leads together, and then doing the same with the two black leads. The 600-250 ohm pad (part of MI-19126) is shown on the aural monitoring rack connection and schematic diagrams, Figures 86 and 88.

In addition to the other monitoring equipment a loudspeaker is required to permit monitoring of the sound signals. The RCA LC-1A speaker is recommended. As shipped, the output of the monitoring amplifier is connected for 500-600 ohm load. Taps may be changed at the output plug which is part of the rack wiring. Change the connections from taps 11-12 to 9-10 for a 15-ohm output.

MONITORING DIODE

The monitoring diode is designed to be mounted on either 3 1/8-inch O.D. or 1 5/8-inch O.D. coaxial transmission line. Two sets of clamps are provided for securing the unit to the line, one for each size of line. A 5/8-inch diameter hole is required for the probe.

The exact location of the hole between the visual transmitter output and the side-band filter input must be determined at the time of installation since a small amount of sound energy normally feeds back into the visual transmission line and may appear as interference in the picture.

For a first attempt, drill the 5/8-inch diameter probe hole in the transmission line outer conductor at any convenient point. The hole should be on the bottom side so that chips and dirt will not fall inside the line. If an additional hole is required, it will be specified in final transmitter tuning.

As shipped; the capacity pickup probe is mounted inside the unit for protection during shipment. Remove the probe and insert it up through the bottom. Orient the long end of the probe toward the short end of the chassis and insert it in the transmission line. Coupling is adjusted by moving the probe down or up to increase or decrease the output voltage.

The monitoring diode is supplied for use on channels 2 through 6. For operation on channels 7 through 13, replace choke L102 (green) with the blue choke which is packed separately.

A 115 volt, 60 cycle a-c supply is required for the diode and should be connected to terminals K8 and K9 in the monitoring equipment racks where it will be energized only when the console is operating.

The visual output of the monitoring diode is 75 ohms and is supplied with a plug. In operation this output is connected through the picture monitoring rack to the first spare pushbutton on the console kinescope and CRO switches.

PRELIMINARY ADJUSTMENTS

FUSES

Before applying power to the transmitter it is recommended that all circuits be checked to see if they are properly fused. With the exception of the filament primary fuses, F416 and F417, all fuses for the transmitter are located on the lower-front panel of cabinet four. Fuses F416 and F417 are mounted on the rear of the front panel of cabinet four and are accessible through the rear door.

The rating of each fuse, and the circuit in which it is used is listed in the following table.

TABLE 6

FUSE COMPLEMENT

SYMBOL	RATING	CIRCUIT
	TRANSMITTER	
F401	20 amperes	Service Receptacles
F402	20 amperes	Service Receptacles
F403	1 ampere	Crystal Oscillators
F404	1 ampere	Crystal Oscillators
F405	10 amperes	Sound Fans and Blowers
F406	10 amperes	Picture Fans and Blowers
F407	20 amperes	Sound Filaments
F408	3 amperes	Sound Bias
F409	10 amperes	FM Exciter
F410	6 amperes	Picture PA Screen
F411	10 amperes	Picture Bias
F412	20 amperes	Picture Filaments
F413	1 ampere	Line Voltmeter
F414	1 ampere	Line Voltmeter
F415	1 ampere	Line Voltmeter
F416	1 ampere	Filament Line Voltmeter
F417	1 ampere	Filament Line Voltmeter
	CONTROL CONSOLE - NONE	
	MONITORING EQUIPMENT	
-	20 amperes	Visual Rack
-	5 amperes	Aural Rack
-	20 amp. or less	Outlet Panel

CONTROL CIRCUIT CHECKS, VISUAL AND AURAL

After installation has been completed, and before attempting to operate the transmitter, a control circuit check should be made. As previously noted, the locations of the various switches, relays, circuit breakers, and terminal points are identified by the first digit of the number following the letter. For example, S417 is located in cabinet four, while switch S1110 is on the control console.

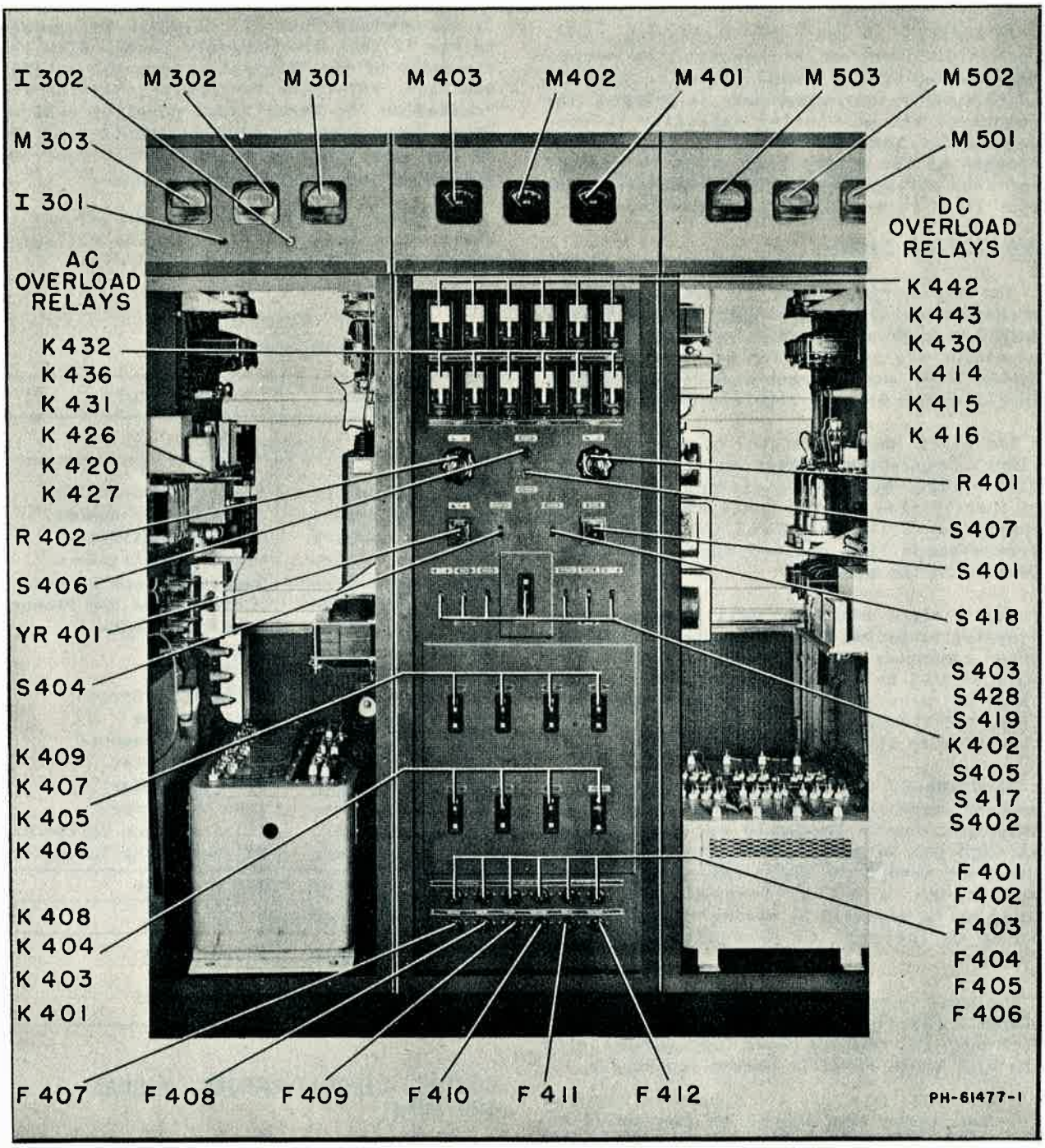


Figure 29 - Control Unit (Frame 4, Front View - Doors Removed)

In the case of terminal points, the symbol 4E12 designates terminal 12 of terminal board "E", located in cabinet four.

Reference to the ladder diagram, Figure 90, will be helpful in checking continuity through the various control circuits. Function and designation of each relay, switch, and circuit breaker are also included on the ladder diagram. The control circuit must be completed from point "A" (terminal 4E12) to contactor K444 (terminal 4E9), and also to the contactor K445 (terminal 4N10). A 250-volt a-c meter, or two series-connected 115-volt lamps not larger than 25 watts each, connected between terminal 4G2 and the several terminal points along the interlock circuit may be of help in locating a fault. Visual inspection of the flowmeter interlocks will usually indicate whether they are closed. When closed, the small bar magnet should be against the glass bulb of the switch. If the bar magnets are not, check for adequate waterflow.

