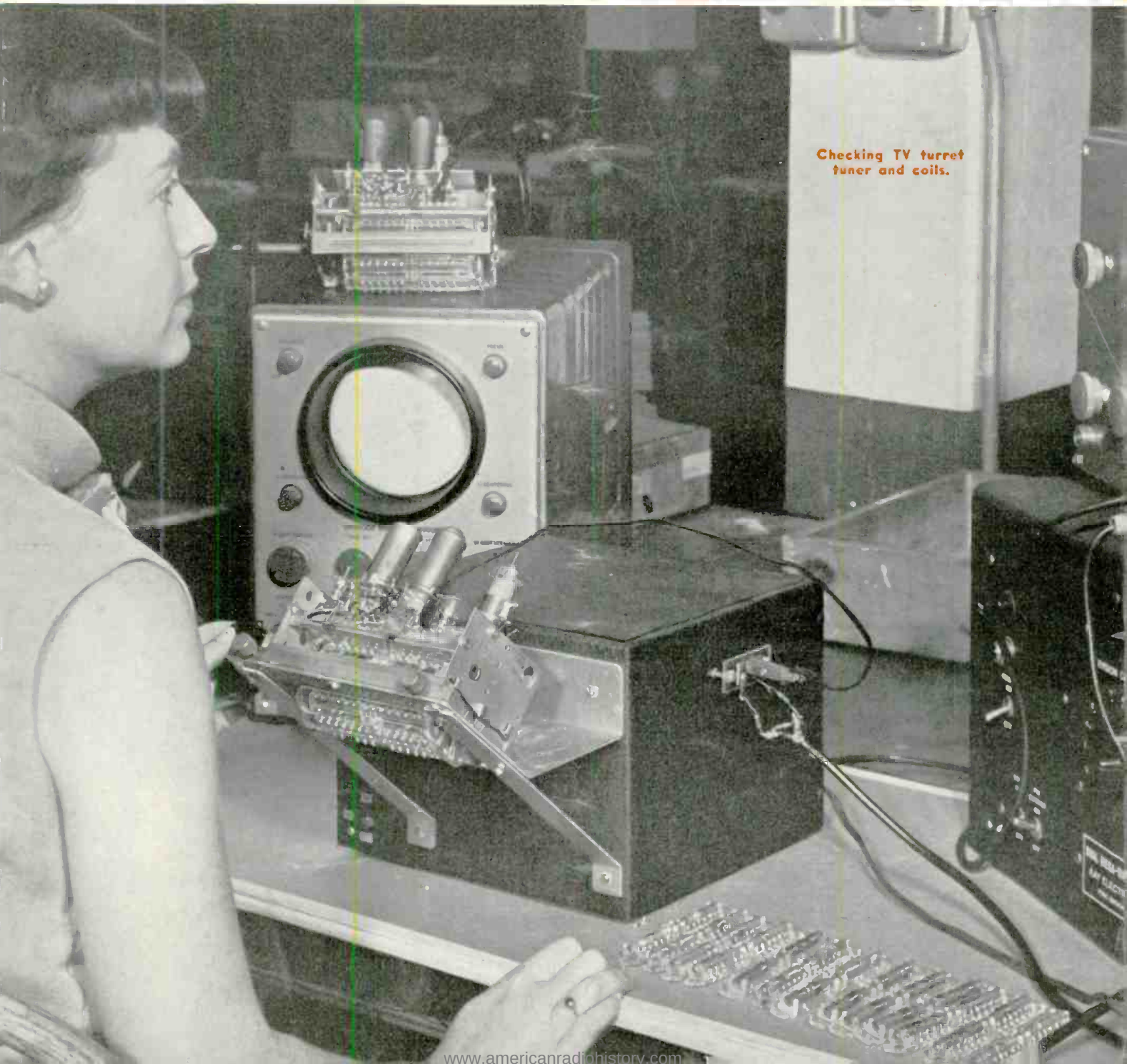
TELE-VISION ENGINEERING

JULY, 1951

The News-Engineering Journal of The TV Industry



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VOLUME 2 **JULY, 1951** **NUMBER 7**

MONTHLY FEATURES

Cover Illustration

Alignment of individual channel strips on turret tuner at assembly plant of National Company, Inc., in Melrose, Mass.

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TELE-VISION ENGINEERING
LEWIS WINNER, Editor

July, 1951

Ultrahighs Win 470-Mc Band—The contest for the 470- to 500-mc band, on the docket for many, many months, has finally come to a close with TV the winner, the FCC declaring that video is more urgently in need of this part of the spectrum than the mobile services.

The Commission pointed out that the loss of this 30-mc space to other services would severely handicap the attainment of a nationwide and competitive broadcast system. There was no denial, it was indicated, that the common-carrier mobile services must expand, but such expansion could be carried out in the bands below 162 mc, using smaller separations between frequency assignments, and in addition, applying more efficient techniques of operation, such as single sideband transmission, multiplexing, etc. The FCC also declared that the existing allocation of 470-475 mc for facsimile broadcasting will be abolished, the faxcasters being told that their transmissions could be aired over the facilities of FM stations.

The announcement, officially contained in the fourth report, disclosed that the new addition of five more channels, providing a total of eighteen for the *uhf* band, will be particularly important to many areas, where the possibilities of ultrahigh assignments had not been bright. Incidentally, the Commission reported that although it had discouraged the filing of applications during the pendency of the current hotly-disputed proceedings, more than 400 applications have been received. The mailbag also contained over a thousand comments, oppositions and petitions relating to the third report and its assignments throughout the country.

The flood of briefs, and the delays caused by the geographical-block allocation question, plus Congressional resolutions for supplementary inquiries on the freeze, have all added up to another delay in the thrice-postponed hearings. It now appears as if the hearings will not be held until the first part of August. However, there is a move afoot to adopt a streamlined schedule which might speed up the city-by-city hearings, so that perhaps a definite freeze lift will become possible before the year is over.

Color Marches On—As pinwheel TV made its official debut a few weeks ago, electronic-compatible color appeared on the scene, too, with a round of stirring field-test shows, demonstrating that tube-type red-green-bluecasting has not only made significant strides during the past few months, but offered striking possibilities for the future.

In an explanation of the system now being used by RCA, Doc Engstrom reported that the sequence of color information, carried on a sub-carrier, which was formerly the same for all the fields, has been altered, with the sequence from one field to the next now being transmitted in reverse, or one field of green, red and blue, and the next field of green, blue and red, etc. It was reported that this procedure had been found to result in better color purity and permitted, too, more tolerance in circuit adjustment, particularly at the receiver. It was also pointed out that the phase and amplitude of the sub-carrier actually carried the hue and saturation of the colors, while the brightness information was contained in the picture signal, just as in black-and-white transmission.

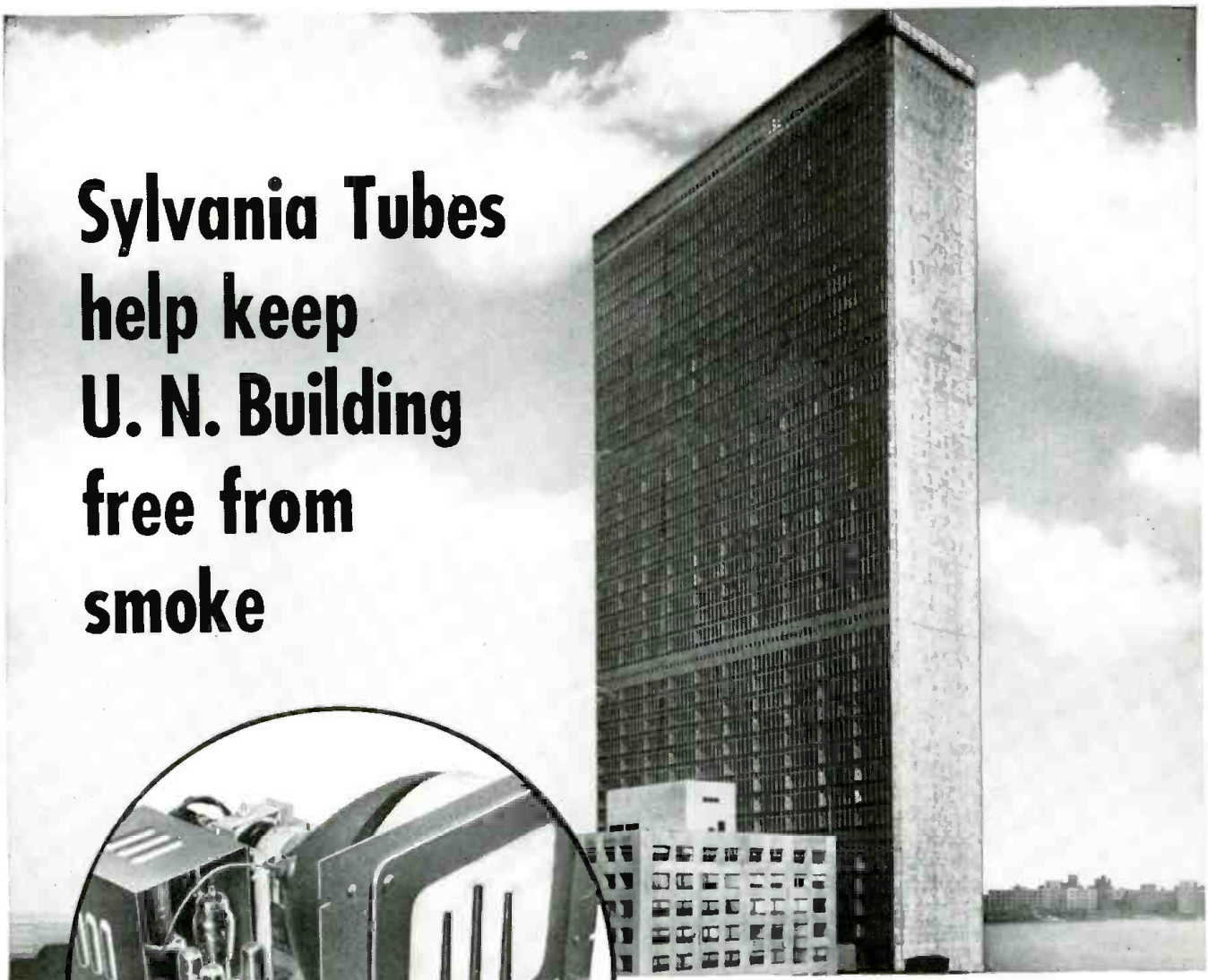
The tests appeared to many to indicate that the system has reached a stage where a bid for standards might be made earlier than anticipated. With the aid of the NTSC program, which has become an extremely active industry-wide project, it is possible that a new, or perhaps a dual set of standards, may be adopted very, very soon.

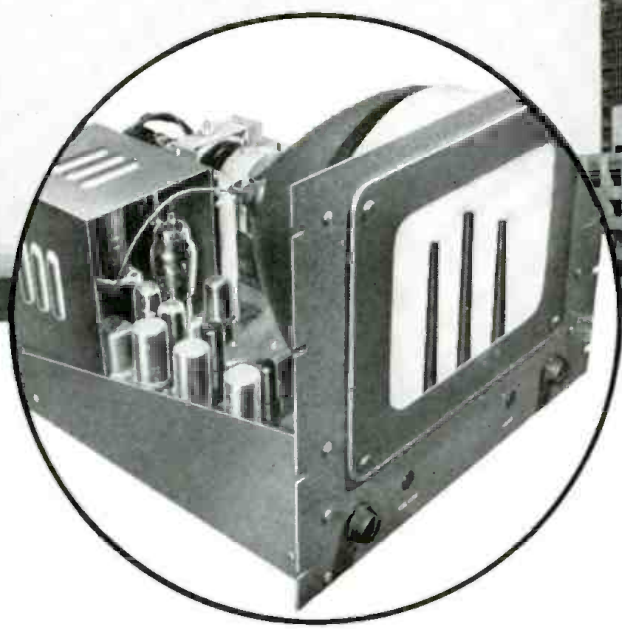
Light Looms As A Major Factor In Color—The recent on-the-air transmissions of color have accented the importance of lighting in colorcasting. It has been acknowledged, even in monochrome broadcasting, that light is an elusive item requiring expert manipulation. On the color set the lighting factor has been found to be an even more difficult problem-child, requiring critical control at the source, in the camera, on the mixing board, and in the makeup room.

The challenging subject has prompted many to survey the possibilities of primary standards. In a report on one study of the subject in Great Britain a short time ago, it was cited that a primary standard of light might simplify color control, and might be realized by the adoption of internationally-agreed visual photometric techniques, involving the use of color filters to minimize color difference. It was noted, however, that all photometric and colorimetric techniques concern the measurement of the physical stimulus, and the results of such measurements, while they are useful as a means of specifying light sources and color patterns, actually bear relation to only what we see under strictly defined circumstances. Accordingly, the subject of light and color represents a field that not only demands attention of the illuminating and video specialist, but those who are students of psychology and emotional response.

Manpower At the TV Station—The complex requirements of the engineering department of a normal telecasting setup were strikingly illustrated recently during a personnel meeting revolving about the manpower needs of a typical station. It was brought out that in addition to supervisors in the field, at the master control and in maintenance, it was necessary to have a chief and assistant station engineer and transmitter technicians, video-control engineer, field technician, studio technician, film technician, field-maintenance technician, all of whom are responsible for cameras, lighting, microphone-boom control, turntable operation, projection, fixed and mobile-audio systems, microwave setups, etc. Whereas, in a broadcasting station it might be possible to operate with a skeleton force of a few, the television station places heavy demands on manpower. While it is possible, as Al Isberg pointed out in an article in TELEVISION ENGINEERING and during the recent IRE meeting, to streamline operations so that one man can perform two or possibly three functions, a substantial crew is still necessary to operate a successful TV station, and all the persons involved in the link from the studio to the transmitter must be considered essential. —L. W.

Sylvania Tubes help keep U. N. Building free from smoke





Showing chassis of "Vericon" Picture Monitor equipped with Sylvania tubes. These monitors are finding a wide variety of uses today in industries and institutions. They were designed to the exacting requirements of the Remington Rand "Vericon" System and built by Television Utilities Corp.

The problem of smoke at New York's beautiful U. N. Area is being solved with the help of Remington Rand's "Vericon" Industrial Television System equipped with Sylvania Tubes.

In reaching a satisfactory solution, much credit goes to the Consolidated Edison Company, located near by, for their all-out cooperation. Among other preventive measures, this company installed and focused a set of Remington Rand "Vericon" TV cameras on their towering stacks.

These cameras are hooked up to five strategically located viewing monitors—(soundless TV sets)—made by Television Utilities Corp. and equipped with Sylvania picture tubes and receiving tubes.

Every day, these monitors are in operation. If at any time smoke should appear, Consolidated Edison observers on watch immediately operate special controls to clear up the situation.

Writes Mr. A. E. Siegel, President of Television Utilities: *"Our monitors have been running all day long without stop for more than three months. All are equipped with Sylvania radio and picture tubes. We are wondering how long the Sylvania tubes will continue to take this kind of abuse without talking back."*

★ ★ ★ ★

The above is another interesting record of the durability and excellent performance of Sylvania tubes. Let us tell you something about the reasons behind this quality. For full technical data about any types of Sylvania receiving, transmitting, or picture tubes write today to: Sylvania Electric Products Inc., Dept. R-1507, Emporium, Pa. *Sylvania Representatives are also located in all foreign countries.*

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TVE-grams . . . .

Reports and Reviews of Current TV News

The Trade Practice Trial in Washington

Set Makers Censured for Malpractices: On several occasions, various associations representing dealers, distributors and Service Men have been quite critical of some of the merchandising and advertising tactics of many receiver manufacturers, noting that unless the situations were cleared up, it would be necessary to resort to a plea to government bureaus. One group in Washington felt that the problem was so acute that they bluntly asked the Federal Trade Commission to hold a hearing on the subject. A few weeks ago the FTC announced that such a hearing would be held and everyone would be given an opportunity to offer their views on industry conditions, and what views were offered, particularly by the dealers group from Washington. Speaking for the association, Edwin A. Dempsey flayed the set makers saying that defective chasses are still leaving the plant every month. He declared that ". . . Of the approximately 12,000,000 television sets now in use, at least 4,000,000 were defective when received by the dealers." In his opinion the . . . "quality of manufacture has not improved since the birth of the industry and this has cost the dealers of this country at least $10,000,000.00 a year in supplying labor and parts to make these defective sets function."

