TT-5A SUPPLEMENT FOR

INSTRUCTION BOOK

SECTION II

SUMMARY OF TECHNICAL BULLETINS

The following is a summary of all the Technical Bulletins pertaining to the TT-5A Transmitter Equipment.

VISUAL PA BROADBANDING

The process of broadbanding the picture transmitter output stage requires a different technique than tuning an AM or FM transmitter. In an AM or FM transmitter the plate tank can be tuned to resonance by observing the dip in plate current. In a TV transmitter that is properly tuned, resonance as observed by a change in plate current is not present.

The primary objective is to achieve a broad, reasonably flat response curve by virtue of proper relative settings of the 3 output tuning controls. The only RF Circuits that effect the bandwidth are the PA plate, output coupling, and output tuning controls. To do a complete job of broadbanding, a video sweep generator (such as the RCA Type WA21A) and an oscilloscope with reasonably good vertical linearity are essential. The BW-5A Side-Band Response Analyzer offers an improved method of broadbanding the visual transmitter in that an oscilloscope presentation of both upper and lower sidebands are obtained. For a description of alignment procedures using the Type BW-5A refer to the Instruction Book for this equipment (IB-36140). It is usually desirable to make the PA tuneup using an RCA Dummy Load, so that any temporary troubles existing in antenna or transmission line, will not be a confusing factor in obtaining proper broadbanding.

The following alignment procedure is based on the use of a Video Sweep Generator and Envelope Diode Detector. The tuning or broadbanding of the Visual transmitter normally consists of three parts to be discussed below:

1. Resonating the unloaded plate tank

   With the PA unloaded (output coil L826 loosely coupled), on low voltage, and with low RF drive, the plate tank (L825) can be resonated by observing a dip in plate current and/or rise in screen current. The output tuning (C865, C866) can also be resonated by observing a maximum in reflectometer reading. Here the similarity between tuning the TV Visual Transmitter and an AM transmitter ends.

2. Loading

   The output coupling should be increased and at the same time the excitation is increased. During loading, care must be taken to keep the screen current within ratings. Approximate loading is obtained when no significant dip can be observed in plate current or rise in screen current upon tuning through the unloaded resonance point. With normal plate and screen voltages on the PA, a rough check of power output can be made with the dummy load. Since the reflectometer indicates average current it can be calibrated to indicate power.

3. Adjustment of Broadband Characteristic

   With a video sweep generator connected to the transmitter (J801) and the PA set to normal plate and screen voltages, the final broadband characteristic can be obtained.

   The tuning and loading adjustments in parts 1 and 2 should produce (approximately) the RF output response shown in Figure 1, with picture carrier in the center of the band. To obtain the required RF bandwidth in conjunction with the sideband filter, the pass band must be effectively shifted until the response of Figure 2 is obtained.

   These RF response curves cannot be actually observed but a detected curve can be seen. The detected output of Figure 1 is shown in Figure 3 and the output of Figure 2 in Figure 4. These video response curves result from addition of the amplitudes of the corresponding upper and lower sidebands in the RF envelope curve. The RF response at the output of the sideband filter is shown in Figure 5. The final detected sweep at the output of the sideband filter should be similar to Figure 6.

To obtain the response shown in Figure 6, adjustments should be made while observing the detected video sweep output. Roughly, the three PA controls have the following effects on the response curve:

PA Plate

Tuning the PA plate control (L825) will tilt the frequency response curve, Figure 6, to peak either the high or low frequency end of the curve. See Figures 7 and 8. In tuning, favor the high frequency side (shorting bar closer to tube). This will accomplish the shift indicated by Figures 2 and 4.

Output Tuning

Operating the output tuning control (C865, C866) will have much the same effect as the PA plate control in that it will tilt the frequency response curve, Figure 6, to peak either the high or low frequency end of the curve.

Output Coupling

Changing the output coupling control (L826) will change the power output and bandwidth. Over the useful tuning range, the power output-bandwidth product is approximately constant. If the power output is low and the bandwidth too broad, reduce the coupling slightly and re-adjust the plate and output tuning controls for the flattest frequency response and the highest reflectometer reading. If the bandwidth is too narrow, increase the coupling slightly and readjust the plate and output tuning.

The modulator frequency response begins to cut off just beyond 5 mc. as shown in curve A, Figure 9. This, of course, will mask any RF bandwidth beyond 5 mc. from appearing as curve B, Figure 9. If the high frequency cut-off region appears to be the same on the modulator frequency response curve as it does on the RF output frequency response curve the RF bandwidth is too wide. The desired overall response is shown in curve C, Figure 9.

When observing broadband response with the antenna connected, it should be expected that transmission line and antenna reflections will show up as the irregularities in curve B, Figure 10. Spacing of reflections will depend on the distance to the mismatch and the amplitude will depend on the magnitude of the mismatch. This will cause no material degradation of the picture as long as the antenna system measurements show the reflections to be within tolerance.

Tuning vs. Tube Changes

When changing tubes (8D21), about the only variation as far as broadbanding is concerned is a slight manufacturing variation in tube output capacitance.

Hence, of the three broadbanding controls only the plate tuning should normally have to be shifted. Some tubes require no change. This effect is minor and the results are not drastic if no change in tuning is made. It is close enough to give a good picture. Therefore, emergency changes can be made, if necessary, without serious consequences.

It is good practice, however, when time is available, to operate each spare 8D21 in the visual PA. With the video sweep generator connected to the transmitter (J801), make an exact tune-up and log the dial settings.

Most tubes may require retuning of the grid circuit, but this does not affect broadbanding and can be done by simply peaking for maximum PA plate current.

TUNE-UP CRYSTAL

The following is an informative statement on the use of the tune-up crystal. In a high-level modulated system in which a side band filter is used, it is not required that any side band trimming be done in the PA. It is required that the upper side band response be flat and good out to 4 mc. If this condition is now met by setting the PA pass band symmetrically around the carrier, the lower side band response will also go out to 4 mc., and a total bandwidth of 8 mc. is obtained. It is obvious that about 2.5 mc. of this lower side band response gets thrown away in the side band filter. In so far as the PA tube (8D21) is concerned, the power out - bandwidth product is a constant over the working range, therefore, power is being wasted when full double sidebands are generated in the 8 mc. response. If the overall response was made narrower but still maintained the high frequency sideband response (carrier plus 4 mc.) such as shown in Figure 11, the same response out of the sideband filter can be obtained, thus saving considerable power by partially cutting the lower sideband in the PA. As seen in Figure 11, this simply amounts to tuning the PA band pass to be narrower (about 6.5 mc.) and to be located unsymmetrically around the carrier. It is one of the major objectives, therefore, in any method used to broadband the transmitter to "offset" the PA band pass with respect to the carrier frequency.