Before proceeding with any control check, make certain that the 8D21 tubes are properly mounted and connected.

Open the water valves in the rear of cabinets one and eight.

Check water gauge on water circulator for proper level.

Remove all plate caps from the high-voltage rectifier tubes in each power supply, cabinets 3, 5, 6, and 8.

When checking the control circuits, the following procedure is recommended:

Operate ALL switches and circuit breakers on the panel of cabinet four to the OFF position.

Operate the Sound Plate and Picture Plate switches (S201 and S701, respectively) to the OFF position.

Operate switches S417 ("Picture OL") and S428 ("Sound OL") to the "Single Trip" position.

Energize the 110-volt circuit to the transmitter. If the crystal holders are in their sockets, the crystal indicator lamps should light. There are three lights in cabinet seven, and two lights in cabinet one. The crystal indicator lamps will operate only intermittently after the crystal ovens have reached proper operating temperatures.

Operating the Picture Service Receptacles and the Sound Service Receptacles switches (S402 and S403, respectively) to the ON position should energize the cabinet ceiling lamps and convenience outlets.

Energize the 220-volt, three phase power circuit to the transmitter. The two neon lamps inside cabinet four should light.

Close the AC Main Line circuit breaker (K401). Rotate the Line Voltage switch (S401) to positions one, two, and three, and read the voltage of each phase on meter M402. This meter is located on the meter panel of cabinet four.

Close the Control Circuit circuit breaker (K402). Alternately press the Plate Power ON and Plate Power OFF pushbutton switches (S406 and S407, respectively). Contactor K413 in the rear of cabinet four should close when S406 is pressed, and should open when S407 is pressed. Operation of pushbutton switches S1109 and S1110, on the control console, should cause similar contactor action.

Depress Plate Power OFF switch, S407.

Close Transmitter Start switches, S404 and S1107. Both switches must be closed before the "Water" and "Air" contactor (K410) will operate.

Although it is possible at this point to start the water cooling unit, the circulating system should be checked separately as specified in the succeeding heading "Circulating System Checks."

The correct operation of all water interlocks will cause contactors K444 (Picture) and K445 (Sound) to close, lighting the water-indicator lamps, I202 and I701 on the transmitter, and I1100 and I1101 on the console. Note that the water interlock circuits include the interlocks on the dummy load, Vestigial Sideband Filter, over-temperature relays (S810 and S113), the flowmeter interlocks in cabinets one and eight, and those on the 8D21 tube-mounting plates.

Close the "Picture Filaments" switch (S405). Relay K411 should close, and the ceiling fans and blowers in cabinets five to eight should operate. Check the lubrication of the blowers. Where required, use SAE-20 oil. All fans have sealed-in lubrication.

Close the "Sound Filaments" switch (S419). Relay K428 should close, and the ceiling fans and blowers in cabinets one to three should start. Check the lubrication of the blowers and where necessary, use SAE-20 oil. The fans have sealed-in lubrication.

Check the primary tap connections on all filament transformers. See Figures 33 and 34.

Rotate the power-amplifier filament rheostats (R401 and R402) to the extreme counterclockwise position.

Rotate the knob on the induction regulator (YR401) to the extreme counterclockwise position.

Rotate the handle of the Line Voltage switch (S401) to position number four.

Close the Filament circuit breaker (K404). Filament indicator lamps on transmitter (I201 and I702) and console (I1110 and I1111) should light.

Time-delay relays, K412 and K429, should operate. These relays should be adjusted to operate in 30 to 40 seconds.

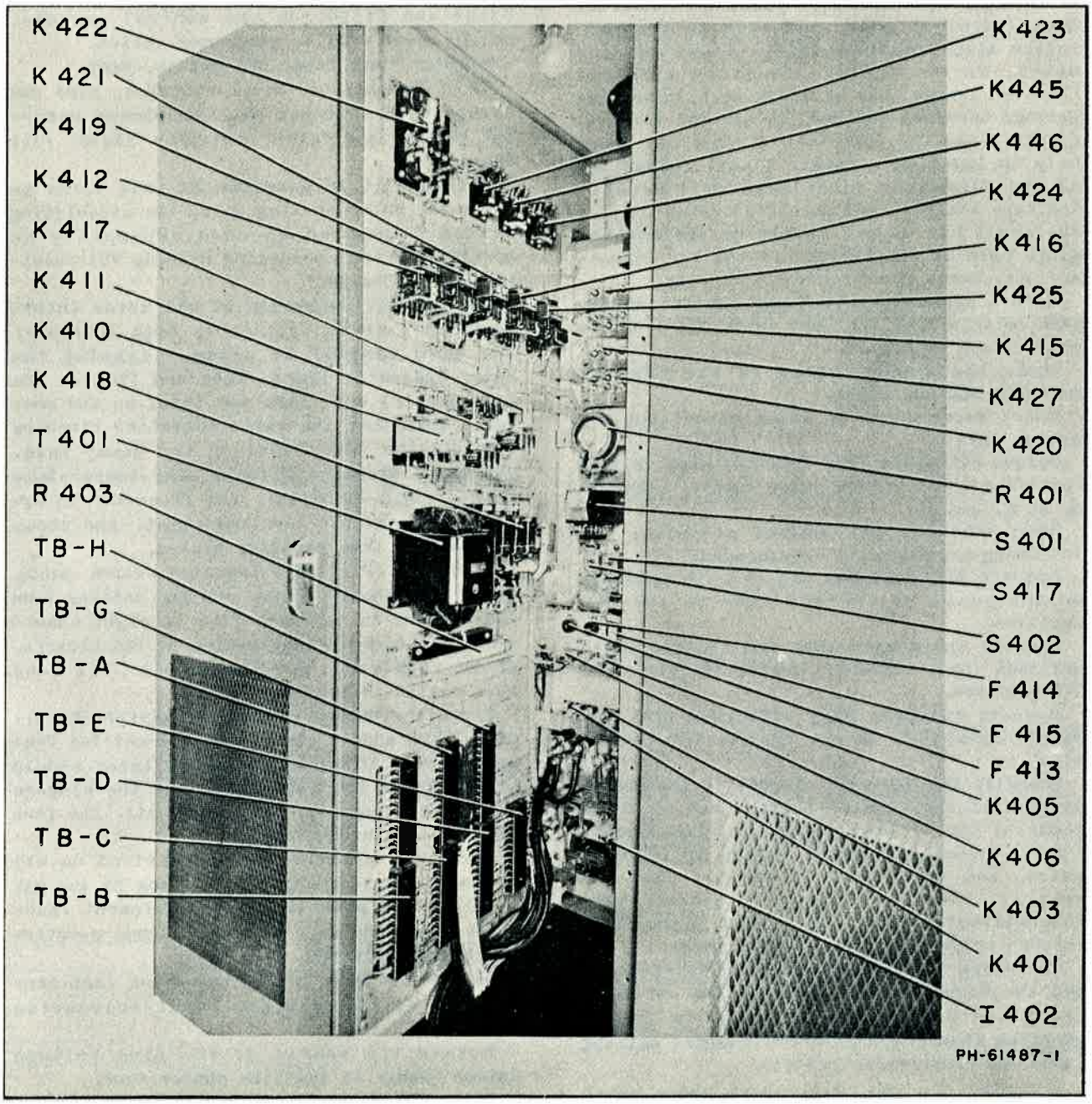


Figure 30 - Control Unit (Frame 4, Rear View - Left)

Raise the filament primary voltage by rotating the knob on the Induction Regulator (YR401) to the voltage (on meter M402), corresponding to the filament transformer connections. See Figures 33 and 34 for a-c connections.

Note the filament voltage of the 8D21 tubes on meters M401 and M403. These readings should be 2 to 2.5 volts. If the voltage is excessive, operate the filament switches to their OFF position, and check the wiring to rheostats R401 and R402, the connections to the primary windings of each 8D21 filament transformer, and the starting reactor (L232 and L732). Reference should be made to installation drawings, Figures 34 and 80, when checking interconnecting wiring.

Measure the filament voltages at the sockets of all tubes in the transmitter. All filament voltages must be within plus or minus five per cent of the rated voltage, except on octal and miniature type tubes which must be within plus or minus ten per cent. If necessary, readjust the primary taps of the filament transformers. Refer to Figures 33 and 34 for connections corresponding to local power sources.

Close all interlocked doors, and operate the Picture Plate switch (S701). If all door interlocks are closed, the high-voltage grounding relays, K501, K601, and K604 should operate. Individually open and close each interlocked door in cabinets four to eight. Opening any one of these interlocked doors should de-energize the three grounding relays.

