

THE NEWSPAPER FOR THE HOBBYIST OF VINTAGE ELECTRONICS AND SOUND

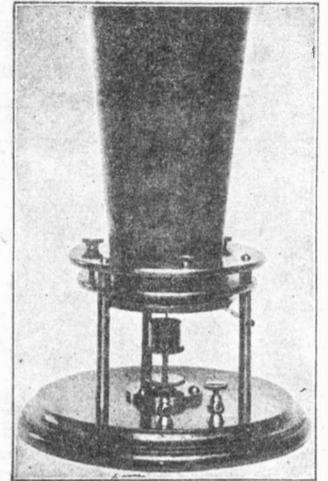
TELEPHONE CENTENNIAL 1876 - 1976

THE HORN SPEAKER

Metal Phonograph Records

By Dr. HARRY A. KNAUSS, M.D.

(THEIR INVENTOR)



I HAVE been occupied for over one year on the design and perfection of a playing commercial phonograph record, double disc, made entirely of metal. I have now succeeded in producing this article, samples of which I have successfully demonstrated to the editors. There are certain terms in the phonograph record which will illustrate more clearly than anything else the problems involved in the production of records.

First of these is, "surface." As nearly everyone knows, there is a tremendous weight concentrated on the small area of the needle point. The material carrying

printing or stamping operation after the proper dies are made.

In the process of making the indestructible metal record, which I have named the Duramel Disc, I carry the electro-deposition several steps further. It is well known that playing records have been made out of copper since the inception of the industry. However, these would not hold up for more than six or eight playings, at most, because the copper soon began to spin under the tremendous weight and the tool action of the sharp needle. Therefore, I first obtained a hard surface by plating an alloy of hard metal directly against the model.

After some experimentation, I found that the only thing which would properly hold the two pieces of thin metal together is tin. The front or playing surface is properly protected, the back surface is properly cleaned, and the two shells are then fitted back to back under pressure and heat. I have designed a special device for making this a simple mechanical operation which can be done by almost anyone with proper instruction. The device illustrated can be used to put together two hundred or more at a time.

One of the first questions asked by the practical phonograph man is, "Where are you going to get enough models and get

hours. The models are then replaced, and the process goes on continuously for twenty-four hours, during which time eight sets of twelve thousand each are stripped from the models. This makes a total of 86,000 halves or 43,000 whole records, in 24 hours.

After the first set of twelve thousand is stripped from its models, it is necessary to center and trim, after which two hundred halves are placed on a center pin, with tin between the backs, and a disc of copper between the fronts. This string of two hundred is then placed in an electrically heated device, and under pressure, the backs are sweated together so that the result is one hundred perfect playing records. It is thus only necessary to have sixty of these "stoves" in order to put together the twelve thousand halves. This operation requires less than three hours, so that the "stoves" are ready for the next set of shells when they come out.

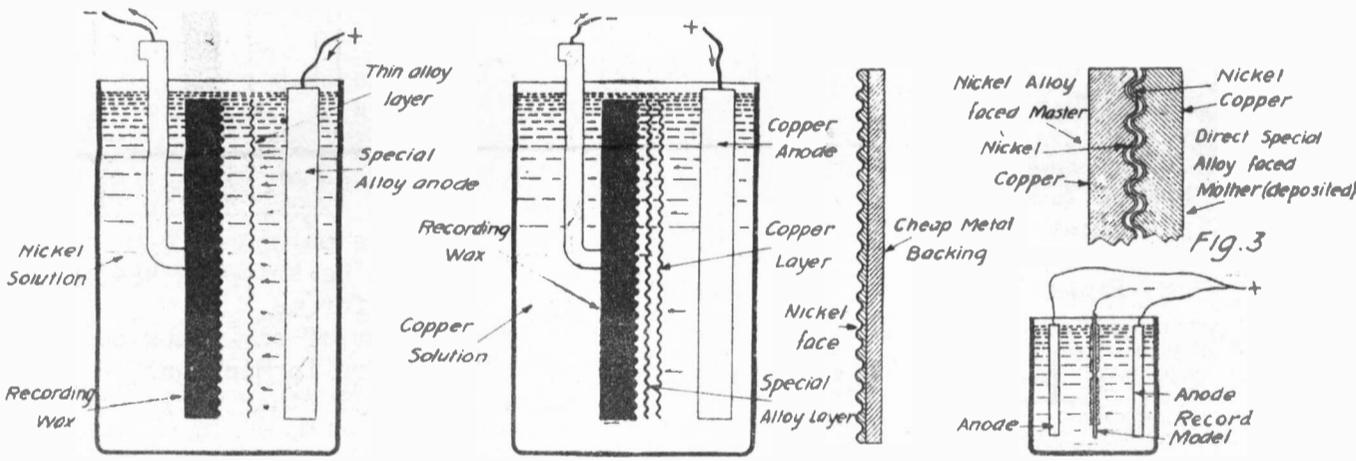
The number of metal records and the speed of production are entirely dependent on the equipment, which costs only one-tenth as much as that required for the corresponding production of the other type of record.

The result speaks for itself. It has scarcely any surface noise, due to the ideal bearing surface of the metal needle on metal. It is so nearly indestructible that only the most extreme mechanical violence will destroy it. It is fireproof, waterproof, acidproof, rustproof, unbreakable, light in weight (weighing only six ounces, which is two ounces less than the common record of ten inches diameter). The metal record can be sent thru the mails without loss from breakage. It costs less for packing and handling.

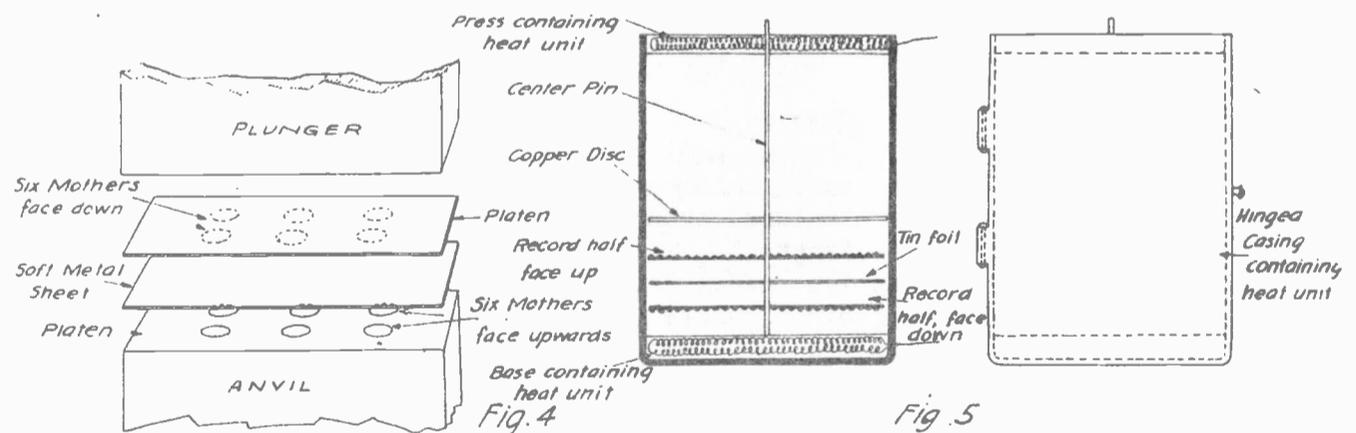
The actual material used in the Duramel Disc costs less than six cents, which is less than that of the common record.

