 157.53 Mf
Buddies Taxi Service 134 Waverly St
Framingham Mass 2 W1XMT 157.53 Bf
Burlington Cab Co 1009 Mebane St
Burlington NC 8 W4XTD 157.53 Bf
Bussard Taxi & Bus Service 3395 S Lincoln
Englewood Colo 51 WØXBB 157.53 Gf
Cab Services Inc 335 Gateway Bank Bldg
Minneapolis Minn 50 WØXMM 157.53 Bf
Cabs Inc 1636 Glenarm Place
Denver Colo 135 WØXFF 157.53 Mf
Caldwell Cab Co 115 Hightower St
Thomaston Ga 20 W4XDJ 157.53 Mf
Calexico Taxi Co Box 961
Calexico Calif 5 W6XDM 157.53 Mf
Calif State Automobile Assn 150 Van Ness Av
San Francisco 2 Calif 5 W6XCF 157.41 Mf
St of Calif Div of Hway 1120 N St
Sacramento Calif 6 W6XYD 2.455 a
Callahan Taxi Service 193 Western Av
Brattleboro Vt 2 W1XMJ 157.53 Kf
Cape Bway Cab Co 702 Bway
Cape Girardeau Mo 15 WØXMU 157 53 Mf
Capitol Hill Taxi Oper Co 133 SW 24th St
Oklahoma City Okla 50 W5XIDM 157.53 Lf
Carbondale Transfer Co 45 N Main St
Carbondale Pa 10 W3XID 157.53 Mf
Caribe Electronics PO Box 4881
San Juan 24 Puerto Rico 3 K4XOX 154.89 Mf
Carl's Cabs 422 Montgomery Av
Sheffield Ala 10 W4XVZ 157.53 Mf
Carolina Cab Co 104 Market St
Charleston SC 23 W4XQX 157.53 Bf
Carpenter's Cabs Box 6
Lincolnton NC 4 W4XUG 157.53 Bf
Norman Carver 126 N First Av
Wausau Wis 8 W9XJX 157.53 Mf
Central Cabs 103 Murray Av
Worcester Mass 41 W1XFI 157.53 Bf
Central Cab Co 532 Forrest Av
Portland Maine 21 W1XJB 157.53 Mf
Central Cab 130 N Scales St
Reidsville NC 6 W4XZP 157.53 f
Central Taxi 2 Jackson St
Lowell Mass 6 W1XER 157.53 Lf
Central Taxi Co 11 North St
Auburn NY 5 W2XOH 157.53 Lf
Central Taxi-Blue Cab Co 266 W Beau St
Washington Pa 5 W3XHT 157 53 Gf
Century Cab Co 3rd St & 3rd Av SE
Cedar Rapids Ia 16 WØXEN 157.53 Mf
Century Taxi Co 200 E Jefferson St
Syracuse NY 18 W2XZD 157.53 Gf
Chapman Cab Co 3308 Wash Av
Newport News Va 10 W4XPY 157.53 Bf
Charlie's Taxi Service 145 N 6th Av
Manville NJ 5 W2XCM 157.53 Mf
Chattanooga Trans Co 912 Market St
Chattanooga Tenn 30 W4XVG 157.53 Mf
Checker Cab Co Inc 2124 St Mary's Av
Omaha Neb 100 WØXFY 152.27 Mf
Checker Cab Co 323 4th St
Bismarck ND 10 WØXHB 157.53 Mf
Checker Cab Co 1415 Tremont St
Denver 2 Colo 50 WØXJP 157.53 Mf
Checker Taxi Co
Boston Mass 10 W1XFT 157.53 Bf
Checker Cab Co 3901 Terrace Av
Pennsauken NJ 10 W2XTG 157.53 Mf
Checker Cab Co 117 E 10th St
Erie Pa 40 W3XGI 157.53 Mf
Checker Cab Main & Swede Sts
Norristown Pa 6 W3XMK 157.53 Mf
Checker Cab Co 705 Saluda Av
Columbia SC 56 W4XNX 157.53 Mf
Checker Cab Co 303 W Whitner St
Anderson SC 14 W4XWG 157.53 Bf
Checker Cab Co PO Box 423
New Orleans La 150 W5XWM 157.53 Mf
Checker Cab Co 330 Central Av
Hot Springs Ark 30 W5XNZ 157.53 Mf
Checker Cab & Transfer Co 265 Lafayette
Baton Rouge La 25 W5XOV 157.53 Mf
Checker Cab Co 115 N Grant
Odessa Tex 20 W5XQL 157.53 Mf
Checker Cab Co 502 Dolorosa St
San Antonio Tex 100 W5XSK 157.53 Mf
Checker Cab Co 114 S First St
Temple Tex 15 W5XTS 157.53 Ba
Checker Cab Co 468 E St
San Bernardino Calif 30 W6XPR 157.53 Mf
Checker Cab Co 100 Ridge St
Sault Ste Marie Mich 10 W8XLD 157.53 Mf
Checker Cab Co 331 Adams St
Steubenville Ohio 17 WBXPO 157.53 Mf
Checker Cab Co 1106 Franklin St
Michigan City Ind 15 W9XJZ 157.53 Mf
Checker Cab Co 621 N Main St
Kokomo Ind 12 W9XKR 157.53 Mf
Checker Cab Co 1655 N Water St
Milwaukee Wis
Checker Cab Co 22 N Colorado St
Midland Tex 15 W5XYQ 157.53 Mf
Checker Cab Co 34 N Bway
Aurora Ill 13 W9XPB 157.53 Mf
Checker-Yellow Cab Co 329 Pine St
Green Bay Wis 12 W9XPH 157 53 Gf
Checker Taxi Co 148 S Blair St
Madison Wis 31 W9XTT 157.53 Mf
Checker Cab Inc 840 5th St
Miami Beach Fla 65 W4XDT 157.53 Mf
Checker Cab Co 1808 O'Neil St
Cheyenne Wyo 20 W7XBQ 157.53 Mf
Checker Taxi Co 302 Sherman Av
Coeur d'Alene Idaho 3 W7XQX 157.53 a
Chesapeake & Ohio Ry Co 823 E Main St
Richmond 10 Va 10 WIØXDX .198 f
Chicago Motor Club 66 E S Water St
Chicago 1 Ill 20 W9XAC 157.41 Mf
Christie Cab Co 6 Bank St
Waterbury Conn 6 W1XEC 157.53 Kf
Cincinnati Automobile Club Ctral Pkwy
Cincinnati Ohio 10 W8XMQ 157.41 Mf
Circle Cab Co 118 E Washington Place
Springfield Ohio 45 W8XHK 157.53 Mf
Citizens Red Line Taxi 44 N 5th Av
Tucson Ariz 15 W7XPJ 157.53 Bf
City Cab Co 2202 Lane St
Falls City Neb 2 WØXDV 157.53 Mf
City Cab Co 11b N Main St
Minot ND 10 WØXHL 157.53 Mf
City Cab Co 306 Beltrami Av
Bemidji Minn 5 WØXIF 157.53 Bf
City Cab Co Inc 253 Main St
Fitchburg Mass 12 W1XGV 157.53 Bf
City Cab Co 10 PO Sq
Taunton Mass 12 W1XMC 157.53 Rf
City Cab Co 383 Lisbon St
Lewiston Me 10 W1XND 157 53 Mf
City Cab Co 23 Fenton Place
Jamestown NY 12 W2XSW 157.53 Rf
City Cab 840 Asbury Av
Ocean City NJ 10 W2XTS 157.53 Lf
City Cab 1050 Blair Av
Tyrone Pa 2 W3XHU 157.53 Lf
City Cabs 341 N Wash Av PO Box 1098
Pulaski Va 10 W4XRQ 157.53 Df
City Cab 215 E Main St
Front Royal Va 10 W4XSJ 157 53 Bf
City Cab Co 329 2nd St
Henderson Ky 3 W4XSW 157 53 Gf
City Cab 1126 N Hudson St
Arlington Va 20 W4XTW 157 53 Gf
City Cab Co 243 S Orange Av
Orlando Fla 25 W4XTZ 157.53 f
City Cab Co 408 Montgomery St
Montgomery Ala 10 W4XXI 157.53 Lf
City Cab 115 S Augusta St
Staunton Va 15 W4XXU 157.53 Lf
City Cab Co 434 W Univ. Av
Gainesville Fla 12 W4XZC 157.53 f
City Cab Co 701–3 Hamilton St
Leaksville NC 6 W4XZL 157.53 Bf
City Cab Co 107 E 4th St
Odessa Tex 7 W5XOL 157.53 Bf
City Cab Co 401 N Spring St
Tyler Tex 10 W5XPM 157.53 Ba
City Cab Co 109 S Theobald
Greenville Miss 10 W5XLF 157 53 Mf
City Cab Co 1308 Bway
Lubbock Tex 20 W5XRV 157 53 Ff
City Cab Co 118 Austin St
Denton Tex 10 W5XSO 157.53 f
City Cab Co 626 N Main St
Borger Tex 15 W5XUY 157.53 a
City Cab Co 117 W 6th St
Amarillo Tex 15 W5XWD 157.53 Mf
City Cab Co 512 W Larkin
Athens Tex 10 W5XYB 157.53 Rf
City Cab 511 Ramond St
Corona Calif 10 W6XCC 157.53 Mf
City Cab Co 2144 Kirk St
Fresno 2 Calif 2 W6XOT 157 53 a
City Cab Co 4581/2 Bell Flower Blvd
Bellflower Calif 10 W6XSJ 157 53 Mf
City Cab Co 1 W Vine St
Mt Vernon Ohio 4 W8XLI 157 53 Mf
City Cab Co 160 Water St
Benton Harbor Mich 12 W8XJK 157 53 Mf
City Cab Co 411 Broad St
Port Huron Mich 6 W8XOU 157 53 Mf
City Cab Co 219 W Court St
Washington C H Ohio 6 W8XPB 157 53 Mf
City Cab Co 124 E Crawford St
Findlay Ohio 12 W8XPL 157 53 Mf
City Cab Co 207 N 4th St
Niles Mich 8 W8XRK 157 53 Mf
City Cab Co 60 N Main St
Oshkosh Wis 14 W9XKV 157 53 Mf
City Cab Co 408 E Hickory
Streator Ill 4 W9XND 157 53 Mf
City Cab Co 108 E Main St
Benton Ill 5 W9XSG 152 27 Mf
City Cab Co 14 N Locust
Janesville Wis 10 W9XVS 157.53 Mf
City Cab Co 1031 19th St
Bakersfield Calif 8 W6XDK 157.53 Mf
City Cab Co 205 W Liberty St
Farmington Mo 6 WØXNQ 157.53 Mf
City Cab Co 1299 Westminster St
Providence RI 50 W1XNR 157.53 Mf
City Cab Co 531 State St
Madison Wis 50 W9XJP 157.53 Mf
City Hall Taxi 1383 Wash St
W Newton Mass 8 W1XNJ 157.53 Rf
City Service Taxicab 430 Genesee St
Buffalo NY 30 W2XOW 157.53 Mf
City Taxi 3604 Wash Av
Newport News Va 6 W4XBL 157 53 Bf
City Taxi Co 113 N Brewer St
Paris Tenn 10 W4XHE 157 53 Mf
City Taxi Co 511 East K St
Grants Pass Ore 5 W7XOW 157.53 a
City Taxi Service 700 S Court St
Visalia Calif 12 W6XBI 157.53 Mf
City Taxi Service 130 South L
Tulare Calif 14 W6XLY 157.53 Mf
City Taxi Service 918 2nd St
Porterville Calif 3 W6XLW 157.53 Bf
City Taxi Service 123 W 3rd St
Rushville Ind 10 W9XBW 157.53 Bf
City Taxi Service 618 W 2nd St
Defiance Ohio 8 W8XRI 157.53 Mf
City Transit Taxi 320 S Garay Av
Pomona Calif 20 W6XQJ 157.53 Mf
City Trans Co 610 S Akard St
Dallas Tex 250 W5XQN 157.53 Gf
Modern Delivery Service 1120 S Olive St
Los Angeles Calif 100 W6XBG 157 41 Lf
City Yellow Cab Co 356 W Bowery St
Akron Ohio 19 W8XAE 157 53 Mf
Clark Cab Co 120 N State St
Belvidere Ill 6 W9XRQ 157.53 Mf
Clark's Taxi 52 E Blackwell St
Dover NJ 2 W2XUJ 157.53 Lf
Clearwater Transit Inc 305 S Garden Av
Clearwater Fla 8 W4XMY 157.53 Mf
Cleveland Auto Club Co 2605 Euclid Av
Cleveland Ohio
Clipper Cab Co 251 W Washington St
Frankfort Ind 5 W9XRE 152 27 Bf
Clipper Cab Co 109 W Pecan St
Sherman Tex 7 W5XVI 157.53 Mf
Clovis Transit Co 117 E Grand Av
Clovis NMex 12 W5XQZ 157.53 Mf
C & L Transportation 124 W Main St
Lewiston Montana 6 W7XKW 157.53 Bf
Club Cars 115 Lake St
Salisbury Md 20 W3XHF 157.53 Bf
Coach Corp of Freeport State & Douglas Sts
Freeport Ill 7 W9XDE 157.53 Bf
Cobby's Taxi 56 W Market St
Corning NY 10 W2XZF 157.53 f
Columbia Yellow Cab Co Inc 801 Cherry St
Columbia Mo 30 WØXFJ 157.53 Wf

BROWNING FREQUENCY METERS

Standard in the Communications Services Since 1939—Constantly Improved to Meet the Needs of Communications Supervisors



MODEL S-4: Hand Calibrated at any 1 to 5 Frequencies between 1.5 and 100 Megacycles

Use the BROWNING model S-4 frequency meter for communications systems operating on frequencies between 1.5 and 100 mc. This meter is calibrated at any number of points from one to five, as required.

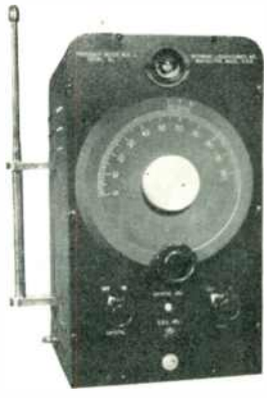
So accurate and convenient is this highly perfected design that you can check the frequency of any transmitter within 60 seconds.

Accuracy of ±.0025% meets the FCC requirements. Stability is assured by the use of crystal control, an electron-coupled oscillator, and a line voltage regulator. Operates from 110–115 volts, AC or DC.

Precision settings are indicated by a cathode-ray eye that flutters at the beat frequency, and holds steady at resonance. Ear phones can be used to check the frequency of distant transmitters, picked up on a suitable receiver. Each dial division represents approximately 25 cycles at the lower frequencies. You don't have to guess when you use this BROWNING frequency meter.

Rugged construction is intended to withstand years of use in communication service. Weight 15 lbs. Six tubes, plus voltage regulator are furnished.

MODEL S-7: Hand Calibrated at any 1 or 2 Frequencies between 72-76 and/or 152-162 Megacyles



The BROWNING crystal-controlled S-7 frequency meter is intended for communications systems operating in either or both bands between 72–76 and 152–162 mc. It is calibrated at any one or two frequencies within that range. In design, this instrument is similar to the S-4, and it can be used with the same degree of speed and precision in checking mobile and headquarters transmitters.