Operate the Sound Plate switch (S201). This should operate the high-voltage grounding relays, K301 and K304. Individually open and close each interlocked door in cabinets one to four. Opening any one of these interlocked doors should de-energize the two grounding relays.

Operate the Overload Reset switch (S418 transmitter or S1108 console). This will energize the reset coil on notching relays K422 and K438.

At this point it is suggested that the visual and aural sections be checked separately.

To check the aural section, operate the Picture Filament switch (S405) to the OFF position. This removes all voltages from the visual section of the transmitter.

CAUTION: Make certain the Delta/Wye switches (S301, S601) and the plate circuit breakers, K408 (Sound Driver) and K409 (Sound PA), are open.

(a) Close the Sound Plate switch (S201).

(b) Close the Sound Filaments switch (S419).

(c) Press the Plate Power ON switch (S406). The Auto-Start indicator lamps (I302 and I1107) will light if the plate time-delay relay has not yet closed.

(d) The plate time-delay relay (K429) will close.

(e) The inverse time-delay relay (K441) will close.

(f) The sound PA bias contactor (K433) will operate and energize the 5U4G bias rectifier plates in cabinet three.

(g) The bias interlock relay (K302) will operate and the bias indicator lamps (I104 and I1103) will light if the bias supply is functioning.

(h) The plate contactor (K434) will operate.

(i) The Auto-Start indicator lamps (I302 and I1107) will be extinguished.

(j) The plate indicator lamps (I103 and I1105) will light.

(k) The bias voltmeter, M202, will indicate the bias voltage.

(l) Depress the Plate Power OFF switch (S407).

To check the visual section of the transmitter, operate the Sound Filament switch (S419) to the OFF position. This removes all voltages from the aural section of the transmitter.

CAUTION: Make certain that Delta/Wye switches (S301, S601) and the plate circuit breakers, K405 (Picture Driver), K406 (Picture PA), and K407 (Picture Modulator) are open.

(a) Install a temporary jumper between terminals 8-B7 and 8-G8 thus short-circuiting the contacts on the PA bias interlock relay (K801). Then close the Picture Filament switch (S405).

(b) Close the Picture Plate switch (S701).

(c) Press the Plate Power ON switch (S406). The Auto-Start indicator lamps (I602 and I1006) will light. The plate time-delay relay (K412) will close and after 30 to 40 seconds the following should occur in the picture section of the transmitter:

(d) The inverse time-delay relay (K425) will close.

(e) Contactor K417 will operate and energize the 5U4G bias rectifier plates in cabinet six.

(f) The bias interlock relay, K602, will close if the bias supply is functioning.

(g) Bias indicator lamps (I801 and I1102) will light.

(h) When the plate contactor (K418) operates the Auto-Start indicator lamps (I602 and I1006) will be extinguished and the plate indicator lamps (I802 and I1104) will light.

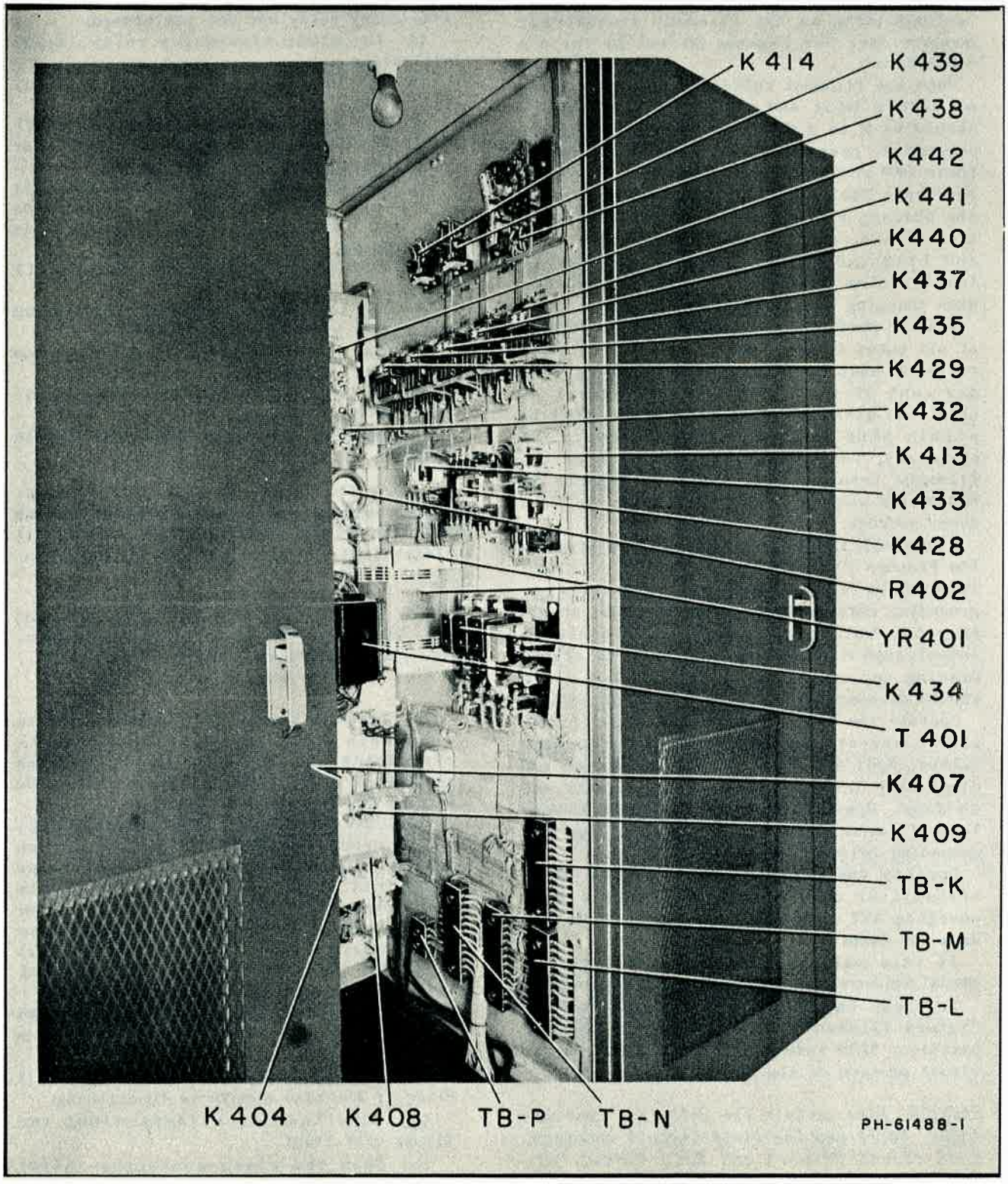


Figure 31 - Control Unit (Frame 4, Rear View - Right)

To set the tripping point of the overload relays, remove the front covers of the overload relays. Note that the tripping point of each relay is adjustable and that the range of adjustment is shown. Adjust the tripping point of the overload relays listed in Table 7.

The following checks should be made to the overload system. Reference is made to the visual portion of the transmitter only, since the visual and aural sections have identical overload circuits. Symbols in parenthesis refer to the corresponding unit in the aural section.

Operate switches S417 (Picture OL) and S428 (Sound OL) to the Single Trip position.

Mechanically trip each overload relay. The following operations should take place immediately:

(a) Plate contactor K418 (K434) will release and the plate indicator lamps (I802 and I1104) will be extinguished.

(b) The inverse time-delay relay, K424 (K440), will operate.

(c) The notching relay, K422 (K438), will operate and advance one notch.

(d) The overload pilot lamps I601 (I301) and I1108 (I1109) and the AUTO-START indicator lamps (I602, I1106 or I302, I1107) will light.

(e) The notching auxiliary relay, K423 (K439) will operate and open contact "L" as shown in Figure 90.

(f) Approximately one second after an overload relay is tripped the inverse time-delay relay, K424 (K440), will reclose.

(g) The plate contactor, K418 (K434), cannot reclose because of the open contact "L".

The following procedure checks the multiple overload recycling sequence of the overload system.

Operate the Picture OL switch (S417), to the Multiple Trip position.

Mechanically trip any one of the overload relays twice in succession. The following operations should take place immediately:

(a) The plate contactor K418 (K434) will release.

(b) The Auto-Start indicator lamps, I602 (I302), and I1106 (I1107) will light.

(c) The inverse time-delay relay K424 (K440) will operate.

(d) The notching relay K422 (K438), will operate twice, thus advancing two notches.

