# TRANSMITTER INSTALLATION

## GENERAL

Installation of the TT-5A transmitter is out side the scope of this book and will be handled separately in instruction book IB-36028 due to the complexity of the equipment and the many factors entering into layout and installation. The following illustrations are included in this instruction book, however, for reference purposes:

| Fig. No. | Title |
|---|---|
| 19 | Typical installation layout (MI-19045 Water Cooler and MI-19104 Sideband Filter) |
| 20 | Typical installation layout (MI-19045-A Water Cooler and MI-19114 Sideband Filter) |
| 79 | Wire Chart |
| 80 | Interconnection Diagram |

Supplementing the foregoing material, the instruction book supplied with the dummy r-f load and wattmeter will supply the data necessary for connecting this unit which will be used during preliminary adjustments and tuning. The sideband filter should be installed in accordance with the accompanying instructions.

For reference during initial adjustments and operation, data sheets on the 4D21/4-125A, 4X500-A, 6AS7G, and 8D21 tubes are included under MAINTENANCE.

## WATER COOLING UNIT

Either of two water cooling units is furnished with the TT-5A transmitter depending on the time of shipment and manufacture. The following instructions, therefore, include directions for installation of both units, to which reference will be made by the "MI" number on the nameplate. For the MI-19045-A unit, use should also be made of the accompanying Trane Company service manual, SM-371. In addition to the illustrations specifically mentioned, Figure 12 may be of value.

The MI-19045 and MI-19045-A water coolers are designed to operate under the following conditions of rating and performance:

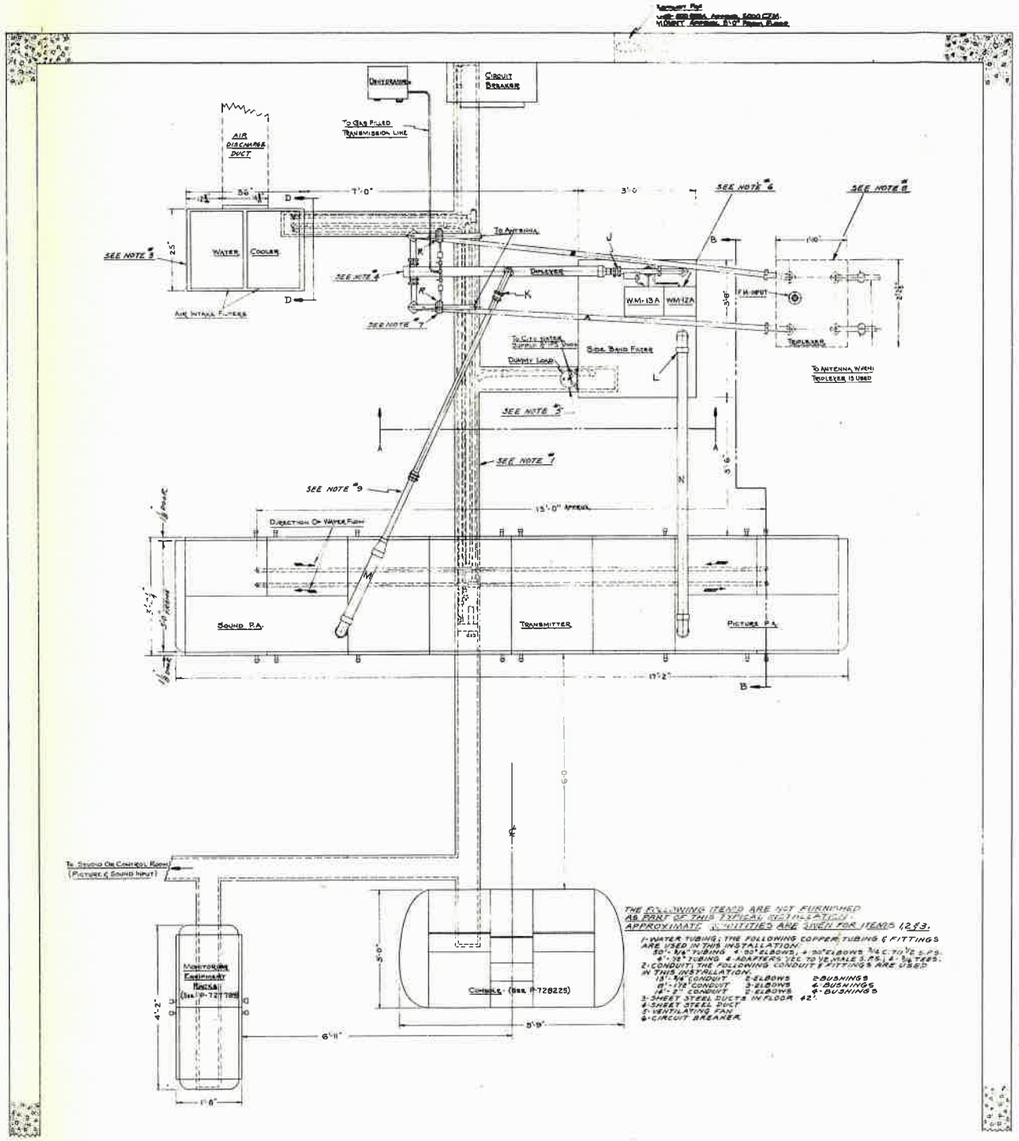
| | |
|---|---|
| Output water pressure | 80 psi nominal |
| Power dissipation (continuous) | 10 kw max. |
| Ambient temperature | 110 deg. F. max. |
| Flow capacity (at 80 psi) | 7 gpm. max. |
| Storage tank capacity | 10 gallons |

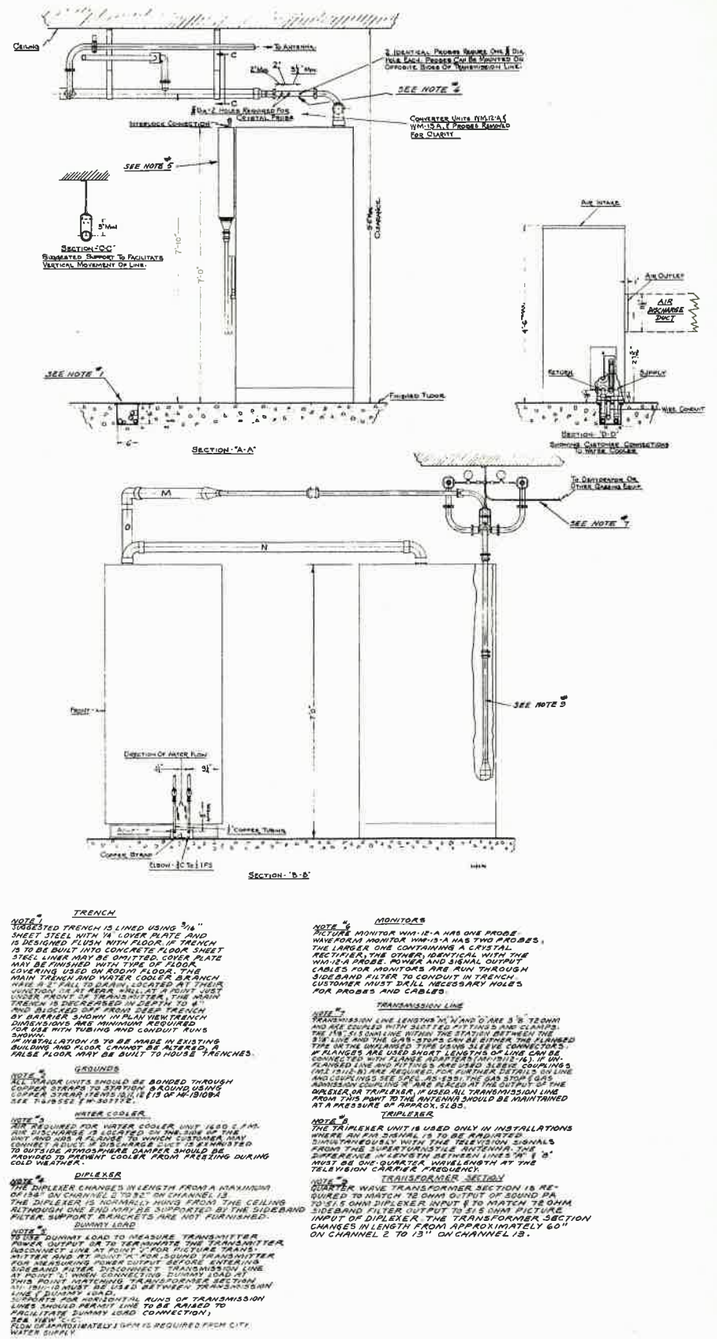
A pressure setting of 85 psi is the maximum rating, and should be used only where this unit is remote from the transmitter, as the normal operating pressure should be between 68 and 75 psi. The output pressure is maintained constant within plus 3 and minus 2 pounds over an external flow range of 2 to 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 between the pump output and supply to the transmitter. Thus, valves in either cabinets one or eight, or both, may be closed and the pressure will remain essentially constant. Figure 21 is a diagram of typical pressures in the water system.