The accuracy of ±.005% meets FCC requirements. By following the simple procedure outlined in the instructions, an accuracy of ±.0025% can be achieved.

Visual indication of resonance is provided by a cathode-ray tube that flutters at beat frequency, and holds steady at resonance. Remote transmitters, picked up on a suitable receiver, can also be checked for frequency. At the low end of the 72-mc. band, each dial division represents about 1,000 cycles. The ease with which readings can be made is an important feature of BROWNING frequency meters.

Operates on 110–115 volts AC or DC. The weight is 15 lbs. Six tubes plus voltage regulator are provided.

MODEL S-5: Hand Calibrated at any 1, 2, or 3 Frequencies between 30 and 500 Mc.

The BROWNING S-5 meter, accurate to ±.0025%, is suitable for all standard and special services on 30 to 500 mc. The crystal, contained in a temperature-controlled oven, is accurate to ±.001%. The electron-coupled oscillator is temperature compensated, and a line-voltage regulator is built into the meter.

If desired, the panel, 8¾ by 19 ins., can be rack mounted. It is not necessary to bring the mobile transmitters to the location of the meter. Signals can be picked up on a receiver to which the meter is coupled. The meter is then tuned for zero beat. An easy-reading scale of 5,000 divisions is operated with a precision worm drive. At 30 mc., one division represents about 24 cycles.

Operates on 105–115 volts AC. Weight 35 lbs. Eight tubes and a voltage regulator are supplied.

IMPORTANT: Every communications system should have a BROWNING model RH-10 calibrator, to check any make of frequency meter against Bureau of Standards WWV signals. The RH-10 is standard for this purpose.

BROWNING LABORATORIES, INC.
750 Main Street, Winchester, Mass.

In Canada, Address:
MEASUREMENT ENGINEERING, Ltd.
Arnprior, Ontario

BROWNING LABORATORIES, Inc.
750 Main St., Winchester, Mass.

Please send me technical details and prices on the following Browning precision products:

- ☐ S-4 Frequency Meter
- ☐ S-7 Frequency Meter
- ☐ S-5 Frequency Meter
- ☐ WWV Frequency Calibrotor
- ☐ Laboratory Oscilloscope
- ☐ FM and FM-AM Tuners

Name.....
Address.....
Company Connection.....

TRUCKS, BUSES, TAXIS — Continued

Columbus Green Cabs Inc 307 S 6th St
Columbus 15 Ohio 56 W8XHR 157.53 Mf
Combined Cab Service Inc 2337 Sherman Av NW
Washington DC 250 W3XDJ 157.53 f
Commercial Cab Co Inc 2923 E 95th St
Chicago Ill 28 W9XVL 157.53 Lf
Community Cab Co 7320 Wisconsin Av
Bethesda Md 25 W3XNK 157.53 Rf
Community Transit Co 15 N Main St
Helena Montana 6 W7XIJ 157.53 Mf
Coning's Elec App Serv Co 114 N Barron St
Eaton Ohio 5 W8XOB 152.15 Bf
State of Conn 100 Washington St
Hartford Conn 1 W1XFY 2.455 a
State of Conn 165 Capitol Av
Hartford Conn 1 W1XHX 2.455 a
Cook's Cab Service 110 Small St
Salisbury Md 20 W3XHB 157.53 Mf
Coop Cab Co Inc 1318 Bway
Columbus Ga 100 W4XAI 157.53 Mf
Corvallis Taxi Serv 213 N 4th St
Corvallis Ore 12 W7XMS 157.53 Mf
Courtesy Cab Co 219 Ocean Av
Laguna Beach Calif 5 W6XWX 157.53 Bf
Courtesy Cab Co 227 W Main St
W Frankfort Ill 7 W9XDT 157.53 Bf
Courtesy Cabs 11 San Marcus Ct
Santa Barbara Calif 20 W6XYH 157.53 Bf
Craig Cab Co Inc 505 S Mulberry St
Muncie Ind 16 W9XOE 157.53 Lf
Crescent Motors Inc 920 Wilmer Av
Anniston Ala 18 W4XRB 157.53 Bf
Crescent Motors Inc 507 W Clinton St
Huntsville Ala 18 W4XRD 157.53 Bf
Crescent Motors Inc 709 1st Av
Gadsden Ala 28 W4XRF 157.53 Bf
Cromwell 6200 Taxi Serv 14 RR Av
Middletown NY 25 W2NVM 157.53 Mf
Crump Bros Cab Co 212 E Houston
Sherman Tex 15 W5XDZ 157.53 Rf
Cubby's Taxi 336 State St
Ogdensburg NY 9 W2XXF 157.53 Bf
Cunningham Taxi Co 404 Weatherly St
Borger Tex 10 W5XTF 157.53 Mf
C & Y Cab Co 522 Robert St
Fort Atkinson Wis 2 W9XCV 157.53 Mf
Dalles Taxi Co 407 Washington St
The Dalles Ore 10 W7XLT 157.53 Mf
D & C Cab Co 44 Bway
Hornell NY 5 W2XVZ 157.53 Lf
Dan's Taxi Serv 826 4th St
San Rafael Calif 10 W6XLQ 157.53 Mf
Danville Vet Cab Co 39 S Vermilion St
Danville Ill 10 W9XQB 152.27 Mf
Geo Wm Davidson 103 Prairie St
Ottawa Ill 1 W9XYB 152.15 Ba
Davis Cab Co 142 Randolph Av
Pulaski Va 10 W4XQJ 157.53 Lf
Davis Deluxe Cab Co 625 Hampshire St
Quincy Ill 10 W9XQF 157.53 Bf
Davis Taxi 19 Perkins St
Gloucester Mass 10 W1XFP 157.53 Mf
Day's Quarter Taxi Co 418 15th St
Columbus Ga 50 W4XZB 157.53 Mf
Decatur Transit 301 1st Av
Decatur Ala 28 W4XME 157.53 Mf
Deerfield Packing Corp Seabrook Farms
Bridgeton NJ 25 W2XHH 157.41 Lf
DeLuxe Cab Co 120 S Green
Ottumwa Iowa 15 WØXER 157.53 Mf
DeLuxe Cab 206 Ward Av
Caruthersville Mo 10 WØXMO 157.53 Mf
DeLuxe Cab Co 914 Houston St
Chattanooga 2 Tenn 41 W4XON 157.53 Mf
DeLuxe Cab Co Broad Av
Albany Ga 20 W4XBB 157.53 Mf
DeLuxe Cab Co 210 S Church St
Jackson 1 Tenn 15 W4XSF 152.27 Mf
DeLuxe Cab Co 222 Main St
La Grange Ga 15 W4XUC 157.53 Mf
DeLuxe Cab Co 127 N 7th St
Nashville Tenn 20 W4XVP 157.53 Bf
DeLuxe Cab Co 507 F St
Eureka Calif 4 W6XYU 157.53 f
DeLuxe Cab Co 1300 N Saginaw St
Flint Mich 35 W8XIL 157.53 Mf
DeLuxe Cab Co 10½ E Main St
Danville Ill 5 W9XFD 157.53 Mf
DeLuxe Taxi Service 207 N Virginia St
Reno Nev 11 W7XMU 157.53 Bf
DeSota Sedan Service 1399 Post St
San Francisco Calif 75 W6XAZ 157.53 Mf
Diamond Cab Co 116 Buffalo St
Johnson City Tenn 12 W4XMR 157.53 Mf
Diamond Cab 20 E Piccadilly St
Winchester Va 10 W4XVT 157.53 Mf
Diamond Cab Co 704 Calif Av
Long Beach Calif 82 W6XKY 157.53 Mf
Diamond Cab Co PO Box 107
Pullman Wash 7 W7XKY 157.53 Mf
Diamond Cab Co 609 Trent Av
Spokane Wash 20 W7XMQ 157.53 Gf
Diamond Cab Co 32447 Piper St
E Detroit Mich 10 W8XOS 157.53 Mf
Diamond Cab Co 6501 W 84th St
Inglewood Calif 15 W6XZD 157.53 Bf
Diamond Taxi Inc 15-25 W Third St
Lowell Mass 30 W1XBG 157.53 Mf
Dime Taxi Co 1316 High St
Alameda Calif 50 W6XBC 157.53 Mf
Ernest E Dinsmore 107 Stanton St
Ames Iowa 5 WØXKD 157.53 a
Dinuba Cab Co 108 E Tulare St
Dinuba Calif 15 W6XDO 157.53 Mf
Dixie Cab Co 553 Ellis St
Augusta Ga 18 W4XSZ 157.53 Bf
Dixie Cab Co 201 S Elm St
Denton Tex 10 W5XQP 157.53 Mf
Dixie Taxi Service Inc 59 Government St
Mobile Ala 30 W4XAL 157.53 Mf
Dodge Taxi & Bus Co 110 W High St
Piqua Ohio 11 W8NJN 157.53 Lf
Domino Taxi 1110 Avenue K
Lubbock Tex 10 W5NAT 157.53 Bf
Don's Cab Co 733 Bway
Seaside Ore 4 W7XQZ 157.53 Bf
Dore's Taxi Inc 179 North Av
Plainfield NJ 7 W2XQS 157.53 Bf
Dotty Cab Co 536 N Parish St
Jackson Miss 35 W5XSQ 157.53 Kf
DuBois Cabs Inc 22 Catherine St
Poughkeepsie NY 20 W2XYL 157.53 Lf
Dundalk Cab Assoc Inc 3006 Dunleer Rd
Dundalk Md 20 W3XHV 157.53 Bf
Dunellen Taxi Serv 311 North Av
Dunellen NJ 4 W2XTE 157.53 Mf
E Providence Cab Co Inc 152 Warren Av
East Providence RI 12 W1XNB 157.53 Hf
Economy Cab Co 316 N Oak Av
Mineral Wells Tex 18 W5X VB 157.53 Gf
88 Cab Co 118 E Madison St
Ottawa Ill 9 W9XNF 157.53 Mf
Electronic Equip Co 301 E 5th St
Fort Worth Tex 1 W5XVM 157.53 Rf
Ellington Taxi Serv 1900 Erie St
N Kansas City Mo 10 WØXLU 157.53 Bf
El Monte Taxi Co 133 S Tyler Av
El Monte Calif 15 W6XMS 157.53 Mf
Emery Hotel Taxi Co Inc 22 South Av
Bradford Pa 10 W3XGB 157.53 Wf
Empire Taxi Co 63 Mohawk St
Cohoes NY 4 W2XZN 157.53 Gf
Egleston Sq Independent Taxi Co 1630 Wash
Boston Mass 10 W1XHU 157.53 Bf
Epps Cab Co 126 N Angelina St
Lufkin Tex 7 W5XKQ 157.53 Lf
Erie Taxicab Co 117 E 10th St
Erie Pa 40 W3XGJ 157.53 Mf
Escanaba Taxi Service 615 Ludington St
Escanaba Mich 6 W8XPF 157.53 Mf
Everett Sq Taxi 449 Bway
Everett Mass 8 W1XGX 157.53 Bf
Peter J Faber 6085 Newburg Av
Chicago Ill 1 W9XDM 157.89 Rf
Falls Cab Co 107 W Portage Trail
Cuyahoga Falls Ohio 7 W8NIX 157.53 Mf
Farrell's Inc 110 S 5th St
Manhattan Kans 12 WØNJV 157.53 Mf
Fayetteville Checkered Cab Co 115 W Center
Fayetteville Ark 10 W5XTX 157.53 Ff
52 Taxi Service 923 Lincoln Av
Pascagoula Miss 10 W5XJF 157.53 Mf
Finnarn Taxi 21 Public Sq
Greenville Ohio 4 W8XIV 157.53 Lf
500 Cab Co 117 N Townsend St
Ada Okla 5 W5XJI 157.53 f
Flamingo Cab Co 1043 5th St
Miami Beach Fla 6 W4XLV 157.53 Mf
Flushing Main St Taxi Serv 135 40th Rd
Flushing NY 5 W2NAO 157.53 Gf
FM Company 260 Main St
Great Barrington Mass 4 W1XMB 157.53 Hf
Thomas M Ford 1311 Green Ridge St
Scranton Pa 12 W3XDR 157.53 Bf
Fort Meade Taxi Serv Hillendale
Silver Springs Md 15 W3XFT 157.53 Rf
Fort Wayne Safety Cab Co 1933 Fairfield Av
Fort Wayne Ind 40 W9XLM 157.53 f
Fort Wayne Safety Cab Co 325 E Wayne St
Fort Wayne Ind 76 W9NJV 157.53 Mf
44 Cab Co Box 37
Pine Bluff Ark 15 W5XII 157.53 Mf
44 Cab & Bus Co Inc Cate & Bridge Sts
Jonesboro Ark 20 W5XKO 157.53 Mf
Fountain City Taxi Co 4612 N Bway
Knoxville Tenn 5 W4XWL 152.27 Mf
Four-O-Eight Cab Co 1530 Virginia Av
Joplin Mo 35 WØXKK 157.53 Mf
Fowler Taxicab Co 710 Court St
New Castle Pa 6 W3XOH 157.53 Mf
Fred's Cab Co 109 N Rock Island
El Reno Okla 10 W5XDT 157.53 Lf
Fulton Taxi Co 62 So 1st St
Fulton NY 3 W2XDF 157.53 Rf
Gallagher & Sons 32nd & Walnut Sts
Philadelphia Pa 3 W3NCR 157.53 Af
Garden Cabs 4954 Whittier Blvd
E Los Angeles Calif 75 W6XPK 157.53 f
Garden City Cab Co Inc 24 Broad St W
Savannah Ga 40 W4XYO 157.53 Mf
Garfield Cab Co 11 Terhune Av
Lodi NJ 5 W2XYJ 157.53 Lf
Gary Cab Co 754 Washington St
Gary Ind 15 W9XAJ 157.53 Mf
Geisen Cab & Coach Co 1300 Jefferson St
Des Plaines Ill 11 W9XQP 157.53 Mf
Gene's Taxi 13 Clinton St
Nashua NH 9 W1XGM 157.53 Kf
Geneva Cab Co 311½ W State St
Geneva Ill 12 W9XTI 157.53 G
George's Radio & Telev Co 816 F St NW
Washington DC 20 W3XGR 157.53 Rf
H B Getz & Sons 69 1st St SE
Massillon Ohio 10 W8XDH 157.53 L
Gillis Taxi Co NW Cor Public Sq
Troy Ohio 10 W8XLK 157.53 Lf
GI Cab Co 35 S Mission St
Wenatchee Wash 10 W7XQL 157.53 Mf
GI Taxicab Co Inc 509 E 5th St
Des Moines Iowa 75 WØXKG 157.53 Lf
Eugene S Goebel 935 Pleasant St
Oak Park Ill 1 W1ØXG 157.89 Mf
Gold Stripe Taxi Co 700 Citizens St Bk Bldg
Houston Tex 53 W5XKY 157.53 Gf
Graham Ambulance Serv 2615 Silver Ridge Av
Los Angeles 26 Calif 1 W6XYB 157.41 Rf
Graham Bros Inc 2000 N Peck Rd
El Monte Calif 26 W6XLU 157.41 Mf
M R Gramling 110 Commerce St
Fort Worth Tex 40 W5XBE 157.53 Rf
Granite Stages 64 Union St
Peterborough NH 20 W1ØXEC 43.30 Mf
Gray Cab Co Inc 357 Cherry St
Macon Ga 15 W4XZN 157.53 K
Gray Service Co 268 E Ferry St
Buffalo 8 NY 10 W2XOQ 157.53 Ff
Green Ball Taxi 214 S 4th St
Waco Texas 25 W5XOG 157.53 Mf
Green Top Taxi Service 1207 Pacific Av
Tacoma Wash 8 W7XHW 157.53 Mf
Greenville Cab Co 315 E McBee Av
Greenville SC 12 W4XOB 157.53 Bf
Green & White Cab Co 207 E Center
Pocatello Idaho 8 W7XNA 157.53 Mf
Green & White Cab Co 1815 Bway
Denver Colo 50 WØNJD 157.53 Gf
Fred A Green 4 Nepessing St
Lapeer Mich 3 W8XOJ 152.27 a
Greyhound Cab 4213 Reisterstown Rd
Baltimore Md 215 W3XGD 157.53 Lf
Greystone Cab Box 888
Nampa Idaho 3 W7XNE 157.53 Kf
Grove Taxi Co 1304 Mifflin St
Huntington Pa 10 W2XSU 157.53 Mf
Hackensack Taxi Service 7 E Mercer St
Hackensack NJ 30 W2XKH 157.53 Lf
Hamiltons Frozen Food Serv 3211 W Davis St
Dallas Tex 6 W5XYG 157.41 a
Ham & Merv Taxi 215 Market St
Alton Ill 10 W9XAG 152.27 Mf
Hampton Cab Service 16 Collier St
Hampton Va 10 W4XSH 157.53 Mf
Hanford Taxi Service 108 N Douty St
Hanford Calif 10 W6XAN 157.53 Mf
Harp Bros 18 S Hanover St
Pottstown Pa 6 W3XCX 157.53 Bf
Harrisburg Taxi & Bag Co Strawberry St
Harrisburg Pa 35 W3XDL 157.53 Mf
Harris Taxi 14 Mill St
Littleton NH 4 W1XLY 157.53 Mf
Hatboro Taxi Serv 37 S York Rd
Hatboro Pa 6 W3XMY 157.53 Rf