Being made almost entirely by electric processes, the energy used can be obtained at a microscopic cost per record, where power is cheap and figures in on a yearly or overhead basis.

Thus it is seen that the metal record is scientifically correct. It is commercial, practical, and the product is indestructible. It can be cheaply made and it is a better article than the present type.



Science and Invention for October, 1921



The Author of the Present Article has Developed a New Process for Making Metal Phonograph Records on a Commercial Scale, Which are Both Lighter and Cheaper than the Present Records and Moreover, They Play with Practically no Scratching and with Infinitesimal Wear. The Successive Stages in Making the Knauss Metal Phonograph Record, are Shown Above, and Those Familiar with Electroplating Will at Once See How the Problem Has Been Solved. The First or Master Record, Recorded in Wax, is Made Suitably Conducting by Coating with Powdered Graphite. A Special Alloy Deposition is First Made on the Wax. Fig. 2—How the Special Alloy Record is Re-enforced with a Copper Deposit in a Copper Sulfate Bath. Fig. 3—Nickel Alloy Faced "Master" Record, Placed in Special Alloy Bath and Thus a Direct Special Alloy Faced "Mother" Record is Deposited. Fig. 4 Shows a Scheme for Impressing Six Records on Top and Bottom of Lead Sheet, Which is Afterward Placed in a Plating Solution and the Record Faces Deposited Thereon. Fig. 5 Shows an Electric Heater for Sweating Two Metal Record Faces Back to Back to Form a Complete Two Faced Record.

the groove which has to sustain this weight and yet track smoothly must be smooth and tough, and should be unbreakable. Heretofore, the nearest approach to these qualities was found in a mixture of shellac, rottenstone, graphite and paper floc, known to the industry as "stock." This mixture, when heated and pressed with dies while warm, takes the impression of the sound grooves from the metal "stampers." These metal stampers are made by electro-deposition of copper, the surface of which is subsequently plated with a very thin coat of nickel. This gives the printing or stamping surface. It is seen that the present method becomes a

This shell is then backed up by electro-deposited copper, as shown in the illustrations. We have, then, a single-faced record, the grooves and playing surface of which must be absolutely accurate reproductions, because they are deposited with molecular accuracy.

But it became immediately apparent, in the course of my research that no single piece of metal would remain flat under the weight of the heavy tone arm of the phonograph. The single sheet of metal would invariably curl and buckle. Of course this led me to the making of double disc records by placing the single ones "back to back."

them quickly enough to deposit the metal records?" Suffice it to say that this is one of the things which makes the process commercial, and it is entirely solved. By means of a pressing operation in soft metal, illustrated in the diagrams, it is possible to turn out twelve thousand metal forms a day from two dies and one large press. On these forms are deposited twelve thousand halves, or six thousand whole records in a period of three hours following their being placed in the electrolytic bath.

Thus twelve thousand halves are stripped from their models at the end of three



TUBE COLLECTOR Look, what I found, a brass-base WD-11 for 25¢.

Club News

THE BUCKEYE ANTIQUE RADIO AND PHONOGRAPH COLLECTORS' CLUB

The following information about a picnic with items for swap, show and/or sale from SOUNDINGS, the official publication of the club. PICNIC: August 3 (rain date Aug. 10) Ken Spriggel's. Plan to eat at 4pm (but come at 1 for more fun). Bring table service and covered dish or dessert. (Meat & soft drinks provided).

Our annual picnic is the highlight of the year so bring the family for an afternoon of fun. Also, for added enjoyment, please bring items for show, swap and/or sale.

A name and address for the Club is: David A. Lieberth, 490 Mineola Ave., Akron, Ohio 44302.

OLDTIME ANNOUNCERS CLUB

Ray Poindexter is publishing some interesting information about oldtime broadcasting. Announcers with 25 years or more experience are entitled to BROADCAST. There are now two editions. Write to Oldtime Announcers Club, P.O. Box 1174, North Little Rock AR 72115.

SOUTHWEST VINTAGE RADIO AND PHONOGRAPH SOCIETY

Under the direction of Glen Zook the Society planned an exhibit of old receivers and broadcast equipment at the Northpark Shopping Center. All members were encouraged to participate in the event which was part of old time broadcasts put on the air by KERA-FM. These activities were planned for the first week to celebrate National Radio Week.

THE AMERICAN PHONOGRAPH SOCIETY 1976 OFFICERS

Art Wilmoth, was re-elected as the president. Advisor Clifford Dew of Northfield, Ohio was elected vice president. Dave Fletcher is again the secretary-treasurer and will be the editor of the JOURNAL and NEWS-LETTER for another year. Dr. Phillip Petersen remains as the society archivist.

By the way the 1976 advisors are: John V. Danner, Metuchen, N.J.; Tim Christen, Belmont CA; Timothy Fabrizio, Bergen, N.Y.; Dr. Harold Iayer, San Francisco CA; Ray Phillips, Los Angeles CA; Larry Schlick, Wauwatosa, WI; Al Seftl, San Francisco CA; Peter Betz, Johnstown, N.Y.; Bernard Skagfjord, San Francisco CA.

ANTIQUÉ WIRELESS ASSOCIATION

This late information from the March 1976 issue of THE OLD TIMERS BULLETIN of the AWA gave the following information about the Old Equipment Contest held at the National Conference in 1975. The contest described as the best ever, had the following winners:

CLASS I REGENERATIVE RECEIVERS
1st--Grebe CR-6 Lauren Peckham
2nd--Paragon RA-10 Alan Douglas

3rd--Remler Panel John W. Johnson
3rd--DIMA (German) John Caperton
CLASS II CRYSTAL SETS
1st--1917 Cohen Ralph Muchow
2nd--Nesco CN-113A Tom Brooker
3rd--Wireless Improve- Joe Pavek
ment Wavemeter

CLASS III TUNED RF RECEIVERS
1st--AK-9 & Log F. W. Sloat
2nd--Kennedy XV Gary Schneider
3rd--Grebe MU-1 Ray Sieracki

CLASS IV SUPERHETS
1st--Magnaformer John Caperton
2nd--1924 Receptrad Alan Douglas
3rd--Leutz Model C Lauren Peckham
CLASS V TUBE TRANSMITTERS
1st--1919 Grebe Ralph Muchow
2nd--DeForest OT-3 Tom Brooker
3rd--VT-2 Modulated Wilson Norwood
oscillator