For the MI-19045 units shown on Figures 22 and 23, the high pressure or input to the transmitter should be connected to the 3/4 inch nominal (actual size 7/8 inch O.D.) copper pipe which extends almost to the base of the cooler in the rear right-hand corner of the unit and which can be reached through the small access door. The return water should be connected to the 3/4 inch 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 through the outer casing, for installations where the piping may have to come out above floor level. Under the latter condition, it may be desirable to make cutouts in the bottom of the casing. The outer casing may be lifted 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 suction pressure during operation, and the access doors should, therefore, be replaced after installation.

For the MI-19045-A units, illustrated in Figures 24 and 25, 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 inch 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.

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.




### TRENCH

NOTE 1
SUGGESTED TRENCH IS LINED USING 3/16" SHEET STEEL WITH ¼" LOWER PLATE AND IS DESIGNED PLUSH WITH FLOOR. IF TRENCH IS TO BE BUILT INTO CONCRETE FLOOR SHEET STEEL LINER MAY BE OMITTED, COVER PLATE MAY BE FINISHED WITH TYPE OF FLOOR COVERING USED ON ROOM FLOOR. THE MAIN TRENCH AND WATER COOLER BRANCH HAVE BEEN PLANNED ADJACENT TO THEIR RESPECTIVE EQUIPMENTS SO THAT ONLY UNDER FRONT OF TRANSMITTER. THE MAIN TRENCH IS DECREASED IN DEPTH TO 8" AND BLOCKED OFF FROM REAR TRENCH BY BARRIER SHOWN IN PLAN VIEW TRENCH DIMENSIONS ARE MINIMUM REQUIRED FOR USE WITH TUBING AND CONDUIT RUNS SHOWN.
IF INSTALLATION IS TO BE MADE IN EXISTING BUILDING AND FLOOR CANNOT BE ADJUSTED, A FALSE FLOOR MAY BE BUILT TO HOUSE TRENCHES.

### GROUNDS

NOTE 2
ALL MAJOR UNITS SHOULD BE BONDED THROUGH COPPER STRAPS TO STATION GROUND USING COPPER STRAP (SEE M-19109A) OR EIS OF M-19109A SEE TABLE I OF M-30119.

### WATER COOLER

NOTE 3
AIR REQUIRED FOR WATER COOLER UNIT, 1620 C.F.M. AIR DISCHARGE IS LOCATED ON THE REAR OF THE UNIT. AIR INTAKE IS LOCATED ON THE FRONT. THE CONNECTION OF A DUCT TO THE AIR INTAKE TO OUTSIDE ATMOSPHERE DAMPER SHOULD BE PROVIDED TO PREVENT COOLER FROM FREEZING DURING COLD WEATHER.

### DIPLEXER

NOTE 4
THE DIPLEXER CHANGES IN LENGTH FROM A MAXIMUM OF 138" ON CHANNEL 2 TO 97" ON CHANNEL 13. THE DIPLEXER IS NORMALLY HUNG FROM THE CEILING ALTHOUGH THE END MAY BE SUPPORTED BY THE SIDEBAND FILTER. SUPPORT BRACKETS ARE NOT FURNISHED.

### DUMMY LOAD

NOTE 5
TO USE DUMMY LOAD TO MEASURE TRANSMITTER OUTPUT OR TO DETERMINE THE TRANSMITTER-DIPLEXER LINE LENGTH FROM PICTURE TRANSMITTER AND AT POINT "X" FOR SOUND TRANSMITTER FOR MEASURING POWER OUTPUT BEFORE ENTERING SIDEBAND FILTER. DISCONNECT TRANSMISSION LINE AT POINT "X" WHEN CONNECTING DUMMY LOAD AT THIS POINT. MATCHING TRANSFORMER SECTION MI-19045 MUST BE USED BETWEEN TRANSMISSION LINE & DUMMY LOAD.
SUFFICIENT HORIZONTAL RUN OF TRANSMISSION LINES SHOULD PERMIT LINE TO BE RAISED TO FACILITATE DUMMY LOAD CONNECTION.
NOTE 6
FLOW OF APPROXIMATELY 1 GPM IS REQUIRED FROM CITY WATER SUPPLY.

### MONITORS

NOTE 7
PICTURE MONITOR WM-12-A HAS ONE PROBE. WAVE FORM MONITOR WM-13-A HAS TWO PROBES, THE LARGER ONE CONTAINING A CRYSTAL RECTIFIER, THE OTHER, IDENTICAL WITH THE WM-12-A PROBE, POWER AND SIGNAL OUTPUT CABLES FOR MONITORS ARE RUN THROUGH SIDEBAND FILTER TO CONDUIT IN TRENCH. CUSTOMER MUST DRILL NECESSARY HOLES FOR PROBES AND CABLES.

### TRANSMISSION LINE

NOTE 8
TRANSMISSION LINE LENGTHS "A" AND "B" ARE 3 ⅛" 72 OHM AND ARE COUPLED WITH SLOTTED FITTINGS AND CLAMPS. THE 3 ⅛ 72 OHM LINE WITHIN THE STATION BETWEEN THE TRANSMITTER AND THE SIDEBAND FILTER IS OF THE TYPE IN THE UNBALANCED TYPE 50 OHM SLEEVE CONNECTIONS. IF FLANGES ARE USED SHORT LENGTHS OF LINE CAN BE CONNECTED WITH FLANGE ADAPTERS (MI-19116-A). IF UN-FLANGED LINE AND FITTINGS ARE USED SLEEVE COUPLINGS, (MI-7112-B) ARE REQUIRED. FOR FURTHER DETAILS ON LINE AND COUPLINGS SEE SPEC. AS-1251. THE 50 OHM FLEXIBLE TRANSMISSION LINE "C" ARE FITTED AT THE OUTPUT OF THE DIPLEXER OR TRIPLEXER. IF USED ALL TRANSMISSION LINE FROM THIS POINT TO THE ANTENNA SHOULD BE MAINTAINED AT A PRESSURE OF APPROX. 5 LBS.

