COLOR SUPPLEMENT

FOR

TT-5A TELEVISION TRANSMITTER

RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DIVISION CAMDEN, N. J.

IB-36036-CS

COLOR SUPPLEMENT

TO

TT-5A

TELEVISION TRANSMITTER

Disposition

To be included with the instruction book for the Type TT-5A Television Broadcast Transmitting Equipment. This supplement supplies information for making the necessary checks and additional adjustments required for transmitting color television signals with the TT-5A Transmitter.

Manufactured by
RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DIVISION
Camden 2, New Jersey, U.S.A.

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IB-36036-CS

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

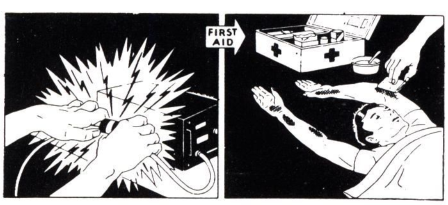
Personnel engaged in the installation, operation and maintenance of this equipment or similar equipment are urged to become familiar with the following rules both in theory and in the practical application thereof. It is the duty of every radioman to be prepared to give adequate First Aid and thereby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

FIGURE 3

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 4

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.

FIGURE 5

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.

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.

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LIST OF ILLUSTRATIONS

TECHNICAL SUMMARY

The following revised performance specifications for combined color-monochrome operation of the TT-5A Transmitter should be used in place of the Technical Summary given in IB-36036:

ELECTRICAL SPECIFICATIONS	VISUAL	AURAL
Type of Emission -----------	A5	F3
Frequency Range (Channels 2 to 13) ------------------------	54-216 mc	54-216 mc.
Rated Power Output -------	5 kw peak. Measured at output of sideband filter or filterplexer	2.5 kw. Measured at aural section output (diplexer or filterplexer input).
RF Output Impedance -------	51.5/72 ohms. Depends on sideband filter supplied	72 ohms.
Input Impedance -----------	75 ohms	600 ohms.
Input Level ---------------	1 volt peak-to-peak minimum	+10 ±2 dbm.
Amplitude vs. Frequency Response (with respect to response at 200 kc) * ----------------------	+1, -1.5 db at carrier plus 0.5 mc +1, -1.5 db at carrier plus 1.25 mc +1, -1.5 db at carrier plus 2.0 mc +1, -1.5 db at carrier plus 3.0 mc +1, -1.5 db at carrier plus 3.58 mc +1, -3.0 db at carrier plus 4.18 mc -20 db max. at carrier plus 4.75 mc	Uniform ± 1 db from 50 to 15,000 cycles.
Lower Sideband Attenuation (with respect to response at 200 kc)	20 db min. at carrier minus 1.25 mc 42 db min. at carrier minus 3.58 mc	
Variation in Frequency Response with Brightness -----------	±2 db. Maximum departure with respect to response at transmitter mid-characteristic, measured at brightness levels of 22.5% (peak-to-peak) modulation	
Carrier Frequency Stability ---	±1 kc	±1 kc. Maximum variation with respect to standard 4.5 mc separation between aural and visual carriers.
Modulation Capability -------	12.5 ± 2.5% (reference white)	±50 kc.
Audio Frequency Distortion ---		1.5% max., 50 to 100 cycles. 1.0% max., 100 to 7500 cycles. 1.5% max., 7500 to 15,000 cycles.
F-M Noise ---------------		60 db below ±25 kc deviation.
A-M Noise (rms) ------------	30 db below 100% modulation	50 db below carrier.
Amplitude Variation (over one picture frame) ---------------	Less than 5% of sync peaks	
Regulation of Output ------	7% maximum	
Harmonic Radiation (below peak visual power) --------------	60 db	60 db.
Burst vs. Subcarrier Phase	±7 degrees. Maximum departure from the theoretical when reproducing saturated primary colors and their complements at 75% amplitude	

* - As measured by the Type BW-5A Sideband Response Analyzer at transmitter mid-characteristic; also, 4.75 mc Low Pass Filter, MI-27132, is required to meet specifications.

ELECTRICAL SPECIFICATIONS

	VISUAL	AURAL
Brightness vs. Subcarrier Phase	±7 degrees. Maximum phase difference with respect to burst over the brightness range between 15% and 75% of output sync peak. Measured at the VSBF output using a diode demodulator and with the subcarrier amplitude adjusted to be 10% (peak-to-peak) at the output of the diode demodulator.	
Subcarrier Amplitude ------	±15%. Maximum departure from the theoretical when reproducing saturated primary colors and their complements at 75% amplitude.	
Linearity (incremental gain) #	80% minimum. Measured at 3.58 mc with increments of 10% (peak-to-peak), as indicated by a diode demodulator at the output of the VSBF, between 15% and 75% of the output sync peak.	
Envelope Delay vs. Frequency +	±0.04 microsecond at 3.58 mc ±0.08 microsecond at 4.18 mc ±0.08 microsecond from 0.2 to 2.1 mc Maximum departure from standard curve. The tolerances vary linearly between 2.1 and 3.58 mc and between 3.58 and 4.18 mc.	

- A Type TA-7A or TA-7B Color Stabilizing Amplifier is required to meet the specifications.

+ - Low and High Frequency Phase Equalizers (MI-34025 and MI-34026) are required to meet the specifications.

POWER LINE REQUIREMENTS

Transmitter:

Line	208/230 volts, 1 phase, 60 cycles
Slow Line Variations	±5% maximum
Rapid Line Variations	±3% maximum
Regulation	±3% maximum
Power Consumption, Black Picture	
Channels 2 to 6	24 kw
Channels 7 to 13	27 kw
Power Factor	0.90

Crystal Heaters:

Line	115 volts, 1 phase, 60 cycles
Power Consumption	56 watts

MAXIMUM ALTITUDE ---------------------------------- 5000 feet above sea level-#

AMBIENT TEMPERATURE

Minimum	10^0 C (50^0F)
Maximum	45^oC (113^oF)

- For operation at rated power and normal plate voltage.

RECOMMENDED TEST EQUIPMENT

The following additional test equipment is recommended to facilitate adjustment and maintenance of the TT-5A Transmitter.

Oscilloscope, RCA Type TO-524D
Cross-over Filter Attachment (MI-34021) for oscilloscope
Linearity Checker, RCA Type WA-7B
Color Signal Analyzer, RCA Type WA-6A
Square Wave Generator, Tektronix Model 105 or equivalent

The following list of drawings either supplement or replace corresponding figures in IB-36036:

Figure 16 - Monitoring Unit replaces Figure 16 (page 42).

Figures 13, 14, and 15 - Functional Diagrams replace Figure 17 (page 43).

Figures 18 and 19 - Installation Layouts replace Figures 19 and 20 (pages 45/48).

Figure 17 - Monitoring Racks replace Figure 28 (page 56).

Figure 20 - Wire Chart replaces Figure 79 (page 203).

Figure 25 - Console Schematic replaces Figure 81 (page 207).

Figure 1 - Clamp Circuit Revisions supplements Figures 7 (pages 23, 24), 91 (pages 225, 226), and 93 (pages 229, 230).

As illustrated in Figure 17, the monitoring racks designated as MI-19123-A and MI-19124-A are intended to replace the earlier versions, MI-19123 and MI-19124. Slight revisions in coaxial wiring on MI-19124-A are required for color operation. See Figures 22 and 23.

Table I, Monitor Control Console showing revised panel designation replaced Table 4 (pages 38, 39).

DESCRIPTION

The electrical specifications for telecasting color signals can be met adequately by observing the recommendations concerning circuit revisions, adjustment procedures, and operational checks. Although the TT-5A Transmitter was engineered primarily for monochrome specifications, its basic design is admirably fitted to color operation.

CIRCUIT REVISIONS

A. Isolation of the visual modulator signal from the clamp diode, X815, by means of a 10,000 ohm resistor. See Figure 1. The addition of the resistor is necessary to minimize phase shift of the burst signal (3.58 mc.) during clamping action.

The preliminary color supplement instruction book specified a shunt inductance of one millihenry across the 10,000 ohm resistor. This is desirable from the standpoint of best clamp action but tends to upset the frequency response of the circuit due to the coil resonating with the tube capacity of the clamp diode.

B. To provide adequate drive voltage for the sync separator tube, X813, a resistor of approximately 1000 ohms may be added in parallel to resistor R871 (3900 ohms). Whether sufficient drive voltage is available depends upon the required input voltage at the 4E27 tube grids to produce full modulation at the transmitter rated power output. The latter voltage depends upon the tuning of the PA stage, composite gain of the 4E27 tubes, and transmitter power output. A procedure for checking the adequacy of sync separator drive voltage is described on page 30.

C. Sync compression in the visual PA stage is likely to be excessive if the transmitter is operated at full power output. At the recommended d-c plate voltage for the PA stage (5000 volts), the sync compression may be as much as 50% after tuning adjustments have been completed. Even a new PA tube may produce this much compression and as the tube ages more compression occurs because of loss of peak emission capability.

Stretch circuits provided for compensation of sync compression, have a tendency to change the phase and amplitude of the burst signal (3.58 mc.) when required to correct for a deficiency of 2:1 or more. It is desirable, therefore, to reduce the sync compression by increasing the PA d-c plate voltage to 6000 volts. This should reduce sync compression to approximately 20 to 25% without impairing operation of the PA tube or requiring replacement of any components. See page 28 for checking sync compression.

D. The clamping action during the vertical blanking interval may be improved by making component changes in the pulse former stage, X814. The changes outlined on page 15 may be tried in order to help make the clamp pulses more nearly alike in waveshape and amplitude and also reduce the side pulses.

E. Differential phase (variation of subcarrier phase vs. brightness) is well within specifications in the TT-5A Transmitter. No circuit revisions or special adjustments are required.

Differential phase adjustment is provided in the color stabilizing amplifier (TA-7A or TA-7B) for correction of the white stretch circuits and other minor sources such as the distribution amplifiers.

CIRCUIT ADJUSTMENTS

A. The SYNC AMPLITUDE control, R904, (Figures 91 and 93 in IB-36036) should be set permanently for zero sync stretch. The adjustment provided on the color stabilizing amplifier should be used instead to control sync amplitude.

The transmitter sync amplitude control is unsatisfactory due to the fact that an increase in sync amplitude is accompanied also by an increase in the black region. This produces undesirable phase and amplitude distortion of the burst signal. In addition, due to bandwidth adjustments in the PA stage and transconductance (Gm) variations in the modulator and PA stage, the input signal amplitude at X806 may vary as much as 6 db. For color operation it is essential that the sync stretch characteristic be consistent. This, in turn, requires that the sync amplitude at the input to X806 be fixed.

B. Adjustments to the visual PA stage must be made for correct frequency response, together with adequate bandwidth. Additional requirements include good regulation and suppression of AM noise. Best results are obtained by observing the following points:

- Use optimum coupling between the driver and PA stage.
- Supply the maximum possible R-F drive from driver to PA stage.
- Damp the PA grid circuit heavily by means of water-cooled resistor R735. It is usually desirable to increase the grid loading until the required transmitter power output is just attainable with near maximum R-F drive.
- See page 23 for adjustment suggestions.

C. AM noise is due primarily to power supply hum originating in the PA stage and modulator. The PA stage hum is reduced by proper adjustment as outlined in item B. The hum-bucking potentiometer R864 (Figures 91 and 93 in IB-36036), should be checked periodically for minimum hum out of the modulator. Also, a check should be made when any change is made which alters the required modulator output level.

The procedure for hum-bucking adjustment is described in the Supplement to the TT-5A instruction book, IB-36036-b (also designated as IB-36012-c).

CONTROL FUNCTIONS

Auxiliary components mounted in the monitor racks are provided to meet specifications concerning linearity (incremental gain), amplitude vs. frequency response, and delay distortion (envelope delay vs. frequency). Figures 13, 14, and 15 show functional diagrams of control equipment arranged as recommended for transmitter installations. Figure 17 is an outline drawing of the monitor racks. The TTC-1B Console is shown as a typical control desk. Jack numbers refer to video jacks mounted on the MI-19124-A and MI-27158 racks.

Functions of the control components are as follows:

Distribution Amplifier No. 1 (RCA TA-3A or TA-1A)

- Isolation of the incoming studio line.
- Precise termination of the incoming studio line.
- Provides a monitoring point for incoming signal.

Color Stabilizing Amplifier (RCA TA-7A or TA-7B)

- Provides sync clipping and sync stretching.
- Permits white stretching with differential phase compensation.
- Phase and amplitude control of burst signal (TA-7A only).
- Pre-white stretch monitoring (TA-7A requires modification).
- Output monitoring (not available on TA-7A after it is modified for pre-white stretch monitoring).

See page 16 concerning modification of the TA-7A Stabilizing Amplifier and the purpose of pre-white stretch monitoring.

Low Pass Filter (MI-27132)

- Elimination of extraneous video signals beyond 4.2 mc. The cut-off characteristic of this filter is 20 db down at 4.75 mc.

Distribution Amplifier No. 2 (RCA TA-3A or TA-1A)

- Isolation of the low pass filter from the low frequency phase equalizer.
- Provides gain for the control system (TA-3A).
- Precise termination of the low pass filter.
- Provides sending-end termination for the low frequency phase equalizer.
- Supplies an auxiliary monitoring point (TA-3A).

Amplitude Equalizer (MI-34035)

Not shown in Figures 13, 14, and 15.
- Inserted in signal circuit at input of the low frequency phase equalizer to peak the response in the 4 mc. region. This is necessary to compensate for small deficiency in amplitude response of the low pass filter and the phase equalizers. See Figure 10.

Low Frequency Phase Equalizer (MI-34025)

- Compensation for delay distortion produced by the transmitter and by the vestigial sideband filter. No compensation is provided for low frequency delay distortion in receivers.

Receiver High Frequency Phase Equalizer (Part of MI-34026)

- Compensation for receiver delay distortion produced by the sharp receiver cut-off characteristic which is necessary to attain almost complete rejection of the sound frequency (4.5 mc. from the visual carrier frequency).

  This equalizer is physically located on the MI-34026 chassis but electrically is grouped with the low frequency phase equalizer. This arrangement avoids having the three high frequency sections of MI-34026 in cascade and thereby reduces accumulated errors of impedance mismatch.

Distribution Amplifier No. 3 (RCA TA-3A or TA-1A)

- Isolation of the first phase equalizer group from the second group.
- Provides gain for the control system (TA-3A).
- Precise termination of the first phase equalizer group.
- Provides sending-end termination for the second phase equalizer group.
- Supplies an auxiliary monitoring point (TA-3A).

Variable High Frequency Phase Equalizer (Part of MI-34026).

- Compensation for transmitter delay distortion.

Notch High Frequency Phase Equalizer (Part of MI-34026)

- Compensation for delay distortion produced by a notch-type diplexer or a filterplexer. This section is not required where a bridge diplexer is used.

MONITORING FUNCTIONS

It is necessary to observe waveforms, signal levels, and pictures in the transmitter system during set-up and operation. The functional diagrams show monitoring equipment and points where signals may be obtained for observation.

The stabilizing amplifier precedes all phase equalizers because it is desirable to monitor signals into the white stretch stage (pre-white stretch monitor) before it has been pre-distorted with respect to phase. There is no evidence that appreciable phase distortion is created due to the white-stretch circuits (in stabilizing amplifier) preceding the phase equalizers.