(e) The overload reset time-delay relay, K421 (K437), will be energized.

(f) The overload pilot lamps I601 (I301), and I1108 (I1109) will light.

(g) The notching auxiliary relay, K423 (K439), will operate.

(h) Approximately one second after tripping the overload relay, the inverse time-delay relay K424 (K440) will reclose, thereby re-energizing the plate contactor (K418).

(i) The Auto-Start indicator lamps will be extinguished, and the Plate indicator lamps will light.

(j) In approximately one minute, the overload reset time-delay relay, K421 (K437), will operate, resetting the overload notching relay, K422 (K438), and extinguishing the Overload indicator lamp.

TABLE 7

OVERLOAD RELAYS - TRIPPING POINT

OVERLOAD RELAY	RELAY SYMBOL	TRIPPING POINT CHANNELS 2-6	TRIPPING POINT CHANNELS 7-13
Sound PA DC OL	K442	2.5 amperes	2.5 amperes
Sound PA AC OL	K432	160 amperes	160 amperes
Sound PA AC OL	K436	160 amperes	160 amperes
Sound Driver DC OL	K443	2.0 amperes	2.5 amperes
Sound Reflectometer DC OL	K431	0.05 ampere	0.05 ampere
Picture Reflectometer DC OL	K430	0.05 ampere	0.05 ampere
Picture Modulator DC OL	K414	3 amperes	3 amperes
Picture Driver DC OL	K415	2.0 amperes	2.5 amperes
Picture PA DC OL	K416	2.5 amperes	2.5 amperes
Picture PA Screen DC OL	K426	0.4 ampere	0.4 ampere
Picture PA AC OL	K420	160 amperes	160 amperes
Picture PA AC OL	K427	160 amperes	160 amperes

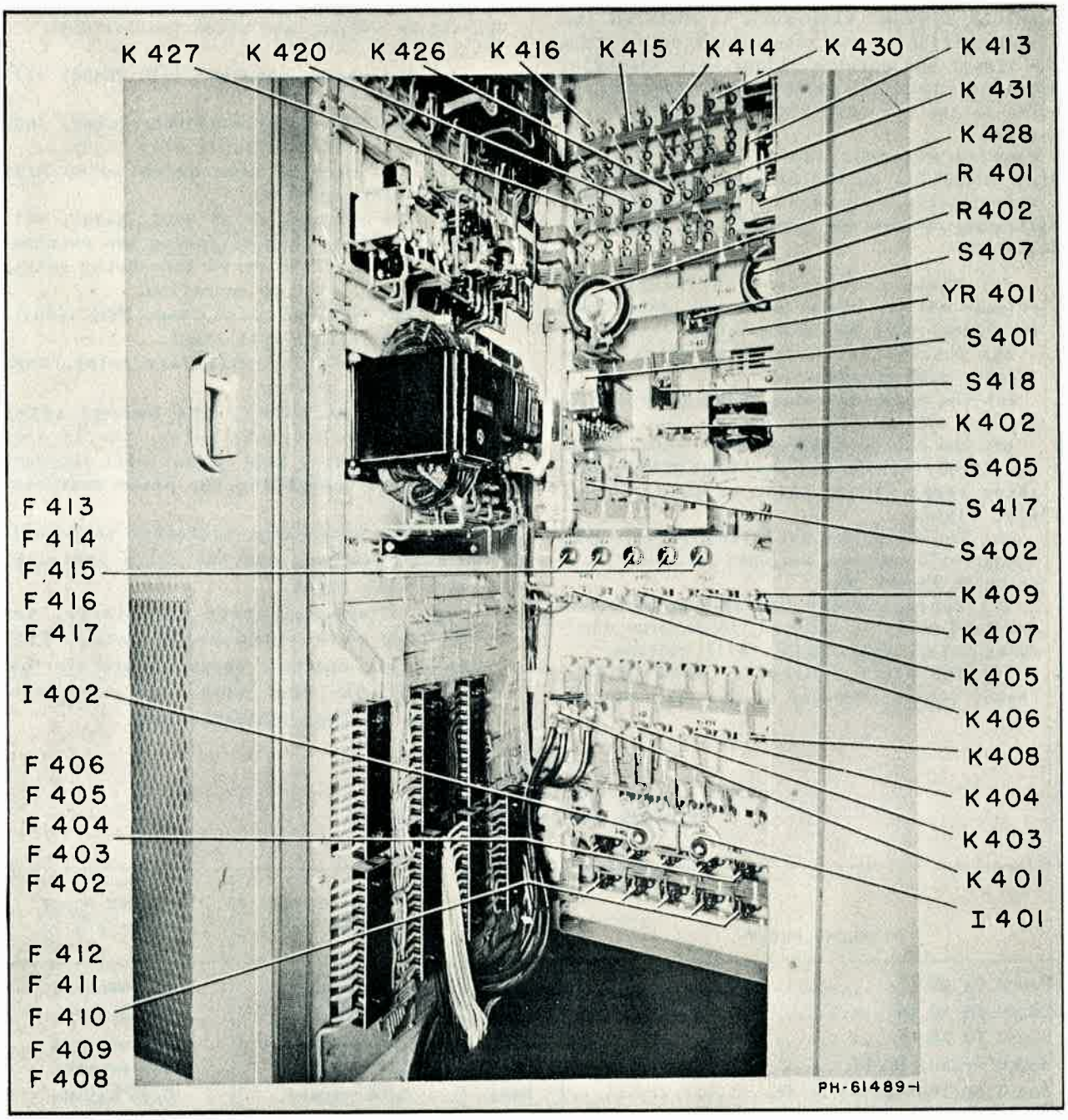


Figure 32 - Control Unit (Frame 4, Rear View - Center)

Mechanically trip any one of the overload relays three times in succession. The following should occur:

(a) The plate contactor, K418 (K434), will release.

(b) The inverse time-delay relay will be energized.

(c) The overload pilot lamps I601 (I301), and I1108 (I1109), will light.

(d) The overload notching relay, K422 (K438), will trip three times in succession causing contact "I" of this relay to open. This in turn removes all energizing voltages from the relays in the overload control circuit preventing the overload circuit from resetting itself.

The automatic reset relay, K421 (K437), will not operate after three overloads occur.

(e) Depressing the overload reset button, S418 (transmitter), S1108 (console), will restore energizing voltage to the overload notching relay, K422 (K438). This will return the contacts of this relay to their normal operating positions permitting resumption of normal control circuit operation.

With the control circuits energized up to, and including the plate contactor, K418 (K434), check the operation of the surge suppressor relay, K603 (K303), as follows:

(a) Again make certain that the Delta/Wye switches (S601, S301) are open.

(b) Operate the Picture (Sound) PA circuit breaker K406 (K409) to the ON position.

(c) The time-delay relay, K419 (K435), will operate and in approximately one second the surge suppressor relay, K603 (K303), will operate. In addition the picture screen relay, K446, will operate.

Having completed all preceding checks, operate the Control Circuit and Filaments circuit breakers (K402, K404) to the OFF position, then remove the jumper from terminals 8-B7 and 8-G8.

Set filament rheostats R401 and R402 to the extreme counterclockwise position.

CIRCULATING SYSTEM CHECKS

To check the water circulating system, the main line breaker K401 and the control circuit breaker K402 must be closed. Then operate the Transmitter Start switches S404 and S1107 to the ON position.

Close circuit breaker K403 ("Air and Water"). The water-cooling unit and the ceiling fan in cabinet four should start. As soon as the water-pump starts, check the following for leakage:

(a) Visual and Aural power-amplifier stages.
(b) Transmitter plumbing.
(c) Station plumbing.

The motor rotation should now 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 cooler noise. As shipped the fan should deliver approximately 1600 cubic feet per minute when the external duct and louver back pressure is 0.2-inch of water.

Check the water pressure in cabinets one and eight. Under the conditions specified on Figure 21, the normal operating pressure should be between 68 and 75 pounds-per-square inch.

It is necessary to maintain a pressure drop of 60 pounds-per-square-inch across the water passages of the 8D21 tube. A gauge located at any one point in the system WILL NOT indicate this pressure.

The pressure gauges in cabinets one and eight do not directly measure the net pressure on the tube because back-pressure values are not taken into account. In order to properly evaluate the pressure gauge readings refer to the typical water system diagram, Figure 21.

It is to be noted from this diagram that the transmitter pressure gauge should read 70 pounds-per-square-inch in order to obtain the required pressure drop of 60 pounds-per-square-inch across the 8D21 tube. The pressure at the output of the water cooler should be approximately 72-pounds-per-square-inch to maintain the required pressure at the tube.