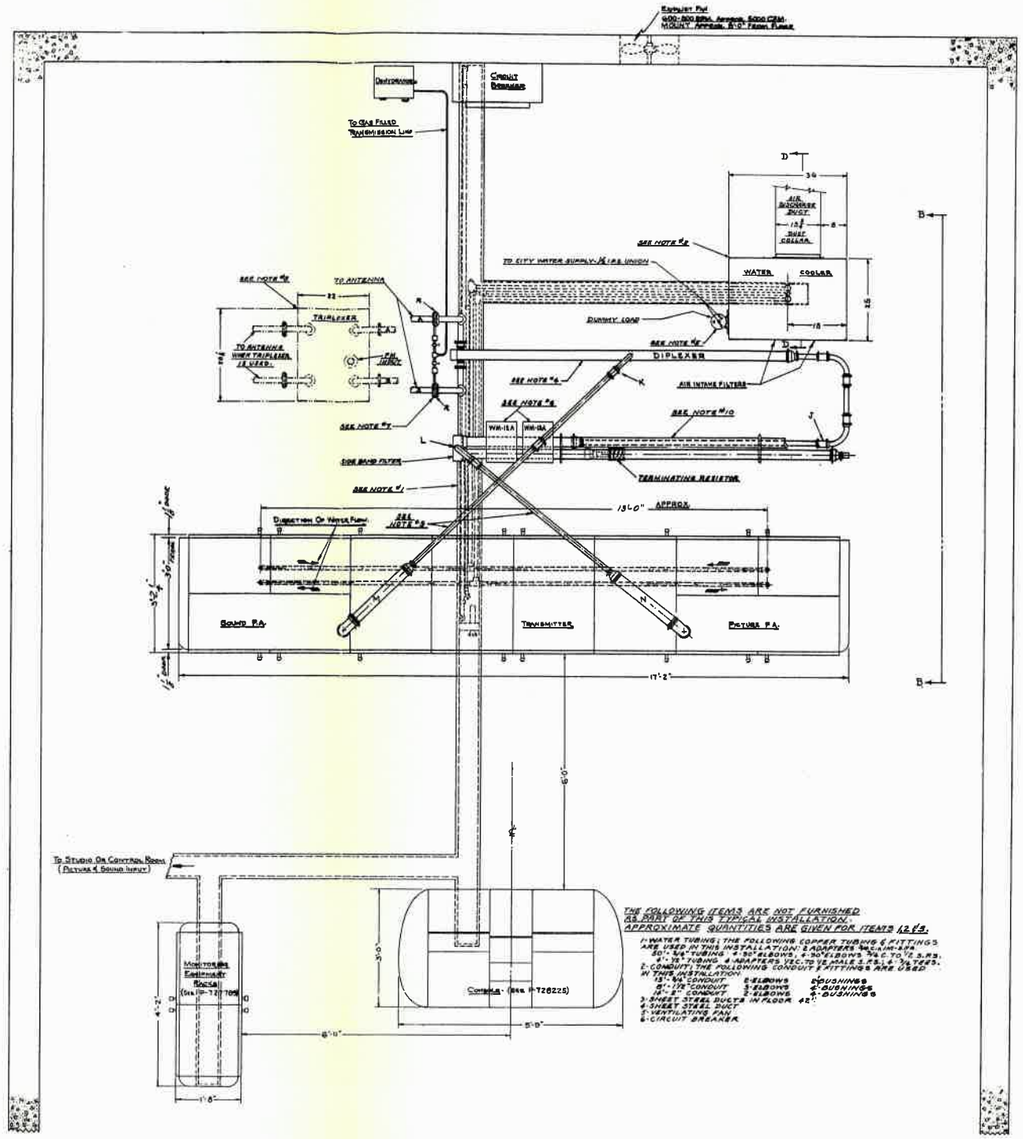
### TRIPLEXER

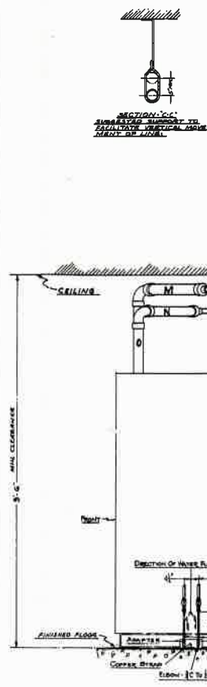
NOTE 9
THE TRIPLEXER UNIT IS USED ONLY IN INSTALLATIONS WHERE AN FM SIGNAL IS TO BE RADIATED SIMULTANEOUSLY WITH THE TELEVISION SIGNALS FROM THE SUPERTURNSTILE ANTENNA. THE DIFFERENCE IN LENGTH BETWEEN LINES "A" & "B" MUST BE ONE-QUARTER WAVELENGTH AT THE TELEVISION CARRIER FREQUENCY.

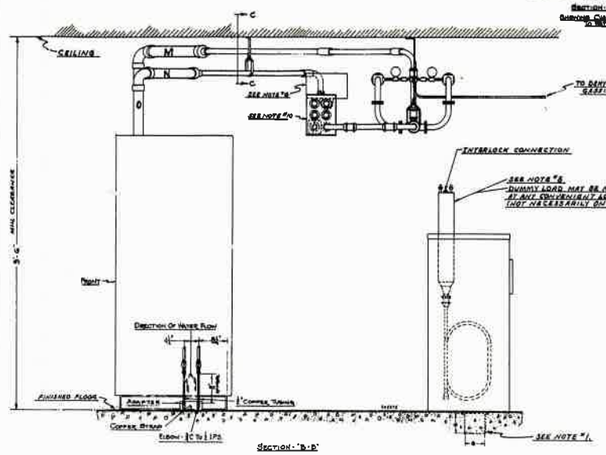
### TRANSFORMER SECTION

NOTE 10
QUARTER WAVE TRANSFORMER SECTION IS RE-QUIRED TO MATCH 72 OHM OUTPUT OF SOUND PA TO 51.5 OHM DIPLEXER INPUT & TO MATCH 72 OHM SIDEBAND FILTER OUTPUT TO 51.5 OHM PICTURE INPUT OF DIPLEXER. THE TRANSFORMER SECTION CHANGES IN LENGTH FROM APPROXIMATELY 60" ON CHANNEL 2 TO 13" ON CHANNEL 13.

Figure 19 - Typical Installation Layout, Using MI-19045 Water Cooler and MI-19104 Sideband Filter (308836-sub 3)




**TRENCH**

NOTE 1
TRENCHED TRENCH IS LINED USING ¼" SHEET STEEL WITH 14" COVER PLATE AND IS DESIGNED FLUSH WITH FLOOR. IF TRENCH IS TO BE BUILT INTO CONCRETE FLOOR SHEET STEEL LINER MAY BE OMITTED. COVER PLATE MAY BE FINISHED WITH TYPE OF FLOOR COVERING USED ON ROUGH FLOOR. THE MAIN "POWER AND WATER COOLER DRAINCH HAVE A 2" FALL TO DRAIN, LOCATED AT THEIR JUNCTION OR AT THAT WALL OF TRANSMITTER UNDER FRONT OF TRANSMITTER. THE MAIN TRENCH IS DECREASED IN DEPTH TO 8" AND BLOCKED OFF FROM DEEP TRENCH BY SUITABLE BRICH IN ORDER THAT THE DIMENSIONS ARE MINIMUM REQUIRED. THE USE WITH TUBING AND CONDUIT RUNS IF INSTALLATION IS TO BE MADE IN EXISTING BUILDING AND FLOOR CANNOT BE ALTERED, A FALSE FLOOR MAY BE BUILT TO HOUSE TRENCHES.