Using the monitoring arrangement shown, the operator should be able to make rapid observations on the master monitor of the input signal (pre-white stretch), modulator output signal, and transmitter output (demodulator output). The color picture monitor (RCA TM-10A or TM-10B) input may be patched in at monitoring points of interest to correlate color picture observations with master monitor presentations.

It is desirable that diode demodulator observations be made after the harmonic filter rather than preceding it. Harmonic energy may be reflected back from the filter in sufficient quantity to produce false indications, that is, false with respect to actual output from the harmonic filter.

The vestigial sideband demodulator is intended to serve two purposes. As a monitoring device it should simulate accurately the response of a typical color receiver, thereby providing the operator with an indication of signal and picture transmitted to home receivers. For this service, delay and amplitude response characteristics of the demodulator should correspond to those present in the average home color receiver. As a measuring device, it should have delay distortion correction as well as excellent amplitude response. This provides a means of adjusting phase equalizers to reduce delay distortion (envelope delay).

The TM-6C Master Monitor is designed for accurate presentation of color signals and luminance picture information. In checking signal levels and amplitudes, the operator must observe carefully the burst signal and other subcarrier components. Signal level at the white stretch stage input (in the stabilizing amplifier) must be maintained constant with reference to sync amplitude and black-to-white span. Since color signal components may extend into the whiter-than-white region, it is necessary to attenuate such components with the IRE roll-off characteristic when checking white level.

INSTALLATION

Typical installation layouts for the transmitter and associated equipment are shown in Figures 18 and 19. Harmonic filters have been added for the aural and visual transmitters. The WM-12A Demodulator and WM-13A Waveform Monitor have been deleted. A WM-20B (not shown) or BW-4A Demodulator is required in place of the deleted items. Either is intended for color monitoring but both require kits to improve performance. In addition, a directional coupler (MI-19396) is necessary when using the BW-4A unit. The BW-4A chassis is mounted in rack No. 2 (MI-19124-A) as shown in Figure 23. For demodulator instructions, consult the following instruction books:

IB-36128 -------- WM-20B
IB-36160 -------- BW-4A

The wire chart shown in Figure 20 indicates interconnections between racks and external connections from racks to console, transmitter, and other units. Indicated console connections are for the TT-5A Console, rather than the TTC-1B model shown in the functional diagrams. Figures 21, 22, 23, and 24 show wiring for the monitor racks. Figure 23 indicates minor changes in coaxial cable connections necessary when using the MI-19124-A rack for color operation. No changes are required on the MI-19123-A rack.

The circuit sequence of control equipment as shown in Figures 13, 14, and 15 is important because it has been arranged for best monitoring and control of color signals. The stabilizing amplifier precedes other components to permit pre-white stretch monitoring of signals before phase correction. This signifies that the operator may observe the signal and picture before it is pre-distorted for phase correction. Application of phase correction after linearity compensation (white stretch) does not create appreciable error in the picture signal. Individual stations may require certain modifications in the recommended sequence of equipment. In this case, carefully investigate their possible effects on transmitter functions and operational control. Distribution amplifiers may be RCA Type TA-1A or TA-3A. The latter is preferable because it is capable of contributing gain to the system in addition to isolation of components. See Figure 10 for typical voltage levels. Note the presence of the amplitude equalizer (MI-34035) which serves to peak signals in the 4.2 mc. region.

MODIFICATIONS TO EQUIPMENT RACKS

For color operation, three racks of input and monitoring equipment are required as specified in ES-19237-A/B, reproduced on page 37. If the equipment specified in ES-19203-A/B is already in use, it is only necessary to add one rack of equipment as specified in MI-27158. This rack includes the high and low frequency phase equalizers and necessary distribution amplifiers. In addition it is necessary to replace the monochrome stabilizing amplifier with an RCA Type TA-7A or TA-7B Color Stabilizing Amplifier. Power for this unit may be supplied by either an RCA Type 580D or WP-33B Regulated Power Supply. The rack unit designated as MI-27158 is equipped with an RCA Type MI-26240 Circuit Breaker Chassis for supplying overload protection to all three racks. The line side of all four breakers should be connected in parallel and the 115-volt power line brought in to one of the breakers. The first three breakers, from left to right (viewing the panel from the front) are used with racks one, two, and three in that order. The fourth breaker is a spare. The connections are made from the load side of each breaker to the terminals in its respective rack as specified on the wire chart. If the MI-4395-G Switch and Fuse Panel is being employed in rack one, it will be necessary to place a jumper across the switch and fuses so as to render this panel inoperative, thereby eliminating duplicate control of AC power to this rack. If the original racks, MI-19123 and MI-19124, are to be replaced by the corresponding later versions, it is possible to utilize the aural interconnections to the MI-19123 rack. Some modifications will be required however, in the MI-19123-A rack wiring. The following outline contains instructions for making the conversion:

Items listed below are suggested for installation of MI-19123-A Rack. They are planned to conform with the aural schematic, Figure 18, page 43 of IB-36036. Function layouts for later transmitters provide for the audio gain control to precede the limiting amplifier and an attenuator to follow it. The required preemphasis is provided in the transmitter exciter unit rather than externally as was done with the TT-5A Transmitter. If satisfactory signal levels can be supplied, it is desirable to follow the later arrangement of placing the gain control ahead of the limiting amplifier. It is necessary, of course, to account for preemphasis network insertion loss in establishing signal levels. The three networks mounted on panel E of MI-19123 are required. They may be remounted on the 8-3/4-inch blank panel or transferred as a group on the E panel.

Audio jack name tabs are revised as follows:

3rd set from right -

Top - change "LINES OR LOCAL FROM CONSOLE" to "LINES FROM CONSOLE"
Bottom - change "LIMITER AMPL INPUT" to "PREEMPHASIS NET IN"

4th set from right -

Top - change "LOCAL" to "PREEMPHASIS NET OUT"
Bottom - change "LOCAL TO CONSOLE" to "LIMITER AMPL INPUT"

5th set from right -

Bottom - change "TO CONSOLE PAD" to "TO CONSOLE GAIN CONTROL"

6th set from right -

Top - change "FROM CONSOLE PAD" to "FROM CONSOLE GAIN CONTROL"

Wiring change required at audio jack panel:
Interchange Pr. 115 with Pr. 117. Each pair retains its original number.

Wiring modifications required for networks mounted below the monitoring amplifier. All connections should be made with shielded Pr. lead.

1. Line transformer - 600/600 ohms, Bal./Unbal.
   Connect transformer terminals 7A and 12A to TB-H terminals 69 and 70.
   Connect transformer terminals 1A and 6A to TB-H terminals 71 and 72.
   Strap TB-H terminals 65 to 69 and 66 to 70.

2. 10db Network - Bal. H, 600/250 ohms.
   Disconnect Pr. 114 from terminals 11 and 12 on P1 of the monitoring amplifier.
   Connect Pr. 114 to 10db network terminals, 24 and 25 by means of a splice.
   Connect network terminals 20 and 21 to terminals 11 and 12 on P1 of monitoring amplifier.

3. Preemphasis Network, MI-4926-A.
   Connect MI-4926-A terminals 1 and 5 to TB-H terminals 29 and 30.
   Connect MI-4926-A terminals 11 and 15 to TB-H terminals 31 and 32.
   Strap TB-H terminals 29 to 39 and 30 to 40.
   Strap TB-H terminals 31 to 35, and 32 to 36.

The following external connections should be made to Terminal Board H:

Terminals	Connection
1-2	Studio line #1
3-4	No connection
5-6	No connection
7-8	Spare line #2 to Console

Terminals	Connection
9-10	Line #1 to console
11-12	No connection
13-14	No connection
15-16	Console monitor gain control
17-18	Studio line #2
19-20	No connection
21-22	No connection
23-24	No connection
25-26	Line #2 to console
27-28	No connection
29-30	Strapped to 39-40
31-32	Strapped to 35-26
33-34	Strapped to 37-38
35-36	No external connection
37-38	Line return from console (switch S1100)
39-40	No external connection
41-42	Console gain control input
43-44	No connection
45-46	No connection
47-48	No connection
49-50	Return from console gain control
51-52	No connection
53-54	No connection
55-56	Transmitter input
57-58	Transmitter multiple to console monitor
59-60	No connection
61-62	Spare #1 to console
63-64	Spare #1 in
65-66	Strapped to 69-70
67-68	No connection
69-70	No external connection
71-72	To console monitor
73-74	Spare #2 in
75-76	No connection
77-78	No connection
79	Ground return to console
80	Ground return to console

The following external connections should be made to terminal board **L**:

1	Ground to rack frame
2-3	To monitor speaker
9-10	To remote frequency deviation meter
11-12	To remote modulation meter

TRANSMITTER MODIFICATIONS

A. Install in series with lead between pins 4 and 5 of the clamp tube **X815** and the grids of the modulator tubes X807 through **X812**, a 10,000 ohm ± 5%, 1 watt composition resistor. See Figure 1. The tubes are located in Frame No. 8.

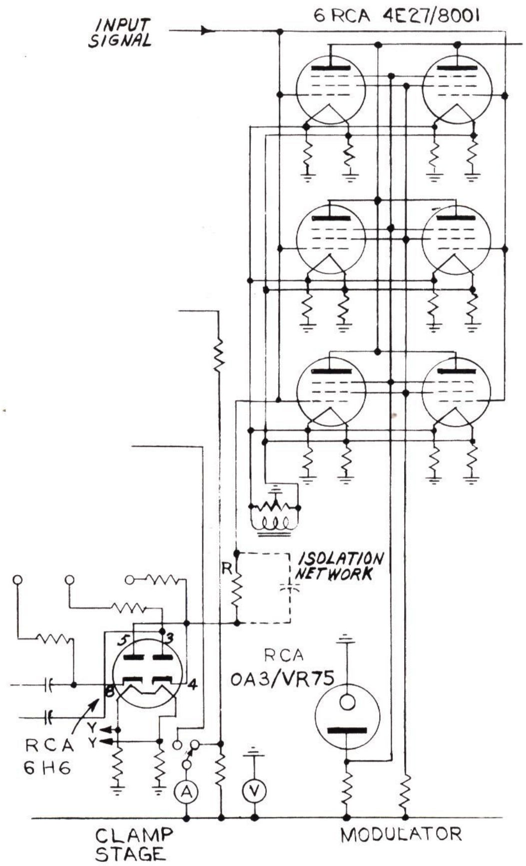


Figure 1 - Schematic Diagram, Clamp Circuit Revisions (474383)

B. Install in parallel with R871 (3900 ohms), a 1 watt resistor of approximately 1000 ohms ± 10%. Resistor R871 is located in Frame No. 8 and is connected in series with the cathode (pin 8) of tube X813 (6J5). The reference drawings are the visual schematic diagrams, Figures 91 and 93 in IB-36036 (pages 225 and 229). Refer to test procedure on page 30 for checking adequacy of sync separator drive voltage.

C. Change connections on high voltage transformer T612 (Frame No. 6) to provide increase in rectifier d-c output voltage from 5000 to 6000 volts. For actual connections, refer to Figure 33 in IB-36036 (page 67). The test procedure for checking sync compression is given on page 28.

D. The following are elective changes which may be made to the pulse former stage, X814 (6AG7), located in Frame No. 8 to improve clamping action during the vertical blanking interval.

1. Change the value of capacitor C846 in the screen grid (pin 6) circuit of X814 from 0.01 mf. to 0.1 mf. ± 10%, 400 volt, tubular.

2. Try several values of mica capacitors ranging from 10 to 100 mmf. ± 10%, 300 volt, across resistor R891 in the plate circuit (pin 8).

3. Try several values of mica capacitors ranging from 0.00047 mf. to 0.001 mf. ± 10%, 300 volt, across coupling capacitors C827 (plate, pin 8) or C828 (screen grid, pin 6).

The reference drawings for the above changes are the schematic diagrams, Figures 91 and 93 in IB-36036 (pages 225 and 229).

INPUT AND MONITORING EQUIPMENT MODIFICATIONS

A. Color Stabilizing Amplifier (RCA TA-7A and TA-7B)

Figure 23 shows connections to the TA-7A Amplifier, including the lead to monitor output jack J11, for pre-white stretch monitoring. Normally, J11 delivers the stabilizing amplifier output signal for monitoring purposes (output from tubes V9 and V10). In order to provide a pre-white stretch signal for monitoring, it is necessary to modify the TA-7A Stabilizing Amplifier as shown in Figure 2. These changes transfer the grids of monitor output tubes V9 and V10 to a point two stages ahead where the whites have not been stretched and the sync has not been stretched or clipped. The instructions are as follows:

1. Mount an insulated board carrying two terminals near and below socket XV10.

2. Remove cathode lead connecting XV9-1 to XV8-1.

3. Change resistors R74 and R76 at V8-1 from 22 ohms, 1/2 watt, to 39 ohms, 1/2 watt.

4. Add two resistors, 39 ohms, 1/2 watt, connected in series from XV10 to chassis. The junction of the resistors is to be connected to one of the two terminals added in item 1.

5. White stretch clamp control R137 is being discontinued and may be removed. Connect the lead from its center arm to the junction of the new resistors added in item 4.

6. Run an elevated lead from the junction of capacitor C18 and resistor R157, near XV14, to the second new insulated terminal near XV10.

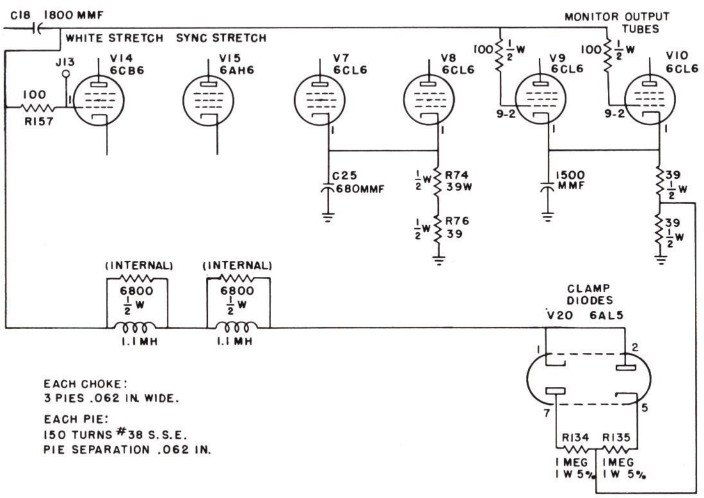


Figure 2 - Circuit Modifications to TA-7A to Shift Monitor Output (473188)

7. Remove resistors R78 and R80, 100 ohms, 1/2 watt, and replace with resistors of the same value but with longer leads to reach the new terminal carrying the lead of item 6.

8. Add new capacitor of mica or paper, 1500 mmf, from XV9-1 to chassis.

9. Remove capacitor C50, 22 mmf. near XV15.

10. Remove capacitor C51, 47 mmf. near XV10.

The TA-7B Stabilizing Amplifier, a later design, provides both pre-white stretch and output monitoring signals without modification. The output monitoring signal is not considered essential, therefore is not provided for on the functional diagrams. It may be connected to the video jack panel and patched in as desired. Pre-white stretch monitoring is essential to maintain constant signal level into the white stretch stage during operation. When the stabilizing amplifier is adjusted to compensate for transmitter compression of the white portion of video signal, the white stretch stage operates as a non-linear amplifier. This means that the white stretch compensation is correct for one signal input level only. Therefore, the white stretch adjustments must be made at the pre-white stretch signal level required for operation; then this level must be maintained during operation.