There are several acceptable methods of accomplishing this. One is the use of an r-f sweep which would show the r-f spectrum response much like that shown in Figure 11. It is not believed that the problem warrants the use of the rather expensive and cumbersome equipment which would be required. A second method, which may be classified as an approximate method, is the use of the tune-up crystal. Analysis has shown that this desired new narrower response has its true center at about 1.6 mc. above the picture carrier frequency. This location is shown in Figure 11 by the dashed vertical line, but note that the drawing is not to scale as regard to the amount of the off-set. If, then, the PA is excited at this "tune-up" frequency and its output circuits tuned up symmetrically around this frequency, its band pass will have been shifted by about the right amount to give the desired asymmetrical location per Figure 11 when the exciter chain is retuned to the operating frequency. This is the basic functioning of the method. Note that the method does not pretend to be of any particular aid in setting PA bandwidth, that is, output coupling. In line with the thinking that this is an approximate method, we feel it sufficient to say that while the tune-up crystal is in, slowly increase coupling L826 while rocking the plate tuning L825 until the resonate PA plate current dip just disappears. The three PA output tuning controls should not be changed after the exciter has been shifted back to the operating frequency.

It is recommended that in all instances where time and a video sweep generator are available that the normal broadband methods be used, involving actually viewing the demodulated output on a scope, and adjusting the three output tuning controls to obtain the response of Figure 10. This method starts by finding the true resonances of plate and output circuits by operating at low power and very loose coupling, then tightening coupling until proper broadband response is achieved. The asymmetrical tuning is achieved simply by favoring the high frequency side of true resonance in the PA and output circuits as they are trimmed during the coupling-up process. It may sound more difficult than it is to actually do it, once a "feel" of the controls has been obtained. In the final analysis it always turns out that the main purpose of the broadbanding is not to achieve a given asymmetry with respect to the picture carrier, but rather to obtain simultaneously the desired response at 4 mc. per Figure 10 (which is established by the upper sideband response) and the rated power output from the PA stage. Thus, the exact location of the PA band pass with respect to the carrier becomes, to some extent, one of the variables which aid in accomplishing the overall required characteristics.

The use of the tune-up crystal was omitted in the instruction book because it was not known how to evaluate the method at the time the book was written. The only reference to it occurs on page 49, IB-36012 (page 83 in IB-36036), under "Oscillator Tuning", and this occurred in error. The paragraph should read "..... to the operating crystal position".

REMOVAL OF QUICK HEATING FILAMENT CIRCUITS IN THE RCA 5713

It has been pointed out that the daily warm-up schedule includes a minimum of 5 minutes with filament only (see page 13 of "Tips on Use of the RCA 8D21") before application of other electrode voltages. If this timing is adhered to, it follows that there is plenty of time for the 5713 filaments to come up to temperature, without having to apply the over-voltage which was found necessary to get them hot in 30 seconds. By utilizing this 5 minute time interval and eliminating the quick-heating of the 5713 filaments there is some reason to believe that there will be less wear and tear on the tubes, and hence the life may be longer. The only disadvantage is in the case of a power interruption lasting longer than 3 seconds, say 10 seconds, in which case it would take the full 1-1/4 minutes time delay (as compared to 30 seconds) to get back on the air. However, an additional advantage would be that the 5713 plate and cathode lines would not be 220 volts a-c above ground during the warm-up period if the quick heating circuit were disabled. It is quite simple and easy to change over to normal warm-up operation of the 5713 filament circuit. Only two changes in each portion of the transmitter are necessary, as follows:

1 On K702 (K202) place a short across the two relay contact terminals (or lift one wire and place on the other terminal)

2 Change the setting of K412 (picture) and K429 (sound) in the Power Control Cabinet from 30 seconds to 1 minute 15 seconds.

Change number (2) above will hold off plate voltage on all stages until the 5713 filament has come up to operating temperature with only normal voltage applied.

It should be noted that relays K703, K704, and K705 are still in the circuit and must function to get the 5713 filament turned on. To remove the relays from the circuit so that their contacts do not carry any current, the following ten wiring changes must be made on the relay and resistor panels. To simplfy the work and leave it possible to restore the circuit to its original function, no parts are permanently removed and some of the relay terminals will continue to be used as connection points.

The wires and terminals referred to below are identified in the Connection Diagram, Relay and Resistor Panels, RCA Dwg. #T-618338. The wiring changes required in the visual and aural sections are identical and are confined to the relay and resistor panels; the only difference being the substitution of 200 series symbol numbers for the 700 series symbols shown on T-618338.

(1) Disconnect and insulate wire 69 from T710-2.

(2) Connect a jumper from terminal 3 to terminal 4 on K703.

(3) Disconnect and insulate wire 44 from K704-7.

(4) Connect a jumper from K704-6 to K704-8.

(5) Connect a jumper from TB-P3 to TB-P4.

(6) Disconnect wire 86 from E705 and tie clear of other connections.

(7) Disconnect wire 82 from E708 and tie clear of other connections.

(8) Connect a jumper (suitably insulated for 1500 volts) from E705 to E708.

(9) Disconnect and insulate wire 73 from K705-6.

(10) Connect a jumper from K705-7 to K705-8.

(11) Reset K412 (picture) and K429 (sound) to 1 minute 15 seconds.

NOTE: The 5713 tubes function as second IPA's in the Visual and Aural R-F chains of the high-hand (channels 7 to 13) transmitters only. They have been subsequently replaced by RCA Type 4X500-A.

REPLACEMENT OF 4E27 TUBES BY RCA 4E27A

Reason for Change: RCA 4E27A tubes have improved base ventilation and a larger plate pin which permits better cooling of the associated seals. Both these changes should contribute to an improvement in tube life. The new tubes have electrical characteristics identical with the old, and fit the same socket, but have slightly different plate connectors.

When to Change: It is recommended that, when 4E27 tubes have reached their end of life, replacements be 4E27A/5-125B tubes.

How to make the Change:

(1) Each 4E27A is furnished with a special heat radiating plate connector which should be attached to the wiring of the transmitter in place of the spring clip connector now used with 4E27 type tubes.