**GROUNDS**

NOTE 2
ALL MAJOR UNITS SHOULD BE BONDED THROUGH COPPER STRAPS TO STATION GROUND WAVE COPPER STRAP (REFERENCE IS #18 OF MI-19109-A).
SEE TABLE 2 OF SECTION

**WATER COOLER**

NOTE 3
AIR REQUIRED FOR WATER COOLER UNIT 1800 C.F.M. AIR DISCHARGE IS LOCATED ON THE SIDE OF THE UNIT AND HAS A FLANGE TO WHICH CUSTOMER MAY CONNECT A DISCHARGE DUCT. IF DUCT IS USED TO DISCHARGE AIR OUTSIDE BUILDING, DAMPER SHOULD BE PROVIDED TO PREVENT COOLER FROM FREEZING DURING COLD WEATHER.

**DIPLEXER**

NOTE 4
THE DIPLEXER CHANGES IN LENGTH FROM A MAXIMUM OF 134" ON CHANNEL 2 TO 32" ON CHANNEL 13. THE DIPLEXER IS NORMALLY HUNG FROM THE CEILING ALTHOUGH ONE END MAY BE SUPPORTED BY THE SIDEBAND FILTER. SUPPORT BRACKETS ARE NOT FURNISHED.

**DUMMY LOAD**

NOTE 5
DUMMY LOAD TO MEASURE TRANSMITTER POWER OUTPUT. AS TRANSMITTER, TRANSMITTER DISCONNECT LINK AT POINT "J" FOR PICTURE TRANSMITTER AND AT SOUND P.A. FOR SOUND TRANSMITTER FOR MEASURING POWER OUTPUT BEFORE ENTERING SIDEBAND FILTER. DISCONNECT TRANSMISSION LINE AND CONNECT DUMMY LOAD TO TRANSMITTER. (MI-19045A WATER COOLER HAS MI-19110-A DUMMY LOAD ATTACHED TO BASE FOR EASY CONNECTION TO TRANSMISSION LINE & DUMMY LOAD.
NOTE 6
SUITABLE FOR HORIZONTAL RUNS OF TRANSMISSION LINES SHOULD PERMIT LINE TO BE RAISED TO FACILITATE DUMMY LOAD CONNECTION.)
SEE VIEW C-C.
FLOW OF APPROXIMATELY 1 GPM IS REQUIRED FROM CITY WATER SUPPLY.

**MONITORS**

NOTE 9
PICTURE MONITOR WM-13-A HAS ONE PROBE. WAVEFORM MONITOR WM-11-A HAS TWO PROBES, THE LARGER ONE CONTAINING A CRYSTAL RECTIFIER, THE OTHER, IDENTICAL WITH THE WM-13-A PROBE, POWER AND SIGNAL OUTPUT CABLES ARE RUN THROUGH A CONDUIT TO TOP OF CONTROL RACK & THEN INTO TRENCH.

**TRANSMISSION LINE**

NOTE 8
TRANSMISSION LINE LENGTHS ¾" AND ⅞" ARE 3 ½" TRUNK AND ARE COUPLED WITH SLOTTED FITTINGS AND CLAMPS. THE 1⅝" SIZE ONE LENGTH BETWEEN THE FITTINGS AND THE 3⅛" AND THE GAS STOPS CAN BE EITHER 3½" TRUNK TYPE OR THE SMALL TYPE WITH SLEEVE COUPLINGS. AT FLANGES ARE USED SHORT LENGTHS OF LINE ONLY AS CONNECTED WITH FLANGE FITTINGS. LENGTHS OF 90° FLEXIBLE LINE AND FITTINGS ARE USED AS SIDE COUPLINGS. THESE (90°-B) ARE REQUIRED FOR FITTING DETAILS OF LINE AND COUPLINGS SEE PAGE 48 (B). THE GAS STOPS (GAS-B) ARE REQUIRED AT THE OUTPUT OF THE DIPLEXER OR TRIPLEXER, IF USED. ALL TRANSMISSION LINE FROM THIS POINT TO THE ANTENNA SHOULD BE MAINTAINED AT A PRESSURE OF APPROX. 5 LBS.

**TRIPLEXER**

NOTE 10
THE TRIPLEXER UNIT IS USED ONLY IN INSTALLATIONS WHERE AN FM SIGNAL IS TO BE RADIATED SIMULTANEOUSLY WITH THE TELEVISION SIGNALS FROM THE SUPERTURNSTILE ANTENNA. THE DISTANCE IN LENGTH BETWEEN LINES AT "J" MUST BE ONE-QUARTER WAVELENGTH AT THE TELEVISION CHANNEL FREQUENCY.

**TRANSFORMER SECTION**

NOTE 11
QUARTER WAVE TRANSFORMER SECTION IS REQUIRED TO MATCH THE 51.5 OHM OUTPUT OF SOUND PA TO 51.5 OHM DIPLEXER INPUT & TO MATCH 72 OHM SIDEBAND FILTER OUTPUT TO 51.5 OHM PICTURE INPUT OF DIPLEXER. THE TRANSFORMER SECTION CHANGES IN LENGTH FROM APPROXIMATELY 60" ON CHANNEL 2 TO 15" ON CHANNEL 13.

NOTE 12
VERTICAL SIDE BAND FILTER
THE VESTIGIAL SIDE BAND FILTER VARIES IN LENGTH FROM 80 TO 120 INCHES DEPENDING ON THE CHANNEL NUMBER. THIS DRAWING SHOWS THE LARGEST POSSIBLE UNIT (CHANNEL 2).
WM-12-A & WM-13-A MONITORS MAY BE MOUNTED ON SIDE BAND FILTER, AS SHOWN. HOLES ARE PROVIDED IN THE SIDE BAND FILTER TO ACCEPT THE MONITORS EQUIPMENT PROBES.

**Figure 20 – Typical Installation Layout, Using MI-19045A Water Cooler and MI-19114 Sideband Filter (308878-sub 1)**

*Flushing and Filling Water Circulating System*- Each new system should be filled with water, thoroughly flushed, and checked to ascertain that no foreign matter remains before the 8D21 tube is installed. This may be accomplished as follows:

Connect a temporary water hose between the inlet and outlet water tubing where the station plumbing enters through the bottom of cabinets one and eight.

For MI-19045 units remove fan drive "V" belt. For MI-19045-A units stop the fan motor by pushing the overload switch stop button.

Fill the water tank with 5 to 7 gallons of water, and operate the system for approximately one hour. This will cause the water to heat.

Shut down, and drain all water at the lowest point in the system.

Remove the water filter from the water cooler and clean thoroughly with hot water. Rotate The "T" handles on filters in frames 1 and 8.

Repeat the foregoing procedure, using fresh water each time, until no signs of foreign matter can be noted in the filter or drained water.