In the MI-19045 unit the regulator pressure may be adjusted by turning the hex cap 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 diaphragm when the pump is started. This valve remains closed during normal

operation and small changes of pressure are governed through a small orifice in the movable part of the relief valve.

If the waterflow is inadequate, check for an obstruction in the tube or transmitter plumbing or, check small orifice in water line to damping resistor R735 in the visual section. The orifice may be cleaned by opening the flare fitting in the water pipe connection between the copper line and the reducing fitting to the plastic isolating coil. The pipe containing the orifice is toward the front of the cabinet, when observed from the rear (cabinet eight). The orifice is in the 3/8-inch end of the fitting, under the flare nut.

The rated and minimum rate of water flow through each element of the RCA type 8D21 tube, based on the rated pressure drop across the tube of 60 pound-per-square-inch, are listed in the following table:

TABLE 8

WATER FLOW THROUGH TYPE 8D21 TUBE

Tube Element	Rated*	Minimum**
Anode (each)	0.55 gpm	0.50 gpm
Control Grid	0.18 gpm	0.10 gpm
Screen Grid	0.18 gpm	0.10 gpm
Cathode	0.18 gpm	0.10 gpm

*Guaranteed values.

**Operation at lower flows will cause permanent damage to the tube.

Operation of the tube at a relatively high water pressure is required because of the small cross-sectional area of the water passages in the tube.

In a new system there are three possible sources of dirt which could cause a restriction in the water passages of the tube or flowmeters. They are listed as follows:

a. Solder, soldering paste, and other dirt left in the plumbing at the time of installation.

b. Foreign matter in the water tank, or circulating system.

c. Packing material from the water circulating pump.

If an element of the 8D21 is clogged, temporarily reverse the waterflow through that element.

If a flowmeter float does not change position as the pump is started or stopped, disassemble and clean the flowmeter as follows:

(a) Above the faulty flowmeter unit, unscrew the hexagon cap or the cap with two holes, using the spanner wrench furnished. Then remove the spring, or, using above wrench, remove inner screw ring.

(b) Push up gently on the glass tube. In some instances it may be necessary to remove the metal and rubber washers. In other cases pushing on the glass tube will force the washers upward and out of the assembly.

(c) Run a soft, clean cloth through the inside of the glass tube.

(d) Lift the float assembly out and clean with a soft, dry cloth. Replace the float.

(e) Replace the glass tube, graduations correct side up. Center glass carefully about the float.

(f) Replace the rubber washer, and then the metal washer.

(g) Set the spring or inner ring in place on top of the assembly and replace the cap. Make certain the gasket seats properly in the opening. If this is not done it may be cut when the cap is tightened.

Do not interchange glasses on the tube mounting plate with those in the rear of cabinets one and eight.

As a further operating aid, procure a piece of scotch tape or a small paint brush and remove any iron filings from the permanent magnets below the water-interlock floats.

Restriction in water flow not due to foreign matter in the system may be caused by subnormal flow in the 8D21 tube passages. In this event remove the 8D21 from the transmitter and connect the low flow circuit of the tube to an external source of water supply. Use as high a pressure as possible, not exceeding 100 psi, and allow the tube to exhaust "free delivery." Flush the tube in this manner and reverse the flow through the tube several times in order to free any particles which may have lodged in the water passages.

In the event this flushing does not remove the restriction it is possible that the tube may have a permanent internal restriction. In order to check for this, apply, from an external water source, a pressure of 60 psi to the tube and measure the flow either by the use of an external waterflow meter of known accuracy, or by the volume-time method. If the results of this measurement indicate subnormal flow, the tube is probably defective. Complete and accurate information on recorded waterflow at the rated pressure of 60 psi should be submitted with any tube believed to be defective.

If the difficulty lies in the filament or control grid water passages, the series hose between the elements should be removed and each element flushed separately.

In the case of the filaments and the control grids, these elements must be connected and measured in series before submitting any tube data for a defective tube.

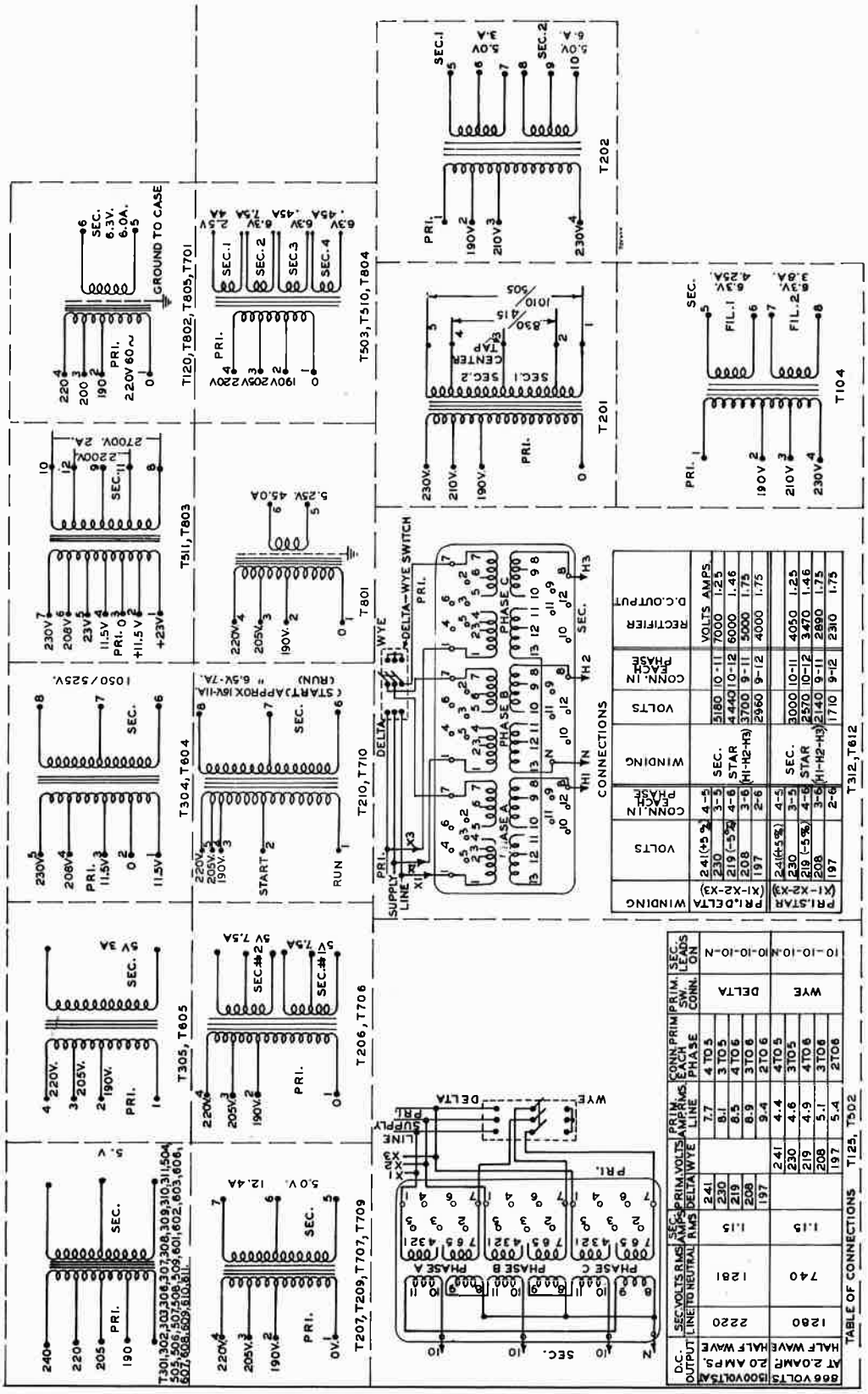


Figure 33 – Transformer Connection Diagrams (735640-sub 0)

Where it is felt that the opening and closing settings of the flowmeter interlocks, as given in Table 5, are incorrect it is possible to adjust the interlocks so as to shift the operating range up or down. However, the spread between opening and closing values is fixed by assembly design and no adjustments are provided. Any interlock adjustments should be made only when absolutely necessary. Adjustment is accomplished by loosening the two clamp screws which secure the magnet assembly and shifting the assembly upward to increase or downward to decrease the values. Extreme caution should be exercised in making this adjustment to avoid lowering the adjustment to achieve a low closing point, thus incurring an opening point which is below the absolute minimum flow indicated in the table.

Under no circumstances should the interlocks be set abnormally low simply for the sake of making the interlock close, since low flow is almost always indicative of restricted waterflow.