TRUCKS, BUSES, TAXIS — Continued

Hathaway Oil Co 501 County St
New Bedford Mass 25 W1XGI 157.41 Lf
Haven Cabs 356 Magnolia Av
Winter Haven Fla 12 W4XUM 157.53 f
Hawley Cabs Public Sq No 315
Troy Ohio 6 W8XPW 157.53 Rf
Hazle Cab Co 10 E Broad St
Hazleton Pa 12 W3XFP 157.53 Mf
M B Healer 115 W Anderson
Brownwood Tex 15 W5XDX 157.53 Rf
Hecks Taxi Co 123 S 4th St
Quincy Ill 6 W9XUM 157.53 Mf
Donald J Henderson 502 E 7th St
Tillamook Ore 5 W7XQJ 157 53 Rf
Henley's Yellow Cab Manatee Av at 10th St
Bradenton Fla 14 W4XYZ 157.53 f
Hennessey Taxi Service 244 Westfield Av
Elizabeth NJ 14 W2XJN 157 53 Lf
Herbert's Taxi 15 Stowell St
St Albans Vt 4 W1XNH 157.53 Bf
H & H Cab Co 11 N Park St
Sapulpa Okla 10 W5XUT 157.53 Mf
Hickey Cab Co 2 Fairfield Av
Bridgeport Conn 15 W1XEF 157.53 Lf
Highway Radio Inc 1424 16th St
Washington 6 DC 200 W9XIQ 43.82 Mf
Highway Radio Inc 1424 16th St
Washington 6 DC 100 W9XPK 157.41 Mf
Hillside Terminal Cabs Inc 509 48th St
Union City NJ 10 W2XIW 157.53 Lf
Hilltop Cab Co 8 Hillcrest Dr
Daly City 25 Calif 5 W6XWK 157.53 Mf
Hislop Taxi 58 Porter St
Portsmouth NH 10 W1XJH 157.53 Kf
Harold Holt Melendy Rd
Hudson NH 10 W1XJJ 157.53 Rf
Virgin Hodson 2136 Sherman Av
North Bend Ore 4 W7XPP 157.53 Rf
Hogan Cab Co 1903 Holladay St
Portsmouth Va 25 W4XTI 157.53 Lf
Holmes Taxi 88 North St
Catskill NY 5 W2XBP 157 53 Lf
Holyoke Yellow Cab Inc 276 High St
Holyoke Mass 10 W1XDM 157.53 Mf
Homestead Cab Co PO Box 759
Homestead Fla 4 W4XAM 157.53 f
Hoots Cab Co 600 Webster St
Chillicothe Mo 10 WØXLO 157.53 Mf
Hot Shot Taxi 210 S Main St
Carthage Mo 10 WØXLB 157.53 Mf
Hotel Boise Cab Co 820 Bannock St
Boise Idaho 16 W7XIF 157 53 Mf
Howe Motor Co Inc 97 Pleasant St
Claremont NH 10 W1XJQ 157.41 Mf
Hub City Taxi Co 107 W Main St
Jackson Tenn 10 W4XBJ 157.53 Mf
Hudson Taxi Co 648 Bway
Bayonne NJ 5 W2XKX 157 53 Lf
James H Hughes 303 E Tyler St
Longview Tex 4 W5XIQ 157.41 Mf
Hurry Cab 127 N 7th St
Klamath Falls Ore 13 W7XKS 157.53 Mf
Hutchinson Bus & Cab Co 16 East A St
Hutchinson Kans 45 WØXFH 157.53 Lf
Ideal Taxi Co 767 Main St
Willimantic Conn 3 W1XJL 157.53 Kf
Univ of Illinois
Galesburg Ill 3 W9XDV 152.15 Mf
Indiana Deluxe Cab Co 710 Niles Av
South Bend Ind 45 W9XMV 157.53 Mf
Indio Yellow Cab 705 Tingman
Indio Calif 5 W6XXD 157.53 Mf
Intermountain Trans Co 2134 Wyoming St
Salt Lake City Utah 20 W7XNH 157.53 Mf
Jacobs Taxi Service 440 S Main St
Spring City Pa 10 W3XPJ 157 53 Rf
Jared Checker Cab Co 402 E Sullivan St
Kingsport Tenn 10 W4XVA 157.53 Mf
Adam Jasielski 1243 N Avers Av
Chicago Ill 10 W9XFD 157 53 Bf
Joe's Taxi 13th & Green Sts
Augusta Ga 15 W4XWJ 157.53 Mf
Joe's Taxi 114 E Market St
Corning NY 4 W2XVH 157 53 Bf
Jolly Cab Co 110 S 2nd St
Memphis 3 Tenn 70 W4XLT 157.53 Mf
Jordan Taxi Co 15 McFarland St
Charleston WVa 30 W8XGH 157 53 Gf
June Newt Cutrer 116½ Walnut St
Hattiesburg Miss 20 W5XRX 157.53 Mf
June Taxi Service Inc 422 S 7th Ave
Mt Vernon NY 10 W2XZJ 157.53 Wf
Kedzie Protective Patrol 6 S Kedzie St
Chicago Ill 22 W9XRK 157.41 Lf
Kellogg Taxi 129 Kellogg Av
Kellogg Idaho 6 W7XLB 157.53 Mf
A A Kemp 706 3rd Av W
Kalispell Mont 7 W7XQT 157.53 a
Kennedy & Sons Detective Ag 1654 NW 19th St
Miami Fla 4 W4XVC 152.15
Kenosha Checker Cab Co 1216 59th St
Kenosha Wis 25 W9XTM 157.53 Mf
Kenton Kab Ko 133 S Detroit St
Kenton Ohio 5 W8XOY 157.53 Ba
Frank Ketter 534 Deerfield Av
Highland Park Ill 25 W9XPP 157.53 Lf
Keystone Auto Club 220 S Broad St
Philadelphia Pa 75 W3XOB 157.41 Mf
Kimball's Taxi Co 224 S James St
Ludington Mich 12 W8XSG 157.53 Mf
Kimble Taxi Service 404 Main St
Boonton NJ 6 W2XON 157.53 Lf
Lester Kinabrew Jr 510 W Larkin
Athens Tex 10 W4XAU 157 53 Gf
Knoxville Airport Transit 521 E Cumberland
Knoxville Tenn 15 W4XXM 152 27 Mf
Konen Cab Co 405 N 5th St
Fargo N Dak 15 WØXJF 157.53 Mf
Kramp's Taxi 183 Broadway
Newburgh NY 10 W2XMI 157.53 Lf
Kresge Taxi Service 204 Spencer St
Ithaca NY 4 W2XTV 157.53 Bf
Kyle Elam Taxi 323 Austin Av
Port Arthur Tex 14 W5XQN 157.53 Lf
Lackawanna Taxi Co 101 S Wash Av
Scranton Pa 5 W3XEM 157 53 Bf
Laclede Gas Co 923 N 7th St
St Louis Mo 75 WØXIJ 157 53 Mf
LaCrosse City Car Co 309 Rivoli Bldg
LaCrosse Wis 24 W9XTV 157 53 Mf
Lafayette Taxi Service 147 Chestnut St
Meadville Pa 10 W3XDO 157.53 Mf
LaGrange Cab Co 108 W Burlington Av
LaGrange Ill 15 W9XPF 157 53 Mf
Lake Cabs Inc 119 Richmond St
Painesville Ohio 10 W8XMG 157 53 Bf
Lakeview Cab 43 N McCamly
Battle Creek Mich 12 W8XPJ 157.53 Lf
Lapeer Taxi Co 256 W Genessee St
Lapeer Mich 3 W8XQZ 157.53 f