This practice must stop, he warned, and to be sure it does . . . "we are asking for a rule that would prohibit the continuance of the practice of the manufacturers charging the dealers for complete functioning television sets, where in fact the dealer only receives in so many cases an assemblage of parts in a cabinet."

Criticizing model changes, Dempsey said that the group . . . "would like to have a rule stopping the practice of manufacturers making numerous and senseless model changes at any time that suits their purpose, without proper notice being given the dealer regarding this change." It was pointed out that often the model changes have come in such rapid succession as to cause practically one distress sale after another. "This destructive practice," he said, "impoverishes the dealers, confuses the Service Men, and hinders the efforts of those who are trying to stabilize the parts end of the industry."

Radiation was cited as another gripe, a situation which could be remedied if there were . . . "a rule making it mandatory for all manufacturers to design and build sets so that the radiation will not measure more than 15 microvolts per meter at 100 feet." Dempsey added that this trouble can be eliminated at the factory, when the set is being built, for one tenth of the cost when done by the dealer in the field.

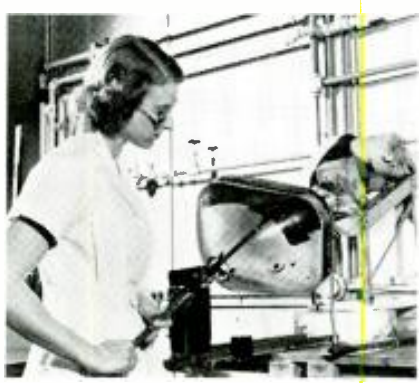
Exaggerated advertising claims were also attacked by Dempsey who said that there should be a rule that would prohibit statements stating that sets would perform satisfactorily with inside antennas in the majority of locations, where in fact these sets perform satisfactorily only within a limited radius of the telecasting station and then only under favorable conditions.

The practice of some manufacturers claiming performance qualities *in fringe* areas because of certain secret super power, should also be discontinued, because usually these sets have nothing in their design or manufacture to justify such claims.

Chassis makers should not be allowed to advertise new models as new and revolutionary, he said, when actually the only changes made involved rounding the corners of the cabinet and changing the shape of the control knobs.

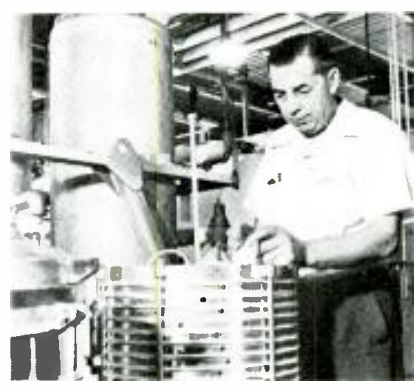
Declaring that the practice of advertising sets as static free is improper, Dempsey said that no set is static free when placed in certain localities or under certain conditions.

The need for accuracy in adapter and converter advertising was also cited in the dealer brief. It was suggested that anyone advertising adapters, converters, and other devices, should spell out clearly just what these devices are and exactly what they can do: "Advertisers should state that the device advertised has the capacity to convert a particular kind of set so that it can satisfactorily receive color television as approved by FCC color transmission standards. The words *color converters* or *adapters* are not sufficient to preclude the possibility of thousands of useless gadgets being sold to the public."



Left: Painting inside of a 20-inch glass TV picture tube at G.E. Electronics Park Lab.

Right: Stainless steel filter used in picture-tube process which removes all sediments from deionized water, employed in making screening solution. Shown with the filter is G.E. foreman Max Fietze.



Material Availability Schedules

Very Short, Tight and Fair Supply Listings Announced: In an effort to guide industry on current and anticipated procurement, Washington has released a compilation of metals, chemicals, plastics and lumber which are and will be critically short, fairly difficult to secure and generally available. The report indicates that certain alloy materials such as nickel, cobalt, and tungsten are in very short supply, and all nonferrous metals are tightening rapidly. In the latter group are aluminum, copper, magnesium, lead, selenium, tin and zinc.

Steel, in spite of capacity production and increased facilities is becoming critical. Only a few types and shapes are generally available.

Chemicals are noted as spotty, with key items tending to tighten related groups, though many important categories are still in fair balance. In this classification have been listed phenol, xenon, crypton, and argon.

The range of adaptability among plastics as substitutes for metals already has resulted in a tightening in their supply, cellulose acetate now being the only important plastic still generally available.

Lumber is the one large materials group that as yet has not been effected seriously.

The *very-tight* situation may be alleviated in the not-to-distant future if the ambitious programs outlined by government are fulfilled. Thus far, through various assistance programs, the Defense Minerals Administration has sought to stimulate the discovery and development of new reserves, to reopen closed mines, and to increase mill, smelter, and refinery capacity to handle the output of both large and small mines.

According to the second quarterly report on mobilization by Charles Wilson, government has agreed to pay 90 per cent of the cost of searching for 15 vital minerals, 75 per cent of the cost for four others, and half the cost in the case of nine.

Through a guaranteed purchase program, government has agreed to contract for the purchase of specified quantities of materials, particularly minerals, at an established floor price. The Wilson report noted that tungsten ores, of a specified grade, would be purchased at a floor price of $63 per unit. Industry is doing its job, too, to expand production. Facilities costing approximately $1 billion will be started this year by mines, mills, smelters, etc.

Fourth Quarter CMP Deliveries

DO Ratings and CMP Requisitions: Many manufacturers have been wondering what effect the institution of CMP in the third quarter would have upon *DO* rated orders already placed with a controlled materials producer calling for delivery in the fourth quarter.

According to Washington *DO* rated orders for controlled materials calling for delivery in the fourth quarter will have no preferential standing. If one who has placed such orders receives an authorized production schedule and allotment number for use in the fourth quarter, it will be necessary to validate his delivery order immediately with the controlled materials producer for the materials which have been ordered for delivery in that quarter. If the person placing such orders does not receive an authorized production schedule and allotment number valid for the fourth quarter, the controlled-materials producer will have to treat this delivery order calling for delivery in that quarter as if it were an unrated order.

The Iron and Steel Scrap Drive

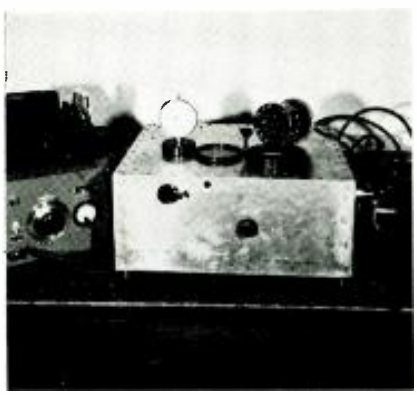
Wanted—More, Much More Scrap: Supplies of heavy industrial iron and steel scrap are reported as dangerously low, several steel companies having less than two weeks inventory on hand. Some have only a few days supply. Others have already lost some production, either through downtime or because the use of inferior grades of scrap has not permitted maximum output per ton of raw materials used.

Recognizing the seriousness of the threatening scrap shortage, special programs are being conducted to seek out dormant scrap and place it in normal channels as quickly as possible.

This is not a household scrap drive like some conducted during World War II. It is aimed rather at management and administrative officials who are in a position to make policy decisions that will assure quick action in (*1*) the collection of random heavy scrap, and (2) the writing off of idle, obsolete machinery and equipment.

It is urgent that there be a concerted effort to go after dormant scrap, keep the scrap flowing, and, make organized, permanent salvage a top-management responsibility.

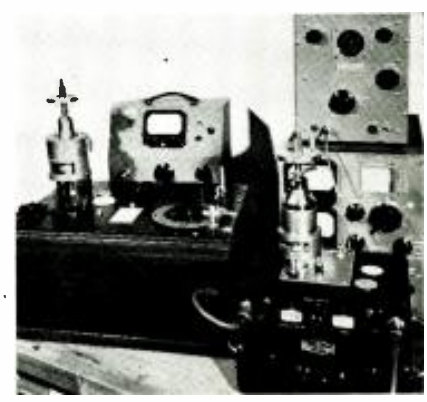
Equipment used for dielectric measurements under controlled conditions over a wide range of temperature and humidity. The measuring unit (center) is designed so that 10 specimens may be conditioned simultaneously and measurements made individually on all specimens without opening the test chamber. This system is used up to 30 mc. The auxiliary apparatus are the humidity and temperature controlling units.



Resonant cavity measuring apparatus used at the National Bureau of Standards for determining dielectric constant and power factor.* The specimen, made into circular disks (center foreground), is inserted into the cavity form part of the resonant circuit. Dielectric constant and power factor are determined from the micrometer readings and the voltages (voltmeters at left) across the specimen. The unit at the extreme right is a signal generator. The cavity at the left operates in the frequency range from 150 to 300 mc, and the smaller cavity in the right foreground operates in the region from 400 to 600 mc.

*TVE-grams, TeleVision Engineering: June, 1951.

NBS equipment for measuring dielectric constant and power factor. Electrode systems are designed so that they may be conveniently plugged into most commercial bridges. In the foreground are two bridges of different frequency ranges with the electrode systems plugged into position. Typical disk specimens are on top of each bridge. Associated monitoring and frequency generating equipment are in the background.



Automatic Antenna Matching

Simplified Antenna-Tuning Technique: An antenna-tuning system has been designed by NRL to match automatically the input impedance of a 35′ whip antenna to a 50-ohm coax transmission line over the frequency range of 2 to 18 mc. Although the unit was designed specifically to operate with a naval communications transmitter (type TCK, 400-watt output), the design is said to be applicable to a variety of automatic impedance-matching problems with only minor variations.

In normal transmitter design a matching device is required at the base of the antenna so that the input impedance to the antenna may be matched to the characteristic impedance of the transmission line. It has been desirable that the matching device be fully automatic and require no band switching, and that the entire matching operation be completed within a minimum time, ten seconds having been considered as a maximum tune-up time.

A study of the impedance characteristic of 35′ whip antennas and a number of impedance-matching networks and error-detecting circuits indicated that automatic results could be obtained with a modified cantilever-type matching system. Because the shunt arm of the cantilever network transforms the input impedance of the antenna to an impedance whose resistive component is equal to the characteristic resistance of the transmission line and the series arm of this network eliminates the reactive component from the parallel impedance of the antenna and the shunt arm, a sensing unit composed of a phase-angle detector and an impedance-magnitude detector was found desirable. The error voltage from the impedance-magnitude detector was set to drive the shunt arm through a servo system, the error voltage from the phase-angle detector driving the series arm in a similar manner.

In the shunt arm were inserted two continuously variable reactances, mechanically coupled so that the inductive reactance would reach a maximum value when the capacitive reactance also reached a maximum, and a minimum value when the capacitive reactance reached a minimum. In the series arm was placed an inductor and a capacitor electrically in series and mechanically coupled in a manner similar to the elements in the shunt arm.

On the basis of the work done to date it was concluded that, if the calculated ranges and voltage ratings of the components of the cantilever network could be realized, the completed unit would match a standard 35′ whip antenna to a 50-ohm coax line with a resulting standing-wave ratio of not more than 1.1 at any frequency between 2 and 18 mc. It has been further concluded that comparable results are obtainable in a wide variety of applications with relatively minor modifications of the original model and that the principal limitations on the range of applications are of a physical nature, such as the tuning ranges available in capacitors and inductances, voltage ratings obtainable with maximum tuning range, and other factors of a similar nature.

Improved Audio Test Room

Fiberglass Soundproofing: A new idea in soundproofing, included in a building constructed *inside out*, with the interior suspended from outside structural supports, has been evolved at the Naval Acoustical Lab at Annapolis, Md.

Featured is an *accordion* form for absorbing sounds, which is made of fiberglass in sheets eight-feet wide, and of various lengths. This glass *pillow* has been wrapped around a collapsible steel framework which when opened, resembles a string of *V*-shaped decorations. The interior of the rooms presents a quilt-like appearance. The accordion form is claimed to be superior to the Harvard wedge block plan for trapping noises.

The framework of the building is actually its exterior. This design was found to eliminate dead spaces between columns, which were erected outside of a 16-inch concrete wall. This construction provided, in general, a solid interior with a perfectly flat surface. The same effect was attained in the ceiling by suspending the roof from beams rather than resting the roof on them, as in the conventional type structure.

Below: Section of wall in one of the rooms at the new Naval Acoustical Laboratory at Annapolis, Md., with part of the accordion form installed. This steel framework coated with covering of fiberglass, takes on appearance of a quilt padding, shown at left. In this room Navy engineers are studying sound at frequencies from 60 to 8000 cps.

Accelerated Fabrication

Semi-Automatic Production Technique: The possibilities of completely automatic hopper-fed assembly and mechanized soldering have always intrigued those in the lab and in the plant.

Current demands of the military and general industry for smaller chassis, produced more rapidly, have accented the importance of the automatic theme and as a result many comprehensive studies and projects have been set up to find practical answers to the problem. Recently, the results of one such probe, described by W. H. Hannahs and W. Serniuk of the Sylvania physics labs during an IRE airborne electronics meeting in Dayton, disclosed that a new mechanized process has made it possible to produce a miniature transformer-coupled unit using a dual pentode, which was not only 70% smaller than the standard type formerly available, but weighed 60% less. Although the unit was specially designed for airborne installation, its construction featured components and circuitry that were noted as common to all facets of transmission and reception, particularly in TV. Electronically, the chassis, an intercom, featured the use of a 26A7GT, with matching to line on both input and output accomplished by balanced and humbucking transformers. A tertiary output winding served to provide a large amount of negative feedback to minimize distortion and stabilize gain.

In the construction, cylinder-type components were evolved and stacked end-upon-end and wrapped in connective wiring attached to a flexible insulating sheet. All terminals were made to protrude axially from the components and bear a special head which could snap and lock into the connections before soldering. This type of assembly eliminated the rigid chassis, the necessary rigidity being provided by a fitting cylindrical case in which the inner assembly was essentially shock mounted by the elastometric wrap. The case was also provided with a hermetic closure.

All terminations were established at the periphery of the tube socket and plug as well as the other components. Thus, it was found possible to use hopper collocating and automatic soldering because the assembly could be indexed in by simple rotary motion.

Describing, in detail, the assembly of the mixer amplifier, the Sylvania physicists said that a hopper feeds the components so that a complete set drops into the connective wrap within a few degrees of the proper orientation. Each part is keyed by its own terminal arrangement, and thus there is only one correct fit. Each lug snap-locks into specially cut slots in the conductor strips as the wrap is applied. This assembly was found to be sufficiently rigid to be self-supporting during soldering and no jigs were found to be necessary. The locking of each lug was said to be designed to withstand a five-pound pull.

It was pointed out that considerable attention was given to the design of the component lugs so that they might be used with other conductors than the punched strips. Small capacitors and resistors, used in this amplifier, slip into recesses in the tube socket and output plug. The leads from the components may be twisted, without tools, into the lugs protruding from the socket and plug in a manner which does not interfere with the locking of the strip conductors of the wrap.

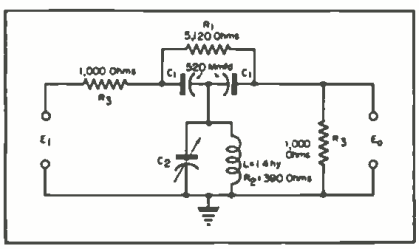
According to Hannahs and Serniuk the prime consideration motivating the choice of a cylindrical structure was that its symmetry permitted the use of simple rotating motions which could be easily mechanized. Thus, soldering of all joints in the amplifier could be handled by an automatic machine. In application, a row of hot-wire soldering tools equal in number to the number of components are poised above the lugs. These tools are individually raised and lowered at the proper moment to effect soldering of the lugs to the conductors. The solder itself is fed from spools near the rear base of the machine. These feeds are operated by means of microswitch-actuated solenoids. The heads and solder were described as cam-operated and activated only when a terminal is presented.

In a discussion of the output transformer, noted as the smallest 17-db unit produced in balanced and humbucking construction, it was said that the reduction in size was achieved principally through the use of better core alloys and improved bobbin winding techniques. Sealing of the transformers and a choke was of the ruggedized impregnation type, covered by specification AN-E-19, but in combination with steel cases so that low frequency magnetic shielding is provided.

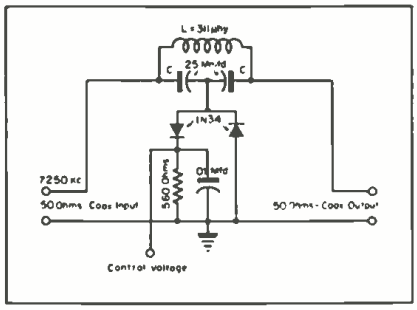
Tantalum electrolytics, used in the unit, were found to extend the temperature operating range of the amplifier, in addition to contributing a space saving of 72%. Incidentally, the output capacitor was hermetically sealed and of high temperature construction.