After the system has been thoroughly flushed, refill the tank with approximately 10 gallons of DISTILLED water. Use of distilled water is necessary not only from a corrosion standpoint, but also because the anodes of the 8D21 tubes operate at 5,000 volts above ground and the conductivity of the cooling water is important. Good distilled water should have a guaranteed total residue of not more than four 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 often result in serious operating 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 tube anode lines.

The attack by chlorine, which is present in most city water, may start a continuous cycle of attack by its being redissolved from the corrosion products. 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, and it should not be used in place of distilled water. The conductivity and elements in spring or mineral water will vary widely but the impurities in the water may cause large deposits and serious attacks on the fittings.

The water tank on both units 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. The top of the tank in the MI-19045 unit has a hand clean-out hole accessible when the casing is lifted.

A- PRESSURE DROP THROUGH FEEDLINE (2 PSI AVERAGE)
B- PRESSURE DROP THROUGH TRANSMITTER PIPING AND WATER COILS (2 PSI AVERAGE)
C- PRESSURE DROP THROUGH 8D21 TUBE (60 PSI)
D- PRESSURE DROP THROUGH TRANSMITTER PIPING, WATER COILS, AND WATER FLOWMETERS (5 PSI AVERAGE)
E- PRESSURE DROP THROUGH RETURN LINE (3 PSI AVERAGE)

NOTE: PRESSURES INDICATED ABOVE IN PSI ARE OBTAINED WHEN WATER CIRCULATOR IS LOCATED ON SAME FLOOR LEVEL AS TRANSMITTER.

* WHEN CIRCULATOR IS LOCATED ONE FLOOR BELOW TRANSMITTER, THESE PRESSURES WILL BE APPROXIMATELY 5 PSI LOWER. IT IS NOT RECOMMENDED THAT THE WATER CIRCULATOR BE PLACED ABOVE THE TRANSMITTER.

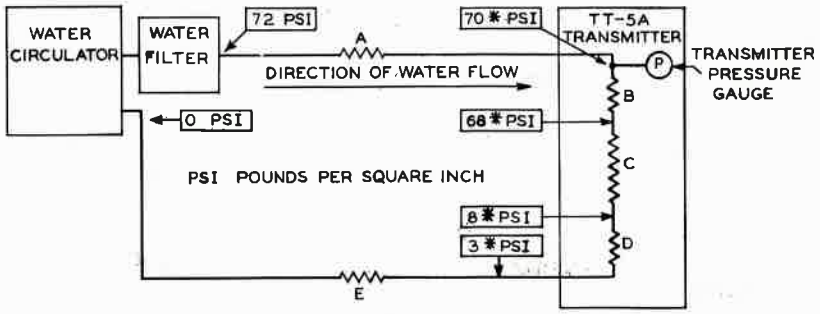



Figure 21 - Typical Pressures in Water Circulating System (454633-sub 0)