TRUCKS, BUSES, TAXIS — Continued

Laurel Line Taxi Co 109 Cedar Av
Scranton Pa 20 W3XHJ 157.53 Mf
Lawa Funeral Home 29 Federal St
Brunswick Me 2 W1XGR 157.41 Mf
Lawson Taxi Co 557 N Columbia St
Frankfort Ind 7 W9XUF 157.53 Bf
Legard's Taxi Service 245 North St
Bath Maine 9 W1XDX 157.53 Mf
Liberal Taxi Co 1 S Lincoln
Liberal Kans 10 WØXLI 157.53 Mf
Liberty Cab Co 601 1st Av S
Fort Dodge Ia 5 WØXHH 157.53 Bf
Liberty Cab Co 624 Vigo St
Vincennes Ind 10 W9XSC 157.53 Mf
Liberty Cab Co 111 Lee St
Montgomery Ala 30 W4XWT 157.53 Mf
Liberty Cab Corp
Evansville Ind 60 W9XLB 157.53 Mf
Limited Cab Co 1191½ E College St
Iowa City Ia 25 WØXCS 157.53 Lf
Limousine Assoc North 3 Lincoln
Spokane Wash 40 W7XKQ 157.53 Mf
F P Lindley MD
Powder Springs Ga 3 W4XUK 157.53 Mf
Little's Red Cab Co 205 S Wash
Crawfordsville Ind 4 W9XTP 157.53 Mf
Logan Cab Co 313 Pearl St
Logansport Ind 5 W9XMS 157.53 Mf
Long's Bag Transfer Co 600 Church St
Lynchburg Va 60 W4XOS 157.53 Mf
Longhorn Taxi Co 348 Proctor St
Port Arthur Tex 10 W5XJO 157.53 Mf
Lorain Cty Radio Corp 203 9th St
Lorain Ohio 2 W8XFU 157.53 Gf
Lorain Cty Radio Corp 203 9th St
Lorain Ohio 2 W8XHF 157.53 Gf
Louisville Taxi & Transf Co 832 W Liberty
Louisville Ky 63 W4XNV 157.53 Rf
Lucas Funeral Home 617 N Sylvania
Fort Worth Tex 6 W5XYS 157.41 a
Luxor Cabs 1461 Pine St
San Francisco Calif 50 W6XCR 157.53 Mf
Lyndhurst Cab Service 576 Valley Brook Av
Lyndhurst NJ 5 W2XNL 157.53 Bf
Lynn Cab Co 3 Almond St
Lynn Mass 18 W1XDE 157.53 Mf
MaComb Cab Co 121 E Carroll St
MaComb Ill 4 W9XVK 157.53 Mf
Manitowoc Checker Cab Co 714 Wash St
Manitowoc Wis 6 W9XWM 157.53 Bf
Marion Radio Red Cab 473 W Center St
Marion Ohio 10 W8XLW 157.53 Ff
Martin Trans Co 113 Beach St
Redwood City Calif 30 W6XSW 157.53 Kf
Maryland Drydock Co 1900 Childs St
Baltimore Md 26 W3XES 157.41 Bf
Mather's Taxi 78 E Commerce St
Bridgeton NJ 6 W2XOZ 157.53 Lf
H C Mattes 6116 N Knox Av
Chicago Ill 2 WIØXEQ 157.89 Rf
G E Matteson 368 Main St
Greenfield Mass 9 W1XHB 157.53 Mf
McConnell's Taxi Service 213 N 9th St
Stroudsburg Pa 15 W3XFR 157.53 Bf
Orvie S McDaniel 323 S Canyon St
Carlsbad NM 14 W5XMG 157.53 Mf
McGill's Taxi Co 240 Sunset Av
Asheboro NC 6 W4XNL 157.53 Bf
Medford Taxi Service 321 Salem St
Medford Mass 10 W1XGB 157.53 Mf
Media Taxi Service 312 Baker St
Media Pa 15 W3XLY 157.53 Mf
Medford Cab Co 104 E Main St
Medford Ore 7 W7XRS 157.53 Mf
Mercer Taxi Service 1735 K St
Mercer Calif 10 W6XZF 157.53 Bf
Miami Bottled Gas Inc 1701 NW 7th Av
Miami Fla 10 W4XNN 157.41 Mf
Michigan Cab Co 715 River St
Lansing 3 Mich 45 W8XMJ 157.53 Mf
Middletown Taxi Service 16 King St
Middletown NY 6 W2XUN 157.53 Lf
Midland Taxi Co 143 Gordon
Midland Mich 15 W8XSD 157.53 Mf
Mid-Way Cab Corp 10¼ Wash St
Poughkeepsie NY 15 W2XNF 157.53 Lf
Miller Taxi Service 112 State St
Springfield Mass 20 W1XJY 157.53 Mf
Minot Cab Co 100 S Main St
Minot ND 10 WØXNN 157.53 Bf
Minute Man Cab 110 Wash St
W Warwick RI 10 W1XMG 157.53 Hf
Mission Taxi Co 151 W San Fernando St
San Jose Calif 5 W6XMU 157.53 f
M L Hall Inc 801 S Victory Blvd
Burbank Calif 15 W6XCN 157.53 Bf
Mobile Taxi Call Service 19977 Woodworth St
Detroit Mich 20 WSXQF 157.53 Mf
Model Taxi Corp 115 S State St
Syracuse NY 30 W2XVB 157.53 Gf
Monroe Cab Co 211 Grammont St
Monroe La 5 W5XWK 157.53 Bf
Monroe Taxi Service Rt 17
Monroe NY 4 W2XSD 157.53 Lf
Moreland's Ambulance Serv 3363 Imperial Hwy
Lynwood Calif 5 W6XBV 157.41 Lf
Morgan Cab Co 445 N Magnolia St
Laurel Miss 20 W5XZD 157.53 Mf
Morro Limousine Serv 693 McDonald Av
Brooklyn NY 15 W2XRL 157.41 Lf
Motorola Inc 4545 Augusta Blvd
Chicago Ill 1 W9XMG 157.89 Mf
Nash Taxi Service 567 Warren Av
Brockton Mass 10 W1XCI 157.53 Mf
Natchez City Lines Inc 23 Aldridge St
Natchez Miss 20 W5XTP 157.53 Mf
National Bestg Co Inc 60 Broad St
New York 4 NY 2 W2XQV 27.44 a
National Bus Commun Inc 141 W Jackson Blvd
Chicago 4 Ill 133 W9XIS 31.02 Mf
National Bus Commun Inc 141 W Jackson Blvd
Chicago 4 Ill 87 WIOXEO 43.98 Mf
Newark Taxi Service 113 E Union St
Newark NY 4 W2XVS 157.53 Bf
Newton's Central Taxi Co 1202 Monroe St
Endicott NY 10 W2XYD 157.53 Bf
Neway Taxi Co 125 Woodstock Rd
Southbridge Mass 4 W1XEK 157.53 Hf
No Chicago Cab Co 1742 Sheridan Rd
No Chicago Ill 9 W9XLG 157.53 Mf
Northampton Cab Service 971 Main St
Northampton Pa 5 W3XMW 157.53 Bf
North Kansas City Cab 216 E Armour
North Kansas City Mo 15 WØXJJ 157.53 Mf
Northland Lines 118 N First St
Ishpeming Mich 6 W8XQH 157.53 Mf
North Side Taxi Serv 40 Bridge St
Corning NY 3 W2XSJ 157.53 Lf
North Taxi Serv Commercial St
Augusta Me 8 W1XGP 157.53 Kf
Northway Cab Co 1233 No High St
Columbus Ohio 50 W8XCS 157.53 Lf
Number 1 Cab Co 925 State St
Traverse City Mich 15 W8XON 157.53 Mf
G P Nyman 823 N Main St
Princeton Ill 2 W9XVH 157.53 Ba
Oakland Taxi Co 1243 33rd Av
Oakland Calif 50 W6XRD 157.53 Mf
Oakwood Taxi Co 116 Lagrave SE
Grand Rapids Mich 40 W8XNG 157.53 Lf
C E O'Dell 118 Michigan Av
Albion Mich 3 W8XFL 157.53 Lf
Ohio State Dept of Hways 63 S Front St
Columbus Ohio W8XDP 157.53 a
OK Cab Inc 1032 Minnesota Av
Kansas City 14 Kans 20 WØXHW 157.53 Bf
Oliver Taxi & Amb Serv 14th & Pacific
Takoma Wash 15 W7XIU 157.53 Mf
O'Malia & Son Taxi Co 613 Hickory St
Iowa Falls Ia 3 WØXNH 157.53 f
121 Cab Line 600 Commercial Av
Cairo Ill 12 W9XVD 157.53 Mf
159 Taxi 129 E Water St
Santa Fe NM 10 W5XUD Bf
Orange Checker Cab Co 59 W S Temple St
Salt Lake City Utah 75 W7XMW 157.53 Rf
Oregon City Taxi Serv 802 5th St
Oregon City Ore 5 W7XQF 157.53 Rf
Orndorff Taxi 210 S Queen St
Martinsburg WVa 4 W8XMS 157.53 Mf
Owl Taxi 124 Court St
Binghamton NY 10 W2XPB 157.53 Lf
Owl Taxi 88 Lincoln St
Santa Cruz Calif 7 W6XCJ 157.53 a
Owl Taxi 114 N Center St
Casper Wyo 5 W7XON 157.53 f
Owl Taxi Co 974 Monterey St
San Luis Obispo Calif 4 W6XMB 157.53 Mf
Owl Taxi Serv 1054 Bond St
Bend Ore 8 W7XQV 157.53 Mf
Owl Taxi Corp 250 50th St
Richmond Calif 10 W6XOF 157.53 Lf
Owyhee Cab Co 105 S 9th St
Boise Idaho 6 W7XIW 157.53 Mf
Pace's Taxi Inc 421 W Main St
Charlottesville Va 20 W4XRU 157.53 Lf
Pacific Laundry Co Ltd 932 Chapin St
Honolulu Terr of Hawaii 20 K6XVC 157.53 Bf
Packard Auto Taxi Co 919 Church St
Easton Pa 20 W3XEH 157.53 Mf
Packard Taxi Co 210 W 6th St
Bloomington Ind 10 W9XXQ 157.53 Bf
Paducah's Consolidated Taxi 201 S 5th St
Paducah Ky 30 W4XSD 157.53 Mf
Palisi Taxi 308 Main St
Beacon NY 15 W2XRJ 157.53 Lf
Paramount Cab Co 32 Water St
Stapleton Staten Isl NY 10 W2XQK 157.53 Lf
Park Cab 9 E Bway
Butte Mont 6 W7XRO 157.53 Mf
Parks Cab Co Inc 5919 S State St
Chicago Ill 5 W9XYD 157.53 Mf
Park's Taxi Serv 420 N Mill St
Pontiac Ill 4 W9XZE 157.53 Bf
Patton's Inc 116 E 7th St
Austin Tex 35 W5XJM 157.53 Gf
Paul's Taxi 265 S Garey Av
Pomona Calif 10 W6XOD 157.53 Mf
Peg's Cab 221 N Cuyler
Pampa Tex 12 W5XBK 157.53 Mf
Philadelphia St Hosp Southampton Rd
Philadelphia 16 Pa 2 W3XLK 152.15 Mf
People's Cab Co 806 Jones Law Bldg
Pittsburgh 19 Pa 100 W3XHI 157.53 Mf
People's Cab & Baggage Co 809 S Main St
Tulsa Okla 100 W5XJQ 157.53 Mf
Peoples Cab & Bag Co 1206 Garrison Av
Fort Smith Ark 30 W5XWN 157.53 Mf
Peoples Central Cab Co 423 Ferry St
Lafayette Ind 12 W9XQY 157.53 Mf
Peoria Cab Corp 607 Franklin St
Peoria Ill 20 W9XKD 157.53 Mf
Pete's Safe-Way Cab Inc 19 S 5th St
Richmond Ind 20 W9XLS 157.53 Lf
Pete's Taxi 30 N Brooks St
Sheridan Wyo 5 W7XOZ 157.53 Bf
Phoenix Taxi Serv Paradise & Chester Av
Phoenixville Pa 15 W3XHL 157.53 Bf
A Pickman 7 Water St
Boston 9 Mass 1 WIOXAJ 157.77 Rf
Piney Branch Cab Co 1001 Flower Av
Takoma Md 20 W3XFW 157.53 Rf
Pioneer Holding Co 717 6th Av S
Minneapolis Minn 65 WØXGR 157.53 Mf
Plainfield Cab Co 4601 W 59th St
Mission Kan 10 WØXMS 157.53 Bf
Pollard Taxi Corp
Roanoke Va 30 W4XPW 157.53 Lf
Posten Taxi Co 62–55 N State St
Wilkes-Barre Pa 35 W3XGN 157.53 Bf
Powell's Garage & Wrecker Serv Millwood St
Columbia SC 7 W4XQE 152.15 Af
Public Cab Co 1524 S 18th St
Newcastle Ind 8 W9XVB 157.53 Gf
Public Service Taxi 62 Burd St
Nyack NY 9 W2XKF 157.53 Lf
Publix Cab Co 1265 Acoma St
Denver Colo 40 WØXMK 157.53 Lf
Quarter Cab Inc 120 Johnson Park
Buffalo NY 10 W2XUU 157.53 Mf
Quick Service Cab Co 302 N Madison St
Bloomington Ill 20 W9XOJ 157.53 Mf
Quick Service Taxi Co 741 N New St
Allentown Pa 20 W3XLU 157.53 Mf
Radio Cab Co 131 N Arkansas Av
Atlantic City NJ 20 W2XGV 157.53 Lf
Radio Cab Co 343 Cookman Av
Asbury Park NJ 20 W2XOE 157.53 Lf
Radio Cab Co 800 Church St
Lynchburg Va 20 W4XMW 157.53 Lf
Radio Cab Co 216 E Olas Blvd
Fort Lauderdale Fla 5 W4XNP 157.53 Af
Radio Cab Co 3150 Woodward Av
Detroit Mich 60 W8XGB 157.53 Mf
Radio Cab Co 1007 1st St S
St Cloud Minn 15 WØXHD 157.53 Mf
Radio Cab Co 117 S Fayette St
Beckley WVa 10 W8XMA 157.53 Mf
Radio Cab Co 116 W Aurora
Ironwood Mich 6 W8XQD 157.53 Mf
Radio Cars 546 N 4th St
Columbus Ohio 60 W8XOQ 157.53 Mf
Radio Cab 61 Av A
Turners' Falls Mass 4 W1XLO 157.53 Bf
Radio Flash Corp 4607 N Sheridan Rd
Chicago Ill 250 W9XLE 157.53 Mf
Radio Taxi Service SW Cor Main & Montgomery
Norristown Pa 10 W3XZQ 157.53 Mf
Radio Tuxedo Cab Co 1715 SW Salmon St
Portland Ore 37 W7XLQ 157.53 Kf
Rainbow Cab Co 503 Main St
Jasper Ind 3 W9XDL 157.53 Ba
Howard C Ramsey 301 6th St
Monroe La 4 W5XZJ 157.53 a
Rapid Traction Co 301 N 6th St
Rapid City SD 10 WØXFQ 157.53 Mf
Russell E Rasmussen PO Box 155
Bloomfield Ia 1 WØXJB 152.15 Lf
Ravina Cab Co 1646 S St Johns St
Highland Park Ill 3 W9XAO 157.53 Mf
Red Arrow Taxi 405 Middlesex St
Lowell Mass 8 W1XNK 157.53 Rf
Red Cab Co 615½ S Main St
Aberdeen SD 10 WØXBO 157.53 Mf
Red Cab Co 1318 Beacon St
Brookline Mass 50 W1XFF 157.53 Gf
Red Cab Co 120 E Garvey
Monterey Park Calif 5 W6XWY 157.53 Mf
Red Cab Co 213 14th St
Toledo Ohio 30 W8XMU 157.53 Mf
Red Cab Inc 2 W 13th St
Indianapolis Ind 61 W9XLT 157.53 Lf
Red Cab Co Ltd 520 2nd St
Macon Ga 25 W4XZJ 157.53 Mf
Red's Taxi 1517 11th St
Monroe Wis 5 W9XFJ 157.53 Mf
Red Star Taxi Co 33 1st St NE
Paris Texas 25 W5XTD 157.53 Mf
Red's Taxi Co 408 E Wishkah St
Aberdeen Wash 8 W7XHY 157.53 Mf
Red Top Cab Co 300 W Locust St
Tyler Tex 20 W5XOC 157.53 Mf
Red Top Cab Co 216 E South St
Washington Ind 7 W9XDX 157.53 Rf
Red Top Cab Co 614 Michigan Nat'l Bk Bldg
Grand Rapids Mich 45 W8XIO 157.53 Mf
Red Top Cab Co 314 W Markham St
Little Rock Ark 12 W5XTI 157.53 Mf
Red Top Cab Co 108 S Dean St
Gladewater Tex 5 W5XTM 157.53 Ba
Red Top Cab Co 209 N Oneida St
Appleton Wis 10 W9XMO 157.53 Mf
Red Top Taxi 113 W 4th St
Olympia Wash 10 W7XLN 157.53 Mf
Red Top Taxi 120 D Street
Marysville Calif 4 W6XDS 157.53 Kf
Red & White Cab 104 1st St
Pulaski Tenn 6 W4XZW 157.53 Mf
Red Top Taxi 133 E Merchant St
Kankakee Ill 20 W9XOS 157.53 Mf
Reliable Cab 6 N 1st St
Yakima Wash 12 W7XHI 157.53 Mf
Rich's Inc 45 Broad St
Atlanta Ga 50 W4XWR 157.53 Lf
Ridgewood Taxi Co 28 Broad St
Ridgewood NJ 25 W2XNW 157.53 Mf
Ringsby Truck Lines 3262 Blake St
Denver 5 Col 150 W1OXOA 157.53 Gf
Rite Rate Cab Co 100 Central Av
St Petersburg 5 Fla 25 W4XOL 157.53
W W Robinson Box 2X 121
Elkridge 21 Md 20 W3XIH 157.53 Ba
Rochelle Cab Co 219 Lincoln Hway
Rochelle Ill 5 W9XTB 157.53 Mf
Rockford-Ace Cab Co 823 E State St
Rockford Ill 5 W9XYT 157.53 Mf
Rockland Taxi Service 12 Park St
Nyack NY 3 W2XRZ 157.53 Ba
Rocky Mountain Motorists 1509 Cheyenne Pl
Denver Colo 4 WØXJX 157.41 Mf
Rolfe Armored Truck Serv 301 NW 9th Av
Miami Fla 15 W4XUY 157.41 Mf
Roseville Cab Co 26561 Gratiot Av
Roseville Mich 6 W8XQN 157.53 Mf
Roskin Bros Inc 23–27 W Main St
Middletown NY 6 W2XZB 157.41 Kf
Roslindale Taxi Inc 775 South St
Roslindale Mass 6 W1XHN 157.53 Bf
Royal Cab Co 114 N High St
W Chester Pa 12 W3XCU 157.53 Bf
Royal Cab 319 E 19th St
Bakersfield Calif 20 W6XSF 157.53 Mf
Royal Cab Co 5704 N Wall St
Spokane Wash 5 W7XMD 157.53 Gf
Royal Cab Co Center & High Sts
Warsaw Ind 8 W9XDZ 157.53 Mf
Royal Cab Co 130 W 6th St
Connersville Ind 8 W9XLK 157.53 Mf
Royal Cab Co 1914 3rd Av
Rock Island Ill 25 W9XVJ 157.53 Mf
Royal Cab Co 504 Bond St
Astoria Ore 10 W7XOP 157.53 Mf
Royal Cab 125 Main St
Winona Minn 12 WØXLG 157.53 Mf
Royal Taxi Co 369 State St
Schenectady NY 7 W2XRU 157.53 Bf
Russell Taxi Co 1301 Monroe St
Endicott NY 10 W2XOS 157.53 Lf
Safely Cab Co 734 5th St
Portsmouth Ohio 40 W8XDZ 157.53 Mf
Safety Cab Co 314 Markham St
Little Rock Ark 1 W5XTH 157.53 Mf
Safety Cab Co 105 E 5th St
Roswell NMex 20 W5XQB 157.53 Bf
Safety Cabs 645 N Atlantic Av
Daytona Beach Fla 6 W4XTF 157.53 Af
Safety Cab Co 403 E Lafayette St
Tampa 2 Fla 46 W4XUT 157.53 Mf
Safety Cab Co 201 S Tenn Av
Lakeland Fla 12 W4XWQ 157.53 f
Safety Cabs Inc 1022 W Bay St
Jacksonville Fla 50 W4XNK 157.53 Mf
Safety Cab 1313 Race St
Newcastle Ind 12 W9XJR 157.53 Lf
Safety Service Taxi Co 6 Clark St
Paterson NJ 25 W2XYU 157.53 Mf
Safeway Cab Co 200 S Main Av
Sioux Falls SD 20 WØXEV 157.53 Mf
Safeway Cab Co 203 N Center St
Longview Tex 20 W5XOQ 157.53 Mf
Safeway Cab Co 701 Veto St
Vicksburg Miss 20 W5XRB 157.53 Mf
Safeway Cabs Inc 631 S 20th St
Omaha Neb 50 WØXIV 157.53 Mf
Safeway State Taxi Co 451 Washington St
Gary Ind 10 W9XNL 157.53 Gf
Safeway Trans Co 117 E 8th St
Amarillo Tex 41 W5XSB 157.53 Mf
Saginaw Radio Cab Inc 802 Tuscola
Saginaw Mich 25 W8XSK 157.53 Mf
Salem Taxi Service 394 N Church St
Salem Ore 15 W7XNC 157.53 Mf
Salt Lake Trans Co 36 West South Temple
Salt Lake City Utah 100 W7XJD 157.53 Mf
Sanple Taxi Co 15 E Strawberry Way
Washington Pa 16 W3XHN 157.53 Mf
Sam's Taxi 10 Richmond Av
Port Richmond S I NY 15 W2XRR 157.53 Lf
Santa Fe Cab & Transfer 113 Wash Av
Santa Fe NMex 10 W5XZL 157.53 Mf
Santa Monica Cab Co 1429 2nd St
Santa Monica Calif 15 W6XNZ 157.53 a
Schultz Cab & Transf Co 502 E Hickory St
Streator Ill 10 W9XBO 157.53 Mf

POLICE

STOP

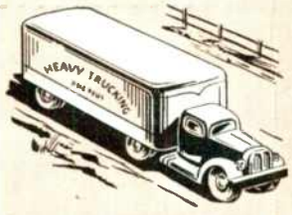
Wasting Minutes!
Wasting Mileage!
Wasting Money!