It was pointed out that the soldering machine with additions of heads and cam changes, can accommodate packages of various lengths, terminals, and diameter. In addition, it was said, the flexible electromechanical principles can be applied in designing machines for other shapes.

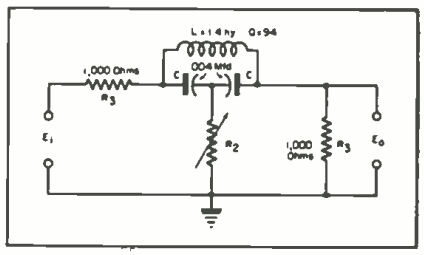
NBS bridged-tee network modulator circuit designed to obtain a phase shift by varying either the capacitance, C_2, or the frequency. With the values of the circuit components as shown and an operating frequency of 4170 cycles, the circuit attenuation has been found to remain constant at 16 db, the phase shifting 90° as C_2 is varied from zero to 25 mmfd.



Network using voltage control of phase which has been found to be effective as a phase-modulating unit inserted in coax coupling between low-level stages of a frequency modulated hf transmitter.

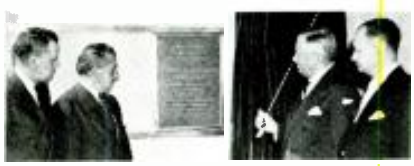


Bridged-tee network circuit in which phase shift is produced by a variation in resistance R_2. At a frequency of 4170 cps, the attenuation of the circuit is constant at 30 db; and when R_2 is varied from zero to 10,000 ohms, the resulting phase shift is about 120°.



TVE-grams . . . Personals

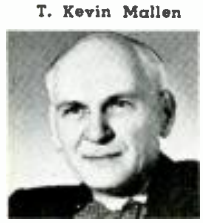
New Posts: *Dr. Henry G. Booker*, professor of engineering at Cornell University and chairman of the U.S. Navy advisory board on antennas, and *John M. Berkowitz*, have been elected to the board of directors of The LaPointe-Plasconold Corp., Windsor Locks, Conn. . . . *Thomas B. Jackoks*, formerly manager of the G. E. Atlantic district, has been named special representative for the General Electric tube divisions, headquartering in Washington, D.C. He will supervise government and service agency activities for the tube divisions in the Washington area. . . . *Chris J. Witting*, formerly DuMont network general manager, has been appointed director of the network. *Mortimer W. Lowei* has retired as network director and is now executive assistant to Dr. DuMont. . . . *Peter H. Cousins* has been named RTMA director of information, succeeding *John Koepf*, who has resigned to take a position with the Savings Bond Division of the U.S. Treasury Department. . . . *Eugene M. Lang*, formerly Heli-Coil Corp. works manager, has been elected vice president, in charge of manufacturing, of the company. . . . *E. L. Hulse*, formerly G. E. electronics department comptroller, has been appointed manager of the newly created components division, in which have been included the facilities of the Illinois Cabinet Co. Precision Labs., Inc., and Wabash Cabinet Works. *G. L. Chamberlin* has been named department comptroller. . . . *Commander Ralph T. Brengle*, USNR, sales manager of Potter and Brumfield, Princeton, Indiana, has been appointed chairman of the relay industry advisory committee of the Munitions Board. Other members of the committee are: *Col. T. M. Natt*, USAF, chairman, electrical division, MB, Washington, D.C.; *H. W. Pfeffer*, Struthers-Dunn, Philadelphia, Pa.; *Edward Gillette*, Allied Control Co., New York; *Dan Dooley*, C. P. Clare Co., Chicago, Ill.; *Emory Howe*, Comar Electric Co., Chicago, Ill.; *John Rowell*, Guardian Electric Co., Chicago, Ill.; *Joseph F. Clark*, Leach Relay Co., Los Angeles, Calif.; *J. Crissinger*, North Electric Manufacturing Co., Galion, Ohio; *James Roughan*, Price Electric Co., Frederick, Md.; *Richard Fischer*, Sigma Instruments, Boston, Mass.; *A. C. Keller*, Western Electric Co., Bell Telephone Laboratories, N. Y.; *Harold L. Olesen*, Weston Electrical Instrument Corp., Newark, N. J.; and *F. H. Clark*, Westinghouse Electric Manufacturing Co. . . . *T. Kevin Mallen* has been elected chairman of the board of directors of the Ampex Electric Corp., San Carlos, Calif. . . . *William G. Church, Jr.*, is now district sales manager in charge of the Chicago sales office and warehouse of Allied Electric Products Inc., Irvington, N. J. . . . *Ellery W. Stone*, prexy of American Cable and Radio Corp., New York City, is now a member of the International Communications Operating Industry Advisory Committee. Other members of the committee are: *William G. Thompson*, American Telephone and Telegraph Co., New York City; *J. D. Hopkins*, Globe Wireless, Ltd., Washington, D. C.; *Bernard P. E. Wolbarst*, Press Wireless, Inc., New York City; *Thompson H. Mitchell*, RCA Communications, Inc., New York City; *Robert V. Hawley*, Tropical Radio Telegraph Co., Boston, Mass.; and *K. Bruce Mitchell*, The Western Union Telegraph Co., New York City. . . . *Dr. Allen B. DuMont* was recently honored at a luncheon in N. Y. City, during which he was cited as one of the most outstanding industrialists in the country. . . . *William Saxon* has been appointed technical equipment coordinator at the Hollywood home office of Neely Enterprises. . . . *Charles A. Hansen*, of Jensen Manufacturing Co., Chicago, has been reelected by the Association of Electronic Parts and Equipment Manufacturers for a second term as their representative on the board of directors of the Radio Parts and Electronic Equipment Shows. EPEM's other representative on the board is *John H. Cashman*, of The Radio Craftsmen, Inc., Chicago. . . . *Louis Kahn*, director of research for Aerovox Corp., New Bedford, Mass., and also director of Aerovox Canada, Ltd., has been appointed expert consultant on components, Panel of Components, and also chairman of the Capacitor Sub-Panel, Research and Development Board for the Armed Forces. . . . G. E. has appointed *Roger B. Yepsen* as manager of marketing research for the tube divisions. . . . *Scott Morency* is now Zenith Radio Washington rep for the war contracts division, which is under the supervision of *L. C. Truesdell*. . . . Harold C. Lund has been named manager of WDTV, Pittsburgh, to succeed *Donald A. Stewart*, currently assisting the network's management group at New York headquarters. . . . *Ray A. Morris*, formerly *I. D. E. A.* assistant sales manager, has become the company's chief engineer. . . . *Louis A. Garten* has been promoted to the post of sales manager of Kay Electric Co., Pine Brook, N. J. *Cyril H. Brown* has been named assistant sales manager. . . . *Edward W. Allen, Jr.*, presently chief of the FCC Technical Research Division, will head the office of the chief engineer of which that division is a component. . . . *John B. Guenther* is now a rep for Planet Manufacturing Corp., in the states of Texas, Oklahoma and Arkansas. . . . *Chester H. Lang*, vice president of G. E. for the past 10 years, has been appointed to a new post, in charge of public relations. . . . *Gil W. Withers*, is now president of Pan-Electronics Corp., 901 West Peachtree, Atlanta, Georgia. . *John B. Peebles* has been named vice president, in charge of engineering of the company.



Frank M. Folsom, president of RCA, unveiling a plaque, during the dedication of RCA's miniature and subminiature electron tube manufacturing plant in Cincinnati, to the memory of the late John G. Wilson, former executive vice president of RCA. Looking on, from left to right: Walter A. Buck, vice president and general manager of the division; L. W. Teegarden, vice president in charge of RCA technical products; and Harold DeMooy, manager of the new plant.

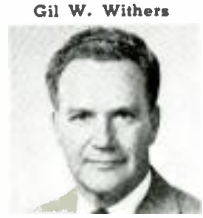
E. M. Lang

T. Kevin Mallen



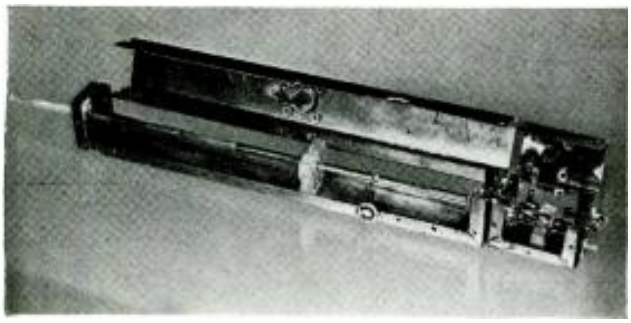
Ralph T. Brengle

Gil W. Withers



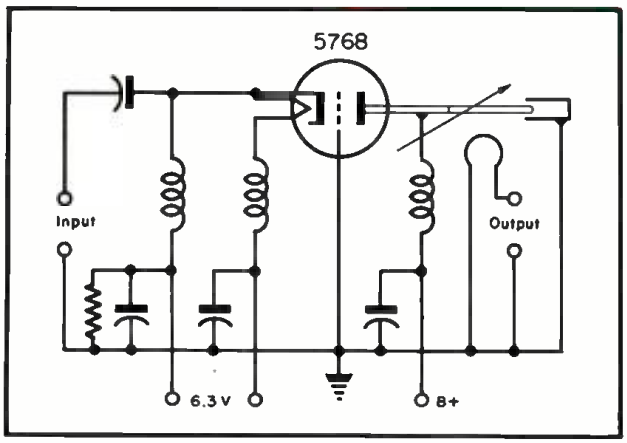
At a recent meeting of G.E. officials with consulting engineers and FCC commissioners at Washington, D. C., during which recently announced high-power uhf television transmitter using a 5-kw klystron was reviewed. Left to right: Commissioner Paul Walker, C. A. Priest of G.E., Commissioner Rosel Hyde, and Paul L. Chamberlain, also of G.E.

U H F RF



Left, top

Physical construction of the amplifier. The tube, at the right, is mounted with its grid disc firmly grounded between the ends of the input and output shield boxes. One side of the input blocking capacitor is soldered directly to the cathode connector, while the other side carries the center pin of a type N input jack. The long shield box acts as the outer conductor of the plate circuit tuning line. The fixed portion of the line is supported by a small insulating block seen near the center; the moveable portion to the left is driven by an insulating push rod. The ground side of the low-frequency loading capacitor is at the extreme left, where it is soldered to the end shield plate. The plate circuit rf choke, to the right of the insulating block, is connected to the tuning line at the point of minimum voltage for the center of the range. This was found to result in the least disturbance to the plate circuit.



Left

Circuit of uhf amplifier. Input blocking and heater and cathode bypass capacitors are all 100-mmfd mica button types. The cathode self-bias resistor has a value of 220 ohms. The cathode and heater feed chokes contain 7 turns of No. 22 wire, wound ⅛" in diameter and ½" long.

IN THE DESIGN of TV tuners, *rf* amplifiers are usually included to improve the receiver's noise figure and to isolate or shield the local oscillator from the antenna input connection and thus reduce the radiation of local oscillator power.

Present plans for *uhf* tuners indicate that in the main there will be used crystal mixers which intrinsically have quite good noise performance. However, in the ultrahigh band, where the initial service range is expected to be limited due to low transmitter powers, small receiving antennas, and inefficient transmission lines, an improvement in noise figure by the use of an *rf* amplifier would be extremely welcome. It is true that the local oscillator excitation power required for optimum conversion in crystal mixers is relatively low, but the radiation might still be high enough to interfere seriously with other TV receivers or other services. An *rf* amplifier can provide a substantial reduction of local oscillator radiation.

In an investigation of these factors and the circuitry problems involved, it was found that very effective results could be obtained with an *rf* amplifier using a small disc-seal planar triode[1] in a grounded-grid circuit. Reporting on this development at the recent National Conference on Airborne Electronics at Wright Field, B. F. Tyson and J. G. Weissman of Sylvania's physics labs, revealed that the tube used had very low lead inductances and interelectrode capacitances, with the grid connection at the center, in the form of a disc or flange completely encircling the tube, so that a very low impedance connection to ground could be made and the shielding between input and output maintained. It was pointed out that the grid-cathode input capacitance and the grid-plate output capacitance were only slightly over 1 mmfd each, the plate-to-cathode capacitance having a maximum value of only 0.015 mmfd. The tube was also described as having a g_m of 6500 micromhos with only 8 ma of plate current. The low plate-cathode capacitance and the high g_m, together with a mu of 100, were noted as desirable characteristics for grounded-grid amplifier operation. In addition, the tube's small physical size and its double-ended construction were found to make it readily adaptable to concentric-line circuitry—an ideal feature for the ultrahighs.

Describing the circuitry, Tyson and Weissman said that the tube's input impedance was so low that it was decided to feed the cathode input directly from a 50-ohm antenna transmission line. The resulting mismatch loss was quite low, between 1 and 2 db. With a direct input connection, it was found that the mechanical complexities of providing a tuned input matching transformer could be avoided without introducing appreciable loss. Thus, an untuned input was used. And in the plate circuit of the amplifier, a half-wave type of concentric line was introduced as the tuning element. Since the gain-bandwidth product of an amplifier is limited by total circuit capacitance, and the capacitance of a concentric line varies inversely with its characteristic impedance, it was necessary to make the impedance of the line as high as physically possible. It was pointed out that the highest practical ratio of outer conductor effective diameter to inner conductor diameter is about 9 to 1, giving a line impedance of approximately 130 ohms.

Analyzing the problem of tuning of the line over the band, the Sylvania specialists declared that this was achieved by sliding a moveable telescoping section of the inner conductor into a fixed hollow section connected to the plate rod. The amount of fixed line external to the tube was determined by the highest desired frequency of 890 mc. This external length was not a full half wavelength at 890 mc, because of the equivalent length of line within the tube itself. Thus, it was pointed out, a length of plate rod approximately 2.8 cm was used; for a line impedance of 130 ohms the grid-plate output capacitance of 1.05 mmfd corresponds to a line length of 3.5 cm. At 890 mc a half wavelength equals 16.8 cm. By subtracting the 6.3 cm due to the tube, an external length of 10.5 cm was found to be available for the telescopic tuning action. With these data, it was said, it then became possible to compute the lowest tuneable frequency; determined by the line

[1]Sylvania 5768.

AMPLIFIER DESIGN

by RALPH G. PETERS

Highlights of Recently-Completed Tyson-Weissman Project on 475 to 890-Mc RF Amplifier Using a Disc-Seal Planar Triode in a Grounded-Grid Circuit.

length at full extension of the telescoping section. Allowing ½ cm of overlap, there resulted 20.5 cm of line external to the tube, plus 6.3 cm in the tube or a total of 26.8 cm. Noting that a half-wave line this long resonates at 560 mc, not low enough for the lower frequency limit of 475 mc, Tyson and Weissman said that the difficulty was overcome by arranging a small length of grounded tubing so that the sliding inner conductor formed a cylindrical capacitor with it at the low-frequency end of the range. This capacitive loading was found to extend the coverage down to 475 mc.

At an impedance level of 50 ohms, it was said that output power could be taken via a small loop coupled to the tuned line. The magnetic field intensity along the length of a half-wave resonator varies sinusoidally, rising to a maximum at a quarter wavelength from the open ends. Thus, it was indicated, loop coupling is essentially electromagnetic, so that the amount of coupling is a function of the position of the loop along the line. Maximum coupling occurs at the region of maximum field intensity resulting in greatest amplifier bandwidth at this point. This, it was said, is not necessarily the point of maximum gain which only occurs when the output impedance of the tube is matched. Tyson and Weissman declared that these effects were explored at several frequencies in the band by cutting a longitudinal slot in the outer conductor of the line so the position of the loop could be varied.