CLASS VI SPARK TRANSMITTERS
1st--Torikata 1910 Ralph Muchow
2nd--Clapp-Eastham $\frac{1}{4}$ kw. Tom Brooker
CLASS VII LOOSE COUPLERS
1st--Meters 1919 Ralph Muchow
2nd--Cliff Navy Lauren Peckham
3rd--Homebrew F. W. Sloat
3rd--Antenna Tuner A.G. Wentzel

CLASS VIII LOUD SPEAKERS
1st--Clapp-Eastham horn Burt Noyes
2nd--Magnavox R-2 horn Gary Schneider
2nd--Two Sarnoff horns Ralph Muchow
3rd--L.E. Knott Mod.B John Johnson
CLASS IX AUDIO AMPLIFIERS
1st--DeForest 1915 Audio L. Whitlock
2nd--1920 Magnavox D. Cleland
3rd--Porcelaines 1917 L. Peckham
(French make)

CLASS X TUBES
1st--Pickard 1915 Triode R. Muchow
2nd--Audion(Wallace) A. Douglas
3rd--Pingen detector S. Johnson

LETTERS

EDITOR'S MAILBAG

Dear Jim:

I have thoroughly enjoyed my first year subscription of The Horn Speaker. Enclosed is a check for \$4.50 for my renewal.

I have only a few comments. I think the radio researchers and inventors throughout radio's history were very sharp and ingenious, such as DeForest, Fleming, Armstrong, Kent and Scott to mention only a few. But what about the cabinet makers for radios? What were the theories on cabinets? To a lot of people I have talked to the cabinets are the eye catch. Did the previously mentioned radio geniuses also design, experiment and develop the cabinets with their fancy designs and selected choices of wood grains? Or, did they leave this to a separate group of people, such as Pooley? What about the colorful separate speaker cabinets and housings? What about the speaker cloth designs?

In your opinion based upon your experience and the experiences of others which cabinets were considered the fanciest and best looking?

These are a lot of questions among others that I am curious about.

Perhaps you may have an article on some of these items some day, or else I've missed them. Your paper is very good. I wouldn't miss it for the world. Thank you for the reading enjoyment.

Sincerely yours,

Ivan I. Johnson
313 Alice St.
Deer Park TX 77536

Ed: A good idea for an article.

Dear Mr. Cranshaw:

Enclosed is a check for \$2.46 for an ad.

I really enjoy The Horn Speaker. Thanks to Keith Parry for telling me about it.

I started collecting radios about 2 years ago when I was 14. I'm still at it and save up my money from a paper route to buy them. My main source is garage sales.

What got me on this, was a local radio station playing old radio programs. I thought it would be nice to have a cathedral style to listen to them on. During my search, I was surprised to see the wide variety of items available. After quite a search, I finally got a U.S. Radio & T.V. Cathedral type. What a mess it was! The radio wasn't much to fix, but the cabinet took over a month, working on the average of 4 nights a week, several hours each night. It's now one of several I now have.

Now I go through list after list sent to me by fellow collectors and hope there's something I can afford. Usually it's the shipping charges that kill it for me.

Do you know of any clubs or other collectors here in Michigan? I would appreciate it if they would drop me a card.

I would like to see more first hand accounts of the radio industry in it's early years. How about some of your older (or more mature!) readers contributing some articles? Keep up the good work.

Sincerely,

David Dazer
2989 Maywood
Port Huron MI 48060

Dear Jim:

Enclosed is an ad, and check for same. I enjoy The Horn Speaker very much. The article on John A. Victor-reen was very interesting and helpful to me, but I need more information.

I recently picked up an old radio with the name 'Imperial Superhetro-dyne' on the H.R. panel, also dial markings, Tuner, Oscillator, Vol. Rheostat, Loop Ant. and speaker jacks. It had 8-201aux tubes in it. Parts are mounted on a wood chassis base, with a ser. #1072. It is bus-bar wired, well designed and constructed. All R.F. transformers are marked and labeled, Victor Products, Victoreen Radio Inc., Cleveland, Ohio. I would like to know if it was a kit set, custom built, or manufactured. It surely doesn't look like 'home brew:' as I have seen

many of those, having built many in the early twenties. Also what year it was made. I have it restored and it works beautifully. I would appreciate any help or information of any kind about it. Many thanks.

Sincerely,
Herb. DeGarmo
203 3rd. St.
Early, Iowa 50535
Phone: 712 273-3571

Editor: Ray Windrix and Dr. Victor-
een will probably help us.

Dear Jim:

In reference to the March issue, you pictured a Crosley Book Case receiver. Inclosed is a picture of a Sentinel Book radio which I have. Although not too old, it is still rather unusual. It is 10½" H X 6" W X 7½" deep. Uses 3525, 50I6, 12SQ7, 12SK7, 12SA7. Model 238, 115AC-DC, 1940s??

Gary B. Schneider
6848 Commonwealth Blvd.
Parma Hgts., Ohio 44130

Dear Mr. Cranshaw:

I received my copies of The Horn Speaker and I want to say that I find them very enjoyable to read and also, they are filled with very informative information about old radios and phonographs. Am very satisfied with it, keep up the good work.

Would like to see more articles on collecting records, about dating them and also steps in their care, that is storing them and cleaning the dirt off of them. Thank you and best wishes.

Sincerely,
William Smith
Hyattsville, Maryland

Ed: We are looking for more articles to print about records.

Dear Mr. Cranshaw:

Inclosed is a check covering the cost of a renewal of The Horn Speaker. I really enjoy it.

I've been in the electronic repair field, working as a bench tech., for about 10 years now. And I've worked on everything from video tape recorders to muti-band portable radios. Everything is just getting more complicated and difficult. I find those old circuits and articles a breath of fresh air.

Keep up the good work.

Yours truly,
Louis K. Yadevia
601 Church La.
Upper Darby PA 19082

DOWN MEMORY LANE

THOMAS H. "TOMMY" COWAN was the first announcer in the Greater New York area. WJZ, Newark was put on the air by Westinghouse in September 1921. The transmitter had been sent from Pittsburgh and was like the one at KDKA. Cowan was a company employee and was selected

to do the talking.

"This is WJZ, WJZ, WJZ, the radio telephone broadcasting station located in Newark, New Jersey. Please stand by to tune your sets. This is announcer Cowan, Newark." After awhile, he shortened it to "ACN."

During the first few nights, there was no program--just talk by Cowan. Even this brought a considerable amount of mail. Cowan decided to put some music on the air. His first job had been with Thomas Edison at Orange, N.J. He went to see Edison to borrow some records. The inventor didn't like radio. Apparently, he thought some of his discoveries had been used in its development. Regardless of his feelings, Edison lent his former employee some records.

WJZ began broadcasting the World Series between the Yankees and the Giants October 5, 1921. Cowan's

voice was heard reporting the action, but he was not at the game. A newspaper reporter relayed the happenings by telephone and Cowan repeated them into the mike. It was such a trying task that when the game was over, he didn't even realize which team had won. (The Yankees won the first game, But the Giants took the series.)

WJZ moved to New York the following year, and RCA acquired the station in 1923. Cowan left to join WNYC, the city-owned station, as chief announcer when it went on the air in July 1924.