FIRE

TAXIS

BUSSES

UTILITIES



TRUCKING

Equip Your Fleet with Federal's
MOBILE 2-WAY FM RADIO TELEPHONE

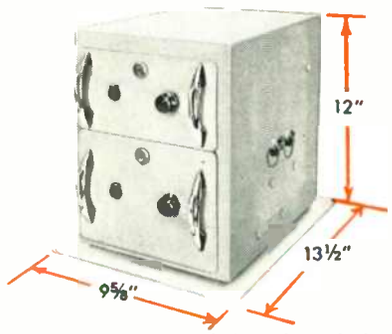
What do *you* do when you want to get in touch with one of your drivers while he's on the job? And how can he contact you? Without mobile radio, a moving vehicle is practically isolated from all contact with the outside world—and any other method of relaying messages between cars and headquarters wastes time and mileage, and costs plenty of money!

Now, with Federal's Mobile 2-way FM radio, you can keep in instant touch with any car, at any time,—for dispatching, re-routing, checking up on any job. The added efficiency of completely coordinated operation will save the cost of the radio equipment many times over!

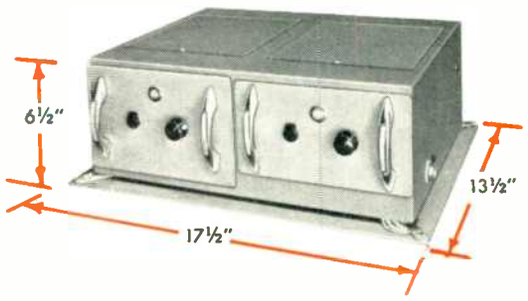
Of course, the return on the investment depends on the equipment used—its operating economy, service life and maintenance cost. And that's where Federal's high standards of quality and workmanship can pay long-term dividends. Before you select your mobile radio equipment, check these outstanding features. Write to Federal for complete information. Dept. 1620.

FEDERAL FEATURES

- **Effective Squelch Action**—receiver muted until called
- **Low Current Drain**—receiver standby, 6.0 amp. transmitter standby: 30 to 44 Mc, 2.1 amp; 152 to 162 Mc, 0.415 amp.
- **Small Size**—less than one cubic foot
- **Interchangeable Units**—transmitter and receiver sections slide out for fast servicing
- **Low Maintenance Expense**—highest quality components throughout
- **Single Cable**—from dashboard control to transmitter-receiver unit.



TRY THESE FOR SIZE—choice of vertical or horizontal arrangement for most efficient use of available mounting space.



KEEPING FEDERAL YEARS AHEAD... is IT&T's world-wide research and engineering organization, of which the Federal Telecommunication Laboratories, Nutley, N. J., is a unit.

Federal Telephone and Radio Corporation

100 KINGSLAND ROAD, CLIFTON, NEW JERSEY

In Canada: Federal Electric Manufacturing Company, Ltd., Montreal, P. Q.
Export Distributors: International Standard Electric Corp. 67 Broad St., N. Y.

TRUCKS, BUSES, TAXIS — Continued

Seattle Farwest Service Corp 1814 7th Av
Seattle 1 Wash 100 W7XIQ 157.53 Mf
Seattle Mobile Radio Serv 5035 26th Av S
Seattle Wash 32 W7XKK 157.53 Ff
Service Cab Co 113 Madison St
Savanna Ill 6 W9XWF 157.53 Mf
Service Cab CA & ER Waiting Rm Main St
Glen Ellyn Ill 5 W9XFB 157.53 Bf
77 Taxi Co 3 N Verity Pkway
Middletown Ohio 17 W8XGR 157.53 Lf
707 Cab & Bus Co 315 Plum St
Red Wing Minn 8 WØXIT 157.53 Mf
777 Cab Co Ryan Hotel
Grand Forks ND 4 WØXBZ 157.53 Mf
Sheboygan Cab Co 936 N 8th St
Sheboygan Wis 5 W9XYK 157.53 Wf
Shore Cab Co 18701 Lake Shore Blvd
Euclid Ohio 20 W8XOH 157.53 Mf
Shore Yellow Cab Co 2336 Pacific Av
Atlantic City NJ 25 W2XTY 157.53 Mf
Signal Trucking Serv 3754 E 26th St
Los Angeles Calif 4 W6XMX 157.53 Rf
Silver Streak Cab Co 311 3rd St
Lewiston Idaho 10 W7XIO 157.53 Mf
Silverton Cabs 7134 Montgomery Av
Silverton Ohio 5 W8XFE 157.53 Mf
Silver Top Cab Co 22 Church St
Selma Ala 15 W4XZH 157.53 Mf
Simard Taxi Serv 175 Mechanic St
Leominster Mass 3 W1XEW 157.53 Mf
600 Cab Co 403 2nd Av N
Columbus Miss 12 W5XSV 157.53 Mf
600 Cab Co 337 S Bway
Coos Bay Ore 5 W7XOL 157.53 a
Six-O-Taxi-Checker Cab 120½ Front St
Hattiesburg Miss 25 W5XIC 157.53 Mf
6400 Cabs Inc
Geneva NY 7 W2XVJ 157.53 Bf
Quintin Skipwith 26 Smith St
Newburgh NY 10 W2XPX 157.53 Mf
Skyline Taxi Co 520 Calif St
Sacramento Calif 3 W6XUO 157.53 Lf
Smith Taxi 187 High St
Portland Me 4 W1XLU 157.53 Mf
Snitty's Cab Co 44 Proctor St
Framingham Mass 5 W1XJW 157.53 Rf
Southeast Taxi Co 9017 Long Beach Blvd
Southgate Calif 22 W6XMM 157.53 Af
Spaulding's Taxi 89 Barre St
Montpelier Vt 6 W1XJG 157.53 Mf
Sperano's Taxi 17 Spring St
Ossining NY 15 W2XWD 157.53 Lf
Bradbury F Sprague Cor Main & Dover Sts
Meredith NH 3 W1XMX 157.53 a
Squires Taxi 27 Garfield St
Waverly NY 6 W2XWQ 157.53 Mf
S & R Town Taxi 75 Railroad St
Braintree Mass 6 W1XLW 157.53 Bf
St Louis Cty Cab Co 8655 Maryland Av
Clayton Mo 21 WØXCM 157.53 Lf
Stag Taxi 478 High St
W Medford Mass 8 W1XLM 157.53 Rf
Stan's Taxi 1265 Willamette
Eugene Ore 10 W7XLV 157.53 Lf
Star Cab Co 220 W Bonneville St
Pocatello Idaho 6 W7XOJ 157.53 Mf
Star Cab Co 100 W Central St
Moultrie Ga 15 W4XYW 157.53 Mf
Star Cab Co 976 Ruffner St
Birmingham Mich 12 W8XQU 157.53 Mf
Star Taxi Co 302 La Branch Av
Houston Tex 175 W5XIW 157.53 Mf
Star Taxi Co 100 5th St
Orange Tex 15 W5XJW 157.53 Rf
Star Taxi Co 636 Park St
Beaumont Tex 40 W5XJY 157.53 Mf
Station Wagon Taxi 4201 W 45th St
Minneapolis Minn 3 WØXGX 157.53 Mf
Stedman's Taxi Serv Elmwood Hotel Main St
Waterville Me 3 W1XBW 157.53 Mf
Steel City Taxi Co 478 W Federal St
Youngstown Ohio 10 W8XNP 157.53 Mf
S Doyle Inc 20 7th St S
Fargo ND 15 WØXIX 157.53 Mf
R E Stidham 1010 S Tower St
Centralia Wash 3 W7XPL 157.53 Rf
Stoner Cab Co 100 W Berry St
Greencastle Ind 6 W9XWB 157.53 Mf
Stringer's Vet Cab Co 2644 Lincoln Way
Ames Ia 2 WØXLC 157.53 Mf
Stuart Gardens Cabs 1835 Wickham Av
Newport News Va 3 W4XYJ 157.53 Bf
Suburban Cab Co Wisconsin & Western Avs
Chevy Chase Md 30 W3XNI 157.53 Rf
Sun Cab Co 34 Court St
Auburn Me 5 W1XNT 157.53 Kf
Tanner Motor Livery Ltd 320 S Beaudry St
Los Angeles Calif 99 W6XOB 157.53 Wf
Tanner Motor Livery Ltd 114 C Santa Monica
Santa Monica Calif 25 W6XTB 157.53 Mf
Tanner Motor Livery Ltd 320 S Beaudry St
Los Angeles Calif 15 W6XTD 157.53 f
Tanner Motor Livery Ltd 910 Front St
San Diego Calif 24 W6XTF 157.53 Mf
Tanner Motor Livery Ltd 320 S Beaudry St
Los Angeles Calif 30 W6XTH 157.53 Bf
Tanner Motor Livery Ltd 320 S Beaudry St
Los Angeles Calif 7 W6XTJ 157.53 f
Tanner Motor Livery Ltd 320 S Beaudry St
Los Angeles Calif 18 W7XJW 157.53 f
Tanner Motor Livery Ltd 320 S Beaudry St
Los Angeles Calif 24 W7XJY 157.53 f
Tanner Motor Livery Ltd 320 S Beaudry St
Los Angeles Calif 15 W7XKB 157.53 f
V G Task 338 Middle St
Portsmouth NH 6 W1XHD 157.53 Lf
Taxi Service Inc 501 4th Av
Huntington WVa 35 W8XNT 157.53 Mf
Taxicabs of Cincinnati Inc 431 W 5th St
Cincinnati Ohio 76 W8XHP 157.53 Mf
Taxicab Service Inc 46 Frelinghuyson Av
Newark NJ 55 W2XPF 157.53 Bf
Taylor Taxi & Transfer 317 N Main St
Helena Mont 5 W7XNQ 157.53 f
Ted McGravey Inc 515 7th St
Des Moines Ia 50 WØXHF 153.53 Mf
Terminal Cab Co 401 N 2nd St
St Charles Mo 10 WØXJH 157.53 Mf
Terminal Taxi Co 44 Dow St
Framingham Mass 2 W1XLB 157.53 a
Terminal Taxi 224 E State St
Ithaca NY 13 W2XLG 157.53 Mf
Terminal Taxi 450 Willamette St
Eugene Ore 15 W7XMY 157.53 Mf
Dr Harry G Thompson 324 N 12th St
Mt Vernon Ill 1 W9XXB 151.41 Mf
318 Cab Co Hotel Frisina
Taylorville Ill 10 W9XBN 157.53 Mf
3333 Cab Co 705 Scott Av
Wichita Falls Tex 20 W5XBI 157.53 Mf
Thrift Cabs Inc 516 Washington St
Jacksonville 2 Fla. 115 W4XKD 157.53 Mf
Tiedemann Service 2 Westwood Av
Westwood NJ 10 W2XHV 157.53 Lf
Tiller's Cabs 720 Fairfax Av
Norfolk Va 20 W4XLX 157.53 Mf
Tobey Taxi 6 Peach St
Passaic NJ 4 W2XKZ 157.53 Lf
Tony's Taxi 5 W Broad St
Haverstraw NY 6 W2XND 157.53 Lf
Top Hat Taxi 101 N Main St
Ottawa Kans 5 WØXHU 157.53 f
Topper Cab Co 1401 20th St
Bakersfield Calif 12 W6XSR 157.53 Kf
Torrey Taxicab Co 5801 Hersholt Av
Bellflower Calif 3 W6XBD 157.53 a
Tower Taxi Service 60 Court St
Mt Clemens Mich 10 W8XFB 157.53 Mf
Town Taxi Co 151 High St
Portland Me 20 W1XGD 157.53 Bf
Town Taxi 1 Mill St
Brunswick Me 10 W1XGK 157.53 Gf
Town Taxi 218 E State St
Ithaca NY 4 W2XRP 157.53 Bf
Town Taxi 229 Howard St
Lawrence Mass 4 W1XGT 157.53 Bf
Town Taxi 22 19¾ Av N
St Cloud Minn 10 WØXLM 157.53 Mf
Town Taxi 418 Roff Av
Palisades Park NJ 12 W2XOG 157.53 Lf
Town Taxi Inc 160 Ipswich St
Boston Mass 10 W1XJD 157.53 Bf
Towner's Taxi 408 Maple Av
Elmira NY 14 W2XJL 157.53 Lf
Toye Bros Yellow Cab Co 1030 Constance St
New Orleans La 400 W5XMK 157.53 Mf
Triangle Cab Co Inc 701 N Willow St
El Paso Tex 35 W5XJB 157.53 Ff
Trio Cab 9 Cass St
Monroe Mich 15 W8NQW 157.53 Mf
Twin City Taxi 1956 3rd Av
Longview Wash 15 W7XPH 157.53 Mf
Try-Me Cab Co 14 Market St
Chillicothe Ohio 10 W8XED 157.53 Mf
Twin City Cab Co 108 W 4th St
Sterling Ill 5 W9XWQ 157.53 Mf
Twin City Cab Co 116 S Lowell St
Ironwood Mich 8 W8XNV 157.53 Mf
Tri-State Cab Co PO Box 1584
Shreveport La 50 W5XVR 157.53 Bf
Twin City Garage 5124 E Imperial St
Lynwood Calif 2 W6XAJ 157.53 Lf
200 Cab Co 100 E Main St
Paragould Ark 10 W5XRZ 157.53 Mf
Union Cab 210 E Eight St
Marion Ind 6 W9XCJ 157.53 Mf
Union Cab Co Inc 507 N Foster St
Dothan Ala 20 W4XSU 157.53 Mf
Union Cab Co 1048 Linwood Blvd
Columbus Ga 75 W4XZR 157.53 Mf
Union Cab Co 205 SW Jefferson St
Portland Ore 40 W7XIY 157.53 Mf
Union Cab Co 800 E Maine St
Stockton Calif 35 W6XRH 157.53 Mf
Union & Club Taxi Co 1131 7th St
Sacramento Calif 30 W6XLH 157.53 Mf
Union Lyceum Taxi Co 24 State St
New London Conn 7 W1XNF 157.53 Gf

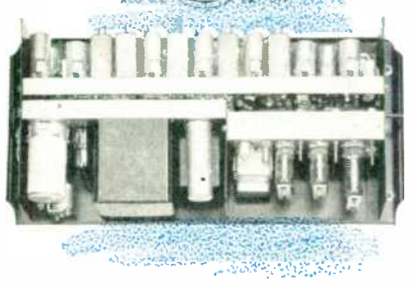
Over 90% OF NEW MOBILE TRANSMITTER DESIGNS USE HYTRON

THE ORIGINAL INSTANT-HEATING TUBE

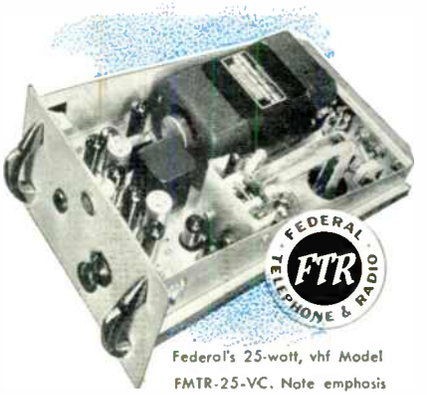
HY69 — the original instant-heating tube.