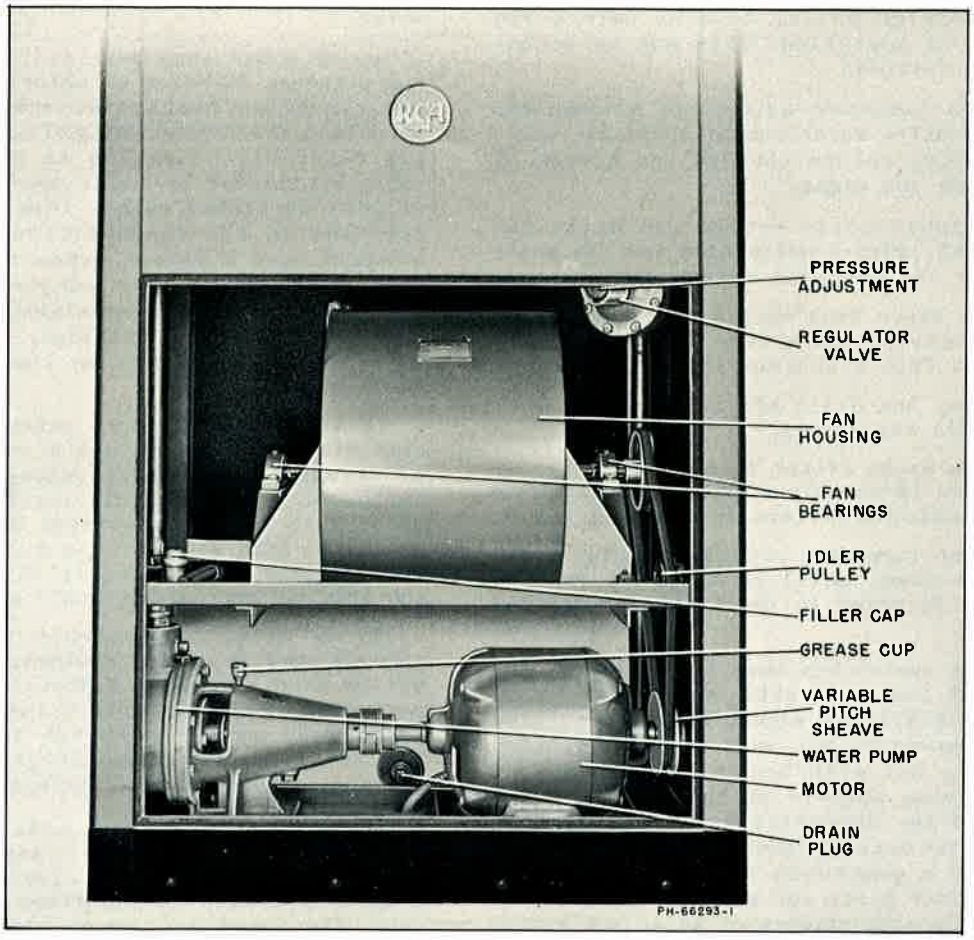



Figure 22 - MI-19045 Water Circulator, Outer Panel Removed

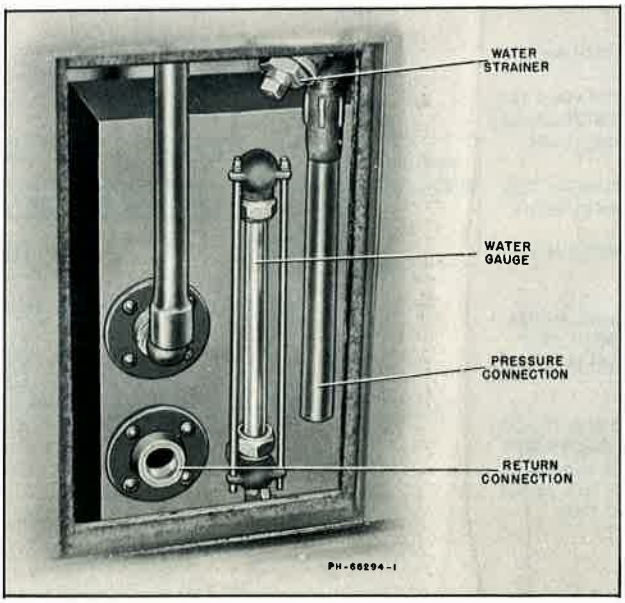



Figure 23 - MI-19045 Water Circulator, Side Plate Removed

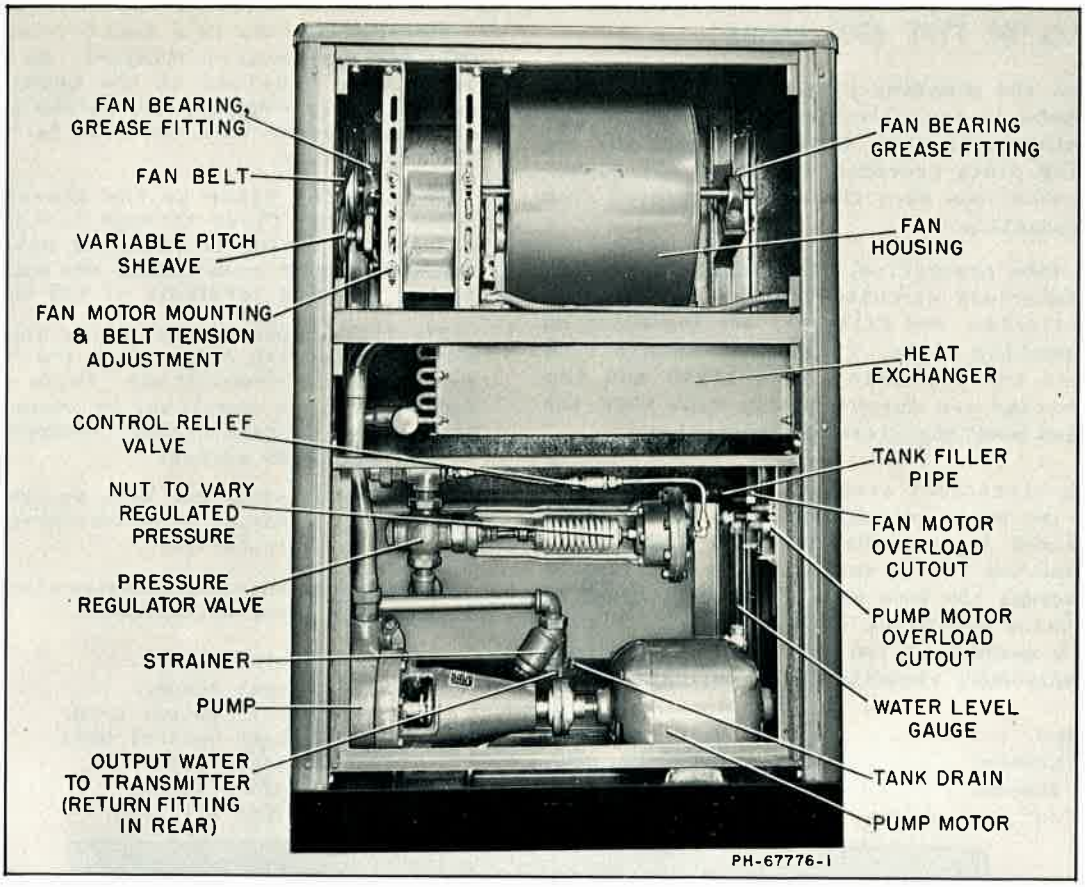



Figure 24 - MI-19045A Water Circulator, Front Panels Removed

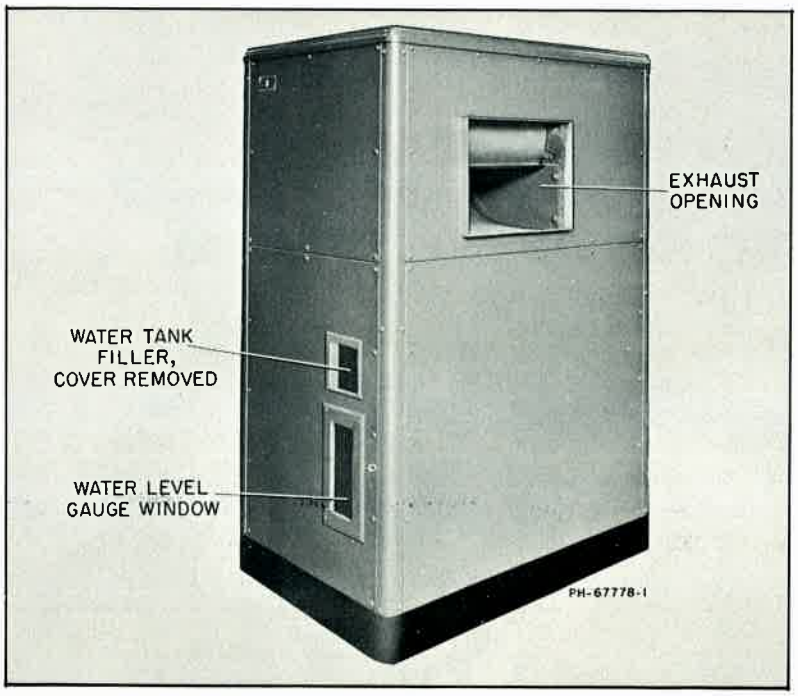



Figure 25 - MI-19045A Water Circulator, Rear View

## INSTALLING TYPE 8D21 TUBES

*General*—The mounting plate in which the type 8D21 tube is installed permits tube changes in a minimum of time. Shown in Figure 26, the mounting plate provides access to all terminal connections when the tube is removed from the transmitter.

For tube protection, individual flowmeters with interlock circuits for the screen-grid, control-grids, and filament, are installed on the mounting plate. Electrical connections between the flowmeter interlocks and the transmitter are automatically made when the tube and mounting plate are installed.

Each electrical terminal on the tube contains two water connections. Due to the small clearances in the tube the water pressure is high and the flow is small. The water pressure drop across the tube should not be allowed to drop below a minimum of 60 psi, nor to rise above a maximum of 100 psi. Waterflow through the individual elements is as follows:

| | |
|---|---|
| Filament. . . . . | 0.18 gpm, min. |
| Grid, Control . . . . . | 0.18 gpm, min. |
| Grid, Screen. . . . . | 0.18 gpm, min. |
| Plate (of each unit). . . . . | 0.55 gpm, min. |

Although the tube is a dual tetrode, there is only one screen-grid terminal. An electrical connection provided on the mounting plate automatically connects the screen grid to its external circuit when the tube is inserted in the transmitter.

The cooling water to the screen-grid and control grids flows through isolating coils of plastic tubing to minimize water-leakage currents. Water connections are made directly to the filament terminals of the tube.

Electrical connections to the control-grids are made by spring clips after the tube is inserted in the transmitter. Anode electrical connections are completed by means of copper straps from the tank circuit fastened in place by knurled thumb screws.

Water connections are made to the plates of the tube by means of snap-fasteners after the tube has been installed.

There are seven separate water circuits within the 8D21 tube, as follows:

Left Anode.
Right Anode.
Left Control Grid.
Right Control Grid.
Screen-Grid.
Left Filament.
Right Filament.