(2) In the first RF stage (V710, amplifier or doubler depending on channel) the clearance above the plate connector can be improved by redressing the bus between pins 3 and 6 on X-711 which is mounted on the shelf above. This lead may be dressed up near the socket, keeping it away from other wires and terminals.

(3) In an emergency the plate connector furnished with the 4E27A/5-125B may be fitted with a short piece of #14 AWG bus which will permit connection to the spring clip connector normally used with 4E27 tubes. Note that, because of space limitations, the heat radiating plate cap must be installed on V710 (first RF stage) after the tube is seated in its socket.

(4) The modulator plate currents should be checked for approximate equality according to the procedure in the TT-5A Instruction Book. The same consideration of matching which applies to 4E27 tubes also applies to 4E27A/5-125B tubes, and in fact a mixture of tubes may be used in the modulator, provided that the one and one-quarter to one current ratio specified in the Instruction Book is maintained.

(5) In the RF stages very slight retuning may be necessary.

CAUTION: The base pins of the RCA 4E27A/5-125B are supported by the glass seals which may be cracked if the tube is roughly handled. Each tube is furnished with a sheet giving instructions for insertion of the tube in sockets. These instructions should be followed carefully.

CARE AND MAINTENANCE OF TT-5A WATER COOLER SYSTEM

1. MI-19041 (Buffalo Forge Co.)

The water cooler system for the TT-5A television transmitter consists of a cooler unit and plumbing in frames one and eight and the two PA cabinets, as shown in Figure 12. The water enters at J and K at the bottom of frames one and eight, and goes to the PA frame where it divides into several circuits, namely to the anodes of the 8D21, to the tube header plate and in frame eight only, to a water cooled resistor. The anode water is fed to the ends of the anode lines through a one-half inch O.D. Saran tube which is coiled up on the top of the PA frame, and the water divides in a fitting just to the rear of the anode lines, as shown on the drawing.

The return water from each anode line is returned separately through three-eighths inch O.D. Saran tubes, which are coiled outside the entering water tubing, as the water flows are individually metered in the flow meter. The Saran tubes are coiled up to provide a long water column between the anode lines, which operate at 5000 volts DC, and the grounded copper piping.

In the picture portion only, an extra water flow goes to the water cooled damping resistor and its return is metered in the front element of the anode flow meter. A flow restricting orifice is located at the end of the 3/8" O. D. copper tubing, which is nearest the balun or in the large end of the reducing coupling connecting the above copper tubing to the 1/4" Saran tube.

The water for the 8D21 tube header plate flows through the rubber hose with its quick disconnect, and then divides into three branches. The flow to the filaments is direct to the tube through the connecting hose while the grid and screen grid flows go through 1/4" O. D. Saran tubes coiled up to provide longer water columns.

The return water paths are similar and the flows combine in the top of the tube header plate flow meter. This return water then combines with the anode return water in the top of the anode flow meter.

The anodes of the 8D21 tubes are operated at 5000 volts positive above ground. Referring to the water flow drawing, Figure 12, points F, G, H and I are at 5000 volts; and points A, B and C are grounded. Good distilled water has a conductivity of about 100,000 ohms per cubic centimeter so the current flow from G and F to C would be less than 150 microamperes, and the current flow from H or I to B or A is less than 80 microamperes in each.

The distilled water circulating in the system will become contaminated to some extent with use. Air finds its way into the water through various openings, and gas impurities contained in the air increase the conductivity of the water. The result is an electrolytic attack at the anode forming corrosion products such as carbonates, hydroxides, etc. Attacks of this nature will remove very minute amounts of metal and will not result in short time deterioration of the fittings. These corrosion products, which carry the potential of the anode, are electrostatically transferred to the nearest ground point. There, after giving up their charge, they have a tendency to build up a deposit of sediment.

A deposit will slowly accumulate at points A, B and C, and a little may deposit at D and E as these points are slightly negative to G and D. This deposited sediment is a very fine powder and would not be removed in an ordinary screen type water filter. Any foreign particles which may be in the water or loose in the circulating system will be electrostatically precipitated, and will accumulate with the above sediment. Thus, the apparent sediment accumulation may be greater when the station is first operated unless extreme care was taken to keep the lines clean when they were installed. The sediment will start to accumulate at the inside ends of the elbow at A, B and C and build up inside the Saran tubing until it may extend beyond the flare nuts. Continued deposits may build up to a point where water flow restriction occurs.

The flare nuts at points A, B and C should be removed at intervals of 1000 to 1500 hours operating time and the deposit in the Saran tubing removed. As some deposit may occur at points D and E, nuts D, E, F, and G should be loosened, and the short lengths of tubing removed for cleaning. When replacing the flare nuts on the Saran tubing, use care that they are not tightened too tight as it is possible to cut off the flare if the nut is tightened excessively. Normally, a little over hand tight is sufficient or approximately one-quarter to a half turn beyond hand tight. No deposit has been found in the tube header isolation coils as the voltages there are much lower.

The water should be circulated for a short time after the above cleaning, and then the entire system drained, getting out all the old water that it is possible to remove from the system. Then refill with good distilled water.

Good distilled water should have a guaranteed total residue of not more than 4 parts per million. If means of measuring the conductivity of water are available, this water will have a resistance of about 100,000 ohms per cubic centimeter. Also, the water should be changed when its resistance falls below 50,000 ohms per cubic centimeter.

Use of other than pure distilled water or the presence of acids or chlorine in the system can result in serious troubles. The conductivity of ordinary city or tap water may be as low as 3,000 ohms per cubic centimeter or about one-thirtieth that of pure distilled water. This means a large increase in the current flow in the water columns, and a faster deposit accumulation. The larger current flow and presence of chlorine sulphur or similar elements, will cause rapid attack on the fittings, especially the inverted flare elbows on the ends of anode lines. The attack by chlorine, which is present in most city water, may be continued by its being redissolved from the corrosion products and thus start a continuous cycle of attack. This recycling does not occur with the major portion of the elements which get into water by its contact with air. Even sulphur will normally attack only once and then go into an insoluble deposit.

Spring water is available in five gallon jugs for use in office coolers, therefore, care should be taken that it is not used in place of distilled water.

The conductivity and elements in spring or mineral water will vary widely but will probably never be as good as pure distilled water. The impurities in the water may cause large deposits and serious attacks on the fittings. In summary, for trouble free operation:

1. Be sure the system is clean after installation.
2. Use only good distilled water.
3. Perform regular maintenance on fittings.
4. Change water regularly.