Every transmitter has a different white compression curve, depending upon tubes, drive, etc. If more white stretch is required than originally provided in the TA-7A, it may be obtained by shorting resistor R147, 270 ohms. And if still more is needed, a second germanium diode may be connected in parallel with CR1, observing the same polarity. The speed of the three white stretch controls may be reduced for more convenient operation by increasing the resistance of R156, 10,000 ohms, 10 watt to 15,000 ohms, 10 watt.

It is also advantageous to modify the TA-7A Stabilizing Amplifier to provide more sync stretch. The available sync stretch may be increased to two times, without distortion of the burst signal. This permits the operator to prolong the useful life of the PA tubes which otherwise might be rejected because of excessive sync compression. The instructions are as follows:

1. Disconnect the +B end of R48, 1000 ohms, 1 watt, located between XV15 and XV13.

2. Place a new flat terminal under the nearby screw fastening the insulated board carrying C54, C53, and C52.

3. Transfer the +B end of R50, 330 ohms, 1 watt, and two +B leads to this new insulated terminal of item 2.

4. These changes should free two terminals of the board between XV15 and XV13 and these should be clipped off.

5. Mount a new 7-pin socket in this cleared space between and above XV15 and XV13.

6. Add new resistor, 100 ohms, 1/2 watt from terminal No. 1 of the new socket to the junction of C19, 3300 mmf. and R59, 100 ohms.

7. Connect terminal 2 of the new socket to chassis.

8. Connect terminals 3, 4, 5, 6, and 7 in parallel with the corresponding terminals of XV15.

9. Change resistor R48 (partially disconnected) from 1000 ohms, 1 watt, to 750 ohms, 5%, 1 watt, and reconnect to its original position from junction of C18 and C19 to load end of R50, 330 ohms, 1 watt.

The TA-7B Stabilizing Amplifier has sufficient sync stretch. The stretching function precedes the white stretch stage. This is desirable because the sync stretch characteristic is established and referenced at the white stretch grid.

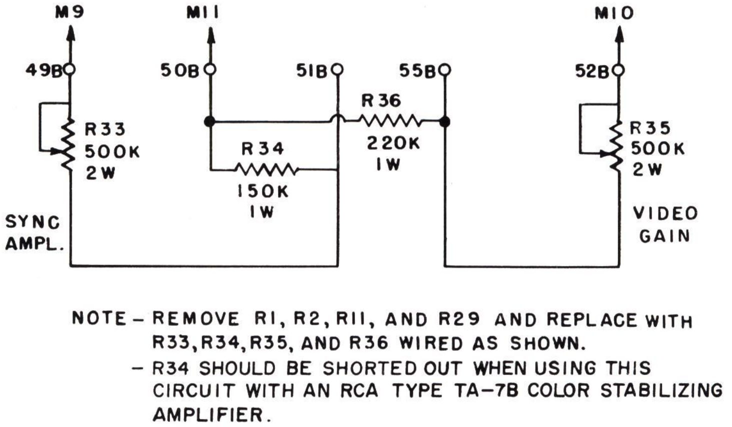


Figure 3 - Circuit Modifications to TTC-1B Control Console (8906110)

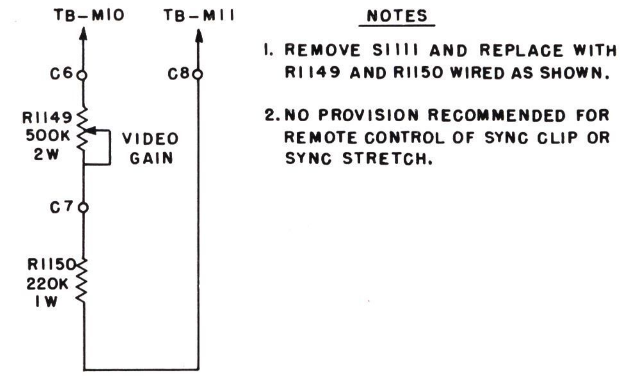


Figure 4 - Circuit Modifications to TTC-1, TTC-1A, TTC-2A Consoles (8906111)

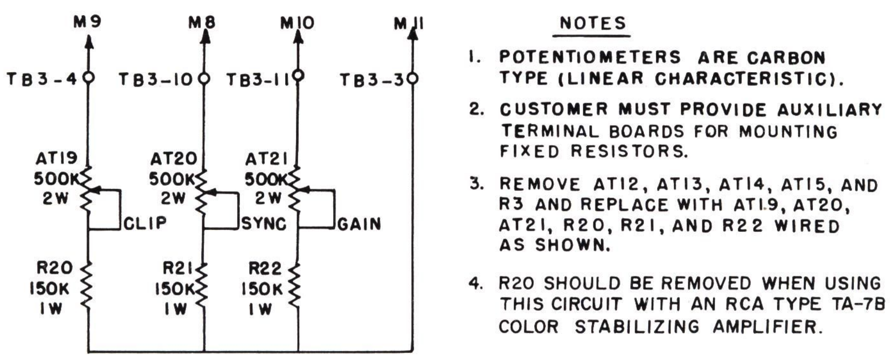


Figure 5 - Circuit Modifications to TTC-3A1 Control Console (8906112)

B. Remote Control (Stabilizing Amplifier)

The TT-5A Control Console may be altered readily to provide one remote control position. As shown in Figure 25, certain circuit changes must be made to the console in order to furnish remote control of the TA-7A or TA-7B Color Stabilizing Amplifier gain adjustment. The following procedure should be employed in making the modification:

1. Disconnect and tape lead No. 1 from switch S1111 and terminal board D, contact 7. Refer to Figures 82 and 83 in IB-36036 (pages 208, 209).

2. Disconnect lead pair No. 6 from switch S1111 and remove the switch.

3. Mount a 500,000 ohm, 2 watt carbon potentiometer in the space formerly occupied by the switch. The terminals on the potentiometer should face toward the panel top.

4. Disconnect and tape the motor leads from terminal board C, contacts 6, 7, and 8.

5. Connect lead pair No. 6 to the potentiometer end terminals. The right-hand terminal should be connected through a 220,000 ohm, 1 watt resistor to contactor 6 on terminal board C. The left-hand terminal should connect to contact 8.

6. Strap the potentiometer center and left-hand terminals.

7. Using shielded lead pairs, make the following connections to the TA-7A Color Stabilizing Amplifier Jones plug, P-12:

   C-6 to P12-6
   C-8 to P12-5

The preceding circuit modification should provide for an increase in stabilizing amplifier gain as the remote gain control knob is rotated in a clockwise direction.

Since both stabilizing amplifier and transmitter gain controls are subject to adjustment during operation, it would be more convenient to have remote controls for both at the console. This may be accomplished by leaving the transmitter remote gain control intact and providing a separate assembly containing the stabilizing amplifier remote controls for video gain and sync amplitude. The wiring for these controls should be similar to that shown in Figure 3 for the TTC-1B Console. Notice that in making the modification using a TA-7B Stabilizing Amplifier, it is necessary to short out the 150,000 ohm resistor in the sync level circuit. (Figures 4 and 5 show modifications to the older type consoles TTC-1 and TTC-3A respectively.)

C. Video Monitoring Circuits (TT-5A Console)

Modification of the video monitoring circuits requires only the following single change:

Refer to Figure 84 in IB-36036 (page 211). Disconnect lead from arm of potentiometer R1127 and reconnect it to the arm of potentiometer R1128. See Figure 25.

D. Monitor Control Panel, Console

Table I on pages 20 and 21 illustrate the revised panel designations, including those applicable to color operation, for the monitor control console panel.

TABLE 4
MONITOR CONTROL PANEL, CONSOLE
(Right Side)

PANEL DESIGNATION	DESCRIPTION	SYMBOL	REMARKS
SOUND LINES	3-position lever switch:	S110	
	-Line 1 position		Connects Line 1 to program amplifier input and Line 2 to telephone.
	-Line 2 position		Reverses above connections.
	-Mid-position		OFF position. In this position, incoming lines are terminated with resistance. A resistor is also connected across the program amplifier input. This does not affect operation of the monitor circuits.
VU METER	Pushbutton switch, five buttons:	S1101	
Line 1			Check sound level on VU meter M1100.
Line 2			Spare. Suitable for bridging 600-ohm line.
Transm-Input			
Transm-Output			
(Blank)			
SOUND MONITOR	Pushbutton switch, five buttons:	S1102	
Line 1			Level control R1124. Level control R1123. Level control R1122. Level control R1121. — Check sound quality on monitor speaker. Level controls provide for same monitor circuit level to Sound Monitor Gain control, R1137.
			Spare. Level control R1120. Suitable for bridging 600-ohm line.
KINESCOPE	Pushbutton switch, five buttons:	S1103	
Transm-Input (Line-Input)*			Signal from stabilizing amplifier monitor output. — Check signal quality on console kinescope.
Mod. Output*			Signal from modulator monitor pick-off. — Check signal quality on console kinescope.
Transm-Output (VSB Demod.)*			Signal from WM-12A (auxiliary equipment). — Check signal quality on console kinescope.
(Blank) (Mod. Ampl.)*			Spare. Normally used for output of MI-19051 diode.
(Blank) (Stab. Ampl. Mon.)*			Spare. 75-ohm input impedance.

TABLE 4 (Continued)
MONITOR CONTROL PANEL, CONSOLE
(Right Side)

PANEL DESIGNATION	DESCRIPTION	SYMBOL	REMARKS
CRO	Pushbutton switch, five buttons	S1104	
Transm-Input (Line-Input)*			Level control R1130. Signal from stabilizing amplifier monitor output. (Check waveform on console CRO. (Level controls, except R1128, simultaneously adjust kinescope input.))
Mod. Output*			Level control R1129. Signal from modulator monitor pickoff. (Check waveform on console CRO. (Level controls, except R1128, simultaneously adjust kinescope input.))
Transm-Output (VSB Demod.)*			Level control R1128. Signal from WM-13 series unit (auxiliary equipment). (Check waveform on console CRO. (Level controls, except R1128, simultaneously adjust kinescope input.))
(Blank) (Mod. Ampl.)*			Spare. Level control R1126. Normally used for output of MI-19051 diode.
(Blank) (Stab. Ampl. Mon.)*			Spare. Level control R-1125.
PICTURE GAIN (Stab. Ampl. Gain)*	Potentiometer	500K ohms	Controls picture input level to transmitter.
VU METER	Weston Type 30	M1100	Sound level monitoring. Circuits selected by VU meter switch, S1101.
PICTURE POWER OUTPUT	0-50 microammeter	M1101	Repeats reading of meter M801 in transmitter. See "TRANSMITTER, Reflectometers" and "TRANSMITTER, Reflectometer Adjustments" under DESCRIPTION and INSTALLATION, respectively.
SOUND POWER OUTPUT	0-50 microammeter	M1102	Repeats reading of meter M104 in transmitter. See "TRANSMITTER, Reflectometers" and "TRANSMITTER, Reflectometer Adjustments" under DESCRIPTION and INSTALLATION, respectively.
SOUND MONITOR GAIN	Volume control	R1137	Control gain to sound monitor.
(None)	Volume control	R1138	Vernier control, to vary M1100 indication ±0.5 db. For calibration of VU meter.
SOUND GAIN	Volume control	R1139	Controls sound input level to transmitter.
VU ATTENUATOR	Volume control	R1140	Step-by-step control +4 to +40 VU for meter M1100.

* - Designations applying to color operation

ADJUSTMENTS

Transmitter adjustments for color transmission include those normally made for monochrome operation, with the added precaution that more precision is required to avoid appreciable degradation of color pictures. Additional adjustments are necessary to meet color specifications, as described below. After completing transmitter system set-up, color and monochrome information may be transmitted interchangeably.

Reference should be made to individual instruction books for details concerning the various components of monitoring control and test equipment. The stabilizing amplifier performance is of particular importance because of its strategic position in the control chain. Its performance should be determined before proceeding with systems testing. Also, the distribution amplifiers should be checked for frequency response, linearity, differential phase, and square wave response at signal amplitudes corresponding to actual operating conditions.

NOTE

> It is recommended that an RCA Type TO-524-D Oscilloscope be used for all scope presentations required in making adjustments.

PRELIMINARY TRANSMITTER ADJUSTMENTS

A. Control Circuit Checks

Proceed according to the directions given in IB-36036, pages 57 to 71. No added requirements.

B. Visual Modulator Test and Alignment

Make control and circuit checks in accordance with instructions given on page 71 of IB-36036 (to middle of second column). Follow alignment procedure in Supplement IB-36036-b, pages 1-2 and 1-3. Note tolerances stated in section B2, page 1-2, and keep in mind that the transmitter output must meet the amplitude vs. frequency response specifications listed on page 2. Low pass filter, MI-27132, is necessary to obtain -20 db maximum, at carrier plus 4.75 mc. The amplitude equalizer, MI-34035, is required to compensate for minor deficiencies near 4.2 mc. in the low pass filter and phase equalizers. If the chroma and burst subcarrier amplitudes are low relative to the monochrome, the HIGH-PEAKER control in the TA-7B Color Stabilizing Amplifier may be rotated clockwise to correct this condition. If it is necessary to provide video peaking in the transmitter, make adjustments in the modulation amplifier stages.

Should the transmitter remote GAIN control (on TT-5A Console) be replaced with a remote control for stabilizing amplifier gain, visual gain must be adjusted manually at the transmitter.

C. Clamp Circuit Operation

Make tests as described on page 1-4 of Supplement IB-36036-b. See Item D under CIRCUIT REVISIONS, page 8, concerning improvement of clamping action during the vertical interval. A final check should be made with a composite test signal, but pulse observation is convenient at this time. Refer to page 30.

D. Hum Bucking Adjustment

See Item C under CIRCUIT ADJUSTMENTS, page 9, for comments concerning AM noise. Follow the procedure described on page 1-4 of Supplement, IB-36036-b.

Note that a temporary adjustment is made in the last paragraph of the clamp circuit test procedure.

E. Sync Stretch Operation

See comments in Item C under CIRCUIT REVISIONS, page 8. Sync stretch is not adjusted at this time. Refer to page 28.

F. Video Gain Check

Proceed as described on page 1-5 of Supplement IB-36036-b. As a preliminary check, video gain may be observed with a sweep signal. A final check should be made with a composite test signal or step signal such as that supplied by a linearity checker.

G. Constant Resistance Network

Proceed as indicated on pages 1-5 and 1-6 of Supplement IB-36036-b.

H. Visual R-F Tuning

The usual procedure (pages 85 to 94 of IB-36036) should be followed until tuning the power amplifier. Resistors R729 and R774 should be tapped to permit maximum permissible driver screen voltage (X722, X723), when adjusting the EXCITATION control, R724. For transmitters operating on channels 2 to 6, the tapped screen resistor is R726 and the EXCITATION control is R722. The driver tubes are X712 and X713.