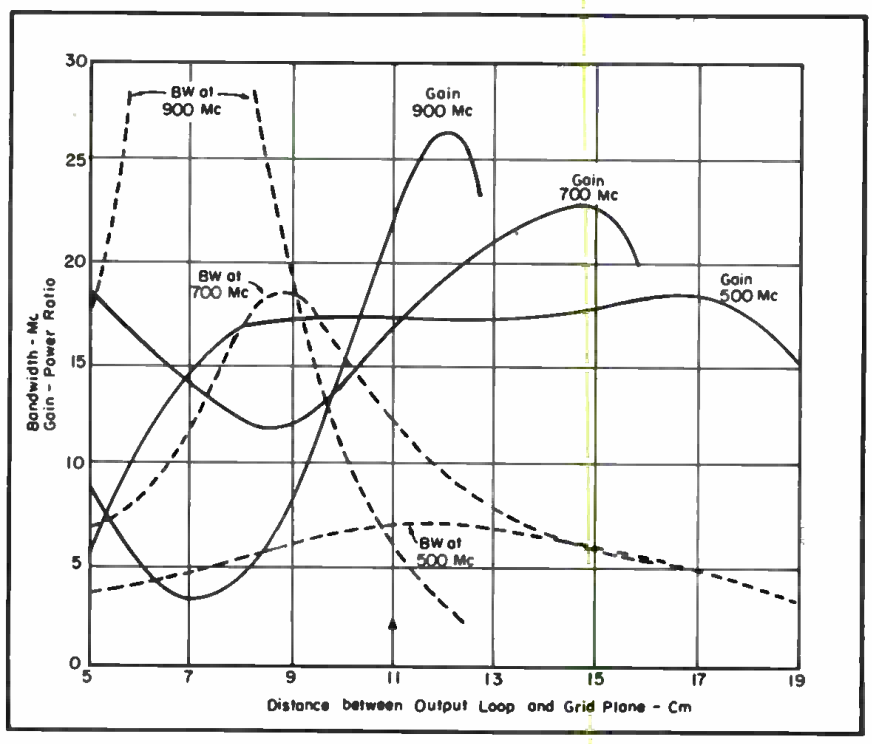
To test the noise figure of this unit, the amplifier was fed to a crystal mixer followed by a 3 db-attenuator, 44-mc *if* amplifier and output meter. The crystal mixer also contained a local oscillator and a cascade-connected *if* preamp. To measure the overall noise figure, the diode noise generator at the input was turned off, the 3-db pad was switched out of the circuit and the noise output observed on the output meter. Then, the 3-db pad was switched in and the noise input from the generator increased until the same output reading was obtained. In this way there was assurance that the generator was producing noise equal to that of the apparatus under test. The ratio of this noise to that produced in the 50-ohm antenna resistance provided the noise figure. The measured overall noise figures ranged between 11 and 11.6 db across the *uhf* band.

The noise figure of the mixer used in these tests was found to be 15 db. Therefore, it was said, use of the *rf* amplifier resulted in an improvement of 3.4 to 4 db over the noise figure of the mixer alone.

Other Features of Tuner

The triode used in the amplifier was described as probably too costly for application in competitive receiver designs. However, it was pointed out, the results obtained showed the possibilities of improving tuner performance in the *uhf* band. Use of this amplifier ahead of a crystal mixer, it was shown, could improve the overall noise figure by 3 to 4 db and reduce the radiated local oscillator power by 500 times.

Curves illustrating show how the amplifier's gain and bandwidth depend on position of output loop. It will be noted that at 700 mc, starting with the loop near the tube end of the line and following the dotted bandwidth curve, the bandwidth increases to a maximum of 17.5 mc with the loop about 8.5 cm from the grid plane and then falls off again. The point of maximum bandwidth at 8.5 cm is the maximum coupling point for 700 mc. The gain curve discloses that the 8.5-cm point gives the lowest gain. The gain rises on either side reaching a maximum when the loop position is about 14.5 cm from the grid plane. This is the point where the tube impedance is matched, while the other point at 8.5 cm is actually the point of greatest mismatch. The curves at other frequencies show similar effects except that the gain and bandwidth maxima and minima appear at different loop positions because of the change of wavelength.



TV Video Switching

by JOHN M. BRUSH, Project Engineer, Television Transmitter Division, Allen B. Du Mont Laboratories, Inc.

Direct Method of Switching, Featuring Use of a Mixer Line Amplifier and Switching Unit with Cathode Follower, Applied to Provide Facilities for Previewing Any One of Nine Input Signals, Involving Three Cameras, Three Film Chains, Two Remotes and a Network Signal, Without Disturbing Use of Signals by Other Banks of Push-Button Switches.

IN DESIGNING equipment for use in TV-program production, it is necessary to bear in mind those features which are desirable from the viewpoint of programming. Although the program director usually makes the decision as to the sequence and timing of the video signal to obtain the desired result, the technical director actually controls the changeover of the video signal. Consequently, both the technical and program directors must be able to preview the picture available from any camera, film chain, flying-spot scanner, remote or network source before it is placed on the air. This means that they must have available some means of selecting any of the one or more video signals from the various sources to be used for the program. At any time, they must be able to change the video signal being transmitted. In making the changeover from one signal to another, any one of three possible transitions may be used. First there is the almost instantaneous changeover which is used when a change of scene is desired without a break in continuity. For a definite break, a fade is used, one picture fading out completely before the next picture begins to fade in. On the other hand, if it is desired to change only the viewpoint of the viewer, then a lap dissolve can be used. In this changeover the second picture starts appearing before the first picture is off the screen, so that for a portion of the changeover period both pictures appear on the screen at reduced levels.

In addition to these basic operations, there is another group of operations which can be classified as special effects. The most commonly used involve montages for both programming and advertising, in which portions of one picture appear on the screen in the blanked out portions of a second picture and vice versa. The blanked out portions may have any size and shape within the limits of the screen. In wiping where one picture is literally wiped off the screen while another one is *wiped on* in its wake, usually the horizontal wipe is used. In this instance, the wiping action appears as a vertical line which moves from left to right or from right to left all the way across the screen, or in some cases only part way. As in the case of the unmixed signals, the operators should be able to preview the mixed signals so that a proper setup can be effected before air time.

There are times when a station schedule requires the handling of signals originating from a remote source, generating its own sync and blanking pulses. Hence, the controlling equip-

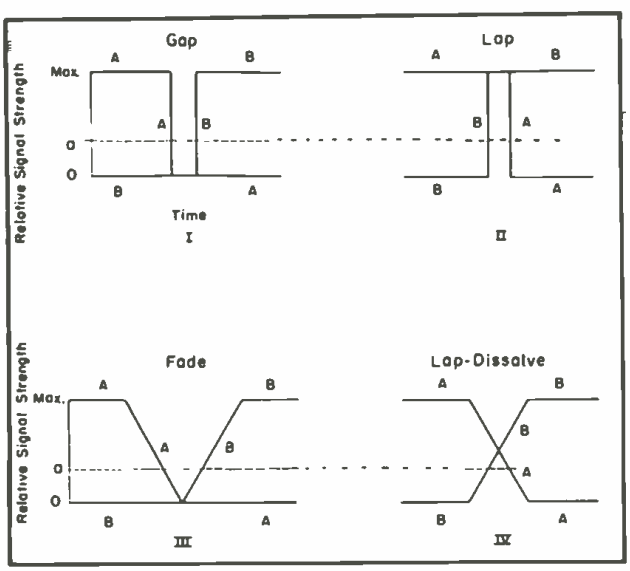


Figure 1

Signal-mixing stages, with the relative signal level from zero to maximum plotted on the vertical axis against time on the horizontal axis. A and B are the two signals being mixed. I shows an example of gap switching; break of A signal before make of B signal. II shows lap switching; make of B signal before break of A signal. III shows the changes required for a fading operation. During the interval from X to Y, the monitor screen will be black, or the raster may be visible depending on setting of monitor controls. IV shows the lap-dissolve operation. The amount of the overlap (interval from X to Y in IV), sometimes called percentage of lap, is determined by the percentage of the time that both signals are at or above the line a, and this in turn is determined by the location of the cross-over point above the line a. The rate of the fade and the rate of the lap are determined by the rate at which the operation is performed. This determines the slope of the lines in III and IV. The location of the crossover point, with respect to maximum and zero levels, determines whether the operation is to be a fade or a lap and the percentage of overlap.

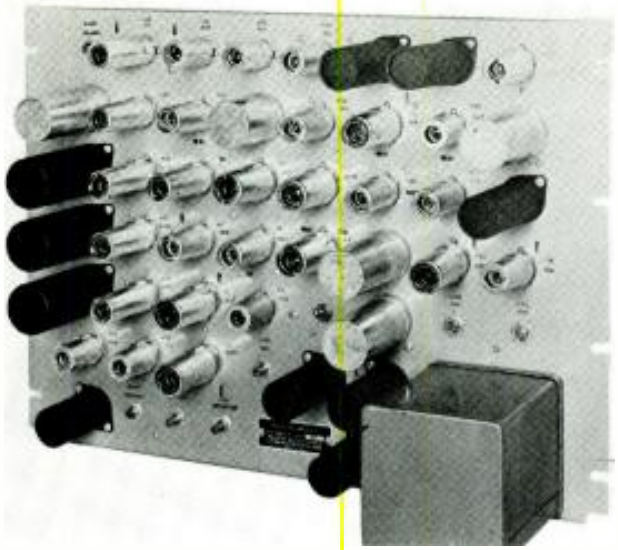


Figure 2a
Front view of the mixer line amplifier.

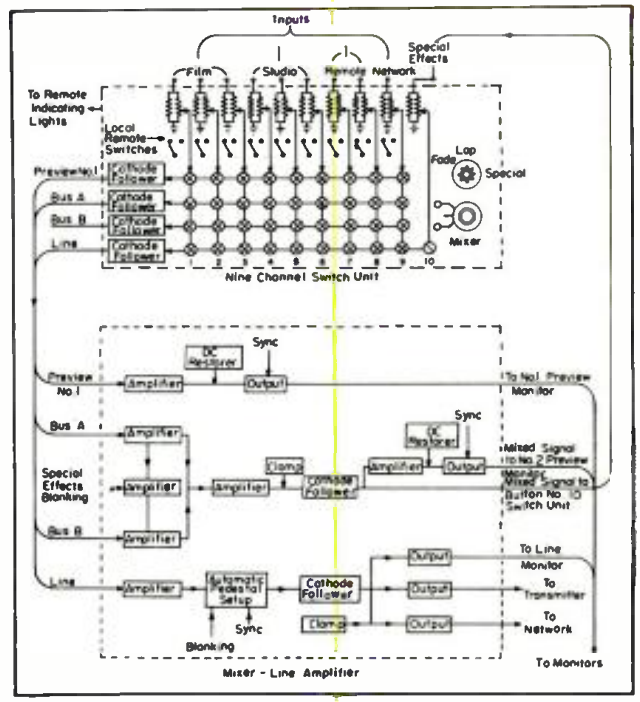


Figure 2
Block diagram of switching unit and mixer-line amplifier.

ment in the studio must be able to handle composite signals, as well as signals from a local source which do not contain sync pulses. If the station has some means for properly phasing the local and remote sync generators, the problem of switching between local and remote signals is simplified. In addition, fading, lap-dissolving and special effects are possible between local and remote signals. If the station is not able to phase local and remote sync generators, then care must be taken, in switching between the local and remote signals, to keep the switching transients to a minimum as well as to disable the sync insertion circuit when the studio equipment is handling the remote signal.

Methods of Switching

There are two fundamental systems of switching used to select one of several possible signal sources; direct and indirect. In direct switching, the operation itself breaks or transfers the video circuit. Examples of this type are found in patch cords, toggle switches and mechanically interlocked push-button switches. This type of switching has been found to be fairly simple in design and construction, the complexity depending on how many auxiliary functions the same switch operation must accomplish. However, it has a disadvantage; the video lines must be brought to the switch unit. In addition, the switch contacts carrying the video signals must be kept clean since the signal level is low.

In indirect switching, the manual operation controls the video switching through another component. For example, the manual switching may control the operation of relays which do the actual switching of the video signals, or it may control the bias on an electron tube so as to cut the signal off or allow it to pass as desired. Both indirect methods allow the control unit to be at a remote point from the unit containing the relays or tubes. In addition, the only circuits between the two units are those necessary for control purposes. The relays have the same disadvantage as the push-button switches in that the video carrying contacts must be kept clean. The use of relays has been found to require more complicated control and interlocking circuits than the push-button switches. The use of tubes eliminates the need for keeping the video contacts clean, but it introduces the problem of transients; the plate current of a conducting tube is cut off and the cutoff tube becomes conducting, both tubes operating into the same plate load. It has also been found that there are problems of power-supply requirements, heat dissipation and tube life. Incidentally, the use of tubes does provide the advantage of signal mixing.

Mixing of Signals

In signal mixing, there is often a signal at full level and another other at zero level (*A* and *B* in Figure 1). Let us suppose it is desired to change from one signal to the other almost instantaneously, through a fading process or through a lap-dissolve process. The instantaneous change can be accomplished by operating the push-button switch. The fade and lap processes can be controlled, as to timing, through the manual operation of potentiometers or through the switching of *rc* circuits. These circuits control the suppressor grid bias on a pair of tubes having a common plate load and with the two signals to be mixed applied to their control grids.

Switch Unit

As a result of a study of switching systems, it was decided to apply the direct method in a system, since it was felt the technique was not only simple and complete for small stations, but could be used as a studio control unit or a master control unit for larger stations. Mechanically-interlocked, push-button switches of the sliding contact type with very small capacitance between open contacts were selected. The unit was designed so that the front panel would have a minimum possible number of controls and indicators; push button switches, single mixer control and a cross-over control. Tally lights, to indicate channels in use for each of four possible outputs, were built into the push-buttons to simplify further the appearance of the front panel. Buttons of colored lucite were selected. These can be lighted from the rear so that when a button is depressed the light behind the button is supplied

*Major portion of this paper was read at the Fifth Annual NARTB Broadcasting Engineering Conference in Chicago.

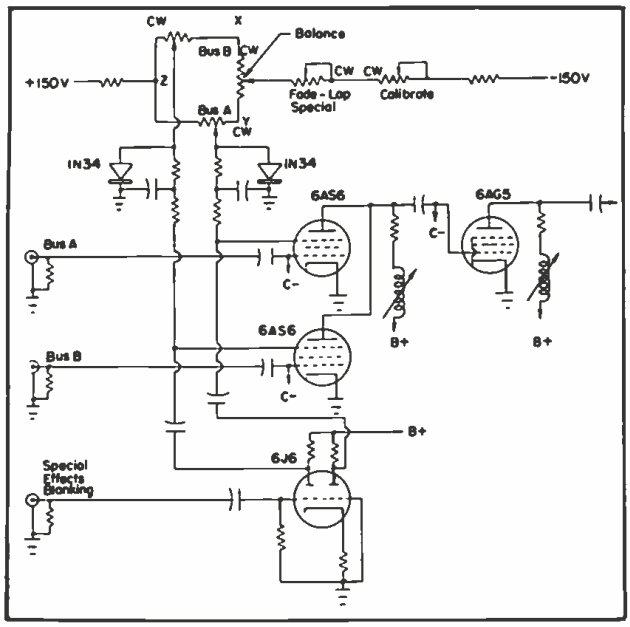


Figure 3
The mixer circuit.

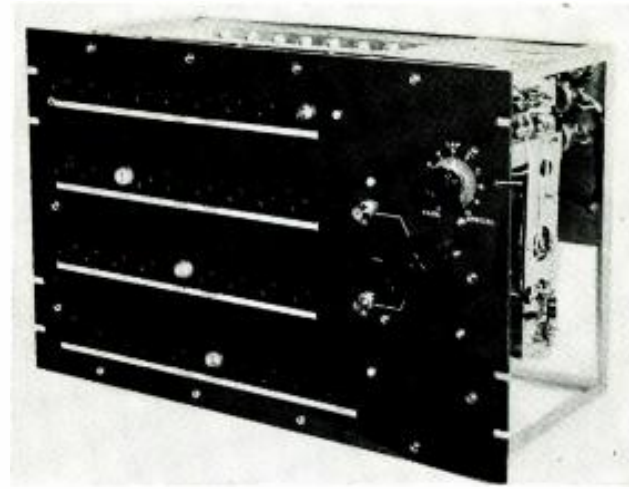


Figure 3a
Front view of the switch unit.

with voltage through the switch contacts. The switch unit was designed to handle up to nine input signals and can be set up as required for handling local camera or film-chain signals, or remote signals. For example, it might be set up to handle three cameras, three film-chains, two remotes and a network signal. By means of toggle switches on the rear panel of the switch unit each channel can be set up separately for local or remote signals. These toggle switches, in conjunction with the push-button switches, determine whether or not the output of a given channel is to have synchronizing pulses inserted. Also mounted on the rear panel of the switch unit are potentiometers, for adjusting the input level of each signal into the unit. These potentiometers are part of the input termination for the coax lines feeding the switch unit.

Circuit Analysis

The system features a mixer-line amplifier unit which can be located as far as 100′ from a switch unit.