2. MI-19045 (Sturtevant Co.) and MI-19045-A (Trane Co.)

The MI-19045 and MI-19045-A water coolers are designed to supply water to the TT-5A transmitter only and dissipate the heat from that unit. The unit was designed to operate under the following conditions of rating and performance:

Output water pressure	80 psi nominal
Power dissipation (continuous)	10 KW max.
Ambient temperature	110 deg. F. max.
Flow capacity (at 80 psi)	7 gpm max.
Storage tank capacity	10 gallons
Size	25 x 36 x 54 inches high
Weight	670 pounds (unpacked) MI-19045 800 pounds (unpacked) MI-19045-A

A pressure setting of 85 psi is the maximum rating, and should only be used where this unit is very remote from the transmitter as the normal operating pressure should be between 68 and 75 psi. The output pressure is maintained constant within plus 3 and minus 2 pounds over an external flow range of 2 to 7 gallons by means of a spring loaded, diaphram type, automatic regulating valve. The valve is located near the output of the water circulator and bypasses back to the storage tank the difference in flow as supplied by the pump and that supplied to the transmitter. Thus, either cabinet one or eight valves or both may be closed, and the pressure will remain almost constant.

In the MI-19045 unit the regulator pressure may be adjusted by turning the hex screw, which is located on the front center of the regulator valve, inward (clockwise) to increase pressure or outward to decrease pressure. It will be necessary to loosen and retighten the lock nut when changing the regulator adjustment.

In the MI-19045-A unit, the regulated or operating pressure may be changed by inserting the rod, which is furnished in the envelope supplied with the unit, into one of the four holes in the rim of the nut which bears against the heavy spring.

Moving the rod downward will lower the operating pressure. Located just above the regulator valve is a modified relief valve which opens to supply a quantity of water to the main regulator diaphram when the pump is started. This valve remains closed during normal operation and small changes of pressure are governed thru a small orifice in the movable part of the relief valve.

For the MI-19045 units the high pressure or input to the transmitter should be connected to the three-quarter (3/4) inch nominal (actual size 7/8" O. D.) copper pipe which extends almost to the base of the cooler in the rear right hand corner of the unit and can be reached through the small access door. The return water should be connected to the 3/4" standard pipe size flange in the end of the storage tank. Holes with removable covers are provided in the bottom of the unit, and two holes are drilled through the frame angles, but not the outer casing, for these installations where the piping may have to come out above the floor level. It may be desirable to make cutouts to the bottom of the casing in the latter installation condition. The outer casing may be raised off the cooler by removing the external screws, removing the air filters, and taking out some of the air baffles around the cooling coil section. THE LOWER SECTION OF THE UNIT IS UNDER A SUCTION PRESSURE SO THE ACCESS DOORS SHOULD ALWAYS BE IN PLACE WHEN THE UNIT IS RUNNING.

For the MI-19045-A units, the high pressure or input to the transmitter should be connected to the bottom end of the water strainer which is located near the front center of the unit. The return water should be connected to the tank mounted elbow just to the rear of the above strainer. Both fittings are 1" female standard pipe thread size. The removable plate on the bottom may be removed, drilled for the pipes and replaced. The outer casing of this unit is not removable but individual side panels can be taken off.

The water tank holds 10 gallons of water and should always be at least half full of water when operating. A drain plug is provided in the front center of the tank, and the top of the tank in the MI-19045 unit has a hand clean-out hole accessible when the casing is lifted.

The first time the cooler is run, the motor rotation should be checked to make certain that the fan and pump are turning in the proper direction. When looking at the motor or V-drive side, both the pump and the fan should turn in a clockwise direction. Fan speed may be altered by changing the diameter of the variable pitch sheave on the motor shaft. If extremely warm conditions or an extra long exhaust duct are encountered, the diameter of the adjustable sheave should be increased thereby increasing the fan speed and providing more cooling air. In the event that the general atmosphere is cool or the exhaust is almost free air, the diameter of the motor sheave may be decreased, reducing the speed of the fan and at the same time reducing the noise of the cooler. The fan should deliver approximately 1600 cubic feet per minute when the external duct and louver back pressure is two-tenths (0. 2) of an inch of water when operated as received.

Power connections should be made to the junction box in the front center in MI-19045 unit or to the separate motor thermo-overload switch boxes in MI-19045-A unit.

Maintenance on the water cooler should be done regularly as follows:

a. Keep the water tank well over half full by adding distilled water through the fill connection which is just inside the removable front cover.

b. Add a drop or two of good machine oil to the idler pulley bearing every fifty (50) hours of operation on the MI-19045 unit.

c. There is one grease cup on the pump proper in the MI-19045 unit, the other bearing being grease sealed. It is recommended that the cup be given one turn every week or 10 days in order to force additional grease into the bearing. At the end of a period of about four months, under normal operation, the grease cup should be refilled, using a good grade of ball bearing grease.

d. Add a good grade of ball bearing grease to the fan bearings approximately at 2000 hour intervals. One of the greases listed in the instruction book (IB-36012 or 36036) or a similar grease may be used.

e. Check the V-belt tension and if excessively loose move the idler to take up the slack in the MI-19045 unit or move the motor down in the MI-19045-A unit.

f. Remove the water filter strainer and clean out any sludge accumulation. This operation should be performed quite frequently during the run-in period. Subsequently, clean the strainer filter as required.

g. The motor bearings are prelubricated for long life, therefore they do not need additional grease for 3 to 5 years of normal life. The grease sealed bearing in the pump should be relubricated at the same time as the motor bearings.

h. Replacement of the V-belt should be made with a size #A49 belt in MI-19045 or #A34 in MI-19045-A.

i. The pump is equipped with a mechanical seal which should run for a long period without attention. This seal should run without leaking, but should a slight drip start, it is a sign that the seal parts are worn and will need replacing. Normally, the leakage would increase slowly with use until it becomes excessive.

3. Saran Tubing

RCA maintains a complete stock of all Saran tube and coil assemblies used in the TT-5A Television Transmitter. However, since some stations have expressed a desire to make up their own assemblies, the following information is offered for guidance.