See comments in Item B under CIRCUIT ADJUSTMENTS, page 9. After making PA grid circuit adjustments described on page 95 (IB-36036), adjust the coupling between the driver and PA circuit until it is relatively loose. Couple the grid damping resistor R735 for intermediate loading. Apply R-F excitation to the grid circuit and tune it to resonance by means of the grid tuning capacitor C744.

Adjust the PA FILAMENT control for correct 8D21 filament voltage. Set the R-F EXCITATION (R724) (R722 on channels 2-6), Picture GAIN (R922) and PA OUTPUT COUPLING controls to their minimum positions. Terminate the transmitter output in a dummy load (on the output side of the sideband filter). Apply reduced PA voltages (plate, screen and grid) as recommended on page 97 of IB-36036. Apply excitation to the PA stage and proceed to tune and load the plate circuit in the usual manner. If more excitation is required, increase the coupling between driver and PA.

Operate switch S601 for full plate voltage (6000 volts) to the PA stage. Adjust the PA screen voltage to 800 volts and set the BLACK LEVEL control (R908) for approximately 0.5 ampere PA plate current. Do not exceed +50 milliamperes of screen current at any time and avoid excessive plate current in the modulator at white level bias.

Recheck plate and grid circuit resonances of PA and driver. Adjust PA plate loading and excitation.

Check the PA broadband characteristic by means of the procedure specified in Supplement IB-36036-b, pages 2-1 and 2-2. Set switch S801 to AC position and adjust the BLACK LEVEL control (R908) for mid-characteristic operation. The BW-5A Sideband Response Analyzer is preferred for this operation but it may be desirable to apply the Envelope Diode Detector also as a check. Observation of the BW-5A output on an oscilloscope will serve as a means of checking the transmitter amplitude vs. frequency response. If high frequency response is insufficient after R-F adjustments are completed, it will be necessary to supply peaking in the modulation amplifier stages. It is desirable to make initial broadbanding adjustments with the PA stage feeding a dummy load. After obtaining an acceptable response, a check should be made at the vestigial sideband filter output, first with a dummy load termination and finally with the antenna transmission line connected.

NOTE

To obtain the best frequency response, it is necessary to operate the PA stage with moderate coupling between driver and PA together with a large amount of PA grid loading. These conditions, of course, are closely related to bandwidth and required power output.

After observing the frequency response, the grid ooupling and loading probably will require further adjustment. Too much coupling tends to put a sag in the frequency response curve. Insufficient loading will reduce bandwidth and stability.

If more excitation is available after completion of the broadbanding adjustments, advance the EXCITATION control to near maximum allowable and increase grid loading to barely permit obtaining the required power output. Of course, all related adjustments must be checked while making these changes. The driver must not be overloaded.

If a sag appears in the frequency response, the grid coupling should be reduced together with a reduction in grid loading as required for full power output and bandwidth. Several trials may be necessary to find the best combination. If difficulty is experienced, likely sources of trouble are PA tubes with reduced emission capabilities and low gain driver tubes.

OPERATIONAL ADJUSTMENTS

The phase equalizers and low pass filter have been aligned properly at the factory and all related adjustments sealed to prevent accidental changes. The filter is designed to provide specified attenuation of video frequencies beyond the pass band. No adjustments are required. The phase equalizers must be set for phase compensation in accordance with the instructions to follow.

It is assumed that the stabilizing amplifier and distribution amplifiers have been checked for correct performance according to directions in their respective instruction books.

Transmitter adjustments should be completed as described previously in this section. This establishes tube operating conditions, thereby determining video signal levels necessary for full modulation as well as the transmitter linearity characteristic.

SYSTEM ADJUSTMENTS

A. Phase Equalizers

Set the controls on the MI-34025 and MI-34026 Phase Equalizers to the following positions:

MI-34025 LOW FREQUENCY PHASE EQUALIZER

S1, VARIABLE EQUALIZER ---------------------------------- IN
S2, DELAY --- 3

MI-34026 HIGH FREQUENCY PHASE EQUALIZER

Receiver Equalizer

S1, RECEIVER EQUALIZER ---------------------------- IN

Notch Equalizer

S2, NOTCH EQUALIZER --------------------------------- IN

(If notch diplexer or filterplexer unit is used with transmitter)

S3, NOTCH EQUALIZER CURVE ------------------ CURVE A

Variable Equalizer

S4, VARIABLE EQUALIZER ------------------------ IN

S5, DELAY --- 3

S6, VARIABLE EQUALIZER FIXED DELAY ------------ OUT

The phase correction settings do not affect other characteristics therefore they may be set arbitrarily until envelope delay tests are made later.

B. Video Terminations

Check video terminations as shown on the functional diagrams. It is important that in the passive networks, 1% terminations be used. Otherwise their phase and amplitude characteristics may be altered. Note that the transmitter video input termination must be set for 1% accuracy.

C. Amplitude vs. Frequency Response

Using a sweep generator, check frequency response from stabilizing amplifier output to transmitter input, and to modulator monitor output. Establish signal amplitudes and distribution amplifier (TA-3A) gains to approximate those of actual operation. Transmitter input response should be well within the specifications given on page 5. The presence of the low pass filter may result in the appearance of high frequency ripple but it should be less than 10% amplitude. This ripple is not passed by the transmitter therefore it may be ignored. If the second harmonic output from the sweep generator is too great, it will cause excessive and unsymmetrical ripple. The sweep generator must be replaced or its second harmonic output reduced. (The phase equalizers will also show unsymmetrical distortion if driven directly by a sweep generator having appreciable second harmonic output.)

If the frequency response at the transmitter input is not correct (aside from ripple) it will be necessary to check individual components. The passive networks are least susceptible to trouble unless subjected to rough handling.

Energize the complete video transmitter, set AC-DC switch S801 to AC positon and adjust the BLACK LEVEL control (R908) for mid-characteristic operation.

Using the BW-5A Sideband Response Analyzer, observe frequency response from stabilizing amplifier output to antenna transmission line and check with the specifications. Particular attention must be paid to frequencies corresponding to carrier plus 3.58 mc, and above. It is especially important that the response be adjusted to within +1, -1.5 db at carrier plus 3.58 mc. Figure 6 is a waveform presentation illustrating the overall frequency response both before (left) and after (right) the vestigial sideband filter.

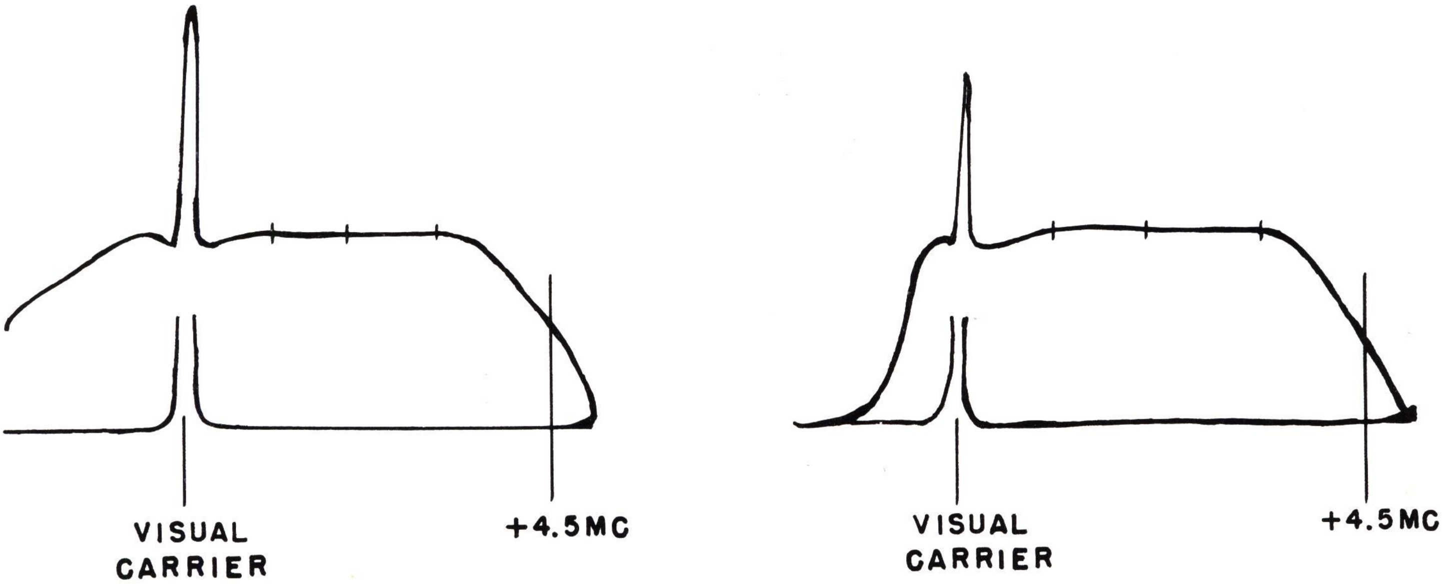


Figure 6 - Sideband Response Analyzer Waveforms (8867272)

In addition, observe the frequency response by means of a diode demodulator (RCA Type MI-19051-A) as specified in the FCC Standards of Good Engineering Practice. Additional frequency response observations are made after completing linearity adjustments.

D. Linearity

1. Adjustment of Linearity Checker

The Linearity Checker (RCA WA-7B) should be adjusted with an oscilloscope to produce a waveform having the proportional levels as shown in Figure 7. Peak-to-peak amplitude should correspond to that normally received on the studio line including 25% sync. The adjustment should be made with the linearity checker terminated in 75 ohms.

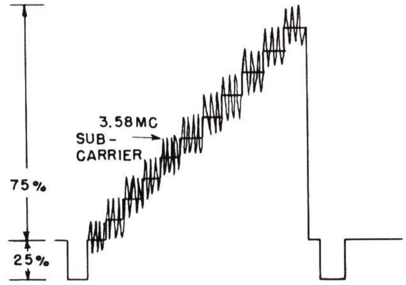


Figure 7 - Waveform produced by Linearity Checker (8867267)

Replace the linearity checker termination with RG-11/U coaxial cable and connect it to the stabilizing amplifier input (internally terminated). The output of the color stabilizing amplifier (RCA TA-7A or TA-7B) should now be checked with the white-stretch switched in and out of the circuit and the unit terminated in 75 ohms. The various waveforms produced are indicated in Figures 11I, 11J, 11K, and 11L.

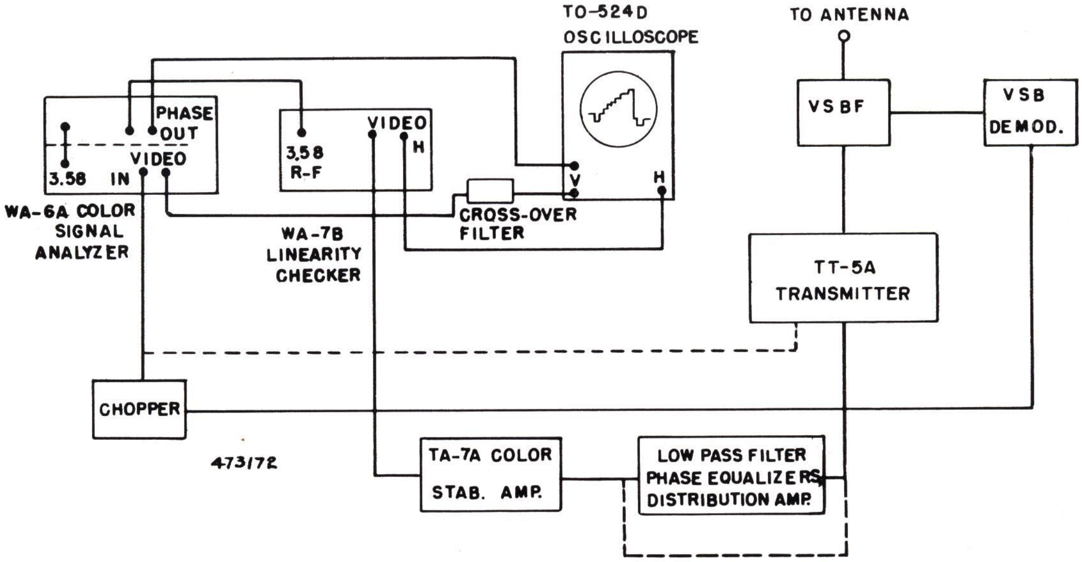


Figure 8 - Test Equipment Set-up for Linearity Adjustments and Differential Phase Measurements (473172)

2. Adjustment of Transmitter

The test equipment should be arranged as shown in Figure 8 with stabilizing amplifier, low pass filter, distribution amplifiers, and phase equalizers in the circuit. Place a directional coupler (MI-19396) between the harmonic filter and sideband filter and supply RF to the diode demodulator for observing transmitter output. The diode demodulator should not be overloaded and its output must be linear. Terminate its output coaxial cable (RG-11/U at the oscilloscope through a Cross-over Filter attachment (MI-34021). In addition, a chopper is required to establish zero reference.

Energize the visual transmitter and set the AC-DC switch S801 to DC position. Make adjustments for normal operation. Observe diode demodulator output ahead of the vestigal sideband filter while adjusting video input signal level for approximately full modulation at required power output. Note that the last step in the waveform as observed on the oscilloscope (without the 3.58 mc. signal) should correspond to 12.5% level for full modulation. See Figure 9.

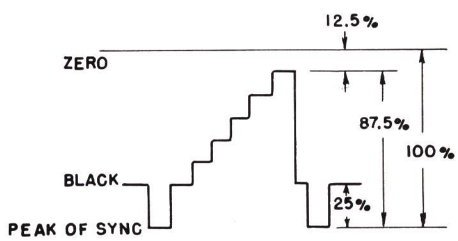


Figure 9 - Waveform for Establishing Depth of Modulation (8867269)

Next, establish signal amplitudes from stabilizing amplifier to transmitter input as shown in Figure 10. It is desirable to operate the distribution amplifiers at lowest possible levels in order to minimize differential phase and linearity distortion.

Set the stabilizing amplifier WHITE STRETCH controls to zero and place the transmitter video GAIN control at approximately 75% of maximum. Supply the signal amplitude established in section D-1 to the stabilizing amplifier and adjust its gain for full modulation of the transmitter at required power output. Check video voltage at grids of first video amplifier (X801, X802, and X803). It should be 1 volt peak-to-peak or less for best performance of distribution amplifiers.

Refer to Figure 10 and adjust gains of the distribution amplifiers (TA-3A) and stabilizing amplifier for equitable voltage distribution. Finally, trim the stabilizing amplifier gain for normal operation.