Recently, I called his former address in New York and learned that Cowan died about three years ago. I talked to former radio actor Frank Ryan, who had known Cowan well.

From Broadcast No. 2, Oldtime Announcers Club, P.O. Box 1174, North Little Rock AR 72115.

REACTIVATION OF THE THORIATED TUNGSTEN FILAMENT VACUUM TUBE

By O.H. McDonald

The process of rejuvenation for the vacuum tube was one of the many secrets of radio that the old-timers used some fifty or sixty years ago. Try it ----- it will give you just another phase of enjoyment in the study of vintage radio. In placing my mind and thoughts in those yester-years helps to give me the fulfilment of this fascinating hobby of antique radio collecting.

In the 1920s vacuum tube rejuvenation was not only an art but a big business. Radio tubes for the home receivers on the average sold for around \$5.00 each. Many so called "black market" tubes were sold for about one half of that amount. The "black market" tubes being the ones that were extremely weak and for all practical purposes had been discarded. Many of these tubes were rejuvenated and sold at the cheaper price with actually a higher profit. Around the mid 20s manufacturers began producing rejuvenators for the service man. This was a big factor in helping to cut the ever rising cost of repairing the home receiver. In this article my intention is to cover the general rejuvenation process for the collector. An understanding of this procedure will enable the enthusiast to possibly reactivate some of his weak emitting tubes. However, I would suggest that you cover this complete article before attempting this process of rejuvenation.

Tubes are usually constructed with tungsten wire filaments. The number of electrons thrown off by such filaments is greatly increased when a chemical known as thorium is added to the tungsten wire when it is manufactured. Filaments having thorium drawn with the tungsten wire are known as thoriated tungsten filaments. Tubes having thoriated tungsten oxide

filaments operate at a much lower temperature than those with other types of filaments and therefore throw off very little light.

Tubes with thoriated tungsten filaments are the only ones that can be rejuvenated. If the filament is burning and the emission is low or even zero, more than likely the tube can be revived. Tubes that have been badly overloaded may not improve, but I will cover a "flashing process" for these tubes before you throw them away.

The filament condition of a tube may be most readily judged by an emission test using the circuit shown in figure #1. The voltages

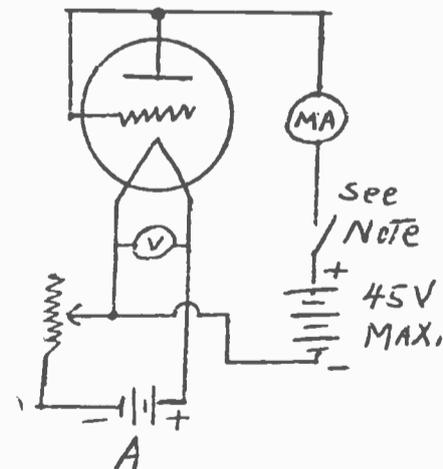


FIGURE #1 EMISSION TEST CIRCUIT
note.. CLOSE SWITCH JUST LONG ENOUGH TO GET READING ON MA. METER AFTER FILAMENT VOLTAGE HAS BEEN ADJUSTED TO RATED VALUE. DISREGARD CHANGE IN FILAMENT VOLTAGE WHICH WILL OCCUR WHEN EMISSION CURRENT FLOWS. TEST FOR SHORTED ELEMENTS BEFORE TAKING EMISSION READING specified should not be exceeded. Higher voltages will possibly damage the vacuum and may even result in a burnout. If the emission is above the minimum value specified in the

4-

table, the tube is in good condition and does not need reactivating. If equipment for reading emission is not available a simple test for the two most widely used tube types can be made on the customary tube test set which measures plate current. This circuit is shown in figure #2.

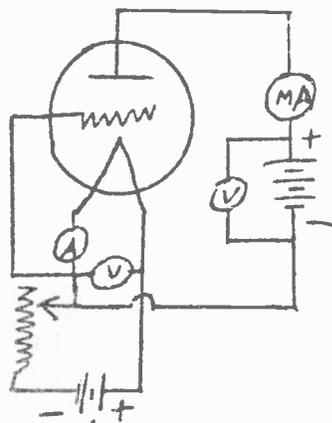


FIGURE #2 PLATE CURRENT TEST CIRCUIT

For UX-199 or CX-199 tubes, set the plate voltage at 45 volts with the grid connected to the negative side of the filament, set the filament voltage at 3.0 volts and read the plate current. Momentarily increase the filament voltage 3.5 volts and read the plate current. If the plate current increases more than .2 MA, the filament is not fully active and the tube may be improved by the reactivation process.

For the UX-201A or CX-201A tubes, the same plate voltage of 45 volts is used but the plate current is read with the filament voltages set at 4 volts and 6 volts. An increase of more than .2 MA in the plate current indicates that the tube may be improved by reactivation.

If the tube will not return to normal after reactivation treatment it is proof that the tube has either served its normal life or has been so heavily overloaded that the thorium content has been exhausted or the vacuum impaired.

METHOD OF REACTIVATION -- The following methods will generally restore the emission, that is reactivate, tubes which have been overloaded and also, at times, will reactivate, for short additional usage, tubes that have dropped in emission at the end of a normal life. The exact process which gives the best results depends upon the overload to which the tube has been subjected.

Tubes which have been subjected to only a slight overload may be reactivated by a very simple process. This consist of burning the filament, with the plate voltage disconnected, at the voltage listed in the table under the heading 'Reactivation Voltage.' This process speeds up the boiling out of the thorium from the body of the wire of the filament while at the same time the surface evaporation is very slow when the plate voltage is not applied. The length of time required to reactivate a tube is from about fifteen minutes to two hours, depending on how long the tube was subjected to excessive voltages. At the end of fifteen minutes, test the tube as explained in the preceding paragraphs. If the emission shows improvement continue the treatment until the tube tests above minimum passing limit.

Tubes which have been badly overloaded may not improve during this process, and a 'flashing' voltage may be used, as outlined in the next paragraph.

First burn the filament for ten

or fifteen seconds at the 'flashing voltage.' Then burn the filament under the process first described, using the reactivation voltages. Read the emission at the end of about thirty minutes and if not improved, continue to burn the filament for about two hours, taking reading every twenty to thirty minutes. If a couple of hours treatment does not restore emission or greatly improve it, then the tube can not be reactivated. No plate voltage is every applied during reactivation. The applied voltages should always be monitored by a suitable volt meter. A small percentage of the tubes reactivated by the 'flash voltage' process may be expected to burn out during the flashing period, but these are the tubes at or near the end of their normal life.

Rapid reactivation, sometimes within ten minutes, can be accomplished by the use of voltages higher than those recommended in the chart. This process very materially shortens the tube life and such reactivation is generally not permanent. Furthermore, the usage of higher voltages greatly increases the percentage of tubes that burn out and the filaments are in worse shape than they were before the process started. This hurry up process of rejuvenation should be highly discouraged.