Three sizes of Saran tubing are used as follows:

Anode supply - 1/2" O.D. by 1/16" wall

Anode returns - 3/8" O.D. by 1/16" wall

Grid, filament, screen grid, and swamp resistor coils - 1/4" O.D. by 1/32" wall

The tubing is made by several firms:

Haveg Corp., Newark, Delaware

Hodgman Rubber Co., Framingharm, Mass. (261 Fifth Ave., New York)

Commercial Plastics Co., 201 North Wells Street, Chicago 6, Illinois

Acadia Synthetic Products Div., Western Felt Works, 4029 Ogden Ave., Chicago, Illinois

Saran, raw material, is a Dow Chemical Co. product. Local plumbing supply houses should be able to supply it.

Saran tubing can be bent without kinking to a radius of from two to five times its diameter, depending on its size and wall thickness. Unlike metal tubes, however, Saran does not take a set and retain the bent shape, but must be heated and cooled in the desired form.

Permanent bends are made by forming the tubing (at room temperature), in a curve having about 7/8 the desired finished radius, and at an angle approximately 25% sharper than that finally required. While in this position, hold it in boiling water for approximately one minute, then allow to cool, or immerse in cold water. Smaller bends may be made by working with pressure applied internally, packing with sand, or two or more stage forming. The 1/4" O.D. tubing screen and grid coils might well be formed by the two stage method reducing the winding diameter in two steps.

Flaring can be done with standard flaring tools using a little care. The end of the tubing should be cut square and perpendicular to the surface of the tube using a sharp knife. Tighten the tubing in flaring tool, and then gently turn the tapered wedge to secure the desired flare. The pressure supplied should only be enough to flare the end, and not thin out the section. This same caution should be observed in tightening the flare nuts to avoid pinch-off of the tubing.

RCA uses a special flaring tool which has an additional step in that a forming button is used to turn the end of the tubing slightly inward before the tapered wedge forms the flare. With this method, the end of the tubing is at the bottom inside of the flare and a double wall thickness flare section is obtained. In tightening the flare fitting on Saran, make them hand tight, plus an added quarter turn with a wrench.

Use an Imperial Brass Mfg. Co., (1200 W. Harrison Street, Chicago, Illinois) No. 175-FP Imperial Double-Flaring tool for the 3/8" and 1/2" sizes, and an Imperial No. 38387 1/4" adapter bushing with a copper tubing flaring bar for the 1/4-inch size. Delivery on the adapter bushing may be slow. The above tool makes a double flare; however if care is used in forming, a single flare will be satisfactory.

If spare fittings are desired, they may also be obtained from Imperial Brass. For the 1/2" tubing, use #41-FS 3/4 x 16 threads. For the 1/4" tubing, use #41-FS 7/16 x 20 threads. Two types are required for the 3/8" tubing; #41-W 5/8 x 18 threads (male) and #41-FS 5/8 x 18 threads (female).

4. Measurement of Anode Water Leakage Current

Anode water leakage current may be readily measured by insertion of a 7-7/8-inch length of Saran tubing as a replacement for the length of straight copper tubing adjacent to the Saran isolation coils mounted outside of and on top of the PA compartment accessible from the rear of frames 1 and 8. See Figure 13.

Good distilled water should not show over 200 microamps leakage. Readings of 500 microamps or over indicate water should be replaced.

5. New Water Hose for 8D21 Tube Plate Assembly

A new type of water hose that has been tested and found superior in comparison to the old type is now available from RCA Replacement Parts Department. The advantage of the new hose is the thick wall, which provides sufficient rubber under the clamp to eliminate the need for the vartex tape.

The new type of hose can be identified as "black braided hose 3/16" I.D. 1/2" O.D.", RCA stock #96730. Each stock number represents 16 feet of hose. The length required for one 8D21 tube plate is 8 feet. For optimum installation of the new hose, a larger hose clamp should be used in place of the former clamps. This hose clamp can be identified as "brass hose clamp, RCA stock #96731". Sixteen (16) clamps are required for one tube plate assembly.

6. Water Flow Interlocks

NOTE: The following information refers only to flow meters made by Fisher & Porter.

A total of four triple-tube alarm unit flow meters are used in each TT-5A Television Transmitter. Eleven of the twelve sections are used to protect elements of the two 8D21 tubes from possible damage in case of low water flow or stoppage.

Proper care and maintenance is required to keep these units in good working order. The tapered glass tubes should be kept clean, and the units correctly assembled and aligned. The attached cross-section drawing, Figure 14a, shows the proper order of assembly of parts. The tapered glass tube is sealed at its bottom by a rubber washer approximately one-sixteenth inch thick, and is sealed at its top by a similar, but dual sealing washer which is approximately one-eighth inch thick. This washer is compressed by the pressure from the spring on the brass washer above it and expands outward to seal against the side walls of the hole in the upper frame block. The spring is compressed by screwing down the cover which has a thin (approximately 1/32 inch thick) gasket washer under its rim. Extending downward on the inside center of the cover is a stop pin which limits the upward travel of the metering float.

The length of this stop pin is important, and several things may happen to prevent its performing its normal function. Changing the thickness of the cover gasket or shortening this stop pin may allow the float to rise high enough that the float extension (see Figure 14a) will come out of its guide and will hang up in this position even though water flow is turned off. A shortened pin may also let the rim or larger diameter of the float seal itself against the upper rubber gasket (see Figure 14b). Further trouble may develop if the compression of the upper tube gasket causes it to "cold flow" inwardly to where its inside diameter approaches the body diameter of the float. This can only occur after considerable service life, and thus any danger of flow restriction or stoppage can be prevented by keeping the inside diameter cut out to 1/2 inch or to coincide with the inside diameter of the brass washer.

Should the transmitter be operated with either the rim of the float sealed against the upper washer or with an upper washer whose inside diameter is near or less than the float body diameter, see Figure 14b, the flow to that 8D21 tube element may be badly restricted or stopped. The water pressure will hold the float up out of its alarm position, and the 8D21 element may be damaged due to overheating. Anode water flow restriction may cause one of the anode Saran "U" loops to burst from excessive heating while a flow stoppage can melt the anode block, filling the 8D21 with water.

The above situation is particularly dangerous because the protection circuits are non-operative, and there is no obvious indication of what is at fault or where the trouble is occurring. Preventive measures therefore, must take the form of regular inspection and proper maintenance to be certain that the conditions which are apt to cause this stoppage do not exist. The tube mounting plate flow meter can be checked for shortened pins by tipping it upside down and observing that the rim of the float does not go beyond the frame body or flush with the end of the normal upper end of the glass tube. It should be possible to see the end of the stop pins with the flow meter in it normal position. The anode flow meters should be inspected to see that the ends of the stop pins extend down to the top of the glass tubes or are visible inside the upper rubber gasket. The amount of cold flow inward of the upper rubber gasket should also be observed, and it should not extend more than approximately 1/32-inch inside the glass tube. If this extension appears to be more than this, the rubber washer should be removed and its inside diameter trimmed out or replaced with a new washer.