In Figure 2 appears a block diagram of the system. The input signal (with a minimum value of 0.75 volt peak-to-peak video) is distributed to four banks of switches. The top bank selects any one of the nine input signals for feeding to a cathode follower. The cathode follower circuit was chosen for its high input impedance and low output impedance. The high-input impedance was selected so that as many as four cathode followers could be shunted across a 75-ohm line termination without any appreciable effect on the signal. A low-output impedance was required to feed up to 100′ of coax table. The signal from the cathode follower is sent to the mixer-line amplifier where it is amplified and has its low-frequency component restored by means of a *dc* restorer circuit. In addition, synchronizing pulses are added to the signal if the toggle switch for the channel selected by the button depressed in the top bank of switches is in the local position. An output of 1.4 volts peak-to-peak video plus sync is fed from the cathode follower to a No. 1 preview monitor. Thus, in this setup there are facilities for previewing any one of nine input signals without disturbing the use of the signals by the other banks of push-button switches. These facilities are available for both composite and local signals. When handling composite signals, the sync insertion circuit can be disabled.

The second and third banks of switches are mixing buses which allow an operator to select any two signals for mixing into a fade, lap-dissolve or some special effect. The two selected signals are applied to two cathode followers, the output of which goes to the mixer-line amplifier. Here, the signals are mixed in a common plate load of a pair of 6AS6s; Figure 3. The amount of each signal present in the common plate load is determined by the bias voltage on the two suppressor grids. The maximum level of each signal is set at zero volts on the suppressor grid, while the bias corresponding to zero signal is -10 volts. The mixer control on the switch unit consists of a knob

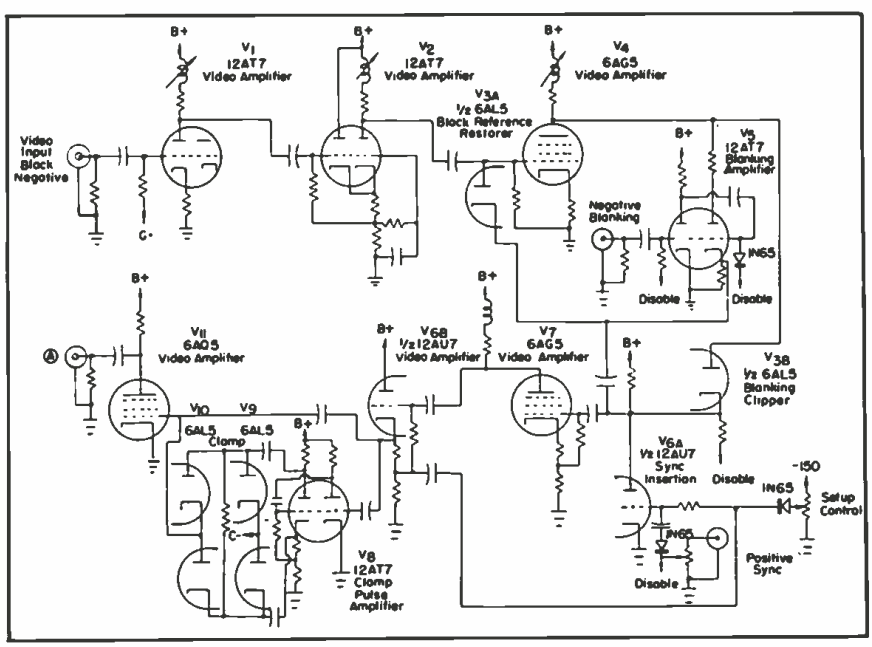


Figure 4
Simplified schematic of the line amplifier.

geared to a dual potentiometer in such a way that the knob rotates approximately 120° to provide a 312° potentiometer rotation. A small angle of rotation was chosen so that the operator could rotate the knob in a single motion of the wrist. The moving arm of one of the potentiometers supplies voltage to the suppressor grid of one of the mixer tubes, while the other arm supplies the other mixer tube suppressor grid. The cross-over point (see Figure 1) must occur in the center of the mixer control rotation. Hence, it is necessary that the voltage from both potentiometer arms at the crossover point should be the same value of -10 volts when mixing signals for a fade and possibly -7 to -5 volts when performing a lap-dissolve. To obtain these values, the dual potentiometer was inserted in a voltage-dividing network, as shown in Figure 3. Also included in the network were a calibrating and balancing potentiometer and a front-panel potentiometer to set the crossover voltage on the dual potentiometer. A potentiometer was chosen for setting the crossover voltage, instead of a switch, to allow the operator to set the control for the percentage of overlap desired on a lap-dissolve. With the crossover control (or *fade-lap potentiometer*) in the fade position (*cw* in Figure 3), the calibrate potentiometer is adjusted so that the output of the mixer stage is zero, or at least below the level which is apparent on a picture monitor when the mixer control is in the center of its rotation. The balance potentiometer is adjusted so that the voltage crossover occurs exactly in the center of rotation of the mixer control.

To obtain the proper voltage for fading, it is necessary to have approximately 20 volts across the dual potentiometers, so that the voltage is -20 volts at *X* and *Y* and 0 volts at *Z*; Figure 3. For a lap-dissolve where the crossover voltage is between -7 and -5 volts, crystal rectifiers on the dual-potentiometer arms prevent the voltage from going more positive than zero, which was set as the condition for maximum signal level. The fully clockwise position of the *fade-lap potentiometer* is used for special effects such as montages and wipes. In this position, the crossover voltage is zero and both tubes in the mixer stage will have full output and the mixed output will be determined by other factors. For example, a pair of cameras may have their lens' turrets rotated in opposite directions so that each has part of its field of view obstructed; then when the two signals are mixed, the resultant picture is a composite of what the two cameras view. There is no overlapping of the video. Facilities have been provided to make use of blanking signals for montages, wipes, etc. These special-effect blanking voltages must be generated externally and applied to a 6J6 cathode-coupled phase inverter which supplies the two-out-of-phase blanking voltages to the suppressor grids of the mixer tubes.

In addition to the use of two cameras in creating a montage, a flying spot scanner can be used with an appropriate mask of the desired shape and size to generate the blanking signal to be applied to the phase inverter stage. A pulse generator operating at a repetition rate equal to the line frequency and having a variable pulse width control has been used experimentally in creating the horizontal wipe effect.

To keep the low-frequency voltages, generated in the mixer plate load by the fading or lapping operation, from appearing in the output, the *rc* coupling circuit between the mixer plate load and the grid of the following stage was designed to have a very poor low-frequency response. A driven-sync-tip line-to-line clamp was included to restore the low frequency component on the grid of the cathode-follower output stage. This permitted the mixed output of 1 volt peak-to-peak video to be returned to the tenth button of the fourth bank of switches on the switch unit through a termination identical to those on the nine input channels. This allows the mixed input level to be adjusted to the same level as the other channels.

A portion of the mixed output is amplified and has its low-frequency component restored by a *dc* restorer. Sync pulses will be added to this signal if the channel in use on the *A* or *B* bus is set up for local signals. The output of 1.4 volts peak-to-peak video plus sync is then fed to the No. 2 *preview monitor*. This setup allows a preview of the mixing operations before they are put on the air. In addition, when the *A* and *B* buses are not in use for mixing, they are available for previewing any of the nine input signals. When previewing a composite signal, the driven-sync-tip clamp is fed sync pulses, sampled off the composite signal, and the sync insertion operation is disabled.

Since it was desired to be able to preview a remote signal on either mixer bus, it was necessary to have the sync insertion controlled also by the mixer control. To illustrate the operation of this provision, let us consider a situation where the switch unit is set up for local signals on channels *1* through *6* and for remote (composite) signals on channels *7*, *8* and *9*. Consequently, the toggle switches on the rear panel for channels *7*, *8* and *9* will be in the remote position. It will then be necessary to depress the channel-1 button on mixer bus *A* and the *channel-8* button on mixer bus *B*. The *fade-lap* control must then be set for a fade, and the mixer control rotated clockwise to the stop. The *A* tally light, to the left of the mixer control and the No. *1* tally light, on the remote panel above the No. *2* preview monitor, will be on. These indicate that the signal appearing on the No. *2 preview monitor* is the channel-*1* signal only. Since the local-remote switch for this channel is in the local position, the driven clamp in the mixer section of the mixer-line amp is operating on local sync pulses and local sync is being added to the signal to give a composite output. As the mixer control is rotated counter-clockwise, the *B* tally light on the switch unit and the No. *8* tally light on the remote panel will go on. Near the end of the rotation, the *A* tally light on the switch unit and the No. *1* tally light on the remote panel will go out. Also, since this channel is set for a remote signal, the driven clamp in the mixer stages is caused to operate on sync pulses sampled from the incoming composite signal and the sync insertion circuit is thus disabled.

The fourth bank of ten push-button switches was arranged to select the

(*Continued on page* 28)

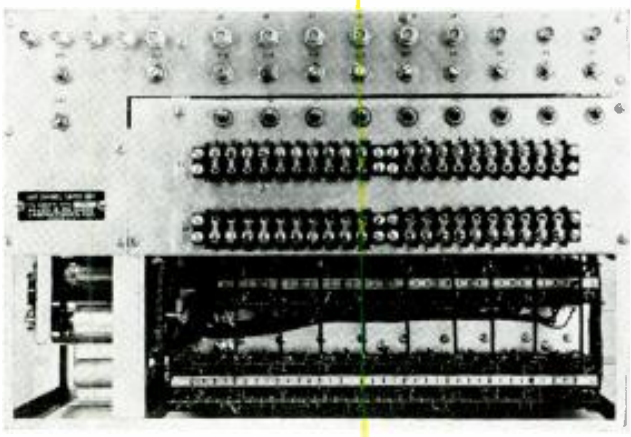
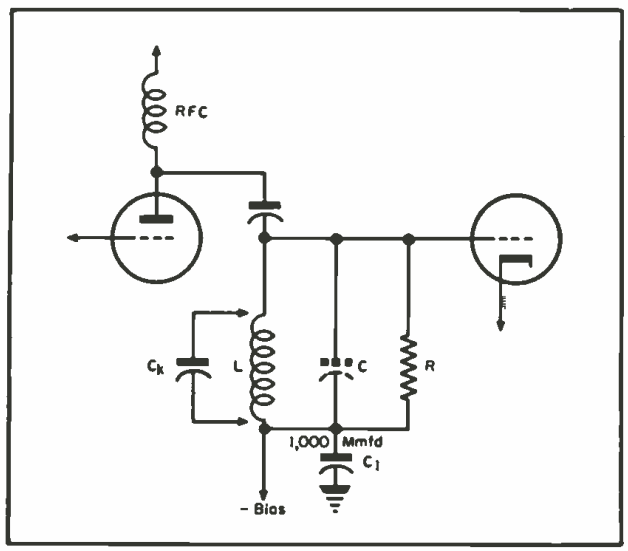


Figure 5

Rear view of the switch unit.

Determining Capacity in Circuits by Frequency-Shift Method

by EUGENE A. SLUSSER



Procedure, Used in Conjunction with Nomogram, Found to Simplify Determination of Total Capacity, Including Strays, Which May Exist at a Given Point in Circuit, So That Minimum Values Can Be Achieved to Secure Maximum Gain, While Retaining Desired Bandwidths.

Figure 1

A 150-mc circuit, whose C values can be determined by the nomogram shown in Figure 2.

IN THE TESTING of a television circuit, it is usually necessary to determine the total capacity that may exist at a given point in the circuit. Generally, it is desired to hold this capacity to a minimum to achieve the maximum gain and yet retain the desired bandwidth. Since the total capacity can be determined by the fixed capacities (tubes) and the stray capacity, the value can be held to a minimum by a proper selection of tubes and by carefully arranging the parts layout. While the tube capacities can be determined from tube data, the stray capacity can only be estimated or measured.

When operating at frequencies above 100 mc, the inductances of leads must be taken into account. It is possible to reduce inductance by increasing the size of the leads, but the net result is an increase in stray capacity. Measurement of this capacity has been found to be almost impossible with a bridge. However, the frequency shift method has been found to offer a solution, since the capacity can be measured at or near the actual operating frequency.

The total capacity in a circuit can be readily determined by measuring the resonate frequency of an *lc* circuit, as it is shifted, by inserting capacities of known values. The resonate circuit involved may already exist in the circuit to be tested, or can be made by shunting the capacity with an inductance. In the latter case, the value of the inductance must be such that the resonate frequency falls near the actual operating frequency. The actual resonate frequency, f_o, is determined by *dip testing* with a grid dip meter. A capacity of known value, C_k, is then shunted across the unknown capacity, C, and the circuit is again dip tested, resulting in a new resonate frequency, f. The values of f_o, f, and C_k can be used to determine the circuit capacity from a nomogram of the type shown in Figure 2.

Best results can be obtained by estimating the value of C and choosing C_k to be about equal to the estimated value of C. Decimal points have not been included on the nomogram since they can be easily determined. Scales *1* and *2* merely set up a ratio, and both frequencies must be expressed in the same units. Scales *3* and *4* can represent values of 0 to 100 mmfd or 0 to 10 mmfd, as the case may be.

Application of Nomogram

As an example of the use of the nomogram, let us assume that we have a 150-mc circuit, similar to that shown in Figure 1. The shunt capacitor C_1 can be neglected in the calculation, due to its size. If the *dc* to the circuit were fed through a series *rf* choke, it would have to be removed during dip testing. Also, any resistors (such as R) used to obtain bandwidth must be removed.

By dip testing L, we find f_o to be 150 mc. By adding C_k (22 mmfd) we find that we have a new frequency, f, or 120 mc. These two points are located and projected to scale *1*. This point is then

(Continued on page 29)

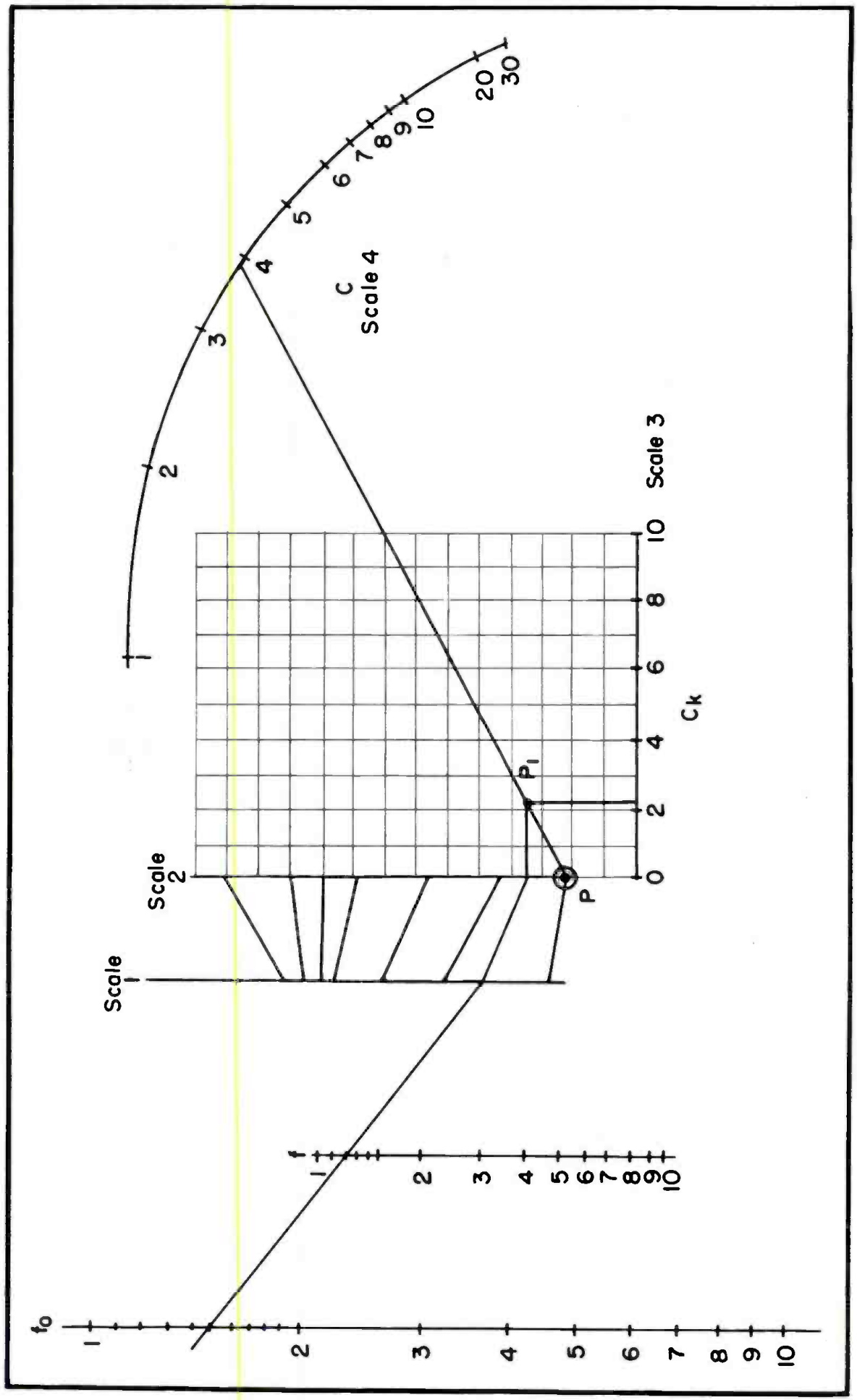


Figure 2

Nomogram developed to determine the total capacity in a circuit by the frequency-shift method. In applying the plot, f_o and f must be in the same units; C and C_k are for 0 to 10 and 0 to 100 mmfd values.