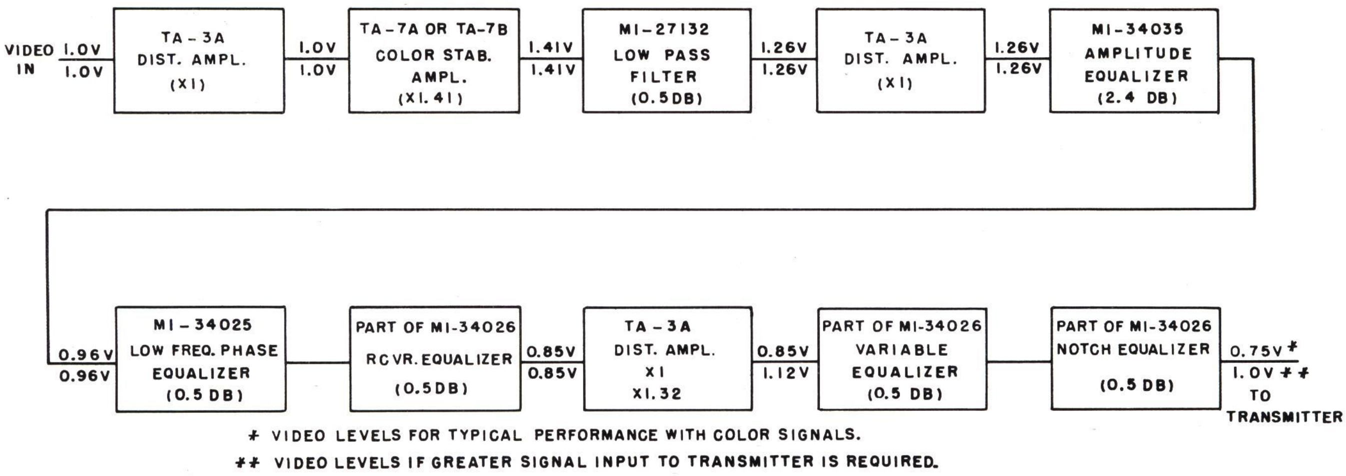


Figure 10 - Typical System Voltage Levels (473196)

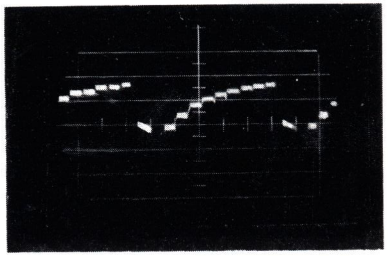
Observe sync compression in the transmitter output at the above operating levels. Adjust the stabilizing amplifier sync controls to produce the correct sync amplitude. Keep the transmitter SYNC AMPLITUDE control set at zero (see page 8). It is undesirable to use a PA tube showing a compression ratio of greater than 2:1.

Check white compression at the transmitter input, modulator output, and diode demodulator output to observe relative contributions in the system. Compression should be checked for low frequencies by observing the step signal waveforms with the Cross-over Filter attachment, (MI-34021) switched to the Low pass position. See Figures 11F, 11G, 11J, and 11K. The 3.58 mc. subcarrier signal compression is measured in terms of incremental gain by switching the filter to High pass position. See Figures 11D and 11E. Contributions of the stabilizing, distribution, and modulation amplifiers should be small. The PA amplifier is the chief contributor. Vary the duty cycle of linearity checker signal and check at the modulator output for any radical change in white compression. Such a change would indicate poor performance in an amplifier stage. Adjust the stabilizing amplifier WHITE STRETCH and GAIN controls for best linearity of the transmitter output at 3.58 mc. for full modulation and required power output. Check sync amplitude and trim adjustments if necessary.

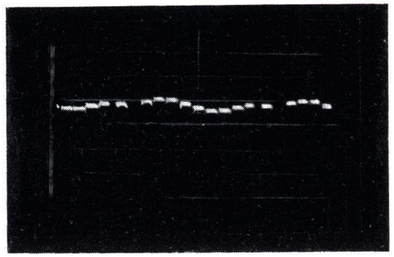
NOTE

If transmitter white compression cannot be compensated sufficiently at the stabilizing amplifier to meet linearity (differential gain) specifications, the modulation amplifier, modulator, and PA should be checked to locate the source of trouble. Most of the contribution may be originating at one faulty stage. The PA tube may be at fault because of its aging characteristics. If no particular stage seems to be at fault, it may be advisable to increase available white stretch in the stabilizing amplifier by changing

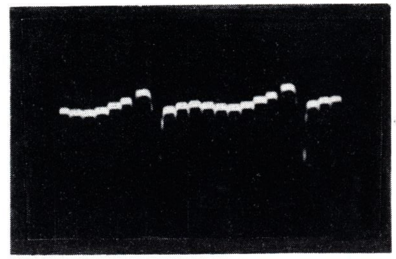
Figure 11 - Oscillograms Obtained During Linearity and Phase Measurements



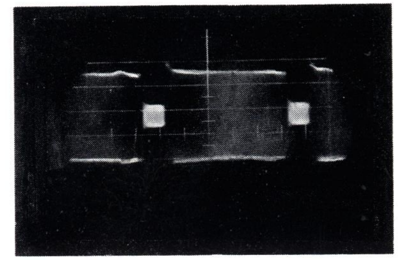
A - OUTPUT OF DIODE DEMODULATOR WITH PHASE CORRECTOR OFF SHOWING DIFFERENTIAL PHASE SHIFT OF ABOUT 10°.



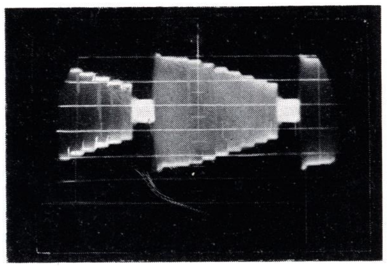
B - OUTPUT OF DIODE DEMODULATOR WITH PHASE CORRECTOR ON SHOWING DIFFERENTIAL PHASE SHIFT OF COLOR SUBCARRIER FROM BLACK TO WHITE.



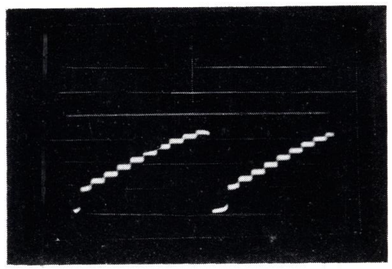
C - SAME AS B EXCEPT THAT REFERENCE HAS BEEN SHIFTED THROUGH 3°.



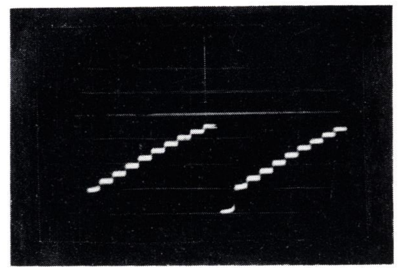
D - OUTPUT OF DIODE DEMODULATOR AFTER PASSING THROUGH HIGH-PASS FILTER WITH WHITE STRETCH ON.



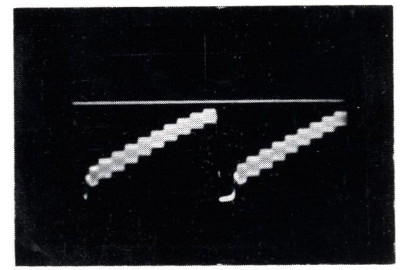
E - OUTPUT OF DIODE DEMODULATOR AFTER PASSING THROUGH HIGH-PASS FILTER WITH WHITE STRETCH OFF.



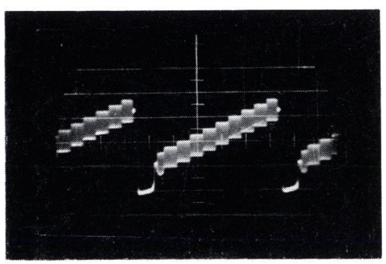
F - OUTPUT OF DIODE DEMODULATOR AFTER PASSING THROUGH LOW-PASS FILTER WITH WHITE STRETCH OFF.



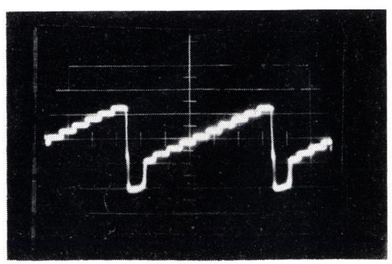
G - OUTPUT OF DIODE DEMODULATOR AFTER PASSING THROUGH LOW-PASS FILTER WITH WHITE STRETCH ON.



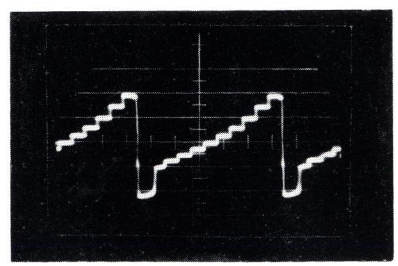
H - OUTPUT OF DIODE DEMODULATOR DIRECT, WITH WHITE STRETCH ON.



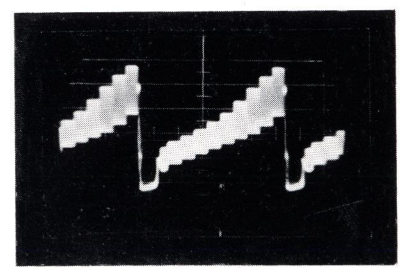
I - OUTPUT OF STABILIZING AMPLIFIER DIRECT, WITH WHITE STRETCH OFF.



J - OUTPUT OF STABILIZING AMPLIFIER AFTER PASSING THROUGH LOW-PASS FILTER WITH WHITE STRETCH OFF.



K - OUTPUT OF STABILIZING AMPLIFIER AFTER PASSING THROUGH LOW-PASS FILTER WITH WHITE STRETCH ON.



L - OUTPUT OF STABILIZING AMPLIFIER DIRECT, WITH WHITE STRETCH ON.

resistors in the crystal diode circuits. See page 17 for modifying the TA-7A Amplifier.

Observe incremental gain by means of diode demodulator output from a point beyond the vestigial sideband filter. Check variations against the specification given on page 6.

At this point it is very important to record on the Master Monitor (IRE roll-off switch in) the signal level at the grid of the stabilizing amplifier white-stretch stage. This level must be maintained during operation to assure proper linearity correction because white stretch settings are a function of signal level. The stabilizing amplifier GAIN control is used to maintain the calibrated level.

E. Variation in Frequency Response with Brightness

Return to the arrangment of equipment used to observe mid-characteristic response of the transmitter system, section C, page 25.

Continue with switch S801 in AC position and observe frequency response indications for various settings of the BLACK LEVEL control (R908) corresponding to brightness levels of 22.5%, 67.5%, and mid-characteristic (peak of sync reference -100%). Adjust the BW-5A Response Analyzer sweep signal to produce 20% peak-to-peak modulation at the mid-characteristic brightness level. Maintain the same analyzer sweep output voltage while observing response at 22.5% and 67.5% brightness levels. Measure variations from the mid-characteristic curve and check against the specification of plus or minus 2 db maximum allowable variations.

F. Sync Separator Input Requirement

Having established the sync level for the modulator input, as the transmitter is presently operating, the sync separator input requirement should be checked. Refer to page 8.

Modulate the transmitter with a test pattern signal and provide sufficient input for full modulation at required power output. Observe transmitter output at the diode demodulator and ascertain if streaking is present due to poor clamping. Presence of streaking indicates faulty clamp operation which must be remedied. Observe composite waveform during the vertical blanking interval to check clamping action. If tilt or other irregularities occur, refer to pages 15 and 22 for suggested modifications to improve performance. Check the transmitter input and stabilizing amplifier output to verify the source of trouble. After eliminating streaking at normal level, reduce the video signal 6 db by adjusting the transmitter VIDEO GAIN control (check with an oscilloscope) and look again for signs of streaking. If present, shunt R871 with a resistor of less than 1000 ohms to produce more clamp drive and eliminate the streaking. Return the VIDEO GAIN control to its previous setting.

G. Differential Phase

Supply 3.58 mc. reference signal from linearity checker to a Color Signal Analyzer (RCA Type WA-6A) through RG-11/U coaxial cable. Check for differential phase shift in the linearity checker at 3.58 mc. to use as a reference. It should be negligible, but if not, record the amount to serve as a correcting factor for measurements to follow. Connect the color signal analyzer video input to the stabilizing amplifier output and terminate. The input to the analyzer should not exceed 1 volt peak-to-peak. If a higher level is present, a suitable video attenuator must be employed. Subsequent phase relation measurements are determined by the pre-white stretch level established in the stabilizing amplifier.

Drive the stabilizing amplifier with the step signal (3.58 mc. subcarrier superimposed) at the pre-white stretch level established in Part D, page 38. Check phase of burst signal relative to the 3.58 mc. reference. Adjust the **BURST PHASE** control (TA-7A only) for minimum phase shift. Burst amplitude may be checked at this time also by observing at stabilizing amplifier input and output with an oscilloscope.

Measure differential phase of the stabilizing amplifier and adjust the crystal diode trimmers using the following procedure:

1. Mark the positions of the three **WHITE STRETCH** knobs accurately.

2. Set the first two knobs on the left to bias their respective crystals off.

3. Adjust the 3rd trimmer knob for its best phase correction.

4. Return the 2nd knob to its marked position and adjust its trimmer for best contribution to the phase correction.

5. Repeat (4) for the remaining crystal and its trimmer.

6. Touch up the trimmer adjustments for best results. It should be possible to limit the phase error to approximately one degree.

Move the color signal analyzer input cable from the stabilizing amplifier output to the output of the last distribution amplifier and measure differential phase shift, maintaining the previously established pre-white stretch level. A large amount of differential phase error indicates faulty distribution amplifiers. A small amount may be compensated for by adjustment of the white-stretch trimmers following the procedure outlined in the preceding paragraph. Transfer the color signal analyzer input to a diode demodulator connected at the output side of the vestigial sideband filter. Provide a chopper at the oscilloscope for establishing zero reference level. Energize the transmitter and modulate with step signal supplied at stabilizing amplifier input from the linearity checker. Check adjustments made in section D, page 26, to produce correctly apportioned output signal, including superimposed 3.58 mc. subcarrier, at full modulation and required power output. Maintain correct pre-white stretch level and avoid overloading the color signal analyzer input.

Measure differential phase and compare to the specification given on page 6.

If the transmitter differential phase error contributions are excessive, it may be advisable to feed the step signal directly from stabilizing amplifier to transmitter input while investigating transmitter performance. A faulty stage is likely to be the source of trouble. Burst phase trouble may be caused by a defective clamp diode or improper isolation between the diode and signal path.

H. Envelope Delay

These adjustments are made last because the passive networks have negligible effect on other system characteristics. A 100 kc. square wave with a rise time of 0.5 microsecond or less, is required as a test signal. Proceed as follows:

1. If the transmitter uses a notch-type diplexer or a filterplexer, switch the **NOTCH EQUALIZER** section of the **MI-34026** equalizer into the circuit.

2. Switch **OUT** the **RECEIVER EQUALIZER** section on **MI-34026**. This section is intended for receiver compensation only and should not ordinarily be included for transmitter adjustments. However, if a demodulator having receiver high frequency characteristics is employed in observing transmitter delay response, then

the RECEIVER EQUALIZER section would be used.

3. Provide R-F sampling for the vestigial sideband (VSB) demodulator in accordance with instructions supplied for the unit. Locate the sampling point on the output side of the notch diplexer or filterplexer. If a bridge diplexer is used, the sampling point may follow immediately after the sideband filter.

   The sampling point preferably should follow the harmonic filter because otherwise, errors are possible due to the presence of harmonic energy. Adjust the R-F signal level to a value low enough to avoid overloading the demodulator input.

   Connect the video output from the VSB demodulator through RG-11/U coaxial cable to the input of an RCA Type TO-524D Oscilloscope. Terminate this line with a 75 ± 5% ohm coaxial termination.