Figure 14a shows a cross-section with a long pin which extends down to the top of the glass tube. A stop pin which extends 5/8-inch or more from the recess in the cover will prevent the float body from reaching the upper gasket. A very short pin as shown in Figure 14b can cause any or all of the three faults mentioned above to occur. Note that Figure 2 shows the float rim about to contact the upper gasket, and that the float extension is out of its guide where it may hang up rather than drop down again.

The stop pins are pressed into the covers but may be drilled out with care, and replaced with longer stop pins. Alternatively, the end of a short stop pin may be tapped with #6-32 thread, and a fillister or round head 6-32 screw used as the stop pin extension.

To clean the glass tubes or remove foreign material from around the edge of the float unscrew the cover, remove the spring, brass and rubber washers, and lift out the glass tube. The rim or larger diameter of the float should not be sanded or deeply scraped such as to change its diameter, or the flow calibration will change. The float extension is magnetic stainless steel, and on those units which were plated, all loose plating should be removed. Do not use emery paper or the grit grains may embed in the stainless steel, and cause local rust spots. If the plating peels off in large areas due to poor adhesion of the chrome, this might restrict or bind movements of the flow. Arrangements have been made with our supplier to rework those units where severe peeling has occurred. Replacements will be supplied by RCA to the stations and old units should be returned to RCA. In order to keep this exchange procedure on a practical and workable basis, the number that can be exchanged will have to be limited to those with severe plating peeling.

Stations which have water flow meters with float extensions which have excessive peeling should notify RCA Broadcast Sales Dept. at Camden, N. J. of the number of those units which need replacing. These units will be supplied, and billed to the station.. Upon return of the deteriorated units, full credit to the station will then be given on those which show needed replacement.

The glass tube should be reassembled as concentric as possible over the float so as not to restrict or bind movement of the float. The floats should drop down freely when the water flow is shut off, and the units should be examined occasionally to see that they are not hung up when the transmitter is shut down. With some of the newer 8D21 tubes the floats will remain up against the stop pin with normal water pressure but in general most of the floats should operate a little below the stop pin. The pressure setting of the regulator valve on the water cooler will determine where most of the floats operate. It is not good practice to operate the water circulator at excessively high pressure (see Instruction Book).

The following parts are carried in RCA Replacement Parts stock and can be ordered by stock numbers:

Part	Stock No.
Mercury Switch	57430
Glass tube 0. 05-35 gpm	55276
Glass tube 0. 35-65 gpm	57429
Gasket washers, bottom (1/16" thick)	57431
Gasket washers, upper (1/8" thick)	57432
Gasket washers, cover (1/32" thick)	57433
Float and Extension	55277