REACTIVATION EQUIPMENT -- Alternating current from the house voltage supply is most convenient and can be stepped down to the proper voltage by a toy or bell ringing transformer. There are numerous step down transformers available with several step-down taps to select from. Connect the transformer in series with a 15 to 20

OHM variable resistor and the filament as shown in figure #3. Again use a suitable volt meter in adjusting voltages. Most A.C. voltmeters draw heavy currents and should not be left connected to the circuit for long periods of time. If an alternating supply is not available any direct voltage supply can be used. The larger voltages for flashing may be obtained from 'B' batteries. Only one tube should be reactivated at a time in order to keep a close watch on the voltages at all times. **NORMAL OPERATION PRECAUTIONS** -- If it is necessary to reactivate tubes at frequent intervals, it is proof that the tubes are being overloaded, and better service can be obtained if the following precautions are observed:

- (1) Do not operate filaments at higher voltages than what they are rated. Keep the filament

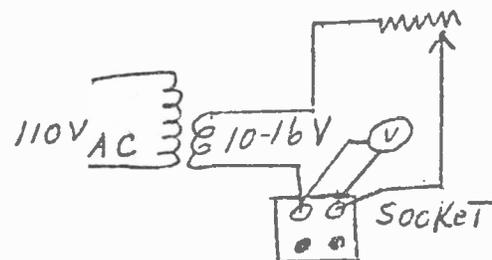


FIGURE #3 REACTIVATING CIRCUIT

rheostat set as low as possible, if possible use a reliable volt meter.

- (2) Do not use high plate voltages unless 'C' batteries are used. With types C-299, CX-299, UV-199, UX-199, and CX-301A, UV-201A and UX-201A better life is obtained, and 'B' battery current drain is lessened when a voltage of 67½ voltage or less is used in the plate circuit in case no 'C' battery is provided.
- (3) Be careful when changing battery connections to see that the battery polarities are not reversed. If the leads connecting the filament supply or the grid bias supply are reversed, the signals and music may still be heard, but they will be faint and distorted. Such a reversed condition often causes the operator to turn the filament voltage to a higher setting, thus injuring the tube without an appreciable results. Al-

TUBE TYPE	FILAMENT VOLTAGE	PLATE VOLTAGE MAXIMUM	MINIMUM EMISSION	MAXIMUM REACTIVATION VOLTAGES	MAXIMUM FLASHING VOLTAGE
199 OR 299	3.3	50	6 MA	4.0	10
120 OR 220	3.3	50	15 MA	4.0	10
201A - 301A	5.0	50	25 MA	7.0	15
200A - 300A	5.0	50	12 MA	7.0	15
171 OR 371	5.0	50	50 MA	7.0	15

TABLE OF EMISSION CURRENT AND REACTIVATION VOLTAGE

ways check battery connections after making any change.

- (1) If an insensitive tube and a tube in perfect condition are operated from the same rheostat, there will be a tendency to overload the good tube in order to obtain a better response from the weaker tube. The weaker tube should be reactivated or replaced. Here again the use of a reliable volt meter for the filaments will save overloading the tubes.
- (5) When using C-299, CX-299, CX-220, UV-199, UX-199, UX-120 types and a filament volt meter is not available, the operation of the set may be checked as follows: Connect two fresh dry cells in series

(3V) for the heater voltage. The rheostats now may be turned on full (no resistance) and if the set and tubes are operating correctly, satisfactory reception will be obtained. If the results are not satisfactory check batteries, battery connections, aerial connections and tubes. The two fresh dry cells will offer satisfactory reception when the trouble is located in the receiver.

GENERAL COMMENT -- The voltages specified in the table are the maximum which should be used. A volt meter should be used to set the applied voltages to the proper values in or-

der to obtain the proper results.

Tubes which have internal shorts between elements can not be reactivated and it may be convenient to make the short test with an OHM meter. If an OHM meter is not available a pair of headphones and a dry cell connected in series will work satisfactory in locating shorts if they exist. When the tube is not lighted, there should be an open circuit between the plate and the grid, the plate and the filament, and the grid and the filament. There should be a closed circuit between the two filament connections.

Tubes in which the vacuum is impaired can not be reactivated. This is usually indicated by a filament

1976 AD

TROUBLE FINDING ANTIQUE RADIO SERVICES REPRINTS, TUBES, BOOKS, OR ANYTHING RELATED TO VINTAGE ELECTRONICS?

TRY THESE BOOKS AND YOU WILL HAVE A REFERENCE LIBRARY FOR THE ENTIRE FIELD!

NOW AVAILABLE in Standard form or living COLOR, ready for Vacation Time, the only publications in our hobby that travels by CAR and PLANE: NEW 1976 QUARTERLY RADIO ANTIQUER'S DIRECTORY and COLLECTOR'S GUIDE SERVICES, covers all phases of our hobby from A to Z, Crystals to Classic Sets, over 75 8½ x 11 pages with protective cover. ORDER same old price \$5.00 (five years), OR SEND \$9.95 and we will copy all photographs IN LIVING COLOR where applicable...ANOTHER FIRST FOR OUR HOBBY!!!

1976 Running Mate: LATEST FLEA MARKET QUARTERLY, list all known markets in the U.S.A. and Canada, State by State, City by City, this interesting book is loaded with money saving and making ideas, collecting trends, lifestyles, CONTAINS: almanac, planning calendars, many persons will be surprised at the number of markets located around them and never ever been to one, THIS IS THE PLACE FOR OLD RADIOS, 48 pages and over 3000 sold per Qtr., ONLY \$2.25 per Issue.

NEW***NEW***NEW***NEW***NEW***NEW***NEW***NEW***NEW***NEW***NEW***NEW***
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ORIGINAL ATWATER KENT 1924-1930 FACTORY SERVICE MANUAL ENCYCLOPEDIA REVISED/SUPPLEMENTS

Why wade through tons of different publications looking for wiring diagrams and service data? Even if you have others, ever wonder why it lacked the information you still needed? It was not economical to publish all Service data on each Model and these manuals were only given to AK authorized Distributors, therefore they are RARE and now you can have one PLUS all know Supplements to 1930. Contents: Over 300 photo's, illustrations, wiring diagrams, charts, Elec/Mech. views, all accessories, 14 MAJOR SECTIONS, Section VI alone covers 16 models (each a FSM itself), 60 pages of RARE supplements, 1923-30 NUMERICAL PARTS LIST AND PRICES FOR ALL AK'S MADE, they were made by the PART NO. and NOT MODEL No., Starts with the Breadboard MODELS: 9 thru all models up to and including the 1930 AC model 57. Total 55 models. SPEAKERS: 13 different models from the Horn Speakers, E-3 Flange, Lug-types thru the Dynamic F-7A series, **HOW TO SERIES** tubes, Reostats, VC'S, Var., and Synchro Condensers, belts, pulleys, parts, amplifiers, transformers, troubleshooting all models point-to-point, causes, CODES. We have added a special biographical story on A. Awater Kent and his Company. The Encyclopedia is over 220 pages, divided in three 8½ x 11 Volumes with protective covers, each weigh 3 lbs. If you are an Atwater Kent fan and or been having trouble repairing them, this is the most comprehensive service manual ever published. Entire AKFSM Encyclopedia Only \$15.00 ppd.