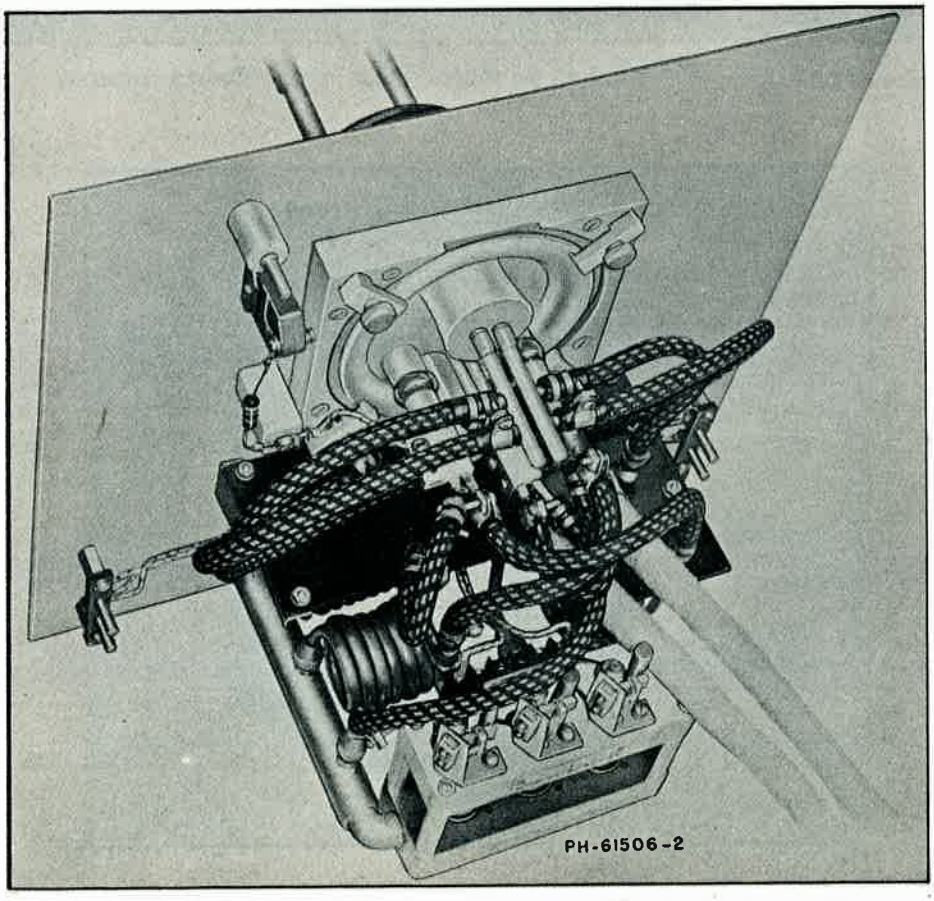
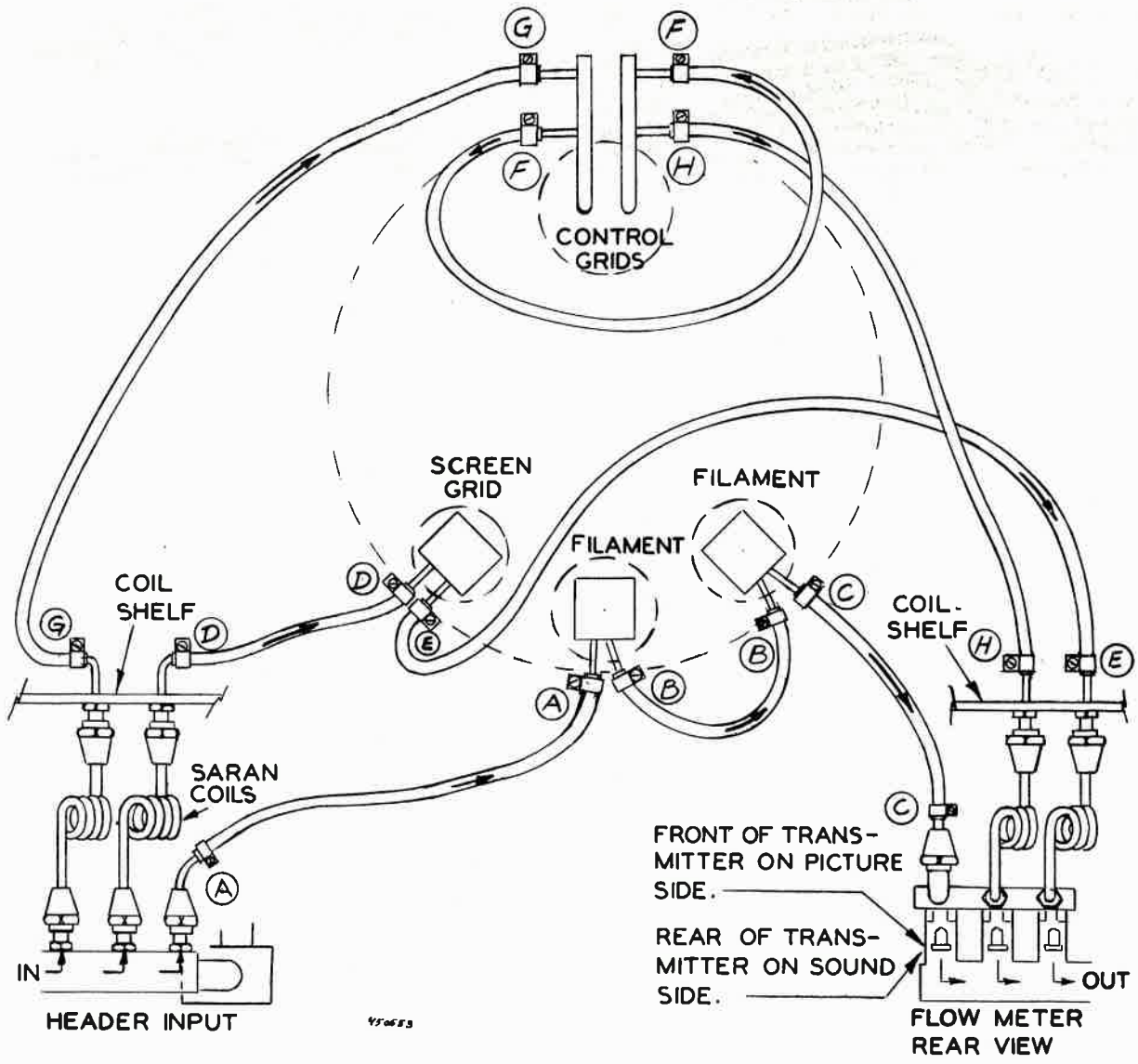



Figure 26 – Type 8D21 Tube and Mounting Plate Assembly




1- DIRECTION OF FLOW NOT IMPORTANT IN FILAMENT OR SCREEN GRID ELEMENTS
2-FLOW DIRECTION MUST BE AS SHOWN IN CONTROL GRIDS

Figure 27 – Type 8D21 Tube, Water Flow and Hose Connection Details (450553-sub 0)

There is an additional water circuit to the grid damping resistor in the visual section of the transmitter. Four of the water circuits are operated so as to be metered by only two flowmeters. The right and left control grids are operated in series and are protected by a single interlock: the right and left filament circuits are similarly connected. Thus, in conjunction with each power-amplifier tube there are a flowmeter and interlock on each of the two anodes, the control grids, the filament circuits, and the screen-grid.

*Flowmeters*—The water flowmeters and interlocks are designed so that these circuits may be metered by two assemblies. One of these assemblies is installed on the 8D21 mounting plate and handles the two control grids in series, the two filament circuits in series, and the screen-grid. A similar assembly is mounted in the rear of the power-amplifier cabinet and measures the flow to each of the two anodes. In the case of the visual power amplifier, this assembly also measures the flow of water through the grid damping resistor. The third metering circuit (in the aural amplifier) is unused. Each flowmeter is calibrated directly

in gallons-per-minute and the flow to each of these circuits may therefore be monitored. Flow is read in line with the top edge of the larger diameter center portion of the float.