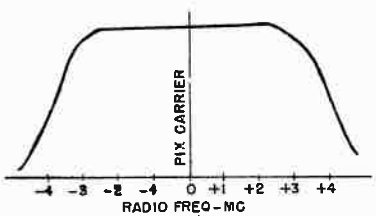


FIGURE 1

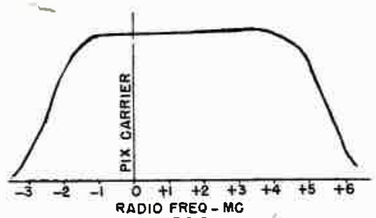


FIGURE 2

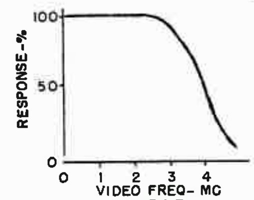


FIGURE 3

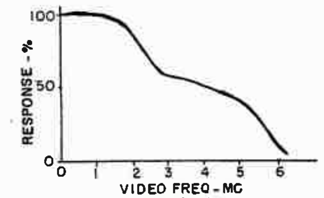


FIGURE 4

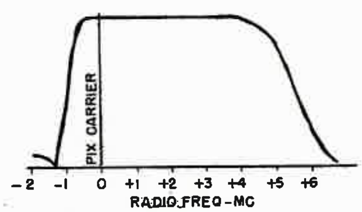


FIGURE 5

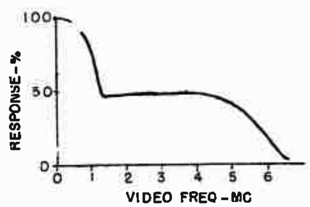


FIGURE 6

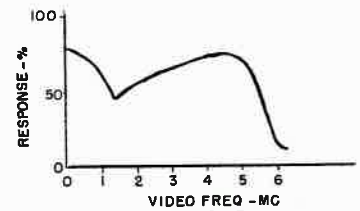


FIGURE 7

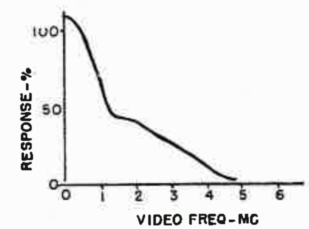


FIGURE 8

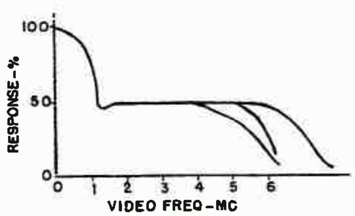


FIGURE 9

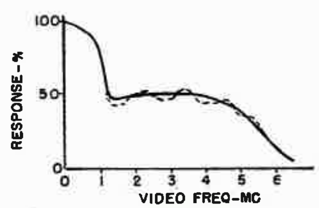


FIGURE 10

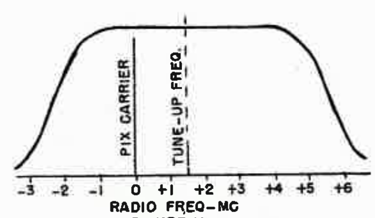


FIGURE 11

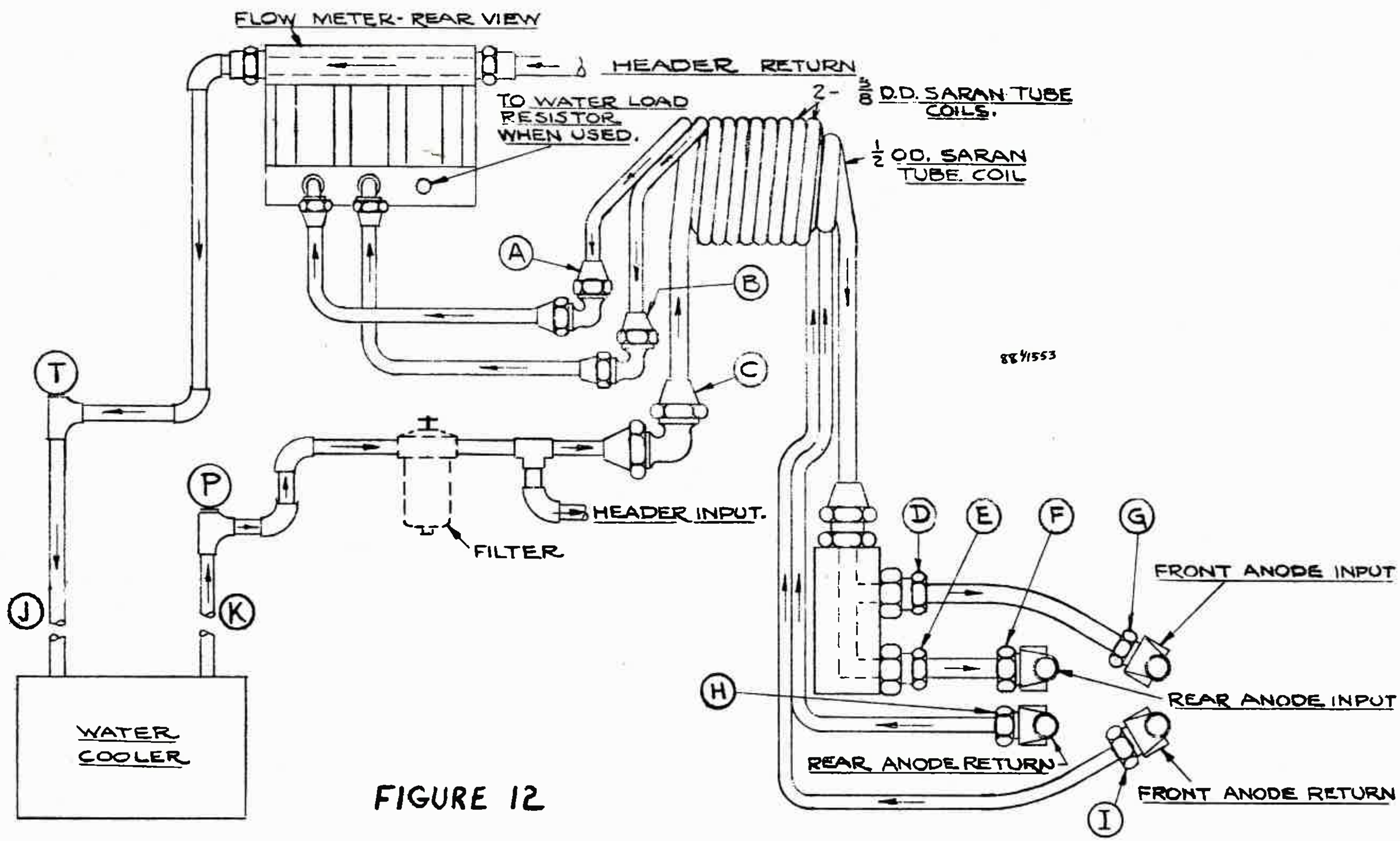
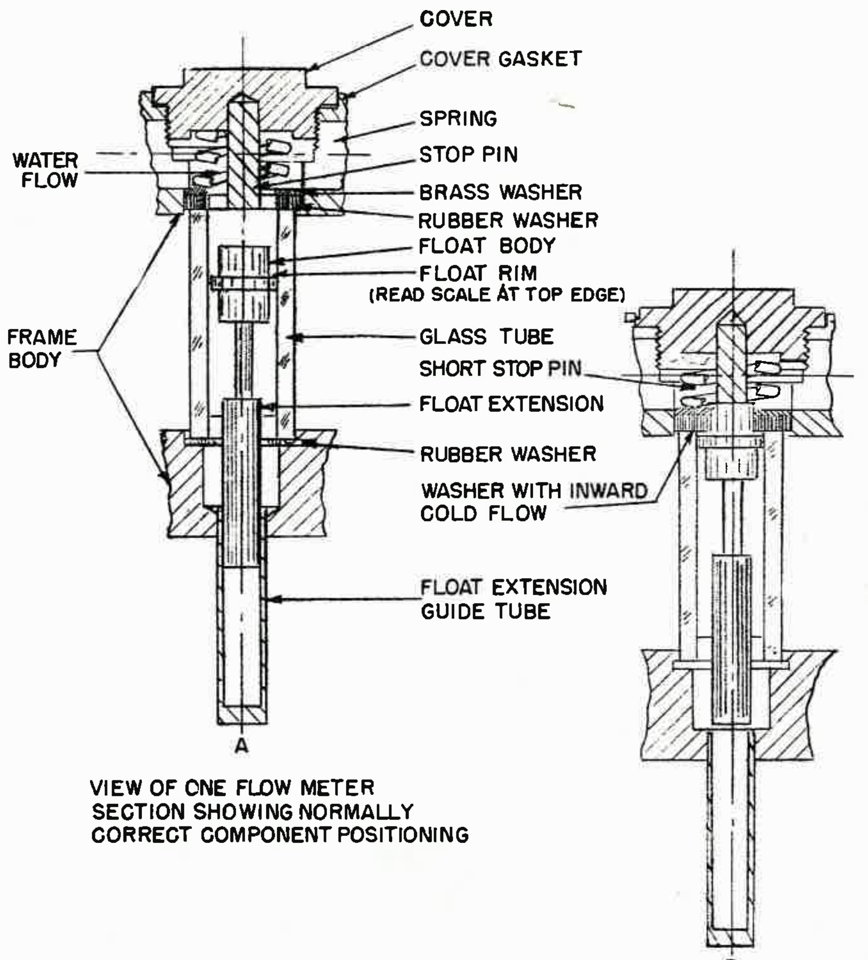