Each power amplifier is protected by a water temperature device, Aquastat, located in the rear portion of cabinets one and eight. The Aquastat is fitted with an interlock which may be set to operate at any temperature up to 200 degrees. This insures that the transmitter cannot be operated under conditions which permit excessively high water temperatures, such as improper operation of the water-cooling system. Under normal conditions of operation the Aquastat interlock should be adjusted to operate at a temperature of 150 degrees Fahrenheit.

ADJUSTING BUCKING BIAS SUPPLY, VISUAL PA

To adjust the PA bucking bias supply, operate all switches and circuit breakers except the main line circuit breaker (K401) and the Transmitter ON switches (S404 and S1107) to the OFF position.

Attach the plate caps to the two type 816 bias supply rectifier tubes (X820, X821).

By means of a temporary jumper, ground terminal E829.

Connect the negative terminal of an auxiliary voltmeter of at least 1000 ohms-per-volt sensitivity and 0-to 300-volt scale to the upper end of R947, and the positive terminal to the upper end of R948. Place the meter so that it may be read through the perforated door. Carefully insulate the meter and leads from high-voltage circuit components.

Operate Control Circuits, Air and Water, and Filaments circuit breakers (K402, K403, and K404, respectively) to the ON position. Close Picture Filaments switch, S405, and Picture Plates switch, S701.

Note the meter readings of the PA Grid Voltage meter (M702) and the auxiliary meter. Because of the temporary ground at terminal E829 meter M702 indicates the bias supply output. The auxiliary meter reads the drop across the 6AS7G tubes. If meter M702 and the auxiliary meter indicate other than 1025 volts and 145 volts, respectively, it is necessary to change the primary tap connection on transformer T803 and to adjust the setting of R946. Because these adjustments are interrelated, it may be necessary to readjust one component after changing the setting of the other.

At this point operate the picture Plate switch to the OFF position.

If the auxiliary meter reading is other than 145 volts, move the lead normally connected to terminal 3 on terminal board TB-L toward terminal 5 if the reading is low, or toward terminal 1 if the voltage is high. The tap should be left on the terminal which results in a meter reading nearest 145 volts. This voltage should not be allowed to exceed 250 volts at any time during adjustment. Terminal board TB-L is located near the lower right-hand corner of the PA Grid Bias Supply.

If meter M702 does not indicate 1025 volts, operate the Picture Plate switch (S701) to the OFF position and rotate R946 clockwise if the voltage is low, or counterclockwise if the voltage is high. *Do not attempt to make this adjustment while the bias supply is operating.* Then operate the Picture Plate switch to the ON position and note the meter reading. Repeat this and the preceding step until both voltages are correct.

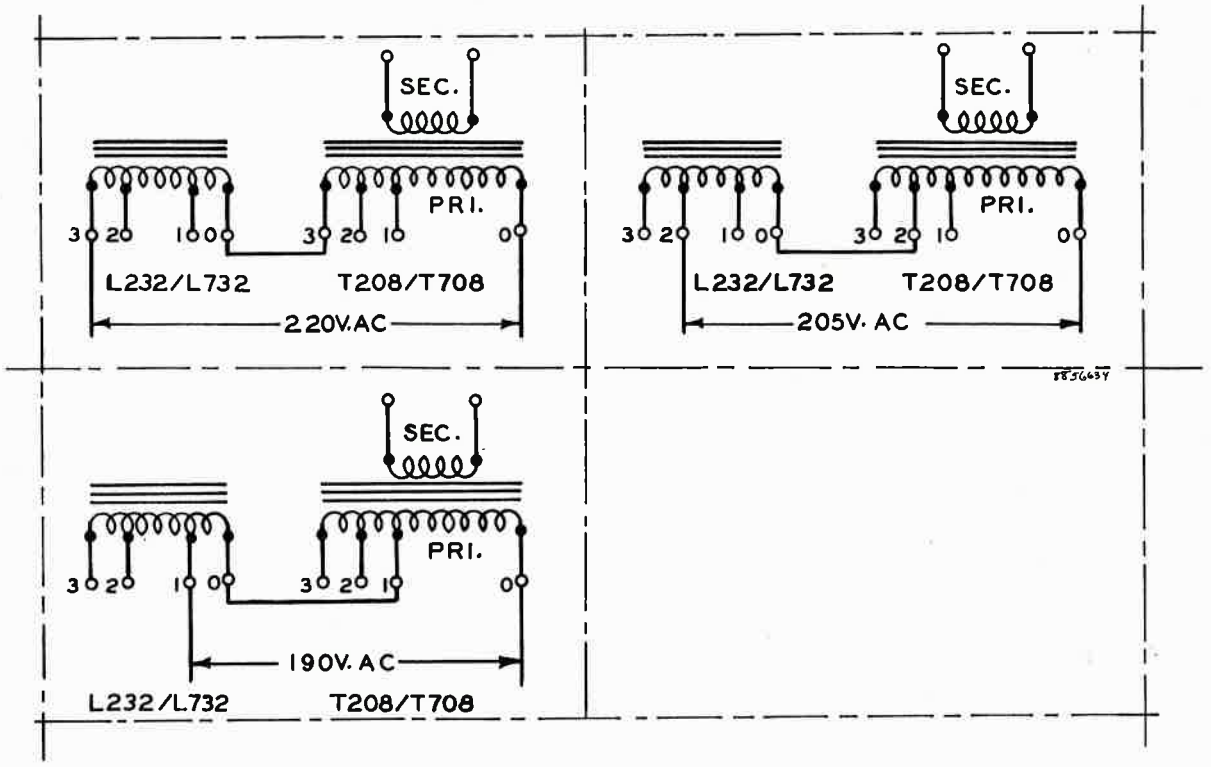
Operate Picture Plate switch to the OFF position.

Disconnect the auxiliary meter, and connect an auxiliary meter with 0-10 volt range and at least 1,000 ohms-per-volt sensitivity across one of the 100-ohm resistors in the plate circuits of X822, X823, and X824.

Operate the Picture Plate switch to the ON position.

Successively measure the voltage drop across each of the 100-ohm resistors in the plate circuits of X822, X823, and X824, repeating this and the three preceding steps when changing voltmeter connections. The plate current (in ma) of tubes X822, X823, and X824 is 10 times the voltage across the plate resistor. These currents should be approximately equal since self-equalizing action is provided by the plate and cathode resistors. Differences are permissible provided the plate dissipation of the 6AS7G tubes is not exceeded at the highest operating line voltage.

Satisfactory operation can be expected if the plate current of each unit of the 6AS7G tubes does not exceed 50 milliamperes (5 volts drop across the plate resistor) at normal line voltage. Excessive differences in current are usually the result of differences in cathode emission caused by aging tubes. If



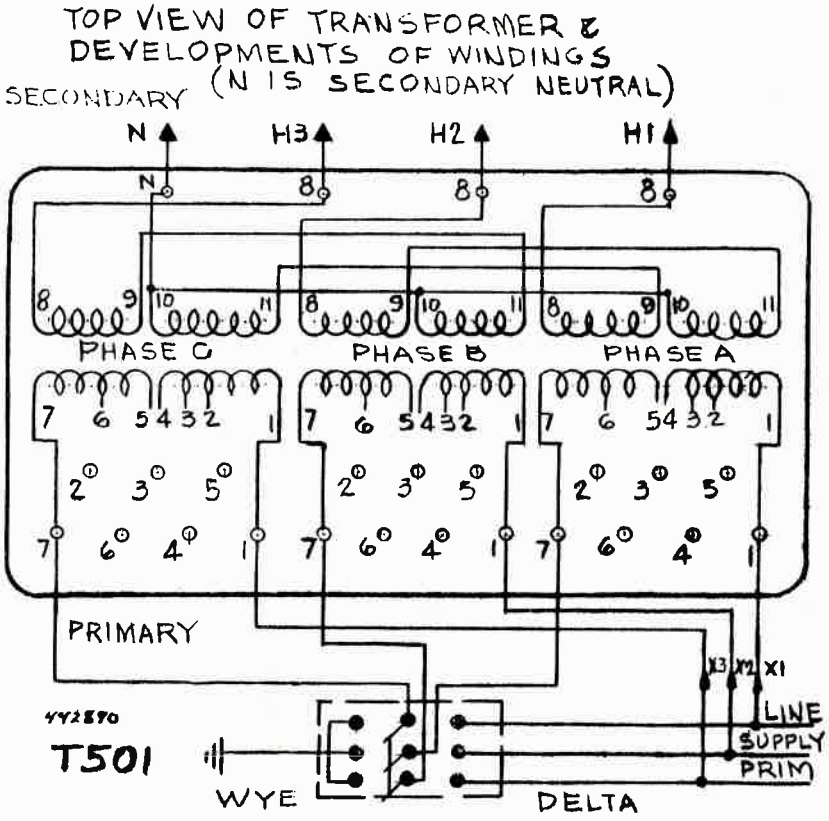


Figure 34 – Filament Transformer and Reactor Primary Connection Diagrams
(442890-sub 4: 8856634-sub 0)

the current in one tube is excessive, one or more of the 6AS7G tubes should be replaced.