Because they fill a real need for conserving filament power, Hytron instant-heating tubes are in. Yes, the 2E25, 2E30, HY69, HY1269, and 5516 are in the new mobile transmitter designs of many famous friends—too many to thank in this small space. The 2E25 and 2E30 also appear on the Army-Navy Preferred List. Why so popular? With no standby current, battery drain can be cut to 4% of that with cathode types—attainable power output and range increase. Potentials of rugged filaments are centered for battery operation. Beam pentode versatility simplifies the spares problem—one type can power all stages. Join the leaders. If you build mobile equipment—for land, sea, air—put Hytron original instant-heating, easy-on-the-battery tubes on *your* preferred list.

BENDIX RADIO



Bendix MRT-3A, 152-162 mc f-m taxicab transmitter uses 2E30's generously.

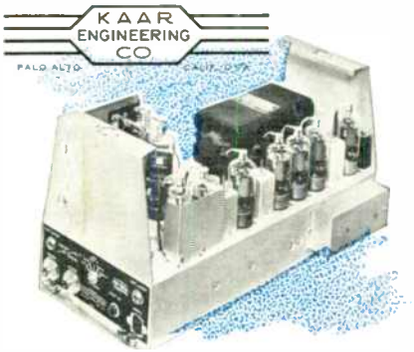


Federal's 25-watt, vhf Model FMTR-25-VC. Note emphasis on 2E30 and 5516.

Harvey Laboratories chose 2E30's, 5516's for its Model 542 f-m transmitter.

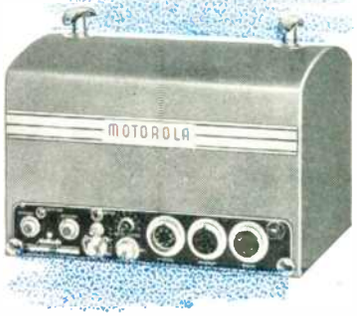
Jefferson-Travis Model 351, 35-watt marine radio-telephone employs HY69's.

KAAR ENGINEERING CO
PALO ALTO



Kaar FM-50X features 2E25, HY69 throughout. Hytron instant-heating tubes since 1939.

Motorola



5516's power both driver-doubler and final of Motorola's Model FMTRU-30D.

WRITE FOR FREE NEW DATA SHEETS: 2E25, 2E30, HY69, HY1269, 5516.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

HYTRON

RADIO AND ELECTRONICS CORP.

HYTRON RADIO TUBES

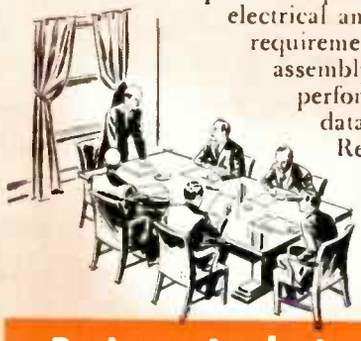
MAIN OFFICE: SALEM, MASSACHUSETTS

The Best Resistors Are Not Enough

SERVICE IS VITAL

The most complete line of high quality resistors is not enough. IRC considers sincere service—cooperative development work, unbiased recommendations, on time deliveries, genuine help in emergencies and friendly follow thru also vital in meeting advancing demands of industry.

The RESISTOR ANALYSIS COUNCIL is a natural development of this concept. Sponsored by IRC, and established to provide experienced technical aid on your resistor problems—electrical and mechanical. Working together on your specific requirements, confidential analysis may disclose ways to cut assembly costs, eliminate expensive "specials" or improve performance. You may obtain this counsel by sending available data on your resistor problem to the RAC at—International Resistance Company, 401 N. Broad St., Philadelphia 8, Pa.



Resistor Analysis Council

A new IRC industry service. Composed of IRC electrical and mechanical engineers plus production specialists, the RAC—Resistor Analysis Council operates as consultant to engineers and designers. Provides confidential analysis of resistor requirements—helps solve electrical, mechanical and cost considerations. RAC's industry knowledge is sufficiently broad that recommendations need not be confined to IRC products. Consult the Resistor Analysis Council on your present or anticipated resistor problems.

Complete Line

Only IRC produces such a wide range of resistor types. All your requirements can be readily supplied from one source. Manufacturing all types, IRC's recommendation on the proper resistor for your product is unbiased. For over two decades IRC has concentrated its engineering and manufacturing talent exclusively on resistors. You benefit by this accumulated experience when you specify IRC. Technical Data Bulletins are available on each IRC resistor type.

On Time Deliveries

Purchasing Agents and material control executives rely upon IRC's "on time deliveries. They know that regardless of a product's high quality, ossembly line problems are a naturol consequence when delivery schedules aren't met. IRC delivers "on time"—also maintains factory stock piles of most popular resistor types and ranges assuring you of real ossistance in emergencies.

Industrial Service Plan

Providing speedy "round the corner" deliveries on your small order requirements, IRC's distributar network maintoins well-stocked shelves of all standord items. No time lost when you need experimental or maintenance quantities in a hurry. When time means money you profit by competent service from the IRC distributor in your area—write for his name and address.

INTERNATIONAL RESISTANCE COMPANY

IRC

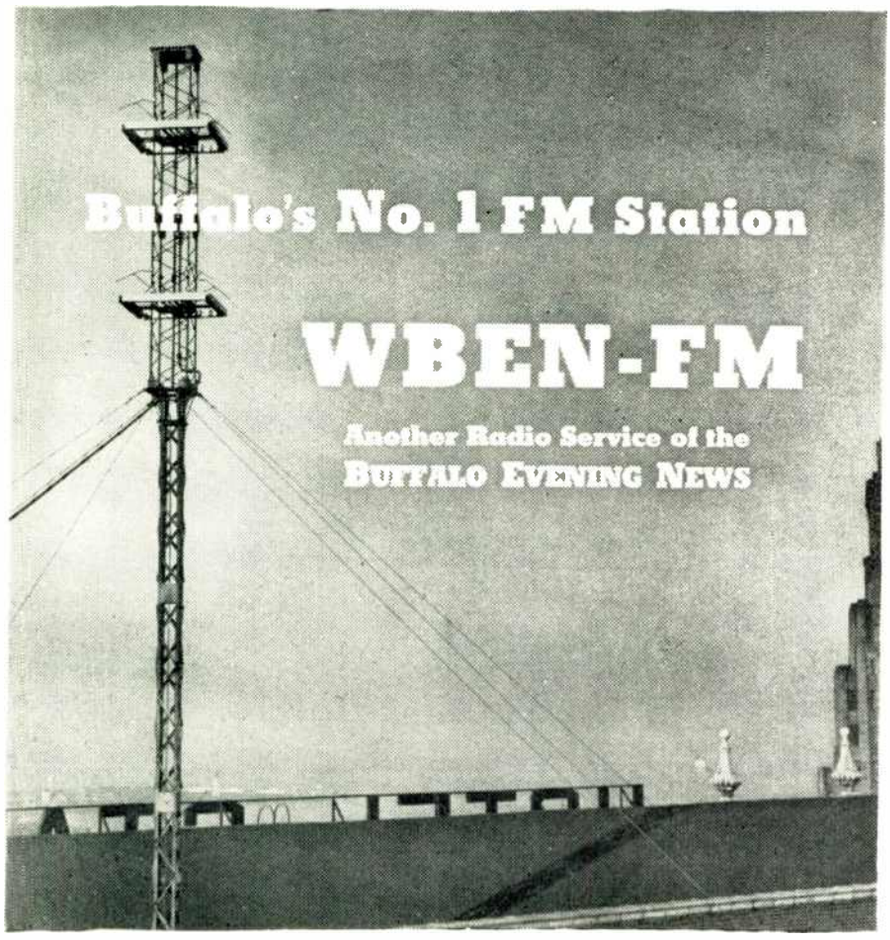
IN CANADA: INTERNATIONAL RESISTANCE COMPANY, LTD., TORONTO, LICENSEE

Power Resistors • Precisions • Insulated Composition Resistors • Low Wattage Wire Wounds • Rheostats • Controls • Voltmeter Multipliers • Voltage Dividers • HF and High Voltage Resistors

TRUCKS, BUSES, TAXIS — Continued

Union Square Taxi Co 116 Middle St
Lewiston Me 18 W1XDC 157.53 Mf
Union Taxi Co 1348½ Bway
Tacoma Wash 15 W7XPZ 157.53 Bf
United Cab Co 9 E 12th St
Anderson Ind 18 W9NKN 157.53 Lf
United Cab Co 620 Monroe St
LaPorte Ind 6 W9XTX 157 53 Mf
United Cab Co 2323 N 24th St
Omaha 10 Neb 10 WØXIH 157 53 Bf
United Cab Drivurself Inc
Rockford Ill 45 W9XJM 157 53 Mf
United Radio Cabs 3159 E Tulare
Fresno Calif 6 W6XQX 157.53 Mf
University Cab Inc 1384 Mass Av
Cambridge Mass 10 W1XDJ 157 53 Mf
Urban-Neon Advt Co 1407-09 Tuscarawas St W
Canton Ohio 3 W8XPY 157 53 Kf
Valley Cab Co 56 E Huntington Dr
Arcadia Calif 10 W6XCM 157 53 Bf
Valley Car Service 14723 Aetna St
Van Nuys Calif 24 W6XPG 157 53 Mf
Valley Coaches Inc 14 9th St
Augusta Ga 40 W4XUW 157 53 Mf
Vandever Taxi Serv 117 W 4th St
Mt Carmel Ill 6 W9XOP 157 53 Mf
Vaniska Inc 1 N Wood Av
Linden NJ 10 W2XSL 157 53 Mf
Veteran Cab Co 22 t N Kansas
Liberal Kans 4 WØXMQ 157 53 Rf
Veterans Cab Assoc 114 Commerce Lane
Rockville Md 12 W3XNF 157 53 Rf
Veterans Cab Assoc 1560 Eckington Pl NE
Washington DC 50 W3XVF 157.53 f
Veterans Cab Co 33 E 6th St
Mansfield Ohio 6 W8XOF 157 53 Mf
Veterans Cab Co 211 S Grove St
Elgin Ill 4 W9XBZ 157 53 Gf
Veterans Cab Co 173 W Lincoln Hway
DeKalb Ill 6 W9XXI 157 53 Mf
Veterans Cab Co 221 W 7th St
Okmulgee Okla 10 W5XVE 157 53 Mf
Veterans Cab Co 207 N 9th
Columbia Mo 20 WØXJM 157 53 Mf
Veterans Cab Co 849 State St
Fort Scott Kans 5 WØXNB 157.53 Bf
Veterans GI Cab Co 245 Pacific Av
Santa Cruz Calif 15 W6NZB 157 53 Bf
Veterans & Radio Cab Co 120 E 4th St
Dubuque Ia 10 WØXFL 157 53 Mf
Veterans Taxi Cab Co 1004 E 4th St
Tulsa Okla 60 W5XRM 157 53 Mf
Veterans Taxi Co 8 Old Post Office Rd
Silver Springs Md 10 W3XLO 157.53 Rf
Veterans Taxi Serv 57 Rye St
Paterson NJ 10 W2XYG 157.53 Lf
Veteran Town Cab Co 596 N Chester Av
Pasadena Calif 4 W6XUT 157.53 Ba
Veterans Transit Corp 433 S Flower St
Los Angeles Calif 100 W6XQB 157.53 Mf
Veterans Yellow Cab 226 N 4th St
Muskogee Okla 20 W5XOE 157.53 Mf
Vets Cab Co 35 Lincoln Way W
Massillon Ohio 6 W8XEG 157.53 Mf
Vets Cab Co 1102 E Douglas
Wichita Kans 50 WØXFU 157.53 Gf
Vets Cab Service 112 E 1st St
Hutchinson Kans 30 WØXKB 157.53 Gf
Vet's Cab 606 Market St
Marcus Hook Pa 5 W3XJX 157 53 Af
Vet's Safe-T-Cab Assoc 58 Pleasant St
Fall River Mass 30 W1KLD 157 53 Mf
Victory Cab Co Inc 923 S 5th St
Louisville Ky 40 W4XDL 157.53 Bf
Victory Cab Co 140 W Argonne Dr
Kirkwood Mo 10 WØXIZ 157 53 Mf
Village Cab Co 747 Madison
Oak Park Ill 42 W9XOM 157.53 Mf
Virginia Dept of Highways 1221 E Broad St
Richmond Va 1 W4XRZ 2 455 a
Vucovich Service 321 N Irwin St
Hanford Calif 1 W6XWW 157 41 a
Walsh's Taxi Co 171 S 14th St
Lindenhurst L I NY 4 W2XHR 157 53 Lf
Wapheton Cab Co 312 6th St N
Wapheton ND 10 WØXMY 157 53 Mf
Ware's Taxi Service 615 Park St
Clearwater Fla 6 W4XYS 157.53 Af
Warren Township Taxi 25046 Van Dyke St
Centerline Mich 15 W8XPH 157 53 Mf
Warren Veterans Car Assoc 148 Pine St NE
Warren Ohio 12 W8XMV 157 53 Lf
F E Waterfield 1421 W Lexington
Independence Mo 10 WØXNJ 157 53 Kf
G J Weems MD
Huntington Md 1 W3XCC 157 53 Lf
Welsh Cab Co 22325 Nine Mile Rd
St Clair Shores Mich 5 W8XLY 157 53 Mf
L L Welsh 26 DuMont Pl
Morristown NJ 21 W2XIJ 157 53 Lf
Western Union Tel Co 60 Hudson St
New York NY 1 W1ØXBN 157 05 Lf
Western Union Tel Co 60 Hudson St
New York NY 1 W1ØXBO 157 05 Lf
Western Union Tel Co 60 Hudson St
New York NY 1 W1ØXBP 157.05 Lf
West Shore Taxi Co Old York Rd
New Cumberland Pa 10 W3XHZ 157 53 Nf
Wheeler & Nutting Taxi Co 2 Lock St
Nashua NH 7 W1XEC 157.53 Ff
White Cab Service 910 Madison St
Lake Geneva Wis 3 W9XRV 157.53 Lf
White Cab Co 801 McCormick Av
Washington Ind 6 W9XDJ 157.53 Mf
White Front Taxi Service PO Box 154
Raven Va 10 W4XSS 157.53 Lf
White Line Cab Co 112 W Larkin St
Athens Tex 2 W5XYD 157 53 Bf
White Line Cab Co Benton & Jackson Sts
Freeport Ill 13 W9XKE 157 53 Mf
White Top Cabs Rt A
Griffin Ga 8 W4XVK 157 53 Mf
White Top Cab Co 110 N 75th St
Houston Tex 7 W5XRK 157 53 Bf
White Top Cab Co 555 Auto Hotel
Jackson Miss 25 W5XTK 157.53 Mf
White Top Cab Co 106 S Madison St
Camden Ark 20 W5XZH 157.53 Mf
White Top Cab Co 701 Chelsea St
Kansas City Kans 12 WØXHY 157 53 Bf
Wholesale Supply Co 108 Bway
Nashville Tenn 5 W4XCE 157 53 f
Wichita Cab Co Inc 728 W Douglas
Wichita Kans 65 WØXLE 157.53 Mf
C H Wies MD 58 Huntington St
New London Conn 1 W1XLS 157.41 Lf
Wilde & Wilde Inc 1861 Bway
Fresno Calif 50 W6XQQ 157.53 Mf
Willett Co 700 S Desplains St
Chicago Ill 200 W9XJH 157.53 Rf