FLOW METER- REAR VIEW
HEADER RETURN
TO WATER LOAD RESISTOR WHEN USED.
2- 3/8 O.D. SARAN TUBE COILS.
1/2 OD. SARAN TUBE COIL
A
B
C
T
P
HEADER INPUT.
FILTER
J
K
WATER COOLER
D
E
F
G
H
I
FRONT ANODE INPUT
REAR ANODE INPUT
REAR ANODE RETURN
FRONT ANODE RETURN
88 4/1553

FIGURE 12



VIEW OF ONE FLOW METER SECTION SHOWING NORMALLY CORRECT COMPONENT POSITIONING

VIEW OF ONE FLOW METER SECTION SHOWING CONDITIONS WHICH MAY LEAD TO PRESSURE BLOCKAGE

FIGURE 14

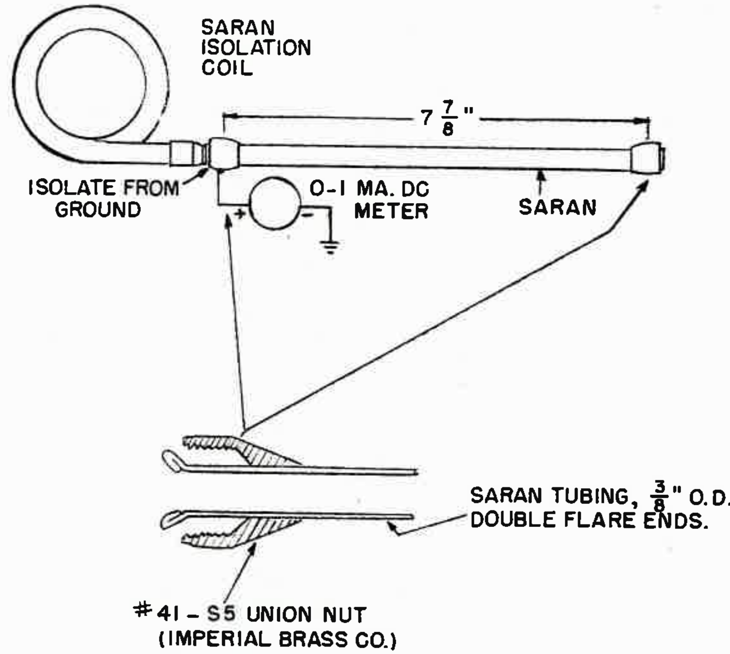


FIGURE 13

FIRST AID

WARNING!

Operation of electronic equipment involves the use of high voltages which are dangerous to life. Operating personnel must at all times observe all safety regulations. Do not change tubes or make adjustments inside the equipment with voltage supply on. Under certain conditions dangerous potentials may exist in circuits with power controls in the off position due to charges retained by capacitors, etc. To avoid casualties, ALWAYS DISCHARGE AND GROUND CIRCUITS PRIOR TO TOUCHING THEM.

ABOUT FIRST AID

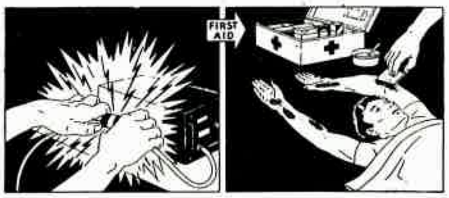
Personnel engaged in the installation, operation and maintenance of this equipment or similar equipment are urged to become familiar with the following rules both in theory and in the practical application thereof. It is the duty of every radioman to be prepared to give adequate First Aid and thereby prevent avoidable loss of life.

FIRST DEGREE BURN

SKIN REDDENED. Temporary treatment—Apply baking soda or Unguentine.

SECOND DEGREE BURN

SKIN BLISTERED. Temporary treatment—Apply baking soda, wet compress, white petroleum jelly, foille jelly, olive oil, or tea.



THIRD DEGREE BURN

FLESH CHARRED. Temporary treatment—Apply baking soda, wet compress, white petroleum jelly, or foille spray. Treat for severe shock.

BACK PRESSURE—ARM LIFT METHOD OF ARTIFICIAL RESPIRATION
(Courtesy of the American Red Cross)

1. Position of the subject (See Fig. 1)

Place the subject in the face down, prone position. Bend his elbows and place the hands one upon the other. Turn his fact to one side, placing the cheek upon his hands.

FIGURE 1

2. Position of the operator (See Fig. 2)

Kneel on either the right or left knee at the head of the subject facing him. Place the knee at the side of the subject's head close to the forearm. Place the opposite foot near the elbow. If it is more comfortable, kneel on both knees, one on either side of the subject's head. Place your hands upon the flat of the subject's back in such a way that the heels lie just below a line running between the armpits. With the tips of the thumbs just touching, spread the fingers downward and outward.

FIGURE 2

3. Compression phase (See Fig. 3)

Rock forward until the arms are approximately vertical and allow the weight of the upper part of your body to exert slow, steady, even pressure downward upon the hands. This forces air out of the lungs. Your elbows should be kept straight and the pressure exerted almost directly downward on the back.

4. Position for expansion phase (See Fig. 4)

Release the pressure, avoiding a final thrust, and commence to rock slowly backward. Place your hands upon the subject's arms just above his elbows.

FIGURE 3

5. Expansion phase (See Fig. 5)

Draw his arms upward and toward you. Apply just enough lift to feel resistance and tension at the subject's shoulders. Do not bend your elbows, and as you rock backward the subject's arms will be drawn toward you. Then lower the arms to the ground. This completes the full cycle. The arm lift expands the chest by pulling on the chest muscles, arching the back, and relieving the weight on the chest.

THE CYCLE SHOULD BE REPEATED 12 TIMES PER MINUTE AT A STEADY, UNIFORM RATE. THE COMPRESSION AND EXPANSION PHASES SHOULD OCCUPY ABOUT EQUAL TIME; THE RELEASE PERIODS BEING OF MINIMUM DURATION.

FIGURE 4

Additional related directions:

It is all important that artificial respiration, when needed, be started quickly. There should be a slight inclination of the body in such a way that fluid drains better from the respiratory passage. The head of the subject should be extended, not flexed forward, and the chin should not sag lest obstruction of the respiratory passages occur. A check should be made to ascertain that the tongue or foreign objects are not obstructing the passages. These aspects can be cared for when placing the subject into position or shortly thereafter, between cycles. A smooth rhythm in performing artificial respiration is desirable, but split-second timing is not essential. Shock should receive adequate attention, and the subject should remain recumbent after resuscitation until seen by a physician or until recovery seem assured.

FIGURE 5