Operate the Picture Plate switch to the OFF position.

Remove the temporary ground from terminal E829 and remove the auxiliary meter.

ADJUSTING MODULATOR POWER SUPPLY, VISUAL

To adjust the output voltage of the visual modulator power supply, place all switches and circuit breakers except the main line circuit breaker (K401) and the Transmitter ON switches (S404 and S1107) in the OFF position.

Rotate the Picture Gain control (R922) to zero and place the Amplifier Coupling switch (S801) in the a-c position.

Connect a one-ampere d-c meter in series with the lead which connects terminal 3 on TB-C to terminal 11 on TB-B.

Connect a d-c meter having a range of 0-300 volts and a sensitivity of at least 1000 ohms-per-volt between terminal 3 on TB-C and terminal E516.

Attach plate caps to modulator rectifier tubes (X507 to X512), inclusive.

Close the Control, Air, and Water, and Filament circuit breakers (K402, K403, and K404). Then close the Picture Filament switch, S405.

Close the Picture Modulator circuit breaker (K407) and the Picture Plate switch (S701). Note the current and voltage indicated on the auxiliary meters. A plot of these values should fall on curve "A" in Figure 35. If not, operate the Picture Modulator circuit breaker (K407) to the OFF position, and change the position of the sliding tap on R502, then operate K407 to the ON position, and plot the new values of voltage and current on the graph. This adjustment should be repeated until the plot of the observed readings is a point on curve "A".

ADJUSTING SCREEN GRID POWER SUPPLY, VISUAL PA

To adjust the PA screen grid supply, operate all switches and circuit breakers except the main line circuit breaker (K401) and the Transmitter ON switches (S404 and S1107) to the OFF position.

Attach the plate caps to the type 816 (X520, X521) PA screen rectifier tubes and to the type 8008 PA plate rectifier tubes (X606 to X611, inclusive).

Connect the negative terminal of an auxiliary voltmeter of at least 1000 ohms-per-volt sensitivity and 0-300 volt scale to the upper end of R539 and the positive terminal to the upper end of R540. Place the meter so that it may be read through the perforated door. Carefully insulate the meter and leads from high-voltage circuit components.

Operate Control Circuits, Air, and Water, and Filaments circuit breakers (K402, K403, and K404) to the ON position. Close Picture Filaments switch, S405, Picture Plate switch, S701, and the Picture PA circuit breaker (K406). Operate the Delta/Wye switch, S601, to the Wye position.

The power-amplifier grid-leak interlock relay, K802, should operate, short-circuiting the grid-bias protective resistor, R944. Opening the Delta/Wye switch will cause the contacts of this relay to open.

Note the PA screen grid voltage on meter M601 and the 6AS7G tube voltage drop on the auxiliary meter. If these meters read other than 800 volts and 145 volts, respectively, it is necessary to change the primary tap connection on transformer T511 and to adjust the setting of R549. Because these adjustments are inter-related, it may be necessary to readjust one component after changing the setting of the other. In any event, make certain the Picture Plate switch is in the OFF position before adjusting any taps.

Thus, if the auxiliary meter reading is other than 145 volts, move the T511 tap connection, normally located on terminal 3, toward terminal 5 if the reading is low, or toward terminal 1 if the voltage is high. The tap should be left on the terminal which results in a meter reading closest to 145 volts. This voltage should not be allowed to exceed 250 volts at any time during adjustment.

If meter M601 does not indicate 800 volts, open the Picture PA circuit breaker and Picture Plate switch. Rotate R549 clockwise if the voltage is low, or counterclockwise if the voltage is high. Do not attempt to make this adjustment while the power supply is operating. Then close the Picture PA circuit breaker and operate the Picture Plate switch to the ON position. Note the meter reading. Repeat this and the preceding step until both voltages are correct.

Operate the Picture Plate switch to the OFF position.

Disconnect the auxiliary meter, and connect an auxiliary meter with 0-10 volt range and at least 1,000 ohms-per-volt sensitivity across one of the 100-ohm resistors in the plate circuits of X513 and X514.

Operate the Picture Plate switch to the ON position.

Successively measure the voltage drop across each of the 100-ohm resistors in the plate circuits of X513 and X514, repeating the three preceding steps when changing voltmeter connections. The plate current in ma of these tubes is 10 times the voltage across the plate resistor. These currents should be approximately equal since self-

equalizing action is provided by the plate and cathode resistors. Differences are permissible provided the plate dissipation of the 6AS7G tubes is not exceeded at the highest operating line voltage.

Satisfactory operation can be expected if the plate current of each unit of the 6AS7G tubes does not exceed 50 milliamperes (5 volts drop across the plate resistor) at normal line voltage. Excessive differences in current are usually the result of differences in cathode emission caused by aging tubes and resistors. If the current in one tube is excessive, one or more of the 6AS7G tubes should be replaced.

Operate the Picture Plate switch and the Picture PA circuit breaker to the OFF position and remove the auxiliary meter.

MODULATOR ADJUSTMENTS, VISUAL

First step in adjustment of the visual modulator is selection of matched tubes which will have approximately identical operating characteristics.

To select the required 4E27 tubes (X807 to X812), attach the plate caps to the 8008 visual modulator rectifier tubes (X507 to X512).

Operate the AC Main Line circuit breaker (K401) to the ON position.

Operate the Control Circuit (K402), Air and Water (K403), Filaments (K404), and Picture Modulator (K407) circuit breakers to the ON positions.

Check reading of the filament meters, M401 and M403, with a meter of known accuracy connected directly to the tube filament terminals. If the filament voltage readings on the auxiliary meter vary from those listed in the typical meter readings, Table 15, change the taps accordingly. The transformer connection diagrams are given in Figures 33 and 34. Record the meter readings on M401 and M403 for future reference.

Operate the Transmitter ON switches (S404 and S1107) to the ON positions.

Depress the Plate Power ON pushbutton switch (S406 on the transmitter or S1109 on the console).

Operate Picture Plate switch S701 to the ON position.

Operate the Picture modulator circuit breaker, K407, to the ON position.

Operate the Black Level control to obtain a modulator plate current of approximately one ampere.

Individually connect a zero-to-three voltmeter of at least 1000 ohms-per-volt sensitivity across one of the modulator 10-ohm plate resistors, R838 to R843, inclusive. These resistors have a five per cent tolerance, and the drop in the resistor will be 10 times the plate current.

Operate the Picture Driver and Picture PA circuit breakers to the OFF positions.

Operate the Picture Gain control to zero.

In this manner, check and record the individual tube currents for each modulator tube. Replace any tubes which give excessively high, or low plate current readings. These tubes may be paired with other tubes which give high, or low readings. The plate currents of individual tubes in the final selection should be matched within a range of one and one-quarter to one.

If the plate current of the modulator suddenly jumps to approximately 1.5 amperes and remains at this value independent of Black Level control setting, the symptoms point to a grid-filament short circuit in one of the 4E27 modulator tubes. The short circuit will very likely be of an intermittent nature and will disappear when the filaments are turned off, hence, the trouble cannot be located with an ohmmeter. Gently rapping the tubes one at a time with an insulating rod will generally locate the faulty tube. Such trouble is generally preceded by a severe plate "hot spot" or local heating.

The constant-resistance network is aligned at the factory to accurately pass square waves between 60 cycles and 100 kilocycles and will ordinarily not require adjustment in the field. However, it may be desirable to check the d-c response since the setting depends slightly upon the regulation of the power line and the adjustment is simple.

Operate the Picture Gain control to zero.

Operate the Ampli Coupling switch to the DC position.

Rotate the Black Level control until the plate current, indicated on the Mod. Plate Current meter M502, increases from an initial indication of 0.4 ampere to a final indication of 1.4 amperes.

Observe the change of modulator plate voltage as indicated by the Mod. Plate Voltage meter, M501. The voltage should change by 500 volts for the one ampere change in current.