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current reading above rated value. If considerable air is in the tube, the filament will not light up at all unless the voltage is raised considerably above the rated value, in which case the filament may burn out.

Cunningham types C-11, CX-12, and CX-200 and radiotron tubes as WD-11, WX-12, UX-112 do not use thoriated tungsten filaments and can not be re-activated.

TESTING THE 200A and 300A DETECTOR TUBES -- The UX-200A or the CX-300A tube is designed only for service as a detector and differs from the other types of tubes in that it contains an alkali vapor. The formation of the vapor occurs during the first three minutes after the tube is lit, during which period the tube characteristics change rapidly causing variation in the plate current and performance of the tube when operating in a radio receiving set. As soon as the tube warmed up, or at the end of about three minutes, the readings become uniform and no further changes occur. As a result of this action, readings taken during the period of change are variable, and are of no value. However, since the change does not usually begin until about one minute after the voltage has been applied to the filament, it is possible to make a quick test immediately after the voltage has been applied, otherwise, the readings should be taken at the end of the three minute warm up period.

Tests on the 200A and 300A series tubes should be made with a plate voltage of 45 volts and no higher voltage should be used. Since these tubes are designed for detector service only, a thorough test of the tubes require considerable equipment. Plate current readings, such as taken in the average test sets, indicate only the condition of the filament and can not be depended upon as a test of the detector sensitivity. For that reason the best practical test for the tube is a check of the operation obtained under actual service conditions in a receiver, with a weak incoming signal being preferred. Quick test during the first minute of warm up will usually suffice, but if any doubt as to the satisfactory performance of the tube arises, it should be allowed to warm up the full three minutes before attempting to complete the test.

A plate current reading obtained with this tube when used in a radio receiving set with a grid condenser and a grid leak is quite different than that obtained in a test set. Under usual conditions the plate current is approximately 1 MA, varying only slightly from this value regardless which side of the filament the grid is connected. The difference in reading as compared with those obtained in a test set is due to the fact that the grid current furnished by this tube is sufficient to establish a voltage drop in the grid leak equivalent

to the use of a grid bias voltage of 2 to $2\frac{1}{2}$ volts.

Under certain conditions a hiss is produced at the time the plate current noted in the preceding paragraph occurs. If a milliamperemeter is placed in a detector plate circuit, it will be noted that the initial reading is about 1 MA remaining at this value for the first minute, while during the second minute the plate current rises slowly to 2 or even 3 MA. It is during this change that the hiss sometimes occurs. The plate current then returns to a value close to the initial value and then the tube will operate quietly.

There are several reasons for not testing these tubes at voltages no higher than 45 volts, first it does not represent the operating conditions of the tube, secondly the grid biasing voltages are often applied when testing at higher voltages. Because of the amplification constant of the tube the plate current will be practically blocked at 90 volts on the plate, if the ordinary voltage of minus $4\frac{1}{2}$ volts is applied to the grid, the reading will be only a fraction of a milliamperemeter.

When a test of the filament conditions and the short test only is desired, the readings from the ordinary tube test set will be found satisfactory. A sample reading using a detector tube 300A at a filament voltage of 5 volts and a plate voltage of 45 volts. During the first minute of warm up the plate drew 1.6 MA with the grid connected to the minus side of the filament and 6.1 MA with it connected to the positive side of the filament. After the three minute warm up the plate drew 2.1 MA with the grid connected to the minus side of the filament and 6.2 MA when the grid was connected to the positive side of the filament. These drastic changes in plate current are due to the formation of the alkali vapor in the detector tubes. The detector tubes are the only tubes required to warm up such a long period of time in order to make the various emission test we have been speaking of in the previous paragraphs.

REACTIVATING POWER TUBES -- The power tubes such as the 203A, 204A, 210, 211, 213, 216B and the 852 can be reactivated only if they have the thoriated tungsten filament. On these tubes the flashing voltages is twice the rated voltage and should not be applied over fifteen seconds. The reactivating voltages are only 20% higher than the rated voltage for the filament. The time required for reactivating is two to fifteen minutes. If the emission is not up to the rated value then the tube has run its normal life.

If you readers have access to some of the old radio books you can find interesting reading on the art of rejuvenation of the vacuum tubes. As a reference I have used a book

titled 'The Radio Manual' by George E. Sterling published in 1926. I hope you have gained knowledge from this article and can use it in search for better operation of your radio relics.

O. H. McDonald is a collector of vintage radios and apparatus. In the mid 40s he was instructor of classes on the theory of basic radio and electricity.

MART

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MISC.

NEW ENGLAND COLLECTORS. At last an Antique Radio Club for east coast collectors. For full information and application write to: President - Bristol Antique Radio Klub, John D. Alley, 48 Judson Street, Raynham, Mass. 02767.

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CUSTOM TAPING: 20,000 pre 1950 records including Edisons. Discs 25¢ per record side, cylinders 50¢, plus cost of tape; cassette or 4 track reel. Anton Johannes, RD #1, Box 285, Wallkill, N.Y. 12589.

FOR SALE OR TRADE

FOR SALE: Authentic reprints of Grebe sales brochure covering the CR-3, CR-5, CR-8, CR-9, RORD & RORK, \$2.25 post paid. Also companion Grebe Instruction Book with hook-ups, graphs and schematics of the CR-3, CR-5, CR-8, CR-9, RORD, RORK & RORN, \$3.95 post paid. Send check or MO to Donald O. Patterson, 1220 Meigs St., Augusta, Georgia 30904.

BLANK BAKELITE STOCK, cut to size, 1/8" to 1/2" thick. Fabricating and engraving services available. SASE for pricing sheet. Norman A. Parsons, 22 Forest St., Branford CT 06405, Phone: 203 488-4267.

WD11 Adaptors, use UX199, 120, VT24. No wiring changes, Radiola III's battery hook-up included \$5.25pp., 2 for \$9.25. Keith Parry, 17557 Horace St., Granada Hills CA 91344.

FOR SALE OR TRADE: Early QST's, CQ's, Radio, call books, handbooks, tubular Audiotrons, Electron relays and early receivers & parts. Erv Rasmussen, W6YPM, 164 Lowell St., Redwood City, California 94062.

FOR SALE: Battery radios of 1920's vintage, tubes, phones, speakers, parts, accessories, early test gear etc., early electric sets. SASE for list. F. C. Haas, 207 West 30, Hutchinson KS 67501.

FOR SALE OR TRADE

FOR SALE: Old wall telephone, Central Telephone & Electric Co., St. Louis MO. Has nicely nickel plated magnets but needs receiver and bells need plating, also have old desk phone with poor receiver. Will sell to best offer. I need AK speaker model E2 or E3. Hugh E. Kuhn, Rt3, Lime Springs, Iowa 52155. Phone: 319 547-2498.