P A Williams 101 S Jefferson St
Mt Pleasant Tex 12 W5XBV 157.53 Rf
Willie's Taxi 213 S Wayne
Milledgeville Ga 5 W4XCB 157 53 Bf
Wilmington Cab Co 127 W B St
Wilmington Calif 15 W6XMK 157 53 Mf
Winona Cab Co 126 E 3rd St
Winona Minn 5 WØXKY 157 53 Bf
Winsby-Fleming 2573 94th Av
Oakland Calif 3 W6XUB 157 41 f
W T Sistrunk & Co 601 W High St
Lexington 31 Ky 16 W4XBM 43 78 Mf
Wyandotte Cab Co 3259 Biddle St
Wyandotte Mich 3 W8XKM 157 53 Mf
Wychwood Cab Co 605 South Av
Westfield NJ 12 W2KPI 157 53 Mf
Yellow Cab Co of Mo 201 W 14th
Kansas City 6 Mo 15 WØXAA 152 27 f
Kansas City 6 Mo WØXCC 152.27 f
Yellow Cab & Bag Co Inc 121 N Kans Av
Topeka Kans 32 WØXAT 152 27 Mf
Yellow Cab Co 518 N Pine St
No Platte Neb 15 WØXKQ 157 53 Mf
Yellow Cab Co 7 N 2nd Av
Marshalltown Ia 10 WØKBW 152.27 Mf
Yellow Cab Co 206 N 7th
Lincoln Neb 26 WØXCT 152.27 Mf
Yellow Cab Co 550 7th St
Des Moines Ia 100 WØXDF 152.27 Mf
Yellow Cab Inc 619 S 20th St
Omaha Neb 150 WØXFV 152 27 Mf
Yellow Cab Co 611 6th St
Rapid City S Dak 15 WØXGU 152.27 Mf
Yellow Cab Co 105 N Court St
Ottumwa Ia 13 WØXGY 152 27 Bf
Yellow Cab & Bag Co 313½ Joplin St
Joplin Mo 30 WØXHQ 152 27 Mf
Yellow Cab Co 210 1st Av N
Jamestown ND 10 WØXJT 157 53 Mf
Yellow Cab Co 428 Central Av
Ft Dodge Ia 10 WØXJZ 157 53 Lf
Yellow Cab Co 109½ W High St Box 214
Jefferson City Mo 15 WØXLQ 157 53 Mf
Yellow Cab Co 339 N Cedar
Owatonna Minn 3 WØXLY 157 53 Mf
Yellow Cab Co 212 W Main St
Cherokee Ia 12 WØXMW 157 53 Lf
Yellow Cab Co 212 1st Av W
Newton Kans 5 WØXNF 157 53 a
Yellow Cab Co 306 S Lamine
Sedalia Mo 20 WØXSB 157 53 Mf
Yellow Cab Co 8 Jewel Ct
Hartford Conn 50 W1XEH 157 53 Gf
Yellow Cab Co 80 Essex St
Lynnfield Mass 1 W1XFB 157 53 Hf
Yellow Cab Co 550 Park Av
Worcester Mass 25 W1XFD 157 53 Gf
Yellow Cab Co 291 Bway
Monticello NY 20 W2XQN 157 53 Mf
Yellow Cab Co 2 Ross St
Pittsburgh Pa 50 W3XAH 157 53 Gf
Yellow Cab Co Clark & Cherry Sts
York Pa 12 W3XBM 157 53 Lf
Yellow Cab Co 508 E Preston St
Baltimore 2 Md 100 W3XBO 157 53 Af
Yellow Cab Co 421 Linden St
Allentown Pa 40 W3XEX 157 53 Mf
Yellow Cab Co 2nd & Walnut Sts
Lansdale Pa 8 W3XEF 157 53 Mf



TRUCKS, BUSES, TAXIS — Continued

Yellow Cab Co Box 199 Chester Pa	30	W3XEJ	157.53	Mf
Yellow Cab Co 1505 Race St Philadelphia Pa	50	W3XNP	157.53	Af
Yellow Cab Co 1801 NY Av NE Washington DC	100	W3XWN	157.53	Gf
Yellow Cab Co 1505 Race St Philadelphia Pa	25	W3XWW	157.53	Af
Yellow Cab Co 509 Inman St Cleveland Tenn	20	W4XAY	152 27	Mf
Yellow Cab Co 218 N Collins Plant City Fla	15	W4XBD	157.53	Mf
Yellow Diamond Cab Co 77 Wentworth St Charleston SC	35	W4XDD	157.53	Mf
Yellow Cab Co 102 S Lafayette St Alexandria Va	25	W4XDF	157.53	Rf
Yellow Cab Co 320 St Ann St Owensboro Ky	40	W4XDH	157.53	Lf
Yellow Cab Co 7 S Granby St Richmond Va	75	W4XDN	157.53	f
Yellow Cab Co Box 371 Rochester Minn	50	WØXDY	157.53	Bf
Yellow Cab Co 20 Houston St NE Atlanta Ga	56	W4XLZ	157.53	Af
Yellow Cab Co 45 E Washington St Orlando Fla	15	W4XMI	157.53	Rf
Yellow Cab Co 112 W Davis St Raleigh NC	35	W4XMT	157.53	Lf
Yellow Cab Co 413–16 Trust Bldg Durham NC	4	W4XNA	157.53	Lf
Yellow Cab Co 126 W Court Greenville SC	24	W4XNH	157.53	Mf
Yellow Cab Co 317 S Popular St Charlotte NC	50	W4XNJ	157.53	Lf
Yellow Operating Co 1048 5th St Miami Beach Fla	50	W4XNR	157 53	f
Yellow Cab Co 306 Jefferson Av Memphis Tenn	25	W4XNT	152.27	Af
Yellow Cab Co 200 Shenandoah Av Roanoke Va	60	W4XPO	157 53	Lf
Yellow Cab Co 39 Federal St Madisonville Ky	12	W4XOQ	157.53	Lf
Yellow Cab Co 3914 Jefferson Av Newport News Va	20	W4XQS	157.53	Mf
Yellow Cab Co 212–10th Av Nashville Tenn	5	W4XRH	157.53	Lf
Yellow Cab 11 W Piccadilly St Winchester Va	6	W4XRO	157 53	Bf
Yellow Dot Cab Co 304 W Broad Av Albany Ga	16	W4XRW	157.53	M
Yellow Cab Co 121 State St Knoxville Tenn	42	W4XTU	157.53	Mf
Yellow Cab Co 152 N Limestone Lexington Ky	75	W4XUO	157.53	Lf
Yellow Cab Co Box 513 Jacksonville NC	22	W4XUS	157.53	Mf
Yellow Cab Co 7th & Virginia Hopkinsville Ky	15	W4XUQ	157 53	Mf
Yellow Cab Co 3108 10th Rd N Arlington Va	25	W4XWB	157.53	Bf
Yellow Cab Co 817 State St Bowling Green Ky	35	W4XWW	157.53	Mf
Yellow Cab Co 315 E Congress St Savannah Ga	100	W4XYL	157.53	Mf
Yellow Cab Co 328–13th St Ashland Ky	10	W4XYU	157.53	Bf
Yellow Cab Co 100 4th St S St Petersburg Fla	30	W4XZT	157 53	Mf
Yellow Cab Co 1110 Av K Lubbock Tex	10	W5XAO	157.53	Bf
Yellow Cab Co 524 Murray St Alexandria La	20	W5XIY	157 53	f
Yellow Cab Co 1420 26th Av Gulfport Miss	15	W5XJK	157 53	Mf
Yellow Cab Co 641 Pearl St Beaumont Tex	17	W5XLP	157.53	Lf
Yellow Cab Co 112½ W Central Albuquerque NMex	20	W5XNR	157 53	Gf
Yellow Cab Co 637 E South St Opelousas La	5	W5XNT	157 53	Mf
Yellow Cab Co 301 W Markham St Little Rock Ark	6	W5XOS	157 53	Lf
Yellow Cab Co 426 Cypress St Abilene Tex	50	W5XOX	157 53	Mf
Yellow Cab Co 304½ S Washington El Dorado Ark	20	W5XOZ	157 53	Mf
Yellow Cab Co 718 Crockett St Shreveport La	55	W5XPB	157 53	Mf
Yellow Cab & Bag Co 216 W Maple Enid Okla	20	W5XPD	157 53	Mf
Yellow Cab Co NE Cor Cherry & Perry Sts Helena Ark	8	W5XQD	157.53	Df
Yellow Cab Co 215 E Houston St Marshall Tex	17	W5XQH	157 53	Mf
Yellow Cab Co 2405 Oak St Greenville Tex	20	W5XQU	157.53	Ff
Yellow & Deluxe Cabs 410 S Dewey Bartlesville Okla	10	W5XRH	157 53	Mf
Yellow Cab Co 301 Lafayette St Baton Rouge La	30	W5XRO	157 53	Ff
Yellow Cab Co Killeen Tex	12	W5XSM	157.53	Ba
Yellow Cab & Bag Co 305 S Fillmore Amarillo Tex	40	W5XSX	157.53	a
Yellow Cab Co 215 S Main St Paris Tex	20	W5XSZ	157 53	Ff
Yellow Cab Co 702 S 1st St Temple Tex	10	W5XUI	157 53	Ff
Yellow Cab Co 32 W Twohig St San Angelo Tex	25	W5XUW	157 53	Ff
Yellow Cab Co 111 State Line Av Texarkana Tex	20	W5XVK	157 53	Mf
Yellow Cab Co 403 E Whaley St Longview Tex	20	W5XVT	157.53	Ff
Yellow Cab Co 122 Parkinson Av Crowley La	10	W5XWB	157.53	Mf
Yellow Cab Co 313 Runnels St Big Spring Tex	15	W5XZF	157 53	Mf
Yellow Cab Service 217 S Los Angeles St Anaheim Calif	10	W6XAP	157.53	Mf
Yellow Cab Co 372 Park Av San Jose Calif	6	W6XAJ	157.53	Mf
Yellow Cab Co 1177 E Anaheim St Long Beach Calif	80	W6XLO	157 53	Mf
Yellow Cab Co 639 13th St San Diego Calif	180	W6XNM	157.53	Mf
Yellow Cab Co 35 W 7th St National City Calif	20	W6XOH	157.53	a
Yellow Cab Co 1408 W 3rd St Los Angeles Calif	1001	W6XPR	157.53	Mf
Yellow Cab Co 245 Turk St San Francisco Calif	600	W6XPE	157.53	Mf
Yellow Cab Co 737 16th St Oakland Calif	200	W6XPI	157 53	Mf
Yellow Cab Co 248 23rd St Richmond Calif	18	W6XQV	157.53	a
Yellow Cab Service 157 Castro St Mountain View Calif	6	W6XRM	157 53	Mf
Yellow Cab Co 101½ S Hill St Oceanside Calif	25	W6XRO	157 53	Mf

TRUCKS, BUSES, TAXIS — Continued

Yellow Cab Co Fox Hotel 4th & Main Sts				
Taft Calif	3	W6XTX	157.53	a
Yellow Cab Co 3755 Market St				
Riverside Calif	15	W6XNB	157.53	Mf
Yellow Cab Co 1301 18th St				
Bakersfield Calif	35	W6XYJ	157.53	Mf
Yellow Cab Co 561 4th Av N				
Twin Falls Idaho	5	W7XHC	157.53	Mf
Yellow Cab Co 111 ½ S 8th St				
Klamath Falls Ore	7	W7XLP	157.53	Bf
Yellow Cab Co 321 W 4th St				
Dayton 2 Ohio	55	W8XMC	157.53	Rf
Yellow Cab Co 247 W Water St				
Kalamazoo Mich	22	W8XME	157.53	Mf
Yellow Cab Co 264 Prairie St				
Elgin Ill	19	W9XAE	157.53	Mf
Yellow Cab Co 510 St Louis Av				
E St Louis Ill	25	W9XCR	157.53	f
Yellow Cab Co 216 Washington St				
Waukegan Ill	20	W9XQK	157.53	Mf
Yellow Cab Co 99 Pine St				
Riverside Rd Ill	5	W9XRX	157.53	Mf
Yellow Cab Co 2907 63rd St				
Kenosha Wis	30	W9XYF	157.53	Wf
Yellow Cab Co 5036 Hohman Av				
Hammond Ind	26	W9XYH	157.41	Bf
R W Yingling 39 Main St				
Lockport NY	3	W2XRN	157.53	Bf
Young's Taxi 18 Sullivan St				
Claremont NH	10	W1XHQ	157.53	Mf
Zion Taxi 2715 Sheridan Rd				
Zion Ill	6	W9XWK	157.53	Mf
Zone Cab Co 317 E Market St				
Warren Ohio	8	W8XIR	157.53	Mf