Plot curve of modulator plate voltage versus modulator current. SEE "Typical Operating Parameters, Visual" Figure 60. A straight line drawn through the points so obtained should intersect the voltage axis at 1000 volts. If not, change the tap connections at the primary of the modulator plate transformer T501. See Figure 34.

If the plate voltage does not change by the correct amount the slider on resistor R503 must be adjusted and the curve re-plotted.

When the correct voltage change is obtained, the d-c load resistance of the modulator will be 500 ohms. This resistance is the same as the high-frequency impedance of the constant-resistance network which forms the modulator plate load.

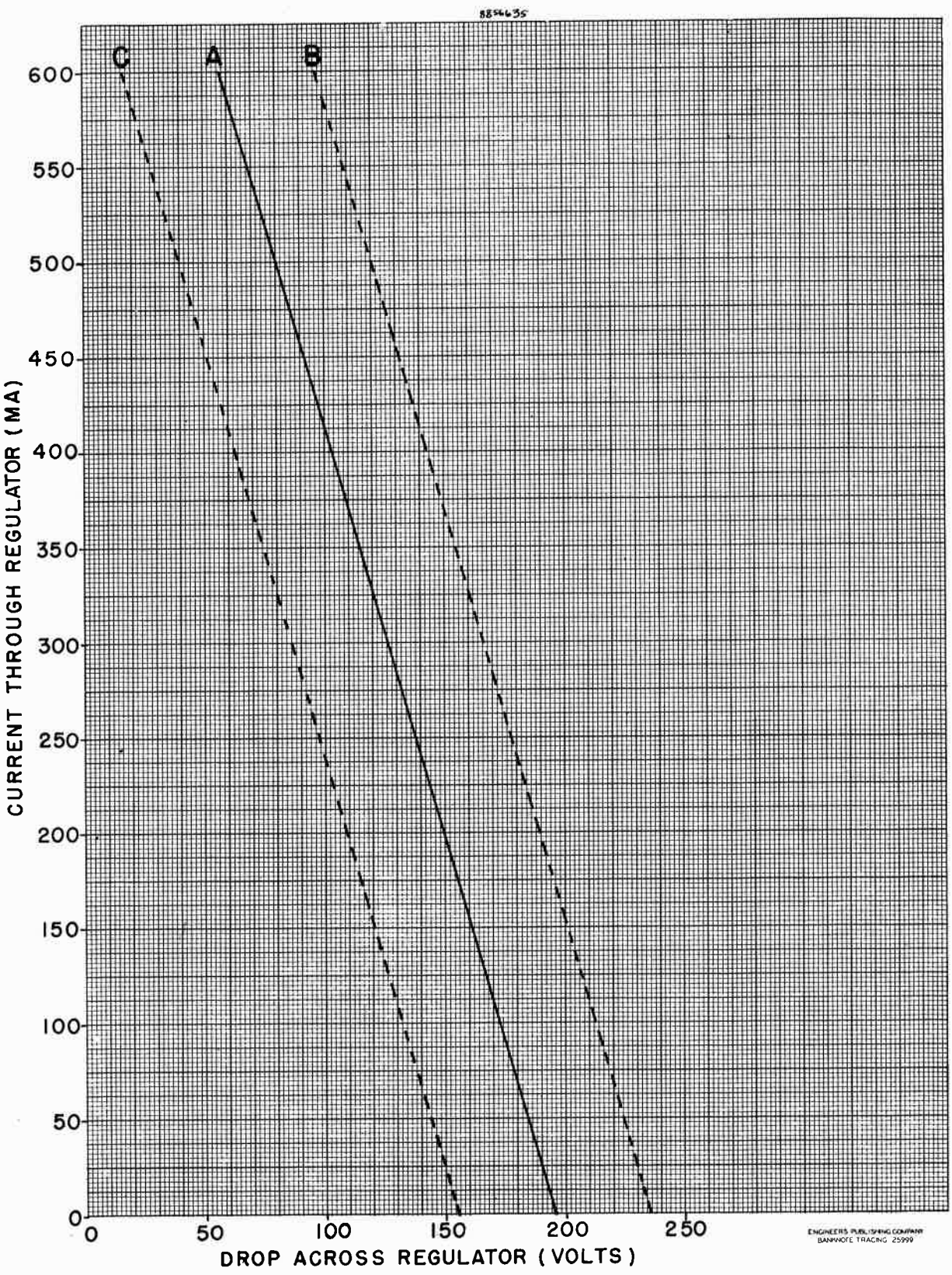


Figure 35 - Modulator Power Supply, Visual - Regulator Characteristics (8856635-sub 0)

Ordinarily, it will not be necessary to change the adjustment of any of the video peaking coils in either the modulator or constant-resistance network. Also, changing tubes will not affect the frequency response sufficiently to warrant re-alignment of the peaking coils.

MONITORING RACK ADJUSTMENTS

The monitoring rack units are equipped with individual power switches and these should be placed in the OFF position before proceeding with the following adjustments. Insofar as possible each unit should be checked individually in accordance with the instruction book accompanying the unit. It should be noted that the Console switch is in series with the rack unit power switches and the Console switch must be ON before any adjustments can be made. Only the frequency monitors are on a separate power circuit.

Both racks contain individual incoming power switches. The rear door of the Visual Monitor Rack also operates an interlock circuit which will remove dangerous potentials when the door is opened.

Visual Monitor Rack - Insert the dual connector plugs into the eight jacks at the left of the visual jack panel.

Operate the switch at the bottom of the visual Monitor Rack, and the Console switch to the ON positions. The indicator lamps adjacent to both switches should light.

Operate the Power switch on the 580-C Regulated Power Supply to the On position. This switch also controls the filament circuits of the TA-5 Stabilizing Amplifier.

Operate the Power switch on the WP-33 Power Supply to the ON position.

Adjust the controls of the Stabilizing Amplifier in accordance with the instruction book supplied with the amplifier.

Operate the power switch of the MI-8262 power supply to the ON position.

Adjust the WM-12 Visual Monitor Converter and WM-13 Visual Modulation Converter as described in the respective instruction books. The WM-12 output is observed on the kinescope and the WM-13A output on the CRO.

The AM carrier deviation meter supplied for use with the frequency monitor unit mounts in the upper part of the rack. This meter has two scales, one on each side of the meter scale.

As shipped the 3-0-3 KC scale is in position for use on channels 2-6. If operation is to be on channels 7-13 the front cover of the meter case must be removed and the meter scale reversed so that it reads 6-0-6 KC.

Operate the power switches of the WF-49B A-M Frequency Meter and WF-50A Frequency Monitor to the ON positions. Adjust these units as described in their instruction books.

Aural Monitor Rack - Operate the power switch at the bottom of the Aural Monitor Rack to the ON position.

Operate the power switch on the BA-4 Monitor Amplifier to the ON position. Adjust this amplifier later as described under TUNING, "Incoming Line Adjustments, Console."

Operate the power switch of the 86-A1 Limiting Amplifier to the ON position. Make the necessary adjustments to this unit when the console incoming line adjustments are made under the subsequent TUNING heading.

Operate the power switch of the F-M Frequency and Modulation Monitor to the ON position and adjust according to directions in the instruction book for that unit.

Place the power switch of the F-M Monitor in the ON position and adjust this unit in accordance with the accompanying instruction book. The duplicate meter at the top of the aural rack has two scales, one on each side of the meter scale. As shipped, the 3-0-3 KC scale is in position for use on channels 2 to 6. If channels 7 to 13 are to be used, the meter front cover must be removed and the meter scale reversed so that it reads 6-0-6 KC.

TUNING

VISUAL SECTION TUNING

General - The tuning procedure for the visual transmitter section involves adjusting the r-f circuits and then obtaining the required modulator output. Since additional r-f stages are required for the higher channels, the tuning procedure for these channels differs slightly. All tuning variations are, therefore, itemized separately where necessary: No differentiation is made for operations common to all channels.

The r-f channels in a television transmitter require a different tuning technique from that used on a-m or f-m equipment. In a picture transmitter the change in plate current usually associated with resonance is lacking. Instead the transmitter output must be "broadbanded" so as to achieve a broad, reasonably flat response curve. This "broadbanding" is accomplished by adjusting the three r-f controls which affect the bandwidth - p-a plate, output coupling, and output tuning controls.

Visual PA Broadbanding Theory - Two broadbanding methods may be used at the discretion of the operator. Both methods yield an output circuit passband characteristic displaced slightly on the high-frequency side of the carrier, thus permitting an appreciably narrower bandwidth than full double-sideband response. One procedure is a "rapid" method