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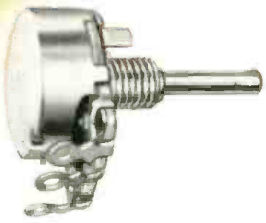

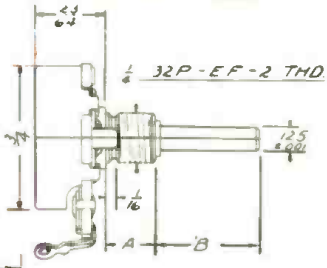

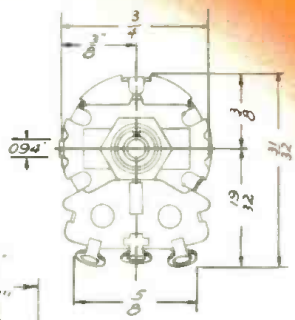

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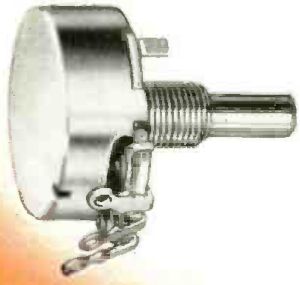

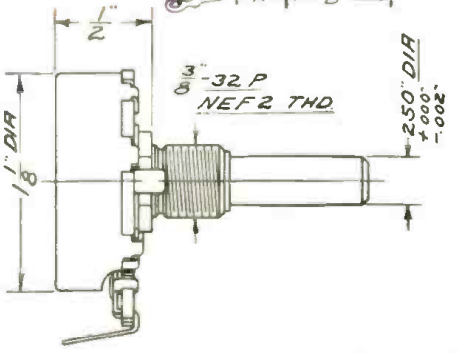

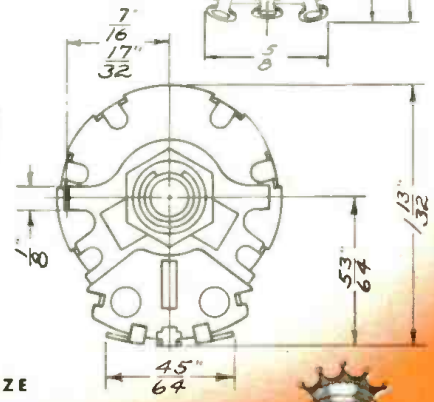

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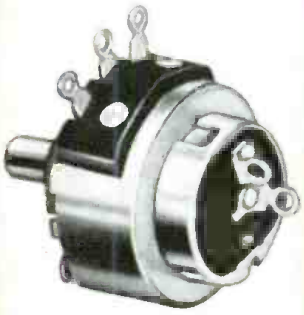

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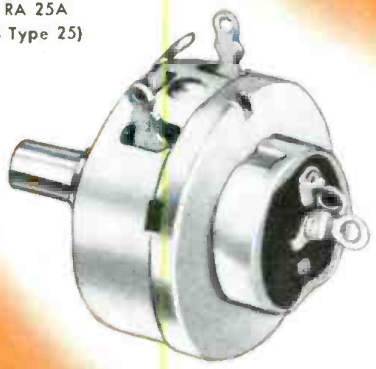

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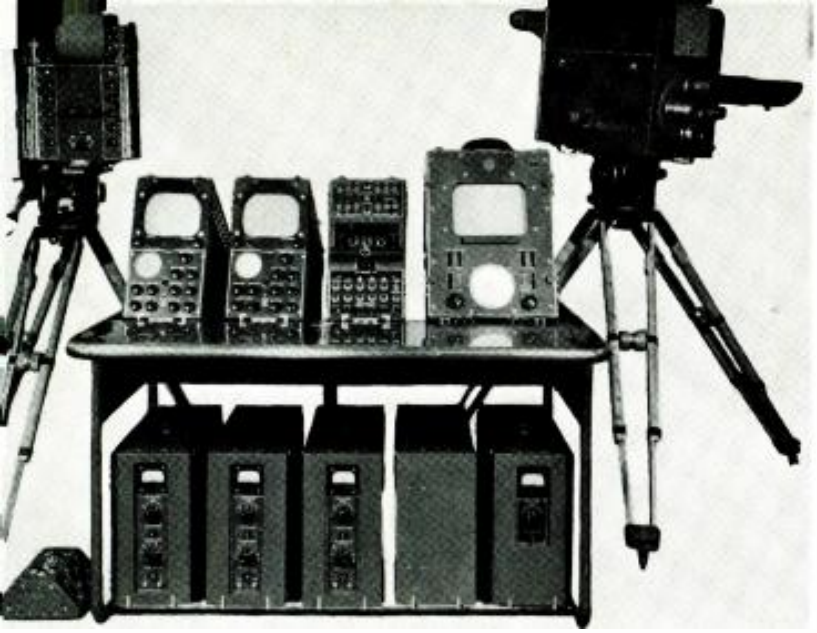


TV Field

Obtaining Maximum Performance from Remote Camera Chains With the Aid of a Comprehensive Continuing Checkup Program.

Figure 1

Assorted field equipment which must receive regular inspection to insure continuous uninterrupted operation.

(Courtesy RCA)

TELEVISION FIELD PICKUP equipment generally requires a more rigid and thorough maintenance schedule than the same type of equipment used in the studio. This is due primarily to the fact that field-type equipment necessarily receives rougher treatment in transportation, setup, and operation, and frequently is subjected to conditions of excessive dust, heat and moisture. It is important, therefore, that a rigid maintenance schedule be set up for checking remote equipment between broadcasts so that program failures can be minimized. At least two camera chains should be available for remote operation, so that one can be left in the maintenance shop while the other is being used. If this is not possible, the remote program schedule should be on, at least, an alternate daily arrangement. Such programming will permit an alternate daily check of performance, a move which will more than pay dividends, by assuring continuous program coverage.

In maintaining the remote-type of equipment it is necessary to conduct the same periodic inspection routines followed for studio equipment. This involves the proper use of test gear and the right kind of measurement equipment, too, plus the daily, weekly and monthly mechanical and electrical checks.

In addition to these general trouble-shooting procedures, there are several points which require rather special treatment. The order in which the tests should be made or the extent to which they should be carried out depends on the nature or probable source of trouble as indicated on the picture or waveform monitors. Individual operating conditions, availability of test equipment, etc., usually determines the number of tests which can be made in the field and those which must be delayed until the equipment has been returned to the shop.

Camera, Viewfinder and Camera Control Checks

Tubes, Cables, Connectors: It is necessary to make sure that all operational adjustments and control settings are correct, and then mechanical connections of all cable terminals and fittings should be checked. Improperly fitting connectors and defective tubes are responsible for the majority of failures. The seating of all cable connectors should be checked by temporarily loosening, then tightening, watching the viewfinder or camera control monitor for results. Tubes should be checked by substitution. (Tube trouble usually will be evidenced by an indication on the picture or waveform monitor.) Only one tube should be replaced at a time, only a proven good tube being replaced in its original socket.

Video Amplifier: In testing this section, the grid of the first video preamplifier should be touched with a screwdriver. Under normal conditions, the amplifier output will show evidence of regeneration or stray pickup.

Vertical Deflection: To conduct a check for deflection, the 'scope should be connected across the vertical output transformer secondary or across a 500,000-ohm resistor in series with one of the secondary leads. The amplitude and shape of the vertical output waveform should then be viewed.

Horizontal Deflection: For a test on the horizontal, a 'scope should be connected across the secondary winding of the horizontal output transformer. Familiarity with the approximate shape and amplitude to be expected under normal conditions will show whether the deflection circuits are free from suspicion.

Image Orthicon Tube: The tube should be removed and voltage and control ranges checked on the rear and shoulder sockets with a high-resistance voltmeter.

If any faulty operation has been traced to one of the foregoing circuits, the defect should be isolated by making a step-by-step check of successive circuit elements.

Checking the Sync Generator

Pulse Former, Pulse Shaper: Small variations in pulse widths or amplitude, or the appearance of unwanted pulses in the sync signal are usually due to aging or weakening of the tubes. The amplitude and pulse widths should be checked periodically to anticipate this occurrence. (Unwanted pulses can often be remedied by adjusting the *clipping level* or white clipper control.)

It is important to make a regular check of the timer countdown circuits to make sure that all controls are properly adjusted and in the center of their respective adjustment ranges. Defective counter circuits or incorrect frequency-range adjustments can be checked by turning the frequency control or *afc* switch to the *off* position and observing the count-down ratios on a 'scope.

Before making timer adjustments, it is necessary to be sure that the sync generator has thoroughly warmed up and the regulated *dc* voltages properly set. These controls should never be adjusted in the field, except after a tube in the regulated power supply has been replaced, since any variation in regulated voltage adjustments will affect the count-down adjustments. If a

Equipment Maintenance

by JOHN B. LEDBETTER
Engineer, WKRC-TV

voltage readjustment is necessary, a complete check of the timer countdown should be made as soon as possible. It must be remembered that a zero-beat between the 60-cycle counted pulse and the 60-cycle sine wave does not necessarily mean the countdown is correct. Neither does the closed base line of the horizontal-frequency pulses (when using a 60-cycle 'scope sweep) prove conclusively that the frequency is 15,750. An abnormally low-amplitude *master oscillator* signal may cause the horizontal blocking oscillator to fire at an incorrect count-down ratio and still appear to give the correct *H* pulse frequency. The only sure way of determining proper horizontal blocking oscillator operation is to observe the count-down ratio (during seven or more successive pulses) on a 'scope.* A 'scope (similar to the DuMont 256-C) when triggered by the 60-cycle countdown pulse would show a horizontal pulse appearing at what seems to be an equalizing pulse rate with its base line closed: This is because the 60-cycle trigger pulse causes the *H* or horizontal pulse to be displaced ½ line for each pulse, therefore making the repetition rate of the horizontal and the equalizing pulses appear the same.

Records should be kept of: (*1*) grid and plate voltages in all pulse forming and pulse shaping circuits, (*2*) amplitudes of all output signals and (*3*) amplitudes of all signals at inter-chassis connectors and test points. These records not only will show up minor changes or variations which often precede equipment malfunctions, but will facilitate more efficient trouble-shooting in the event of failure.

When operating under extreme temperature conditions, one should never attempt to make the generator fall into sync by changing the voltage or countdown adjustments. These adjustments have been correctly set and a tube failure in *one* circuit is the most likely cause of trouble. In this case, changing an adjustment would only result in throwing additional circuits out of adjustment. This may make the real or original trouble extremely difficult to locate, possibly resulting in complete loss of program until the generator has been thoroughly checked and readjusted with a *cro*. If no controls are moved until the faulty tube or circuit has been identified and corrected, then only the the control associated with that particular circuit must be adjusted. (This excludes, of course, obvious circuit faults such as phasing, *afc* failure, etc., which can be checked or corrected with a slight readjustment of one control.)

The same precautions must be followed if the timing unit fails to count down properly in both the *lock-in* or *free-run* positions. None of the adjustments should be moved until the faulty components have been found and replaced, and then only the control affected by the replacement should be adjusted. It is very unlikely that more than one circuit at a time will be at fault, although all associated circuits will, of course, be thrown out of operation by the failure.

Troubles in the wave-shaping unit may be extremely difficult to localize. For this reason, the waveform and block diagrams should be consulted to determine which function is abnormal. After finding which pulse or group of pulses is affected, proper reference to the waveform and block diagrams should indicate the source of trouble.

In sync generators employing triggered or *one kick* frequency counters, there is a simple test that can be applied to eliminate tubes approaching borderline operation: it is only necessary to remove periodically the master oscillator tube. Since the multivibrators normally are quiescent until triggered, there will be no plate current flow. Comparison of plate and grid voltages with those in previous records will indicate whether a tube is conducting or has assumed different operating characteristics.

*DuMont 241; RCA 715B; Tektronix 511.

Typical Troubles

If the program video is normal on the waveform monitor, but unsatisfactory on picture monitor, the picture monitor video amplifier will usually be found to be at fault. (This excludes obvious picture inefficiencies such as poor focus, either optical, beam or photocathode, etc.).

If the sweeps on both the waveform and picture monitors fail or are erratic, the trouble will be found in the sync amplifier or separator circuits, or the horizontal sweep circuits of the picture monitor which furnish the accelerator voltages for both picture tubes.

If the picture monitor sweeps are proper, but the waveform sweeps are not, the trouble can be isolated to the waveform or waveform *cro* circuits.

If both picture and waveform monitor sweeps have failed, but the video output from the video channel looks normal when checked with a test *cro*, the horizontal blocking oscillator evidently is operating normally, otherwise the clamp would not be functioning. Thus, the fault apparently is in the

(*Continued on page* 29)

Figure 2

Mobile equipment, in the field, which must be checked before it leaves studio to guarantee trouble-free results while in use. (Courtesy Du Mont)

Comparison of Silastic (white), which can remain soft and flexible after 90 days at 300° F, and synthetic organic rubber which has become brittle after one day at 300° F.

Silicones in TV

by MAURICE C. HOMMEL, Dow Corning Corporation

A Report on the Current and Possible Applications of Material Which Is Available in Fluid, Compound, Resin and Rubber-Like Form for Components, and in Combination with Other Materials and Assembled Equipment

IN THE PROCESSING of components and equipments for TV and the allied arts, there have been two end-product characteristics which research, development and design departments have adopted as basic essentials: resistance to high temperatures and compactness.

These stringent requirements have prompted extensive studies in materials, with interesting results. For instance, silicones, originally developed for transformers and motors, have been found to meet the temperature and size criteria in a variety of parts and accessories.

Since silicones are available in a variety of physical forms, including fluids, greases and compounds, resins and rubber-like materials, which remain elastic in arctic cold or oven heat, they are adaptable to many applications.

The fluids have been found to be generally inert to chemicals, water repellent and resistant to oxidation. They have also displayed flat viscosity temperature slopes, low surface tension and very good dielectric properties.

When combined with inorganic fillers, the fluids have been found to yield compounds that can serve as dielectrics on ignition systems and other electrical equipment. In addition they are excellent release agents in plastic and rubber molding, serving as slip agents on heat sealing units.

Bodied with suitable metallic soaps, silicone fluids have been found to produce greases that are not only heat-stable, but have a low freezing point, being usable over a temperature range of from —100° to over 400° *F*. Because of this, and their resistance to oxidation, the greases have been referred to as permanent lubricants.

The silicone resins, which vary widely in properties and are tailored to specific uses, have been used by manufacturers of class *H* insulation materials.

Silicone resins have also been produced in thermosetting types for making laminate structures of *fiberglass* or asbestos; and for bonding finely divided particles such as powdered metals or mica, silica or carbon.