EXP. UTILITY & INDUSTRIAL

AT & T (Long Lines Dept) 32 Av of Amer				
New York NY	4	W1OXDZ	153.59	Mf
Arizona-Nevada Constr PO Box 38				
Dinuba Calif	6	W6XRU	153.59	Mf
Nr Minkler Cal		W6XRV	153.59	Mf
Nr Seville Cal		W6XRW	153.59	Mf
Arkansas Western Gas Co 28 E Central St				
Fayetteville Ark	15	W5XYL	33.18	Mf
Asbestos Erectors Inc				
Round Brook NJ	3	W4XQF	42.98	a
Brown & Root Inc 4300 Calhoun Rd				
Houston Tex	15	W1OXCV	33.18	Lf
Calif Elec Pr Co 3771 8th St				
Riverside Calif		W6XKT	72.66	Mf
Riverside Calif		W6XKU	75.50	Mf
Cedar Park Cemetery PO Box 68				
Westwood NJ	10	W2XTL	153.59	Lf
Central Ariz Lt & Pr Co PO Box 2591				
Phoenix Ariz		W7XNS	75.50	Af
Gila Bend Ariz		W7XNT	72.66	Af
White Tank Mt		W7XNV	75.50	Af
Chambers & Garrison 1519 Conn Av				
Washington DC	6	W1OXAI	153.59	Ba
Dallas Pr & Lt Co 515 Park Av				
Dallas Tex	2	W5XOT	39.98	Mf
R B Doe Rt 1 E Norris Rd				
Bakersfield Calif	12	KEVW	30.58	Kf
E Texas Salt Water Disp Co PO Box 633				
Kilgore Tex	6	W5XYH	37.62	Mf
EWA Plantation Co PO Box 2990				
Honolulu Hawaii	20	K6XTU	153.71	Bf
G E Kadane & Sons Hamilton Bldg				
Wichita Falls Tex	22	W5XWS	33.26	Gf
Gulf Pr Co				
Pensacola Fla	2	W4XTP	153.71	Mf
Hawaiian Commercial & Sugar Co				
Honolulu Hawaii	12	K6XAL	153.59	Bf
Hudson Paint & Dec Co Inc 441 Lexington Av				
New York NY	11	W2XUI	153.59	Lf
Interstate Pet Commun 30 Rockefeller Plaza				
New York NY	8	W5XWX	37.82	Mf
Kans Gas & Elec Co.				
Cheney Kans		WØXIB	75.50	f
Atlanta Kans		WØXID	75.50	f
Strauss Kans		WØXIP	———	—
King Farms Co				
Morrisville Pa	11	W3XDB	156.99	Mf
Latex Construction Co 2707 Ferndale St				
Houston Tex	10	W5XYX	33.18	Mf
Los Angeles Transit Lines 1060 S Broadway				
Los Angeles Calif		W6XQF	72.26	Lf
Macon Electric Cooperative				
Macon Mo	2	WØXFI	153.59	Mf
National Steel Corp				
Weirton WVa	8	W8XJI	153.59	f
Oklahoma Railway Co				
Oklahoma City Okla	5	W5XKF	———	—
Panhandle East Pipe Line 1221 Balt Av				
Kansas City Mo		W8XGC	72.66	Mf
Penobscot-Dunklin Electric Coop				
Hayti Mo	8	WØXIO	153.65	Mf
Phillips Petroleum Co				
Sweeney Tex	100	W5XCA	33.26	Mf
Phillips Tex		W5XCB	33.26	Mf
Hansford Tex		W5XCC	33.06	Mf
14 & Klein Sts Dumas Tex		W5XCD	33.26	Mf
City Nti Bank Bldg Houston		W5XCW	33.26	Mf
Placid Oil Co 1107 City Bank Bldg				
Shreveport La	25	W5XVN	37.5	Gf
Potlatch Forests Inc				
Lewiston Ida		W7XMF	33.34	Gf
Portable-Mobile	8	W7XMI	153.59	Gf
Potomac Elec Pwr Co 10th & E Sts NW				
Washington DC		W3XHO	33.82	Gf
Pullman-Standard Car Mfg Co 719 Wabash				
Michigan City Ind	9	W9XLN	153.59	Mf
Riverview Farms Box 258 Washington Av				
Oxford NY	10	W2XTN	153.59	Lf
Robertson-Matheny Oil Co PO Box 3097				
Wichita Falls Tex	9	W5XYJ	33.18	Gf
Roosevelt Irrigation Dist PO Box 1089				
Buckeye Ariz	2	W7XJG	157.53	Af
Seaside Lumber Co 1208 American Trust Bldg				
Berkeley Calif	3	W6XWO	153.59	a
So Calif Edison Co Ltd				
Mojave Calif		W6XTN	75.50	Mf
Santa Monica Calif		W6XSZ	75.50	Mf
Santa Paula Calif		W6XTE	75.50	Mf
Nr Corona City Calif		W6XTL	75.50	Mf
Nr San Fernando Calif		W6XTO	75.50	Mf
Nr Ventura Co Calif		W6XTR	75.50	Mf
Southside Elec Coop Inc				
Crewe Va		W4XXE	75.50	Lf
T B Tripp & Sons 1604 W 2nd St				
Odessa Tex	20	W5XYN	33.18	Mf
Union Bag & Paper Co Sta				
Savannah Ga	1	W4XRX	157.11	Bf

EXP. UTILITIES & INDUSTRIAL — Continued

United Gas Pipe Line Co 1525 Fairfield Av Shreveport La	W5XLK	72.66	Mf
Va Gas Transmission Corp 1033 Quarrier St Charleston W Va	W4XXO	72.66	Lf
Weldon & Carr 1605 Conn Av NW Washington DC	6 W1OXXL	153.59	Ba
Westinghouse Radio Stations 1619 Walnut Philadelphia Pa	5 W8XCG	37.14	Mf
Weyerhaeuser Timber Co PO Box 812 No Bend Ore	2 W7XNL	33 26	f

GEOPHYSICAL

Amerada Petrol Corp 120 Bway New York NY	6 KIHA	1.700	Kf
American Exploration Co 1108 Van Buren St Houston Texas	19 KCJW	1.676	a
Apache Exploration Co 1452 Esperson Bldg Houston Tex	2 KCHI	31.06	Lf
Arkansas Fuel Oil Company Slattery Bldg Shreveport La	4 KHTU	1.676	a
Atlantic Refining Co 260 S Broad St Philadelphia Pa	26 KAUA	1.652	Ka
Atlas Exporation Co Meille Esperson Bldg Houston Tex	2 KBQD	1.676	a
Wm M Barret Inc Giddens-Lane Bldg Shreveport La	8 KFYH	1.676	a
Shreveport La	2 KRYJ	35.06	a
Sol Bronstein 1820 W Franklin St Evansville Ind	2 KEKA	1.602	a
Carr Geophysical Co Commerce Bldg Houston Tex	4 KKOP	1.652	a
S Chapman Dept of Physics Stanford Univ Calif	3 KUJK	35.06	f
Cities Service Oil Co Masonic Bldg Bartlesville Okla	5 KQMF	1.676	Ka
J O Clark Jr Oil Explorations PO Box 565 Mission Tex	3 KKIO	1.676	a
Continental Oil Co Ponca City Okla	9 KAHG	1.676	Ka
Ponca City Okla	4 KBVA	35.54	Lf
Crowell & Steele Inc 3416 Ella Lee Lane Houston Tex	4 KGKY	35.06	f
Geophysical Development Corp 1249 S Boston Tulsa Okla	2 KRRT	35.54	a
Geophysical Eng Corp 199 S Fair Oaks Av Pasadena Calif	3 KBIK	1.676	a
Geophysical Exploration Co 104 Bway Denver Colo	3 KCSL	1.652	Wa
Geophysical Research Corp 120 Bway New York NY	4 WRFI	1.652	a
Geophysical Service Inc 1311 Republic Bk Bldg Dallas Tex	8 KIFW	1.676	a
Geotechnical Corp 3712 Haggar Drive Dallas Tex	23 KAQN	1.676	Ka
Gulf Research & Dev Co PO Drawer 2038 Pittsburgh Pa	79 KAUO	35.54	Lf
Humble Oil & Refining Co 1216 Main St Houston Tex	25 KIYK	1.700	a
Houston Tex	23 KJAB	153.11	Ba
Houston Tex	6 KJAE	35.54	a
Independent Exp Co Esperson Bldg Houston Tex	8 KIWN	35.54	a
Houston Tex	20 KREX	1.700	a
Houston Tex	10 KKVI	152.75	Ba
Interstate Petrol Comm Inc 30 Rockefeller Pl New York NY	47 KBJB	1.700	a
New York NY	10 KNAR	35.54	a
Keystone Exploration Co 2813 Westheimer Rd Houston Tex	2 KSGB	31.06	Lf
Magnolia Petroleum Co Magnolia Bldg Dallas Tex	14 KHBN	1.700	a
McCollum Exploration Co Esperson Bldg Houston Tex	23 KBPH	1.700	Ka
Houston Tex	1 KCPG	1.602	Ka
Nat'l Geophysical Co Tower Petroleum Bldg Dallas Tex	21 KAUB	31.06	a
Dallas Tex	4 KNFU	1.676	a
New York Trap Rock Corp 252 Water St Newburgh NY	2 WKNT	152.75	a
Offshore Navigation Inc 1402 Hibernia Bldg New Orleans La	10 KONI	1.700	a
Petty Geophysical Eng Camp 317 6th St San Antonio Tex	22 KBQH	1.700	Ha
Phillips Petrol Co Phillips Bldg Bartlesville Okla	12 KHJR	35.54	Ka
Pure Oil Co Dept of Geology Houston Tex	2 KOGE	1.700	a
V T Reynolds 3805 Inverness Houston Tex	2 KFAV	1.652	a
R H Ray Co 608 Nat'l Standard Bldg Houston Tex	21 KBXQ	1.700	Ka
Rogers Ray Inc 608 Nat'l Standard Bldg Houston Tex	4 KWDQ	1.700	Ka
Houston Tex	4 KRPH	35.54	a
Seismic Eng Co 1125 Kirby Bldg Dallas Tex	2 KBTF	1.652	a
Dallas Tex	30 KAIN	1.700	a
Seismograph Service Corp 828 Main Chaldron Neb	54 KAHV	1 700	a
Socony-Vacuum Oil Co Inc 412 Greenpoint Av Brooklyn NY	2 WCSM	1.653	a
Sohio Petroleum Co Esperson Bldg Houston Tex	8 KTXG	1.700	a
Southern Geophysical Co Sinclair Bldg Fort Worth Tex	4 KRWX	1.700	a
Fort Worth Tex	2 KWFJ	1.628	Ka
Fort Worth Tex	2 KAJJ	31.06	a
Stanolind Oil & Gas Co 5th & Boston Sts Tulsa Okla	33 KEXU	1.700	a
Tulsa Okla	3 KHCI	153 47	a
Tulsa Okla	9 KVRU	35 54	Ff
Sun Oil Co PO Box 2831 Beaumont Tex	25 KAVC	153 47	Lf
Beaumont Tex	4 KTJG	35.14	kf
Superior Oil Co 400 Oil & Gas Bldg Houston Tex	26 KSOG	35.54	Lf
Houston Tex	3 KCKZ	1.700	a
Houston Tex	3 KFBJ	152.75	Bf
Texas Co 135 E 42nd St New York NY	36 KAVS	1.700	a
New York NY	6 KRMN	35.54	Lf
Towlinson Geophysical Serv 506 City Bank Bldg Shreveport La	KCEP	1.700	Ja
Union Oil Co of Calif 617 W 7th St Los Angeles Calif	6 KUCO	33.54	Mf
United Geophysical Co 595 E Colo St Pasadena Calif	99 KAOK	43.18	Ka
Universal Exploration Co 2044 Richmond Rd Houston Tex	4 KUEH	1.700	a
Western Geophysical Co 1333 S Hope St Los Angeles Calif	4 KAJM	1.700	a
Yegua Corp 2302 Esperson Bldg Houston Tex	6 XRWT	31 06	f

WHAT'S NEW THIS MONTH

(CONTINUED FROM PAGE 15)

work service by the end of 1948 if the demand exists."

(5) NEW YORK AND CHICAGO: "Coaxial cable is expected to be completed between New York and Chicago by the fall of 1948 and television circuits can be provided over that route shortly thereafter."

(6) CHICAGO AND ST. LOUIS: "It is expected a connection could be provided between Chicago and St. Louis by the fall of 1948, by means of coaxials through Terre Haute."

(7) LOS ANGELES AND SAN FRANCISCO: "Television facilities between Los Angeles and San Francisco are expected to be available in 1949."

It can be seen from the above quotations that the American Telephone and Telegraph Company on its own initiative had made definite plans for a far flung network of television stations; but despite the tremendous growth of FM, had no similar plan for FM networks, even though a present demand existed for such facilities.

11. It is also noteworthy that *no charge has been made by the American Telephone and Telegraph Company for the use of these network facilities for television broadcasting* for either sustaining or commercial broadcasts in those communities where television stations now operate inter-city. By contrast, a request for the use without charge of the Washington to New York facility for FM network purposes was denied by the American Telephone and Telegraph Company.

12. PETITIONER THEREFORE REQUESTS:

A. That the Commission pursuant to Section 205(a) of the Communications Act make an investigation to determine whether there has been compliance with the provisions of Section 202(a).

B. That this petition be regarded as an informal complaint pursuant to Section 208 of the Communications Act, and Sections 1.572 and 1.573 of the Rules and Regulations; and that these questions be taken up by the Commission with the American Telephone and Telegraph Company in an effort to bring about satisfaction.

C. That a hearing be held regarding the establishment of common carrier facilities for FM network operation and following such hearing that the Commission prescribe just and reasonable charges for the service desired by FM broadcasters.

D. That until such time as reasonable rates and charges are fixed, to order the respondent, American Telephone and Telegraph Company, to afford FM broadcasters the use of facilities for network purposes on the same basis as presently used by television broadcasters.

Respectfully submitted,

LEONARD H. MARKS
General Counsel
FM Association

December 13, 1947

Price Reduction

The words "price reduction" don't appear in type very often in these times. But here they are, and they apply to the subscription rates on *FM* AND TELEVISION Magazine. We think you'll agree that we have an outstanding record among the radio publications:

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1 year	$3.00	2 years	$ 5.00
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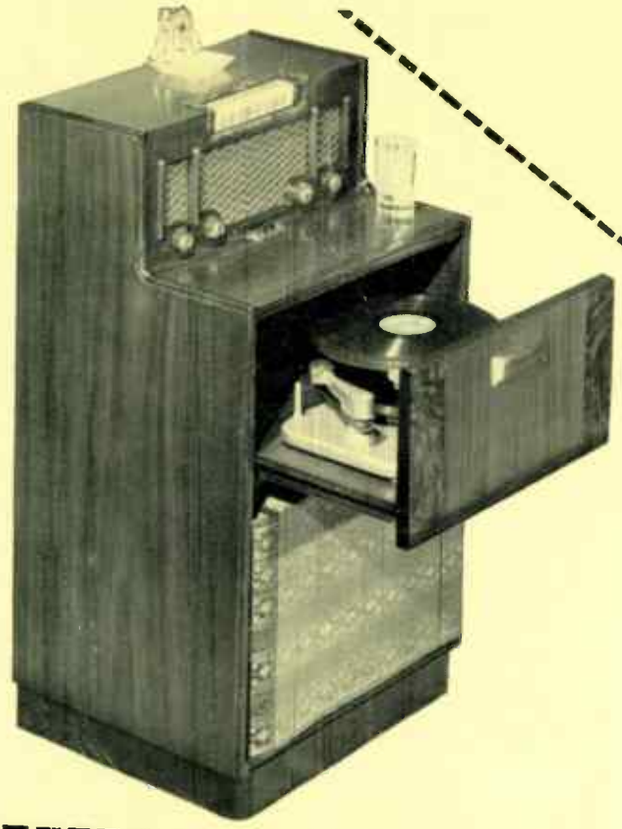

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