4. Set the demodulator switches as shown in the following tables so that the oscilloscope presentation most nearly represents the transmitter system delay.

BW-4A or BWU-4A		
S1	SOUND TRAP	OUT
S2	PHASE COMPENSATOR	OUT
S3	ENV. DET. DEMOD.	DEMOD.

WM-20B		
	SOUND CARRIER TRAP	DISCONNECT
S1	SOUND VIDEO TRAP	OUT
S2	PHASE COMPENSATOR	OUT

CAUTION

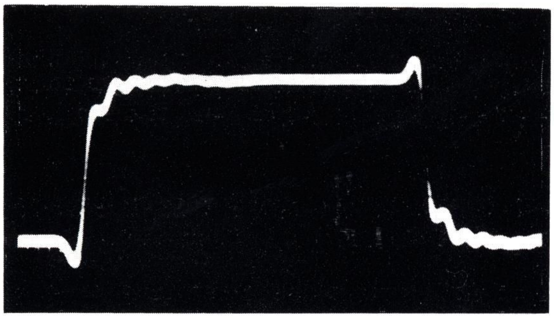
SINCE SOUND TRAPS ARE DISCONNECTED, DO NOT ENERGIZE THE AURAL TRANSMITTER OR MEASUREMENTS WILL BE INACCURATE.

5. Using a Tektronix Type 105 Square Wave Generator provided with 75 ± 5% ohms termination on its output cable, supply a 100 kc. square wave signal to the input of the MI-34026 High Frequency Phase Equalizer. Switch the NOTCH EQUALIZER either IN or OUT in accordance with step 1. If switched IN, set selector switch to a CURVE A.

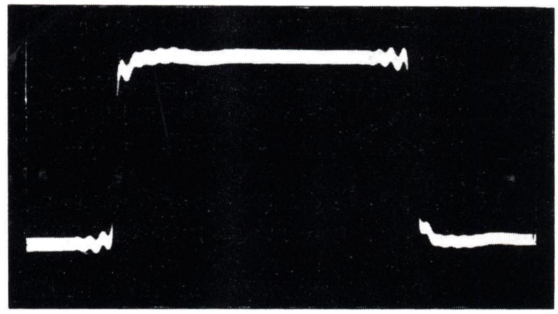
   Switch OUT the VARIABLE EQUALIZER of MI-34026.

6. Energize the visual transmitter, leaving the aural transmitter off, and adjust for "A-C" operation.

   Modulate the transmitter to approximately 25 percent and observe the square-wave response on the oscilloscope connected in Step 3. The waveform should be similar to that shown in Figure 12A although the exact waveform obtained will be a function of the particular transmitter and VSB demodulator used. Phase and amplitude errors in the demodulator must be corrected within the unit itself if the oscilloscope presentation is to show the true transmitter response. These instructions assume that the demodulator has the desired characteristics.



—A—



—B—

Figure 12 - Typical System Square Wave Response

7. Transfer the square wave generator output lead and its termination to the input of the Low Pass Filter, MI-27132. Switch OUT the Low Frequency Phase Equalizer, MI-34025. (The Receiver and Variable Equalizer sections of the High Frequency Phase Equalizer, MI-34026, must be switched OUT.)

   Without disturbing the distribution amplifier gain settings previously established, modulate the transmitter to approximately 25 percent and compare the response on the oscilloscope to that obtained in Step 6. The same type of response indicates that intervening components are performing properly. The principal change in the response will be the addition of high-frequency ringing contributed by the Low Pass Filter, MI-27132.

   Switch IN the Low Frequency Phase Equalizer and adjust its DELAY control to obtain a waveform as nearly as possible like that shown in Figure 12B. Ringing may be more prominent at this stage of adjustment.

8. On the High Frequency Phase Equalizer, MI-34026, switch IN the NOTCH EQUALIZER section if required (see Step 1) and the VARIABLE EQUALIZER section. Select CURVE A for the NOTCH EQUALIZER then adjust the DELAY control for minimum ringing. Note that ten possible delay curves are available by using combinations of the five DELAY knob positions and the VARIABLE EQUALIZER FIXED DELAY, IN-OUT switch.

   Repeat this adjustment with the NOTCH EQUALIZER switch set to CURVE B. Determine the most satisfactory combination for best symmetry and minimum ringing as shown in Figure 12B.

   If the Notch Equalizer is not required, high frequency compensation involves adjustment of the Variable Equalizer only.

9. Using envelope delay sweep equipment, check the high frequency equalizer settings employing a diode detector in place of the VSB demodulator (at the same R-F sampling point). This equipment will enable more sensitive adjustments to be made, with a corresponding increase in accuracy In addition, a quantitative measure of envelope delay for frequencies above a specified value is obtained. A low frequency reference may not be present in the display because the envelope delay sweep range of some commercially available equipment is limited at the lower end to frequencies above 0.75 mc.

If the previously mentioned equipment is not available, phase equalizer settings obtained by the square wave procedure will serve as adequate correction with reference to FCC specifications.

10. After completion of the preceding adjustments, switch IN the RECEIVER EQUALIZER section of the MI-34026 High Frequency Phase Equalizer.

    With all required equalizers switched IN, check the amplitude response at the output of either the modulator or the transmitter. Adjust the transmitter, if necessary, to obtain a flat response.

11. The overall system should now be correctly compensated for best production of color television pictures on a typical receiver.

    An indication of picture quality on a home television receiver may be obtained by switching in the sound trap circuits of the VSB demodulator, then feeding its output to a color monitor.

I. Subcarrier Amplitude (vs. Luminance Amplitude)

Make observation of signal waveforms on the output side of the vestigial sideband filter, using a diode demodulator, chopper, and oscilloscope.

Test signal must be supplied from a Colorplexer (RCA Type TX-1A or TX-1B), driven by a Color Bar Generator (RCA Type WA-1D). If this signal is not available at the transmitter installation, it must be relayed from the studio control center. In either case, the test signal must be acceptable in that it is satisfactory as produced by the colorplexer and is not seriously degraded before arrival at the transmitter system input.

After completing colorplexer adjustments and setting the bar generator pattern switch at No. 4 position, measure subcarrier maximum and minimum levels for each color at the transmitter system input. Use blanking as a reference.

Apply colorplexer composite signal to the transmitter system input. Make adjustments, including correct pre-white stretch level, to produce full modulation at required power output. Check pre-white stretch level and modulation level of the transmitter output on a Master Monitor (IRE roll-off switched in). Take measurements of subcarrier maximum and minimum levels with reference to blanking.

Compare corresponding color subcarrier amplitudes of transmitter system input signal and vestigial sideband output. Departures of the latter should not exceed a maximum of ± 15%.

Check corresponding color luminance levels (centers of subcarrier amplitudes) with reference to blanking to detect any appreciable departures due to the transmitter system.

The purpose of these measurements is to detect any serious change in the relative amplitudes of luminance and subcarrier signal components. A constant ratio for each color is important in maintaining true color saturation.

J. Burst vs. Subcarrier Phase

With the transmitter system adjusted properly as outlined in the preceding section, measure the phase angles of each color subcarrier at both the transmitter system input and vestigial sideband filter output using a Color Signal Analyzer (RCA Type WA-6A).

The reference 3.58 mc. subcarrier signal for the analyzer may be obtained from a Burst Controlled Oscillator (RCA Type WA-4A) which in turn is controlled by a burst signal derived from the composite color or "colorplexed" signal arriving at the transmitter location.

At the transmitter output the diode demodulator signal from the vestigial sideband filter is used to control the burst oscillator and the phase measurements are made in the same way.

Compare corresponding color phase angles of the transmitter system input signal and VSBF output. Departure of the latter should not exceed ± 7 degrees. These measurements will determine the fidelity of the color hues.

K. Intercarrier Frequency Stability

In addition to maintaining the aural and visual carrier frequencies within acceptable tolerances, it is necessary to specify that their difference (4.5 mc.) be held within ± 1 kc. at all times. This tolerance is much less than the ± 5 kc. employed in monochrome service.

The subcarrier frequency (3.579545 mc.) was selected to provide interlace for the beat frequency of 0.921 mc. between the subcarrier and sound intercarrier (4.5 mc.). The reduction in visibility of low frequency beat patterns in receivers will not be fully realized if the ± 1 kc. intercarrier tolerance is exceeded.

Maintain the aural and visual carrier frequencies to meet the intercarrier tolerance specification given on page 5.

OPERATION

Operation of the transmitter during color programming is essentially the same as that employed for monochrome. However, observations and adjustments should be made in a systematic manner to assure the most satisfactory transmission of the color signals.

If linearity correction of the transmitter is not maintained properly, distortion of the chrominance information will occur resulting in the colors of the scene having incorrect saturation and brightness. After linearity correction in the color stabilizing amplifier has been established, retuning of the modulated stage and adjustment of BLACK LEVEL are not permissible.

If the transmitter peak power output should drift without a corresponding change in RF excitation, it is not good practice to restore the correct power level by adjusting the EXCITATION control.

Reference white level, as indicated on the console master monitor, must be a true white. Some of the chrominance signals may extend beyond white depending upon the particular hue and saturation. The operator should coordinate his observations with studio control and other sources of program signal to be informed concerning the presence of a true white signal. A color monitor will serve to supplement other sources of information.

The following suggestions are offered as an aid in maintaining optimum operating conditions at all times. Possible shifts or variations from normal are outlined with the appropriate corrective action listed in each instance:

1. Modulation level out of modulated stage ------------------ shifted
   RF excitation amplitude ------------------------------ shifted
   Peak power output -- shifted
   Modulator output level ---------------------------------- unchanged

   Return RF excitation to proper amplitude by means of the RF EXCITATION control. Power output should return to normal.

2. Modulation level out of modulated stage ------------------ shifted
   RF excitation amplitude ------------------------------ unchanged
   Peak power output -- unchanged
   Modulator output level ---------------------------------- shifted
   Pre-white stretch video level ---------------------------- unchanged

   Adjust transmitter GAIN control for correct modulation. Do not adjust stabilizing amplifier GAIN control.

3. Modulation level out of modulated stage ------------------ shifted
   RF excitation amplitude ------------------------------ unchanged
   Peak power output -- unchanged
   Modulator output level ---------------------------------- shifted
   Pre-white stretch video level ---------------------------- shifted

   Adjust stabilizing amplifier GAIN control for correct pre-white stretch level. However, if modulation level is still incorrect, the transmitter GAIN will have to be adjusted. Modulator output level may then be observed as a check.

LIST OF CONTENTS OF SCHEDULE ES-19237-A

ES-19237-A VHF TELEVISION TRANSMITTER INPUT & MONITORING EQUIPMENT (COLOR)

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
1	1	MONITORING EQUIP. RACK NO. 1 (LEFT HAND) WIRED AND INCLUDING: 1 BR-84D CABINET RACK 1 MI-30526-G84 PANEL MOUNTING ANGLES (PAIR) 1 MI-30541-G84 SIDE PANEL 1 MI-11645-A DOUBLE JACK PANEL 1 MI-11647-1 JACK MAT 1 MI-4570-A TERMINAL BOARD BRACKET 1 MI-4569 AUDIO TERMINAL BLOCK 2 MI-4568 POWER TERMINAL BLOCK	MI-19123-A	
2	1	MONITORING EQUIP. RACK NO. 2 (CENTER) WIRED AND INCLUDING: 1 BR-84-D CABINET RACK 1 MI-30526-G84 PANEL MOUNTING ANGLES (PAIR) 1 MI-30541-G84 SIDE PANEL 1 MI-4570-A TERMINAL BOARD BRACKET 1 MI-30590-2 INTERLOCK SWITCH 2 MI-4568 POWER TERMINAL BLOCK	MI-19124-A	
3	1	MONITORING EQUIP. RACK NO. 3 (RIGHT HAND) WIRED AND INCLUDING: 1 BR-84-D CABINET RACK 1 MI-30526-G84 PANEL MOUNTING ANGLES (PAIR) 1 MI-4570-A TERMINAL BOARD BRACKET 1 MI-4568 POWER TERMINAL BLOCK 1 MI-30590-2 INTERLOCK SWITCH 1 MI-26240 CIRCUIT BREAKER CHASSIS 3 MI-26764-1 CIRCUIT BREAKER 1 MI-26764-2 CIRCUIT BREAKER	MI-27158	
4	2	ELECTRICAL SHIELD	MI-30546-G28	
5	1	ELECTRICAL SHIELD	MI-30546-G21	
6	2	SINGLE TRIM STRIP	MI-30566-G84	
7	2	DOUBLE TRIM STRIP	MI-30568-G84	
8	1	BLANK PANEL 5 1/4"	MI-4592-B	
9	1	BLANK PANEL 3 1/2"	MI-4591-B	
10	1	BLANK PANEL 8 3/4"	MI-4594-B	
11	1	BA-6A LIMITING AMPLIFIER (INCLUDES PANEL BUT LESS SHELF AND TUBES)	MI-11225	
12	1	TUBE KIT FOR BA-6A	MI-11289	
13	1	BA-14A MONITORING AMPLIFIER (LESS TUBES)	MI-11234-A	
14	1	TUBE KIT FOR BA-14A	MI-11267	
15	1	PANEL FOR BA-14A	MI-11598-B	
16	2	BR-2A SHELF FOR BA-14A AND BA-6A	MI-11599	
17	3	WP-33B REGULATED POWER SUPPLY (WITH ONE SET OF TUBES)	MI-26085-B	
18	1	TA-7A STABILIZING AMPLIFIER (WITH ONE SET OF TUBES)	MI-40205	
19	1	BLANK CHASSIS 3 1/2"	MI-26525-2	
20	2	VIDEO JACK PANEL	MI-26245	
21	1	BW-4A VISUAL DEMODULATOR (WITH ONE SET OF TUBES)	ES-34006	
22	*	GENERAL RADIO VHF STATION MONITORING EQUIPMENT COMPLETE WITH ONE SET OF TUBES AS FOLLOWS: TYPE 1183-T1 FOR CHANNELS 2 - 6 INCLUDING: 1 GR-1170-BT1 FM MONITOR 1 GR-1171-AT1 VISUAL FREQUENCY MONITOR 1 GR-1176-AT VISUAL FREQUENCY METER OR TYPE 1183-T2 FOR CHANNELS 7 - 13 INCLUDING: 1 GR-1170-BT2 FM MONITOR 1 GR-1171-AT2 VISUAL FREQUENCY MONITOR 1 GR-1176-AT VISUAL FREQUENCY METER OR HEWLETT PACKARD TV MONITOR MODEL 335E FOR CHANNELS 2 - 13 *(NOTE) SUPPLY ONE OF THE ABOVE ITEMS AS SPECIFIED ON SALES ORDER.		
23	1	BW-5A SIDEBAND RESPONSE ANALYZER	ES-34010	
24	1	BLANK CHASSIS 1 3/4"	MI-26525-1	
25	3	AUDIO PATCH CORD	MI-4652-2B	
26	6	VIDEO PATCH CORD	MI-7233-4	
27	16	VIDEO DUAL CONNECTOR PLUG	MI-19118	
28	2	BLANK CHASSIS 5 1/4"	MI-26525-3	
29	1	BLANK CHASSIS 8 3/4"	MI-26525-5	
30	1	HIGH FREQUENCY EQUALIZER	MI-34026	
31	1	LOW FREQUENCY EQUALIZER	MI-34025	
32	3	TA-3A DISTRIBUTION AMPLIFIER	MI-26157	
33	*	BLANK PANEL 12 1/4" *(NOTE) SUPPLY ONE ONLY IF HEWLETT PACKARD MONITOR IS SPECIFIED.	MI-4596-B	
34	*	BLANK PANEL 14" *(NOTE) SUPPLY ONE ONLY IF HEWLETT PACKARD MONITOR IS SPECIFIED.	MI-4597-B	
35	1	COAXIAL TERMINATION 75 OHMS ±5%	895438	501
36	1	COAXIAL TERMINATION 75 OHMS ±1%	895438	503
37	1	ENVELOPE CONTAINING THE FOLLOWING DRAWINGS: (A) WIRING DIAGRAM RACK #1 (B) WIRING DIAGRAM RACK #2 (C) WIRING DIAGRAM RACK #3	 311385 318026 318023	