FOR SALE: Best offers on World War I portable spark coil transmitter. Looks nice and working. Crocker Wheeler 5 piece add a unit/ with CR earphones one tuner coil missing. Looks good. SASE please. Steve Sideroff, RFD 1, Marlboro, New Jersey 07746.

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TRADE: Have Crosley Pup w/12 tube for down payment on AK 5 or 12 or B.O. Also for sale or trade a Howe and a Radionette crystal set. W. Harder, 911 Northrup W., Lansing, Mich. 48910.

FOR SALE: Very primitive appearance, Weston Model #537, radio set tester and tube checker. Circa 1926, \$60.00 postpaid. Puett Electronics, P.O. Box 28572, Dallas TX 75228.

FOR SALE OR TRADE: 2 Federal F 10 radios; Crosley 550; FADA neotrodyne kit set; Hudson Symphonic Six; Magnavox R 3 Horn; Crosley Dynacone Speaker; less tubes, all work. F.O.B. SASE for details. Herb. DeGarmo, Early, Iowa 50535. Phone; 712 273-3571.

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FOR SALE: Battery and electric radios. D. Anderson, 607 Ridgebury Rd., Ridgefield CT 06877.

IOWA COLLECTOR: Iowa-manufactured receiver, Standard Radiophone Company T.R.F., for sale, \$45. Art Harrison, 1021 Falcon Dr., Columbia MO 65201.

SASE for list of radios, tubes, mags., catalogs, parts, etc. Cecil Bounds, Pine Springs Rte., Carlsbad N.M. 88220.

FOR SALE OR TRADE



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WANTED: Primary coil, secondary coil, tickler coil (box), and crystal detector all exact types used with crystal detector receiver like National Electric Supply Co., Model CN239 (p64, Vintage Radio) but probably 1916 model. Robert Meisenholder, 13900 S.E. 44th Place, Bellevue, Wash., 98006.

WANTED For Scott Allwave 12 double dial tuning; Need the dial assembly, comprising dial drum, alluminum frame, tuning knob shaft and pulleys. Ralph G. Maddox, Purgitsville, W. VA 26852.

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WANTED: Early battery and/or AC radios, equipment and parts for small private collection. Describe and give best price. Leland Smith, W5KL, Route #3, Jasper AR 72641.

WANTED: National SW-3, old tubes 210, 203A, 204A and other vintage transmitter parts. Fenton Wood, 3122 Ann Arbor, Sugar Land, Texas 77478.

WANTED

WANTED: Cabinet for Federal 59. Would consider good replica. Also looking for any Marconi items. Have Edison gold molded cylinder records - 2 minute - for sale - make offer. Pat Stewart, W7GVC, 1404 Ruth, Walla Walla, Wash. 99362.

WANTED: Base for AK type "L" horn speaker. Also need AF transformer for Wells Manufacturing Co. "Arlington Receiver." Want Magnavox TRF - 50 and Westinghouse Aeroila Sr. Electric radios for sale or trade. SASE for list. D. Dazer, 2989 Maywood, Port Huron MI 48060.

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WANTED. Bristol 1924 1-dial reflex. Have Kennedy XV, Aerola Sr, and others for trade. Art Harrison, 1021 Falcon Dr., Columbia MO 65201.

WANTED: Old magazine Radio News, Radio Broadcast, Popular Radio Short-wave Craft 1928 thru 1932. L. P. Rayner, 5512 N. 71st. Place, Scottsdale, Ariz. 85251.

WANTED: Any radio fan magazines. Also, any radio magazine with commercial broadcast or star information. Examples--Radio Guide, Radio Stars, Radio-TV Mirror, etc. Also Photoplay magazines. 1 or a 100. Fred L. Davis, 5106 Skippy Street, Memphis, Tennessee 38116.

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THE HORN SPEAKER

1976



Major-General James G. Harbord, President of the Radio Corporation of America, was much interested in the German transmitter, exhibited at the recent New York Radio Show, which was captured in the territory where, he commanded the marines of our Second Division

RADIO BROADCAST

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1923



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 PUBLISHERS OF
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LIST NO. 15