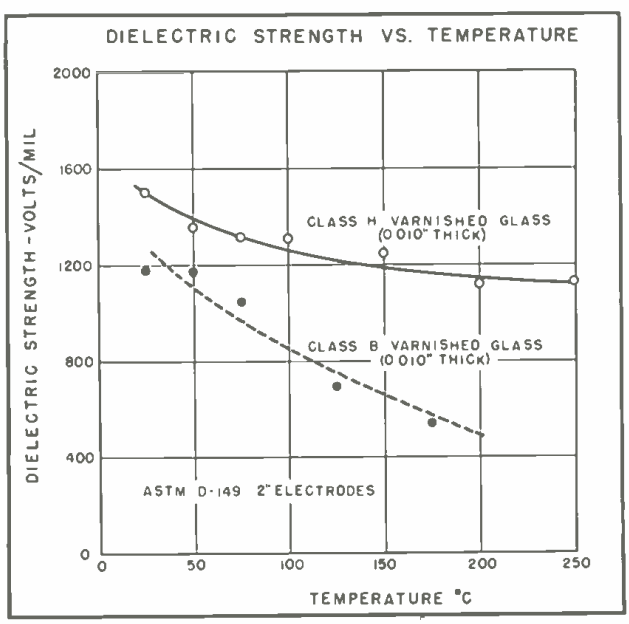
*Silastic**

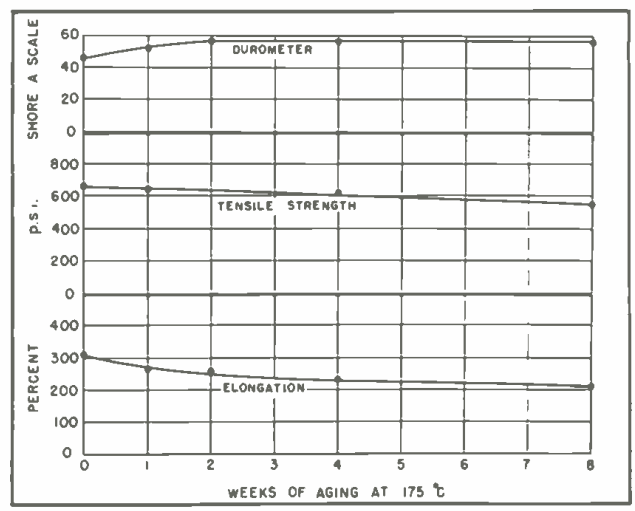
In many instances a semi-inorganic, rubber-like material with a serviceable temperature span of at least 600° *F* from —100° to above 500° *F*, is required. *Silastic*, or silicone rubber, has been found to meet this spec. It will withstand continuous exposure to temperatures of at least 300° *F* for an indefinitely long period of time.

The inherent stability of *silastic* has been further demonstrated by its re-

*Dow Corning trade-name for silicone rubber.
**Dow Corning 200.

Right
Plot illustrating effect of aging on Silastic at 175° C or 347° F.





Left
Graph illustrating the effect of temperature on dielectric strength of class H and class B insulation.

sistance to oxidation and to outdoor weathering and resistance to many oils and to a variety of chemicals.

On the Production Line

This heat-stable, rubber-like material has also been used for high vacuum gasketing on lens coating and metal spattering equipment. It has been found to give prolonged life on the vacuum chucks in TV tube production. It has also served as a dry dielectric for *rf* transformers.

Silicone Fluids

Silicone fluids,** available in various viscosities, have been used for many purposes in TV. Since they serve to conduct the heat away from the unit, it has been found that they can increase the efficiency of certain capacitors.

For moisture-proofing and water repellency the fluids have been used as impregnants for paper capacitors and leather diaphragms. The fluids have also been used to treat ceramic parts for high frequency transmission equipment, to waterproof ceramic insulators for transmitters and in vapor impregnation of parts to improve corona resistance. When applied to the base of tubes, the fluids have been found to increase moisture resistance and surface resistivity. Silicone fluid impregnants have been applied to capacitors in high-voltage units.

Additional Applications

In other instances, they have been applied as bonding agents in the manufacture of metal surfaced items; as non-corrosive soldering flux.

On picture-tube fronts, silicone fluids have served to eliminate low spots.

Silicone fluids have also been used in compounding lubricants for TV antenna rotating devices.

Compounds and Greases

Silicone compounds have also been applied as the dielectric in TV tuning capacitors. In radar, the compounds have been used to lubricate the natural rubber seal on the revolving shaft of an aircraft reflector.

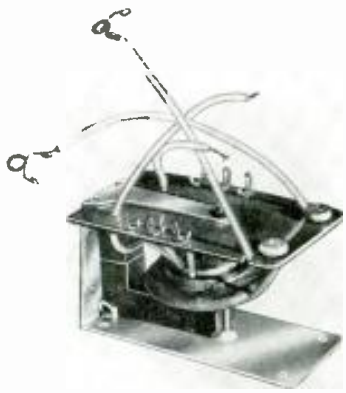
The compounds have also been found important in many diversified applications, acting, for instance, as a thread lubricant on instruments molded of plastic. They have been found to prevent arc-over on high-voltage transformers.

The compounds also have been used as lubricants in horizontal controls and contact points of some tuners.

TV Parts & Accessory Review

Horizontal Deflection Output and HV Transformer

FERRITE CORE HORIZONTAL DEFLECTION OUTPUT AND HIGH VOLTAGE TRANSFORMERS are now available. Said to be capable of supplying 12 to 13 kv to a 70° tube. Provides for horizontal or vertical mounting and for use of No. 8 self-tapping screws.—*Type H1A1, Electronic Parts Division, Allen B. Du Mont Laboratories, Inc., 35 Market St., East Paterson, N. J.*



Du Mont horizontal deflection output and hv transformer.

Metallized Paper Capacitors

METALLIZED PAPER TUBULAR CAPACITORS that are said to feature self-healing characteristics, have been announced.

One capacitor, the *Pup*, with metal end caps and enclosed in a wax impregnated paper tube, is said to be usable over a temperature range from -40° to +60° C without derating. Available in a range of nine capacities from .01 to 2 mfd at 200, 400 and 600 volts *dcw*, and in tube dimension ranges from 3/8" x 5/8" to 23/32" x 2 1/8" diameter and length.

Metallized paper tubulars, *Sealpups*, range in size from .175" x 11/16" to .750" x 2 3/16" diameter and length, and are available from .01 to 2 mfd at 200, 400, and 600 *v dcw*.

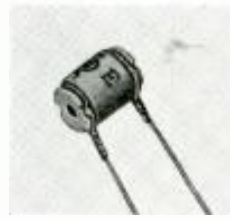
Hermetically-sealed metallized paper capacitors, *Metapup*, are enclosed in a one-piece metal tubular case, pressure sealed. Available from .01 to 6 mfd at working voltages up to 600 volts *dcw*. Size ranges are from 3/8"x 15/16" to 1 1/4"x 2 7/16" diameter and length. Both the *Sealpup* and *Metapup* are said to be usable in ranges from —55° to +95° C.—*Complete data in bulletins 142, 143, 144; Cornell-Dubilier Electric Corp., South Plainfield, N. J.*

HV Capacitors

HIGH VOLTAGE CAPACITORS of 1000 and 2500 volts *dc* three-terminal network feed-thru design have been announced. Capacitors are said to be suited for suppression of interference and harmonic generation in high-voltage circuits in transmitters and industrial electronic equipment.—*Data available in engineering bulletin 212B; Sprague Electric Co., North Adams, Mass.*

Wide-Range Subminiature Resistors

RESISTORS 13/32" IN BODY LENGTH and 9/32" in diameter have been announced. Available resistances range from 10 ohms to 0.160 megohm. Have a rating of 0.15 watt at 85° *C* ambient temperature, and a maximum temperature coefficient of 0.0025% per °*C* from 20° *C* to 100° *C*. Maximum voltage is 150 *v.*—*WW-10; International Resistance Company, 401 N. Broad St., Philadelphia 8, Pa.*



IRC subminiature resistor.

UHF and VHF Transmission Lines

UHF AND VHF TRANSMISSION LINES in diameters of 1 5/8", 3 1/8" and 6 1/8" have been announced. Suppressors are available to suppress higher order modes of propagation in the 6 1/8" line. Transmission lines are available for from 54 to 890 mc. —*Data available in bulletin 73; Andrew Corp., 363 East 75th St., Chicago 19, Ill.*

Antenna Distribution System

A DISTRIBUTION SYSTEM which provides simultaneous operation of four TV receivers from a common antenna has been developed. Unit is said to have sufficient isolation to prevent interference resulting from local oscillation. Six coax sockets provide for four outlets, the signal input and the signal output. —*Model 3100; Electro-Voice, Inc., Buchanan, Mich.*

Colored Airlead

COLORED SPACED AIRLEADS in bright red, pink, bright blue, baby blue, pastel green, chrome yellow, ivory, soft white, clear and brown, are now available. Produced in reels of 100', 250', 500', 1000' and 2500', in dimensions of .375" x .083".—*Don Good, Inc., 1014 Fair Oaks Ave., South Pasadena, Calif.*

Ceramic-Core Resistors

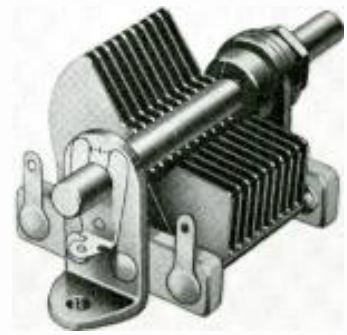
RESISTORS, that are said to have ± 1 per cent tolerance, have been produced. They are made by coating a treated ceramic core with a film of micro-crystalline carbon, protected by an insulating sleeve of thermoplastic material.

Temperature coefficient is said to be less than —.0003 per cent per °*C* from —40° *C* to + 60° *C*. Maximum instantaneous peak voltage is 6000. Available in ½ watt, 100 ohms to 5 megohms; 1 watt, 100 ohms to 10 megohms, and 2 watt, 100 ohms to 20 megohms.—*Stablohms; Kay Electric Co., 14 Maple Ave., Pine Lawn, N. J.*

Compact Variable Capacitors

A SMALL-SIZE VARIABLE capacitor has been announced. Plates are of brass, .0225" thick. Standard spacing is ordinarily .0245" for maximum capacitance ranges up to 325 mmfd. Other spacings up to .0715" can be made. Dimensions are 1 5/8" wide by 1 11/16" high (plates extended).

Steatite insulating bars are used. Features all-soldered and riveted construction.—*Type R; E. F. Johnson Co., Waseca, Minn.*



E. F. Johnson variable capacitor.

Subminiature Resistors

A NEW LINE OF SUBMINIATURE RESISTORS has been designed to meet JAN-R-93 specifications. One type (SM-15) measures 5/16" diameter by 3/8" long. Power rating is 0.15 watt; maximum resistance, 200,000 ohms. Another (SM-30) measures 5/16" by 3/4". Power rating is 0.30 watt; maximum resistance, 400,000 ohms. Tolerance of 1% is standard; 1/10% can be supplied. Coating is fungus-proof. Sealed-in-bakelite construction.—*Instrument Resistors Co., 1036 Commerce Ave., Union, N. J.*

RF Coax Switches

RF COAXIAL SWITCHES that are said to reduce reflection losses by maintaining coaxial configuration have been announced. Switches are claimed to have a standing wave ratio of 1.5:1 or better at 10 kmc.

Units are available for switching a common input to any one of from 2 to 6 circuits. A 6-position, remotely-operated switch having the standard characteristic impedance of 50 ohms, is approximately 4½" long by 3" diameter.—*General Communication Co., 681 Beacon St., Boston 15, Mass.*

Miniature Rotary Switch

A MINIATURE ROTARY SWITCH has been announced. Insulation between shaft and contact arms is said to withstand 2500 volts *ac*.

Diameter of the switch is 5/8" and the switch body is 3/16" thick. Contacts are of pure silver and the contact arm is silver plated beryllium copper.—*Data available from Electro Development Corp., 6014 W. Washington Blvd., Culver City, Calif.*

TV Broadcast Equipment

Video Distribution Network

A VIDEO DISTRIBUTION NETWORK which divides the output of a single source into from one to five bridging amplifiers for video program distribution has been produced.

Network is inserted in the line between the source and the load. An internal variable capacitor is provided on each output channel for the adjustment of any change of capacity introduced by the addition of channels. Switch is provided for terminating the source with an internal adjustable 73-ohm resistive load.—*V-101; The Daven Co., 191 Central Ave., Newark 4, N. J.*

Daven video distribution network.

Monoscope

A MONOSCOPE featuring composite output, and both horizontal and vertical feedback sweeps, is now available. Possible damage to the monoscope tube in event of sweep failure is prevented by an automatic sweep protection circuit.

A rack mounted unit, it incorporates a separate input for any test signal and an adjustable sweep yoke for obtaining a rectangular raster.

Video response of the new unit is said to be within ±½ db to 7 mc, and 3 db down at 9 mc. Signal to noise ratio is approximately 35 db.—*Type PH-3-A; G.E., Syracuse, N. Y.*

Flying Spot Scanner

A TV FLYING SPOT SCANNER that converts slide information to video signals has been developed. Console-mounted, scanning unit has been designed to handle, semi-automatically, from one to thirty-six 2" x 2" double frame, 35 mm slides which may be shown in or out of sequence. Featured is an automatic signal cut-out which blanks out the picture while the slide is in motion.

With an *add-a-unit* feature, equipment may also be employed as a dual scanner consisting of the single scanner plus an auxiliary unit, and may be used to obtain lap dissolves, fades and other flexible arrangements between two scanner units.

Units are said to have a wide contrast range, and a 600-line horizontal resolution. —*FTL-35A, FTL-82A; Federal Telecommunication Labs., Inc., Nutley, N. J.*

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VWOA News

Personals

HAROLD K. BERGMAN has notified ye secretary that he is up at WGY on the Voice of America program. He reports that he likes to recall the days when he was with United Fruit, and operating in the radio department at Swan Island, US and aboard such ships as the Saramacca, Metapan and Pastores. . . . R. T. Brooks is now sailing aboard the SS Atlantic Trader. . . . At the recent VWOA spring get-together held in the Fireplace Cafe, in New York City, were Ken Richardson, E. F. Duskin, L. B. Victor, John Lohman, J. A. Bossen, Frank Orth, Henry Hayden, Edward Dros, G. W. Johnstone, Fred J. Gommo, Fred Burgess, H. B. Koch, George N. Mathers, C. R. Shanholtzer, C. I. Elliott, Herman H. Parker, R. L. Fischer, A. C. Tamburino, H. T. Williams, Sam Schneider, Vic Villandre, John V. L. Hogan, A. A. Haas, J. W. Holland, C. B. Cooper, George E. Duvall, James Owen, A. H. Knight, L. E. Bonduaux, W. C. Simon, R. H. Pheysey, R. J. Iversen, W. J. McGonigle, Robert W. Gunderson, C. D. Guthrie and E. C. Cochrane. Guest of honor was Bob Gunderson, who has been blind since birth, but who, nevertheless, has achieved striking success as an inventor, engineer, radio teacher and publisher, and operator of ham station W2JI0. Bob reviewed his experiences as a teacher for the handicapped, particularly in the use of radio, as a vocational aid. Describing his own method of instruction, Bob pointed out he uses his *multi-tester* in which the measuring needle is replaced by a buzzer and the dial, in Braille, replaces the meter. Among other of his inventions described were a Braille slide rule designed to read to four places for mathematical calculations, and a complete set of other electrical radio testing instruments. During the talk, Bob told about one of his students, who though deaf as well as blind, managed to pass an FCC examination and obtain an amateur license. By using a loud speaker and placing the student's hands against it to feel the vibrations, he was taught the principles of amateur radio. In March, '50, ten years after obtaining his *ham* license, Bob started publication of *The Braille Technical Press, The Radio and Electronic Magazine for the Blind.* Written entirely in Braille, this magazine contains valuable data. Although it is available by subscription, Bob sends it free to blind persons unable to pay for it. Publication of this magazine is made possible by contributions. One such contribution, fifty dollars, has been sent from members of the VWOA.

Industry Literature

Parker-Kalon Corp., 200 Varick St., New York 14, N. Y., has published a 24-page handbook, *480*, covering self-tapping screws. Detailed are screw selection, application information, recommended hole sizes and corresponding drill size numbers.

Telechron, Inc., Ashland, Mass., has released a 20-page booklet containing a description of its facilities. Detailed are the engineering staff, personnel, training research staff and facilities, model shops, tool and die shops, assembly line setup and quality control.

F. J. Stokes Machine Co., 5900 Tabor Rd., Philadelphia 20, Pa., has issued an 18-page brochure, *509*, on plastic preforming. Covered are the properties of preforms, methods, punches and dies used, and specifications and preform presses made by the company. Included also is a treatise on properties of preforms showing relationship between screen analysis of material and pill weight, between pressure and density of phenolic material, and between preform hardness and material temperature.

Engineering Products Department, Radio Corp. of America, Camden, N. J., has prepared a brochure, *IJ4226*, describing studio-transmitter link equipment. Detailed are equipment which may be used in the 890-911-mc band for TV aural channels, by AM stations in the 925-940-mc shared service band, and by FM stations in the 940-952-mc band.