LIST OF CONTENTS OF SCHEDULE ES-19237-B

ES-19237-B VHF TELEVISION TRANSMITTER INPUT AND MONITORING EQUIPMENT (COLOR

ITEM	QUAN.	DESCRIPTION	REFERENCE	PART OR GROUP
1	1	BR-84B CABINET RACK, CONSISTING OF: 1 MI-30951-E84 RACK 1 MI-30535-G84 DOOR 2 MI-30541-G84 SIDE PANELS	MI-30951-B84	
2	2	BR-84D CABINET RACK, CONSISTING OF: 1 MI-30951-E84 RACK 1 MI-30535-G84 DOOR	MI-39051-D84	
3	2	ELECTRICAL SHIELD	MI-30546-G28	
4	1	ELECTRICAL SHIELD	MI-30546-G21	
5	2	SINGLE TRIM STRIP	MI-30566-G84	
6	2	DOUBLE TRIM STRIP	MI-30568-G84	
7	1	BLANK PANEL 5 1/4"	MI-4592-B	
8	1	BLANK PANEL 3 1/2"	MI-4591-B	
9	1	BLANK PANEL 8 3/4"	MI-4594-B	
10	1	BA-6A LIMITING AMPLIFIER (INCLUDES PANEL BUT LESS SHELF AND TUBES)	MI-11225	
11	1	TUBE KIT FOR BA-6A	MI-11289	
12	1	BA-14A MONITORING AMPLIFIER (LESS TUBES)	MI-11234-A	
13	1	TUBE KIT FOR BA-14A	MI-11267	
14	1	PANEL FOR BA-14A	MI-11598-B	
15	2	BR-2A SHELF FOR BA-14A AND BA-6A	MI-11599	
16	3	WP-33B REGULATED POWER SUPPLY (WITH ONE SET OF TUBES)	MI-26085-B	
17	1	TA-7A STABILIZING AMPLIFIER (WITH ONE SET OF TUBES)	MI-40205	
18	1	BLANK CHASSIS 3 1/2"	MI-26525-2	
19	1	BLANK CHASSIS 1 3/4"	MI-26525-1	
20	2	VIDEO JACK PANEL	MI-26245	
21	1	BW-4A VISUAL DEMODULATOR (WITH ONE SET OF TUBES)	ES-34006	
22	*	GENERAL RADIO VHF STATION MONITORING EQUIPMENT COMPLETE WITH ONE SET OF TUBES, AS FOLLOWS: TYPE 1183-T1 FOR CHANNELS 2-6 INCLUDING: 1 GR-1170-BT1 FM MONITOR 1 GR-1171-AT1 VISUAL FREQUENCY MONITOR 1 GR-1176-AT VISUAL FREQUENCY METER OR TYPE 1183-T2 FOR CHANNELS 7-13 INCLUDING: 1 GR-1170-BT2 FM MONITOR 1 GR-1171-AT2 VISUAL FREQUENCY MONITOR 1 GR-1176-AT VISUAL FREQUENCY METER OR HEWLETT PACKARD TV MONITOR MODEL 335E FOR CHANNELS 2 - 13 *(NOTE) SUPPLY ONE OF THE ABOVE ITEMS AS SPECIFIED ON SALES ORDER.		
23	1	BW-5A SIDEBAND RESPONSE ANALYZER	ES-34010	
24	1	~~BLANK CHASSIS 10 1/2"~~	~~MI-26525-6~~	
25	3	AUDIO PATCH CORD	MI-4652-2B	
26	6	VIDEO PATCH CORD	MI-7233-4	
27	16	VIDEO DUAL CONNECTOR PLUG	MI-19118	
28	2	BLANK CHASSIS 5 1/4"	MI-26525-3	
29	3	PAIR OF PANEL MOUNTING ANGLES	MI-30526-G84	
30	3	TERMINAL BOARD BRACKETS	MI-4570-A	
31	1	AUDIO TERMINAL BLOCKS	MI-4569	
32	5	POWER TERMINAL BLOCKS	MI-4568	
33	1	BJ-24 DOUBLE JACK PANEL	MI-11645-A	
34	1	JACK MAT FOR BJ-24	MI-11647-1	
35	2	INTERLOCK SWITCH	MI-30590-2	
36	1	BLANK CHASSIS 8 3/4"	MI-26525-5	
37	1	HIGH FREQUENCY EQUALIZER	MI-34026	
38	1	LOW FREQUENCY EQUALIZER	MI-34025	
39	3	TA-3A DISTRIBUTION AMPLIFIER	MI-26157	
40	*	BLANK PANEL *(NOTE) SUPPLY ONE ONLY IF HEWLETT PACKARD MONITOR IS SPECIFIED.	MI-4596-B	
41	*	BLANK PANEL *(NOTE) SUPPLY ONE ONLY IF HEWLETT PACKARD MONITOR IS SPECIFIED.	MI-4597-B	
42	1	COAXIAL TERMINATION 75 OHMS ±5%	895438	501
43	1	COAXIAL TERMINATION 75 OHMS ±1%	895438	503
44	1	ENVELOPE CONTAINING THE FOLLOWING DRAWINGS: (A) WIRING DIAGRAM RACK #1 (B) WIRING DIAGRAM RACK #2 (C) WIRING DIAGRAM RACK #3	 311385 318026 318023	
45	1	CIRCUIT BREAKER CHASSIS	MI-26240	
46	3	CIRCUIT BREAKER	MI-26764-1	
47	1	CIRCUIT BREAKER	MI-26764-2	

(E) TERMINATIONS (75 ± 5% Ω) REQUIRED AT ALL TA-3A AMPLIFIER AUXILIARY OUTPUTS.

NOTES

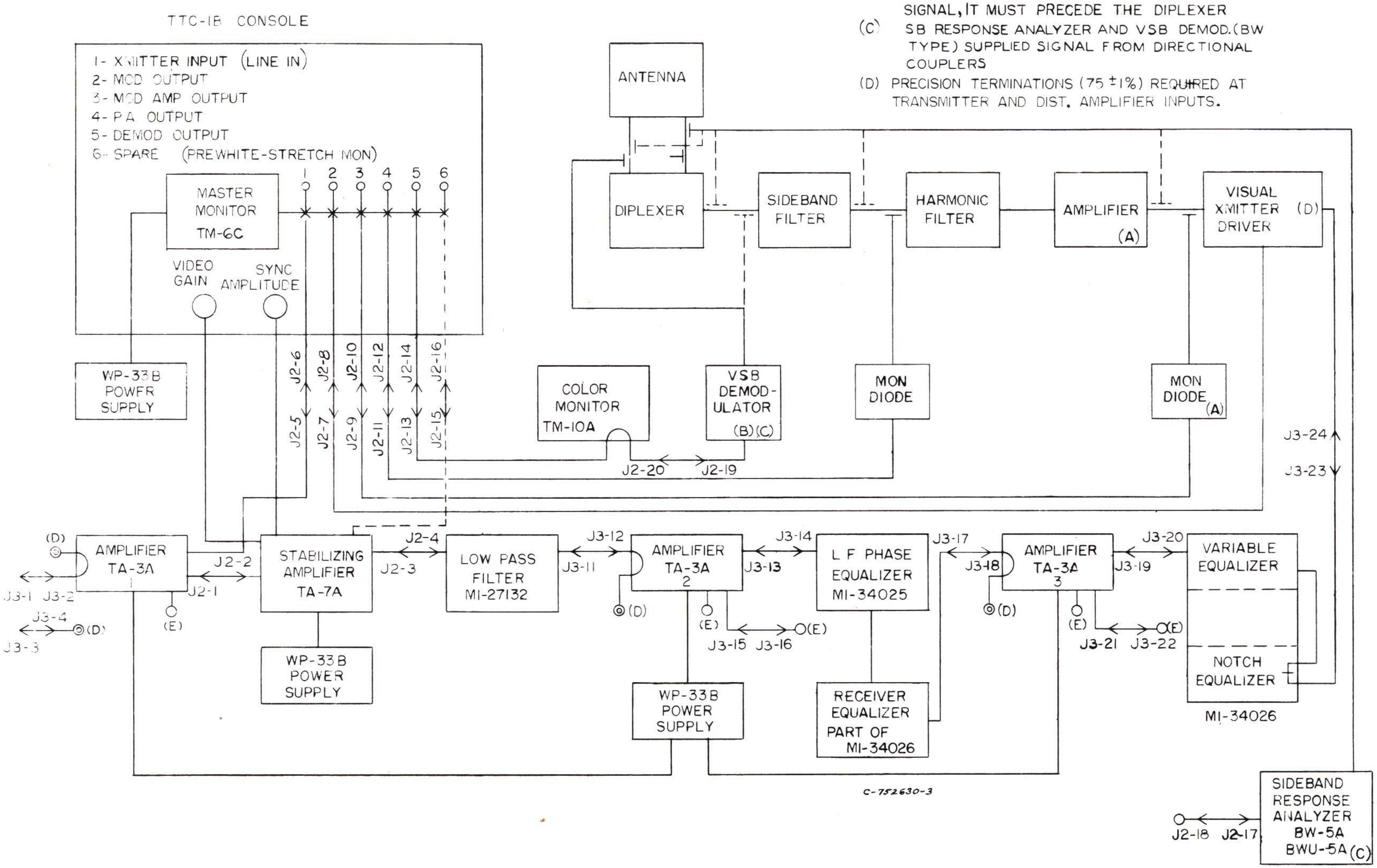
(A) ITEMS REQUIRED ONLY IF AMPLIFIER IS PRESENT

(B) 1-BOTH ANTENNA LINES MUST BE EQUIPPED FOR MONITORING, ONE TO SERVE DAILY, THE OTHER AS CHECK POINT.

2-IF DEMODULATOR DOES NOT REJECT AURAL SIGNAL, IT MUST PRECEDE THE DIPLEXER

(C) SB RESPONSE ANALYZER AND VSB DEMOD. (BW TYPE) SUPPLIED SIGNAL FROM DIRECTIONAL COUPLERS

(D) PRECISION TERMINATIONS (75 ± 1%) REQUIRED AT TRANSMITTER AND DIST. AMPLIFIER INPUTS.



COLOR SIGNAL CIRCUITS FOR RCA TV TRANSMITTERS USING DIPLEXER, TTC-1B CONSOLE AND ES-19237 MONITORING RACK SERIES.

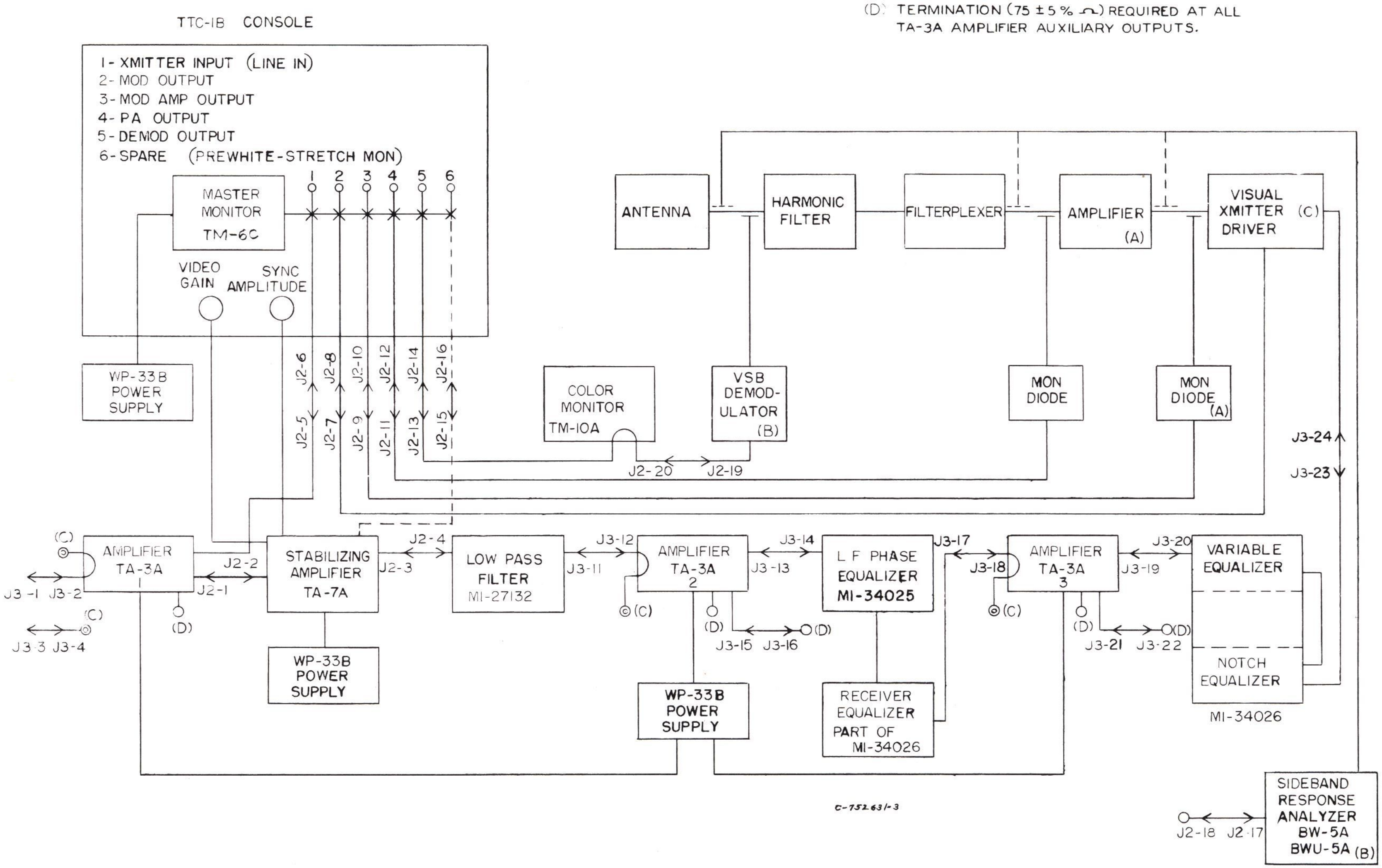
NOTCH EQUALIZER PORTION OF MI-34026 NOT REQUIRED WITH BRIDGE DIPLEXER.