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0A4	11G5	3Z4	6F8	6U5	1245	11B7	3523	41	5891	3
0B3	11H4	6A3	6G5	6U4	1246	11C5	3524	41	5703	3
0C3	11N5	6A4	6G6	6U3	1247	11C7	3525	41	5751	2
0D3	11P5	6A5	6G7	6U2	1248	11C8	3526	41	5814	2
0E4	11Q5	6A6	6G8	6U1	1249	11C9	3527	41	5814	2
0F4	11R5	6A7	6G9	6U0	1250	11D7	3528	41	5814	2
1A1	11S5	6A8	6H6	6U9	1251	11D8	3529	41	5814	2
1A2	11T5	6A9	6H7	6U8	1252	11D9	3530	41	5814	2
1A3	11U5	6B4	6H8	6U7	1253	11E7	3531	41	5814	2
1A4	11V5	6B5	6H9	6U6	1254	11E8	3532	41	5814	2
1A5	11W5	6B6	6H0	6U5	1255	11E9	3533	41	5814	2
1A6	11X5	6B7	6H1	6U4	1256	11F7	3534	41	5814	2
1A7	11Y5	6B8	6H2	6U3	1257	11F8	3535	41	5814	2
1A8	11Z5	6B9	6H3	6U2	1258	11F9	3536	41	5814	2
1B5	1105	6C4	6H4	6U1	1259	11G7	3537	41	5814	2
1B7	1115	6C5	6H5	6U0	1260	11G8	3538	41	5814	2
1B8	1125	6C6	6H6	6U9	1261	11G9	3539	41	5814	2
1C1	1135	6C7	6H7	6U8	1262	11H7	3540	41	5814	2
1C5	1145	6C8	6H8	6U7	1263	11H8	3541	41	5814	2
1C6	1155	6C9	6H9	6U6	1264	11H9	3542	41	5814	2
1C7	1165	6D4	6H0	6U5	1265	11I7	3543	41	5814	2
1D5	1175	6D5	6H1	6U4	1266	11I8	3544	41	5814	2
1D7	1185	6D6	6H2	6U3	1267	11I9	3545	41	5814	2
1D8	1195	6D7	6H3	6U2	1268	11J7	3546	41	5814	2
1D9	1205	6D8	6H4	6U1	1269	11J8	3547	41	5814	2
1E1	1215	6D9	6H5	6U0	1270	11J9	3548	41	5814	2
1E5	1225	6E4	6H6	6U9	1271	11K7	3549	41	5814	2
1E7	1235	6E5	6H7	6U8	1272	11K8	3550	41	5814	2
1F4	1245	6E6	6H8	6U7	1273	11K9	3551	41	5814	2
1F6	1255	6E7	6H9	6U6	1274	11L7	3552	41	5814	2
1F7	1265	6E8	6H0	6U5	1275	11L8	3553	41	5814	2
1G2	1275	6E9	6H1	6U4	1276	11L9	3554	41	5814	2
1G6	1285	6F4	6H2	6U3	1277	11M7	3555	41	5814	2
1G9	1295	6F5	6H3	6U2	1278	11M8	3556	41	5814	2
1H1	1305	6F6	6H4	6U1	1279	11M9	3557	41	5814	2
1H5	1315	6F7	6H5	6U0	1280	11N7	3558	41	5814	2
1H6	1325	6F8	6H6	6U9	1281	11N8	3559	41	5814	2
1H9	1335	6F9	6H7	6U8	1282	11N9	3560	41	5814	2
1H9	1345	6G4	6H8	6U7	1283	11O7	3561	41	5814	2
1H9	1354	6G5	6H9	6U6	1284	11O8	3562	41	5814	2
1H9	1364	6G6	6H0	6U5	1285	11O9	3563	41	5814	2
1H9	1374	6G7	6H1	6U4	1286	11P7	3564	41	5814	2
1H9	1384	6G8	6H2	6U3	1287	11P8	3565	41	5814	2
1H9	1394	6G9	6H3	6U2	1288	11P9	3566	41	5814	2
1H9	1404	6D6	6H4	6U1	1289	11Q7	3567	41	5814	2
1H9	1414	6D7	6H5	6U0	1290	11Q8	3568	41	5814	2
1H9	1424	6D8	6H6	6U9	1291	11Q9	3569	41	5814	2
1H9	1434	6D9	6H7	6U8	1292	11R7	3570	41	5814	2
1H9	1444	6E4	6H8	6U7	1293	11R8	3571	41	5814	2
1H9	1454	6E5	6H9	6U6	1294	11R9	3572	41	5814	2
1H9	1464	6E6	6H0	6U5	1295	11S7	3573	41	5814	2
1H9	1474	6E7	6H1	6U4	1296	11S8	3574	41	5814	2
1H9	1484	6E8	6H2	6U3	1297	11S9	3575	41	5814	2
1H9	1494	6E9	6H3	6U2	1298	11T7	3576	41	5814	2
1H9	1504	6F4	6H4	6U1	1299	11T8	3577	41	5814	2
1H9	1514	6F5	6H5	6U0	1300	11T9	3578	41	5814	2
1H9	1524	6F6	6H6	6U9	1301	11U7	3579	41	5814	2
1H9	1534	6F7	6H7	6U8	1302	11U8	3580	41	5814	2
1H9	1544	6F8	6H8	6U7	1303	11U9	3581	41	5814	2
1H9	1554	6F9	6H9	6U6	1304	11V7	3582	41	5814	2
1H9	1564	6G4	6H0	6U5	1305	11V8	3583	41	5814	2
1H9	1574	6G5	6H1	6U4	1306	11V9	3584	41	5814	2
1H9	1584	6G6	6H2	6U3	1307	11W7	3585	41	5814	2
1H9	1594	6G7	6H3	6U2	1308	11W8	3586	41	5814	2
1H9	1604	6G8	6H4	6U1	1309	11W9	3587	41	5814	2
1H9	1614	6G9	6H5	6U0	1310	11X7	3588	41	5814	2
1H9	1624	6D6	6H6	6U9	1311	11X8	3589	41	5814	2
1H9	1634	6D7	6H7	6U8	1312	11X9	3590	41	5814	2
1H9	1644	6D8	6H8	6U7	1313	11Y7	3591	41	5814	2
1H9	1654	6D9	6H9	6U6	1314	11Y8	3592	41	5814	2
1H9	1664	6E4	6H0	6U5	1315	11Y9	3593	41	5814	2
1H9	1674	6E5	6H1	6U4	1316	1207	3594	41	5814	2
1H9	1684	6E6	6H2	6U3	1317	1208	3595	41	5814	2
1H9	1694	6E7	6H3	6U2	1318	1209	3596	41	5814	2
1H9	1704	6E8	6H4	6U1	1319	1210	3597	41	5814	2
1H9	1714	6E9	6H5	6U0	1320	1211	3598	41	5814	2
1H9	1724	6F4	6H6	6U9	1321	1212	3599	41	5814	2
1H9	1734	6F5	6H7	6U8	1322	1213	3600	41	5814	2
1H9	1744	6F6	6H8	6U7	1323	1214	3601	41	5814	2
1H9	1754	6F7	6H9	6U6	1324	1215	3602	41	5814	2
1H9	1764	6F8	6H0	6U5	1325	1216	3603	41	5814	2
1H9	1774	6F9	6H1	6U4	1326	1217	3604	41	5814	2
1H9	1784	6G4	6H2	6U3	1327	1218	3605	41	5814	2
1H9	1794	6G5	6H3	6U2	1328	1219	3606	41	5814	2
1H9	1804	6G6	6H4	6U1	1329	1220	3607	41	5814	2
1H9	1814	6G7	6H5	6U0	1330	1221	3608	41	5814	2
1H9	1824	6G8	6H6	6U9	1331	1222	3609	41	5814	2
1H9	1834	6G9	6H7	6U8	1332	1223	3610	41	5814	2
1H9	1844	6D6	6H8	6U7	1333	1224	3611	41	5814	2
1H9	1854	6D7	6H9	6U6	1334	1225	3612	41	5814	2
1H9	1864	6D8	6H0	6U5	1335	1226	3613	41	5814	2
1H9	1874	6D9	6H1	6U4	1336	1227	3614	41	5814	2
1H9	1884	6E4	6H2	6U3	1337	1228	3615	41	5814	2
1H9	1894	6E5	6H3	6U2	1338	1229	3616	41	5814	2
1H9	1904	6E6	6H4	6U1	1339	1230	3617	41	5814	2
1H9	1914	6E7	6H5	6U0	1340	1231	3618	41	5814	2
1H9	1924	6E8	6H6	6U9	1341	1232	3619	41	5814	2
1H9	1934	6E9	6H7	6U8	1342	1233	3620	41	5814	2
1H9	1944	6F4	6H8	6U7	1343	1234	3621	41	5814	2
1H9	1954	6F5	6H9	6U6	1344	1235	3622	41	5814	2
1H9	1964	6F6	6H0	6U5	1345	1236	3623	41	5814	2
1H9	1974	6F7	6H1	6U4	1346	1237	3624	41	5814	2
1H9	1984	6F8	6H2	6U3	1347	1238	3625	41	5814	2
1H9	1994	6F9	6H3	6U2	1348	1239	3626	41	5814	2
1H9	2004	6G4	6H4	6U1	1349	1240	3627	41	5814	2
1H9	2014	6G5	6H5	6U0	1350	1241	3628	41	5814	2
1H9	2024	6G6	6H6	6U9	1351	1242	3629	41	5814	2
1H9	2034	6G7	6H7	6U8	1352	1243	3630	41	5814	2
1H9	2044	6G8	6H8	6U7	1353	1244	3631	41	5814	2
1H9	2054	6G9	6H9	6U6	1354	1245	3632	41	5814	2
1H9	2064	6D6	6H0	6U5	1355	1246				