Eutectic Welding Alloys Corp., 172nd St. and Northern Blvd., Flushing, N. Y., has published a 6-page folder containing specifications on low temperature welding alloys. Detailed information is given for each alloy and electrode, covering: type and preparation of joints; preheating of parent metal; color match rating for metals listed; approximate heat and corrosion ratings.

The Superior Electric Co., Bristol, Conn., has released a 12-page bulletin, *S531*, covering standard automatic voltage regulators.

Sola Electric Co., 4633 West 16th St., Chicago, Ill., has prepared a 24-page booklet describing their research, design and production facilities.

E. I. DuPont de Nemours & Co., Wilmington 98, Del., has issued a 28-page booklet, *The Story of Research*, detailing the significance and importance of industrial research.

Sprague Electric Co., North Adams, Mass., has published a bulletin, *602*, detailing ratings and sizes of standard Bulplate flat ceramic capacitors. Described are six capacitors in single and multiple capacitance combinations with voltage ratings up to 5000 volts.

The Hickok Electrical Instrument Co., 10529 Dupont Avenue, Cleveland 8, Ohio, has published a 16-page booklet illustrating and describing the different theories and the four basic methods of tube testing. Includes circuit diagrams and formulas. Also contains summary of a survey on nature of failures of TV receiver tubes. Booklet is available gratis.

Federated Metals Division, American Smelting and Refining Company, 120 Broadway, N. Y. C., has published a 36-page book educational brochure on the nature, properties, and uses of solder. Separate sections are devoted to thermal effects, mechanical properties, principles of soldering, and fluxes. Offered, too, are data on the selection of the proper solder for a job. There is also a section on the melting range of tin-lead solders; ASTM, SAE, federal, and military specifications, as well as wire tables.

James Knights Co., Sandwich, Ill., has released a catalog, *No. 51*, describing applications of stabilized crystals. Presented are dimensional drawings and general specifications on crystals and holder types, and old replacement types.

John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., have published a book, *Plant Layout: Planning and Practice*, by Randolph W. Mallick and Armand T. Gaudreau.

Discussed are the problems of determining plant capacities, balancing machine operations, equipping work stations, designing production and assembly lines, and analyzing material-handling systems.

Contains 391 pages and is priced at $7.50.

Gates Radio Co., Quincy, Ill., have released a catalog covering transmitter accessories and parts. Described are wire transmission line equipment, meter switches, relays, sockets, meters, remote-metering equipment, coaxial cable, *rf* inductors, sampling loops, isolation coils, power lighting chokes and metal cabinets.

Video Switching

(*Continued from page* 15)

signal to be put on the air; the first nine buttons allowing selection of the nine incoming signals, while the tenth button selects the mixed signal for the line output. This bank of switches feeds a cathode follower which in turn feeds the line amplifier section of the mixer-line amp. An additional pair of contacts on each switch will operate a remote tally light to indicate the channel appearing on the master or line monitor, and remote on-the-air tally lights to indicate on a camera, film chain, flying spot scanner control or other equipment, that its output is being put on the air. When the tenth button is depressed placing the mixed signal on the air, control of the remote *on-air* tally lights is transferred from the line switches to the mixer bus switches. Under this condition, the remote tally lights may indicate that either or both of the channels, set up on the two mixer buses, are in use depending on the position of the mixer control at any time. Thus, if the mixer control is at either extreme of its rotation, then one or the other remote tally light will be on and both lights will be on, when the mixer control is in any other position. It has been found that when using the mixer bus switches for feeding the line amplifier, through the tenth button of the line switches, remote (composite) signals should not be handled this way, but through line switches only.

The line amplifier section of the mixer-line amp was designed for an input from the switch unit of 0.3 volt peak-to-peak video across 75 ohms and three standard RTMA outputs of 1.4 volts peak-to-peak video, plus sync with a source impedance of 75 ohms and isolated from *dc*. One of the outputs is shown in Figure 4. The frequency response of this video path, as well as the others mentioned previously, has been found to be flat within 0.5 db to 8 mc and down less than 6 db at 10 mc. All the *rc* coupling circuits in this amplifier have long-time constants, except where a restorer or driven clamp maintains the low-frequency component on a grid. After amplification (in the 12AT7s), the signal is applied to an automatic-setup control circuit. Within certain limits, this circuit will automatically control the signal so that it contains a pre-determined percentage of setup, in accordance with the average picture content. An averaging *dc* restorer (V_{3A}) on the grid of a 6AG5 (V_4), which is keyed off during blanking intervals by V_5, adjusts the video in accordance with the average content of the darker portions of the picture. Additional blanking is inserted in the plate load of the 6AG5 by V_5 and a series clipper clips off the blanking at the required level to obtain the desired setup. The level of operation of the series clipper is determined by an adjustable grid bias on one-half of a 12AU7. Local sync pulses are applied to the grid of this triode for adding to the video signal. The resulting signal is further amplified and fed through a cathode follower (V_{3B}) to the grids of the three output tubes. A four-diode clamp (V_9 and V_{10}), which derives its driving pulses from the signal, restores the *dc* component to the signal on the output tube grids. The capacitor and crystal between the cathode of V_{3B} and the grid of V_{3A} are used to cause the output to be black when there is no video, as during a fade.

When a line button for a remote channel is depressed, auxiliary contacts

on the push-button switch (in conjunction with the local-remote toggle switches) disable the automatic setup control circuit, including the blanking and sync insertion. (The actual disable network is not shown in the simplified schematic, but the points controlled are labeled *disable*.)

The switch unit has a small regulated supply for the cathode-follower plate voltage. It also supplies the positive end of the voltage-dividing network, which contains the dual potentiometers of the mixer control. The unit also supplies power for all the remote tally lights.

The mixer-line amp contains a small regulated-bias supply for the various stages in the unit, for the disable circuits, and for the negative end of the mixer voltage dividing network. An external regulated power supply is required for the plate and screen voltages in the mixer-line amp.

Capacity In Circuits

(*Continued from page 16*)

projected to scale 2 according to the angle of the projection lines between scales 1 and 2. The point on scale 2 and a point on scale 3, determined by the value of C_x, are used to determine a new projection point, P_1. A line is then drawn through points P and P_1, intersecting scale 4.

The total circuit capacity, C_t is taken from scale C and in this case is about 39 mmfd. For a precise determination of C, other values of C_x can be chosen and the process repeated, giving an average value of C_x. Stray capacity can then be determined by subtracting the fixed capacities from the total capacity, C.

Extreme care must, of course, be taken in plotting the points to obtain best results.

Field Equipment Maintenance

(*Continued from page 21*)

picture monitor horizontal sweep or in the associated high-voltage supply.

If the frame frequency fails in both waveform and picture monitor, the fault must lie in the vertical blocking oscillator or vertical section of the sync separator. (If either sweep fails independently, the trouble of course is in that particular section.)

Credits

Thanks are due RCA and DuMont for material assistance in preparation of this paper.

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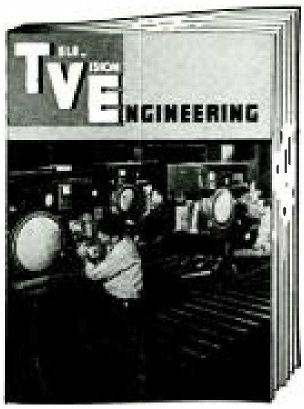

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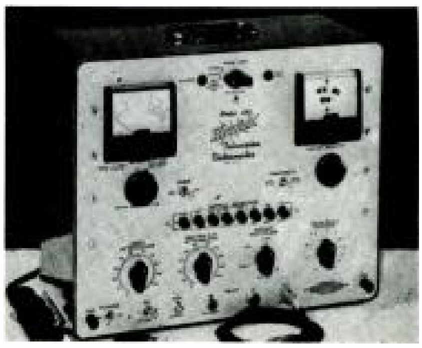
Instruments

Television Videometer

A VIDEO GENERATOR to identify visually and localize trouble in any section of a TV receiver, independent of station operation, has been developed.

Generator is crystal controlled and has *rf* output directly calibrated in microvolts. Includes a line voltage scale, and horizontal and vertical sawtooth voltages. It is said to be usable as a TV transmitter to transfer simultaneously a program to any number of TV receivers on any desired channel.—*Model 650; Hickok Electrical Instrument Company, 10529 Dupont Ave., Cleveland 8, Ohio.*



Portable Picture Tube Checker

A PORTABLE CHECKER which permits testing of picture tubes in the carton without removal has been announced. Checker utilizes a beam current test which is proportional to the light output capability of the tube. It provides also for continuity and short checking of the electron gun.—*Cathode-Ray Tube Checker; National Union Radio Corp., 350 Scotland Road, Orange, N. J.*

Voltage Regulated Power Supply

A VOLTAGE POWER SUPPLY that features one regulated *B* supply, one regulated *C* supply and one unregulated filament supply, has been developed.

B supply is continuously variable from 0 to 600 volts and delivers from 0 to 200 ma. —*Model 815; Kepco Laboratories, Inc., 149-14 41st Ave., Flushing, N. Y.*

Production

Bronze Bearings and Bushings

BRONZE BEARINGS AND BUSHINGS, ranging from small sizes up to 24" in diameter, have been announced. Included are types which may be plain, flanged, split or any combination, in machine finish or semi-finish.

Provided are flanged types of bearings and bushings in all finishes with standard flanges, or with outstanding lugs or other fastening members for special adaptation.—*Bronze Bearings, Inc., 1002 North Ave, E. Cranford, N. J.*

Numbering Tool

A NUMBERING TOOL that uses straight-line flat surface marking type with an insert segment for marking convexed surfaces, has been developed.

Each piece of type is standard body width, that may be removed from the holder, but due to a segment piece blank that is placed between each piece of type, a curvature is obtained conforming to the surface being marked. A formed metal plate with a flange on it, held taut by a coil spring, locks each piece of type and each segment spacer in place. Provided in press styles having a shank for standard ram sizes.

Standard sizes of holder are 4, 6, 8, and 10 piece capacities of type, sizes ranging in 16ths and 32nds from 1/16" to ¼".—*Hercules Concave Holders and Hercules Shoulder Style; The Acromark Co., 602 Morrell St., Elizabeth, N. J.*

Simulated Metal Finish for Wood Products

A SIMULATED METAL FINISH for wood products has been introduced.—*Warmet; Warsaw Products, Inc., Warsaw, N. Y.*

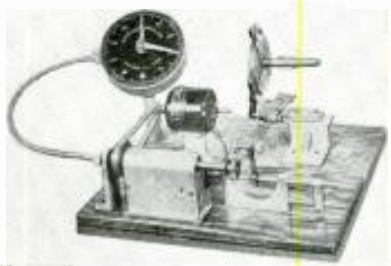
Miniature Coil Winder

A MINIATURE COIL WINDER for winding tiny, fine wire, random wound bobbin coils up to ¾" width and up to 1½" diameter, has been announced. Winder measures 24" long, 12" wide and 8" high.

Available is model T-2 tension with supporting bracket for wire gauges 20 to 42 and spools up to 4½" diameter, and model T-6 for wire gauges 42 to 46.

Winding speeds up to 5000 *rpm* are said to be achieved by 1/25 hp variable speed, series wound, *ac-dc* motor and foot-operated speed control.

One winding setup is furnished for the coil to be wound, and 48 pitch gears are used. Cams range from 1/64" to ¾" in steps of 1/64" and gears from 20 to 100 teeth. Clock dial counter for from one to 10,000 turns, is directly coupled to winding head.—*Model 39; Geo. Stevens Mfg. Co., Inc., Chicago 30, Ill.*



Class H Transformer Insulation

CLASS H INSULATION for dry type transformers has been developed.

Insulation consists of organic materials such as glass, porcelain, mica, asbestos bonded or impregnated by the silicone resins or rubbers or by the flurocarbons. Compared to class B insulation, the difference lies in the resins and varnishes used as bonds and impregnants. Exposed to air, class H insulation is said to have about 100° *C* temperature range.

Available in voltages of 15 kv and below, through 3000 kva ventilated and 1500 kva sealed-in-nitrogen.—*Pennsylvania Transformer Corp., Canonsburg, Pa.*

Electric Dial-Taper

A DIAL-TAPER, a gummed tape machine with a telephone type of dial that displaces manual with automatic operation, has been announced. The operator selects on the dial the length of tape needed and a twirl of the dial starts and stops the machine automatically as it dispenses any desired length of tape.—*Marsh Stencil Machine Co., Belleville, Ill.*

Rectangular Tube Insulating Ring and Sleeve

A MOUNTING AND INSULATING RING* and sleeve* for 21-inch rectangular glass-metal picture tubes has been announced.

The ring and sleeve combination is said to assure safe and shock-proof mounting, as well as complete insulation against the high second anode voltages.—*21 RFE and 21AP4/IC; Anchor Industrial Company, 533 Canal Street, N. Y.*

*U.S. Pat. 2503813; other patents pending.

Lathe Tool Holder

A TOOL HOLDER of the universal type, known as the 10 in 1 tool holder, is now available in five sizes for South Bend Lathes and can be adapted for other makes.

Constructed of heat-treated steel, this tool holder features screw adjustment for tool height. Holder comes equipped with a self-aligning knurling head and a pair of medium diamond knurls. Coarse and fine diamond knurls; and coarse, medium, and fine straight pattern knurls are available. Boring tools, cutting-off blades and a set of four ground cutter bits are also available for boring, cutting-off, turning, facing, and threading operations.—*South Bend Lathe Works, South Bend 22, Indiana.*

Terminal Block

A UV TERMINAL BLOCK is now available. Made of molded phenolic plastic, it provides segregated, individually accessible connections.—*Shaw Insulator Co., 160 Coit St., Irvington, N. J.*

Miniature Wires

MINIATURE WIRES with four strands of No. 40 copper wire, said to be so small that 1400 strands occupy an area of ¼" x ⅝", have been announced. Miniaturization has been made possible by *tensulation*.

Featured is the use of thermoplastic, thermoelastic and other film in tape form, applied parallel to the conductor after this film has been heated. Conductors, cabled or singly, may be covered with metal or fabric braid.—*Tensolite Insulated Wire Inc., Tarrytown, N. Y.*

Briefly Speaking . . .

SOUTH OF THE BORDER TV is rapidly becoming a major factor in the video industry. With stations in Mexico and Brazil already in operation, a 5-kw system announced for Argentina, and installations in other countries in the blueprint stage, a good neighbor net may not be too far off, particularly since long-jump microwave links are being used or considered in all setups. . . . The production facilities of Amperex Electronic Corp. will soon be doubled through the addition of a 100,000-square-feet one-story building on a 7-acre tract on Duffy Ave., Hicksville, L. I. The present facilities at 25 and 79 Washington St., Brooklyn, N. Y., will be retained. . . . A new metallurgical laboratory at Bayside, L. I., is being planned by Sylvania Electric. It is estimated that the new lab will cost between one and two million dollars. . . . The Carboloy Co., Inc., formerly a G.E. affiliate, has become a department of the company, with headquarters in Detroit. Five other manufacturing affiliates have also become departments: General Electric X-Ray Corp., Milwaukee; Locke, Inc., Baltimore; Telechron, Inc., Ashland, Mass.; Monowatt, Inc., Providence, R. I.; and The Trumbull Electric Manufacturing Co., Plainville, Conn. . . . KXEL, Waterloo, Iowa, has placed an order for a complete DuMont TV system including transmitter, film projector, camera chain and antenna. . . . Warren B. Cozzens, 720 Main St., Evanston, Ill., has become a Measurements Corp. sales rep in the states of Ill., Ind., and Wisc. . . . A plant-facility brochure has been released by the Pentron Corp., 221 East Cullerton St., Chicago 16, Ill. . . . Philips Laboratories, Inc., has granted to the General Ceramics and Steatite Corp., Keasbey, N. J., a license under patents pertaining to magnetic ferrites and their manufacture. . . . Pioneer Electronics Co., Santa Monica, Calif., has received a Signal Corps contract involving the production of radar tubes. . . . A 4-page catalog describing parabolic antennas, has been released by The Workshop Associates, Division of the Gabriel Co., 135 Crescent Rd., Needham Heights 94, Mass. . . . Professor Walter J. Creamer's new text on *Communication Networks and Lines* has been published by Harper & Brothers, 49 E. 33rd St., New York 16, N. Y. The book offers a unified presentation of network theory, a review of the design relations for filters and equalizers, and a detailed analysis of transmission lines through the use of hyperbolic functions. Text, with 353 pages, is priced at $6.00.

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JULY, 1951

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