All flowmeters used in this transmitter have a definite value of flow at which interlocks will close. Similarly these interlocks have a value of flow at which contacts will open. These two values are not identical values due to "hystersis" effect of the flowmeter action. These meters are designed to have as small a difference as possible between the opening and closing values, as listed in Table 5.

*Mounting 8D21 Tube in Assembly* - When installing the 8D21 power-amplifier tube in the mounting plate, reference should be made to Figures 12 and 27 as an aid in making the installation.

*Caution: Care must be exercised in making the following hose and electrical connections to tube terminals, particularly to the control grids. Always support the water piping with one hand and attach the water hose with the other to avoid strain on the terminals.*

Place the mounting plate upside down on the bench with the weight of the assembly resting on the top of the tube plate and flowmeter.

Loosen the four knurled thumb screws which hold the tube clamps in position, and turn the clamps so that they clear the tube opening.

Insert the 8D21 tube from the side on which the clamps are attached. Rotate the tube, keeping the grid terminals furthest from the water coil assembly until the top edge of the mounting plate and the anode terminals are on the same horizontal plane, as determined by a level. *The tube must be mounted in a horizontal position, and must be within five degrees of being level.*

Swing the clamps back into position and tighten the knurled thumb screws.

Fasten the two heavy leads to the filament terminals with the four 10/32 screws furnished. The filament terminals are to the lower-right of the tube as viewed in its inverted position, and are identified by the two holes through the sides of each terminal.

Attach the wire from the screen-grid mounting plate connection to the tube screen-grid by means of the machine screw furnished. This terminal is to the left of the filament terminals.

Attach the water hose from the water input header to one pipe of the lower filament terminal. These connections are marked "A-A" on Figure 27.

Connect the five and one-quarter-inch length of water hose between the other pipe of the lower filament terminal and one pipe of the upper filament terminals, as shown at "B-B".

The remaining filament water connection "C-C" from the upper filament terminal should be made to the flowmeter. The direction of waterflow through the filaments is not important.

The water hose from the Saran isolating coil, at the left of the flowmeter, connects to the left-hand pipe of the screen-grid terminal as shown at "D-D". The right-hand pipe of this terminal connects to the Saran coil at the right of the assembly "E-E". The direction of water flow through the screen-grid is also unimportant.

Connect the long jumper hose between the inner water pipe (closest to tube) of the left-hand control-grid terminal, to the outer pipe (furthest from tube) of the right-hand control-grid terminal. These hose connections are marked "F-F". Support the grid terminals with one hand to avoid strain. Direction of water flow through the control grids is important. Connection "F-F", as well as "G-G" and "H-H", must, therefore, be made with care.

Connect the grid water input hose "G-G", between the Saran Coil, adjacent to and at the left of the mounting plate, and the outer pipe (furthest from tube) of the left-hand control-grid terminal.

The grid water output hose "H-H", should be connected between the coil at the right of the mounting plate, and the inner pipe (nearest tube) of the right-hand control-grid terminal.

TABLE 5

TYPE 8D21 TUBE, TYPICAL FLOWMETER INTERLOCK SETTINGS

| FLOWMETER ASSEMBLY | WATER CIRCUIT | FLOW TO CLOSE | FLOW TO OPEN |
|---|---|---|---|
| Anode | Right Anode | 0.54 gpm | 0.50 gpm |
| Anode | Left Anode | 0.54 gpm | 0.50 gpm |
| Anode | Damping Resistor | 0.54 gpm | 0.50 gpm |
| Mounting Plate | Control Grids | 0.17 gpm | 0.12 gpm |
| Mounting Plate | Filaments | 0.17 gpm | 0.12 gpm |
| Mounting Plate | Screen Grid | 0.17 gpm | 0.12 gpm |

*Installing 8D21 Plate Assembly in Transmitter*– Insert the 8D21 tube mounting plate into the contact clamps provided along the top and bottom of the power-amplifier frame. These clamps ground the mounting plate to the frame.

Check that the screen-grid voltage terminal on the tube mounting plate makes good electrical contact with the clamp.

Connect the two filament leads from the tube to the terminals provided at the rear of the frame. Tighten the wing-nuts on the terminals.

Connect the two spring clips attached to the end of the grid-line to the control-grid terminals.

Attach the water block from the plate tank to the anodes. This may be accomplished as follows:

(a) Carefully align the water block with the anode by inserting the water block into the anode water openings provided.

(b) Spread the clamp by unscrewing the thumb screw and then applying pressure to the head of the thumb screw. This will snap the clamp out of its grooves and spread the clamp fingers.

(c) While maintaining the proper alignment push on the end of the clamp fingers. They should snap into place and hook into the tube anode, then tighten the thumb screw finger tight.

Connect the tank circuit to the anodes by means of the copper connecting straps and the knurled thumb screws.

Connect the inlet and outlet water hose from the rear of the cabinet to the water connections on the mounting plate. These connections are easily accomplished by pushing back on the sleeves while inserting the connectors.

Check all water connections.

## CONSOLE INSTALLATION

### GENERAL

Installation of the control console with respect to the transmitter proper is shown on Figures 19 and 20.

Wiring to the control console may be brought up through the open bottom. The wire kit is intended for duct installation. Eight terminal boards and six coaxial connectors are provided in the console for making all necessary external connections.

The wire chart supplied in Figure 79, lists all transmitter terminals, terminal boards, types of wire, and the equipment to which connections should be made. Note that the impedance of all console sound lines is 600 ohms and that of the console coaxial lines, 75 ohms. The console schematic diagram, Figure 81, the connection diagrams, Figures 83 and 84, and the interconnection diagram, Figure 82, will be of assistance in installation.

As shipped, step-down transformer T1101 is connected for operation from a 115-volt power source. If the incoming line voltage is other than 115 volts, the transformer tap should be changed accordingly.

### MASTER MONITOR

The Master Monitor chassis is shipped in place in the console. All tubes are installed except the kinescope 1816P4, and the C.R. oscilloscope, 5CP1-A. These tubes are shipped in separate cartons, securely packed. Before installation carefully remove the monitor chassis from the console, remove all packing material and inspect the unit for damage and loose parts. Then refer to instructions in IB-36021-2, shipped with Master Monitor, for complete installation details.

Connection for the monitoring diode is not shown on the drawings, but should be made to the first spare pushbutton on switches S1103 and S1104, through the jack panel in the visual monitoring rack.

## MONITORING EQUIPMENT, INSTALLATION

### MONITORING RACKS

Install the monitoring equipment units in the two monitoring racks as shown in outline drawing, Figure 28. The visual and aural rack connection and schematic diagrams, Figures 85 to 88 should also be referred to for interconnection details.

Although not indicated on the drawings, provision should be made for connecting the monitoring diode to the picture monitoring rack.

The individual equipments in the racks are equipped with protective fuses. In addition, for protection of wiring, fuse receptacles are provided in the 57-C switch and fuse panels and in the outlet panel. Because of the various applications of these units, fuses are not provided. In the Television Station Monitoring Equipment the following fuses should be installed:

In 57C for Picture Rack..20 amperes
In 57C for Sound Rack.... 5 amperes
In Outlet Panel.....20 amperes or less

In some installations the BA-14 series amplifier will be utilized instead of the BA-4 series. Where this is the case, the 10 db, 600-250 ohm pad should be removed from the amplifier input circuit. This pad may be disconnected by taking off the four leads attached, soldering and taping the two red