NO.1 TA-3A AMPLIFIER MAY BE OMITTED IF INPUT SIGNAL MONITORING IS NOT DESIRED.

Figure 13 - Functional Diagram A, Visual Signal Circuits (752630)

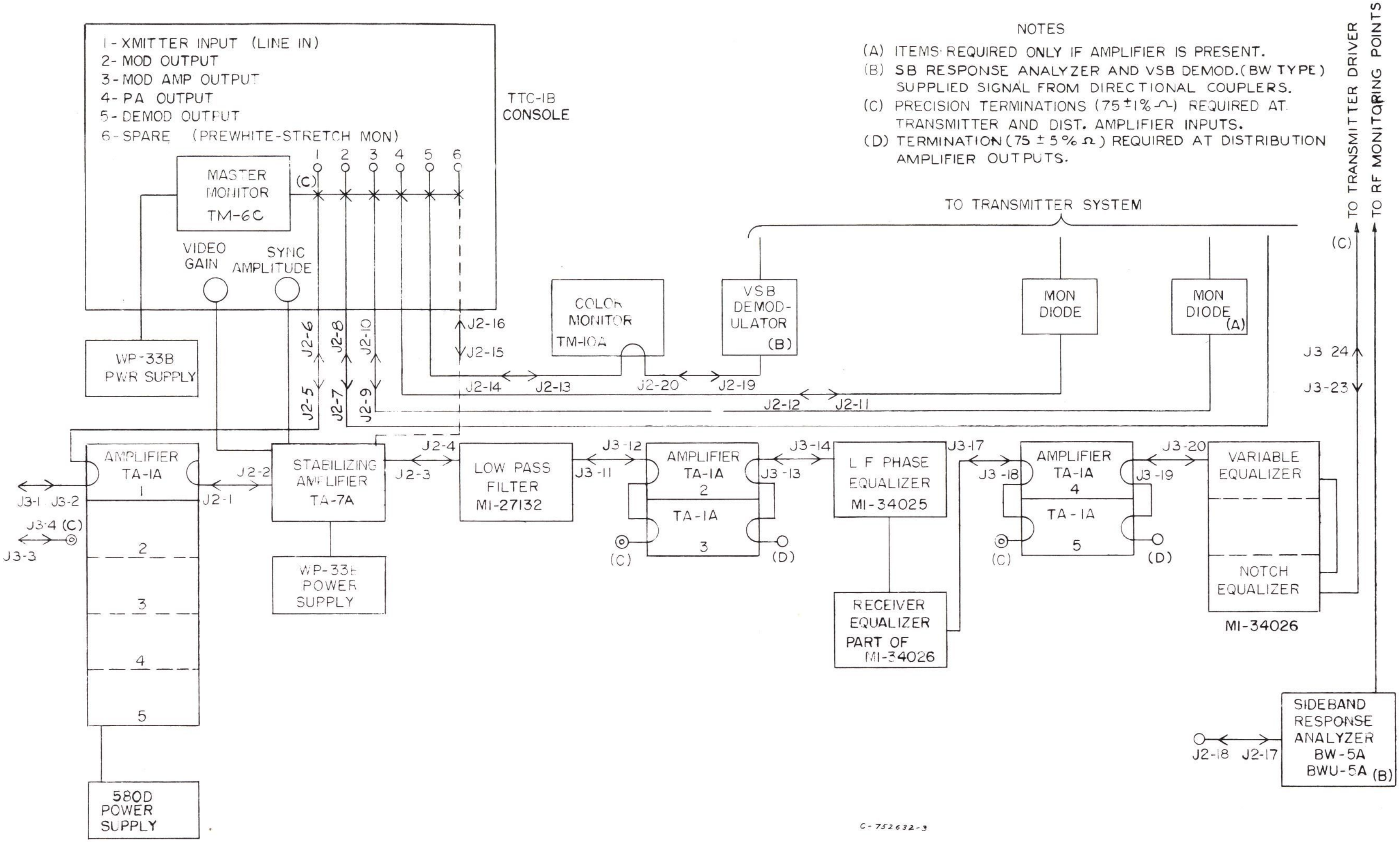
NOTES

(A) ITEMS REQUIRED ONLY IF AMPLIFIER IS PRESENT.
(B) SB RESPONSE ANALYZER AND VSB DEMOD. (BW TYPE) SUPPLIED SIGNAL FROM DIRECTIONAL COUPLERS.
(C) PRECISION TERMINATIONS (75 ± 1 Ω) REQUIRED AT TRANSMITTER AND DIST. AMPLIFIER INPUTS.
(D) TERMINATION (75 ± 5 % Ω) REQUIRED AT ALL TA-3A AMPLIFIER AUXILIARY OUTPUTS.



COLOR SIGNAL CIRCUITS FOR RCA TV TRANSMITTERS USING FILTERPLEXER, TTC-IB CONSOLE AND ES-19237 MONITORING RACK SERIES.
NO. I TA-3A AMPLIFIER MAY BE OMITTED IF SIGNAL INPUT MONITORING IS NOT DESIRED.

Figure 14 - Functional Diagram B, Visual Signal Circuits (752631)

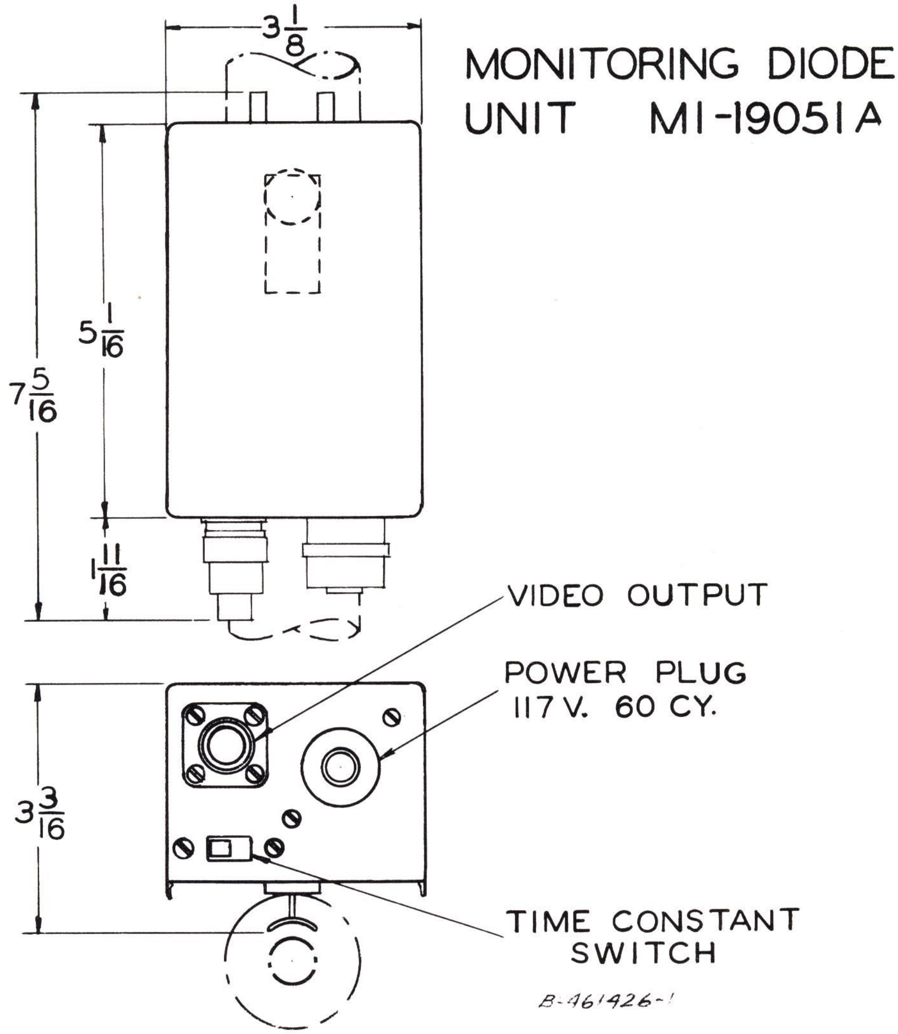


COLOR SIGNAL CIRCUITS FOR RCA TV TRANSMITTERS USING FILTERPLEXER OR BRIDGE DIPLEXER, TTC-1B CONSOLE AND ES-19237 MONITORING RACK SERIES (TA-1A DISTRIBUTION AMPLIFIERS.)

IF BRIDGE DIPLEXER IS USED THE NOTCH EQUALIZER PORTION OF MI-34026 MUST BE SWITCHED OUT

NO.1 TA-1A AMPLIFIER MAY BE OMITTED IF INPUT SIGNAL MONITORING IS NOT DESIRED

Figure 15 - Functional Diagram C, Visual Signal Circuits (752632)



MECHANICAL SPECIFICATIONS:

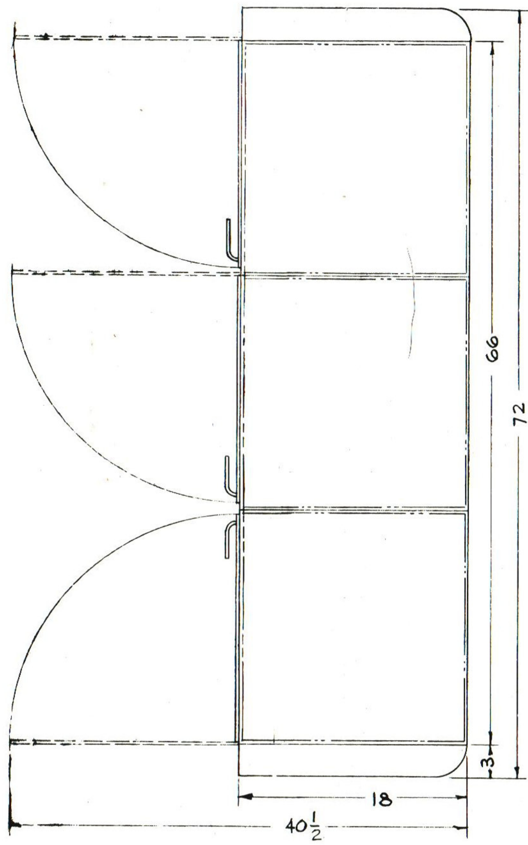
MOUNTING:	1 5/8 INCH O.D. OR 3 1/8 INCH O.D. COAXIAL LINE.
WEIGHT:	3 LBS.

ELECTRICAL SPECIFICATIONS:

FREQUENCY RANGE:	54-216 MCS
INPUT CIRCUIT COMPENSATED FOR UNIFORM PICKUP OVER THE 12 VHF CHANNELS.	
OUTPUT IMPEDANCE:	70 OHMS
OUTPUT VOLTAGE:	1.5 V./2.0 V. ADJUSTABLE BY VARYING PICKUP.
VIDEO OUTPUT CONNECTION:	RG-11/U CABLE
POWER REQUIRED:	5 WATTS

B-461426-1

Figure 16 - Outline, Monitoring Diode Unit (461426)



SPACE REQUIREMENTS

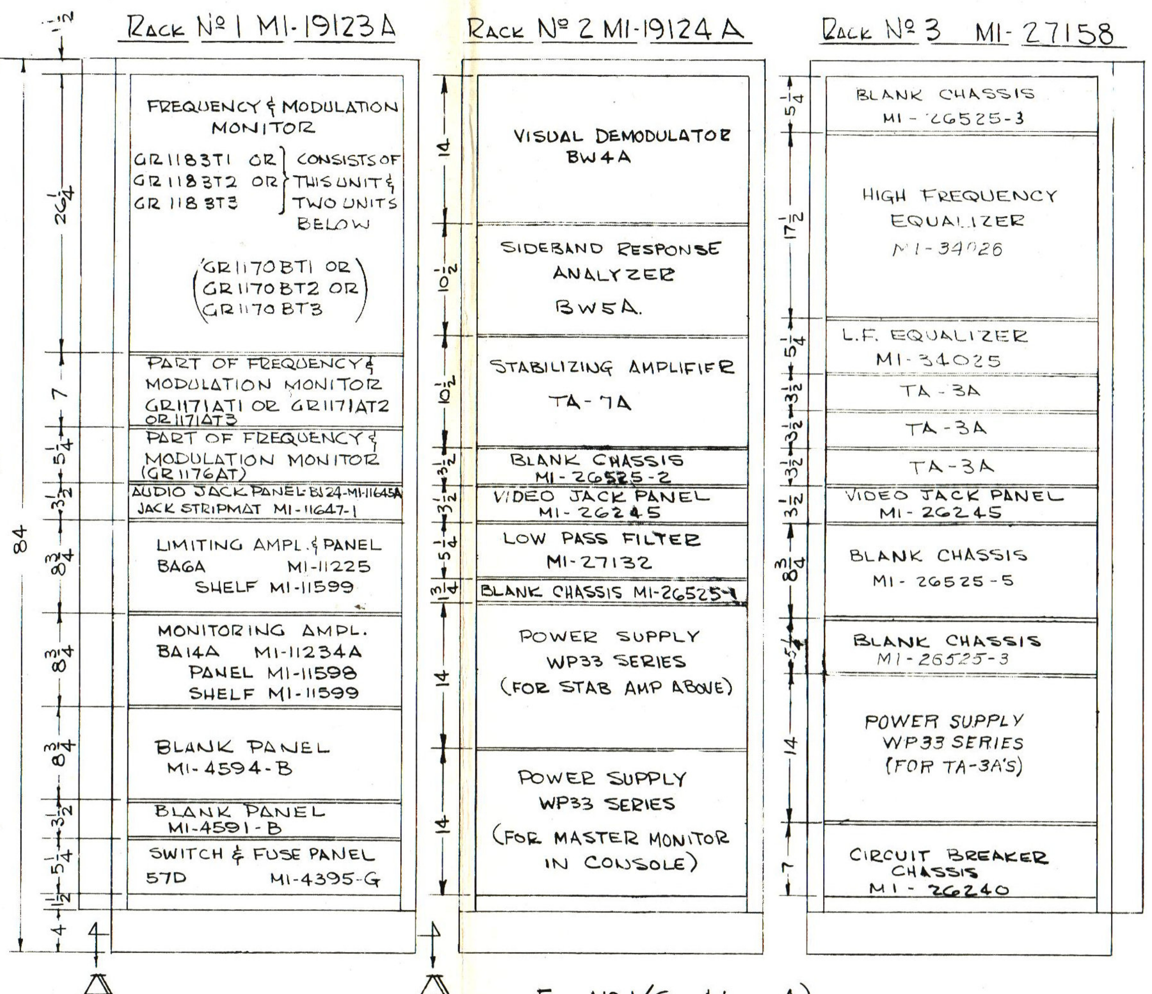
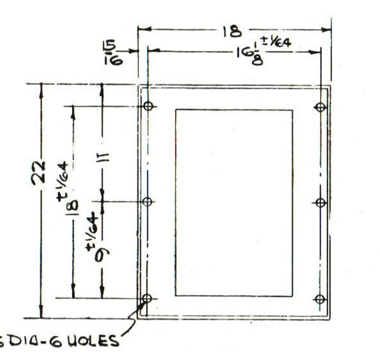


FIG. No 1 (SEE NOTE 4)

634925-1



TYPICAL BASE MTG. LAYOUT THRU SEC. A-A

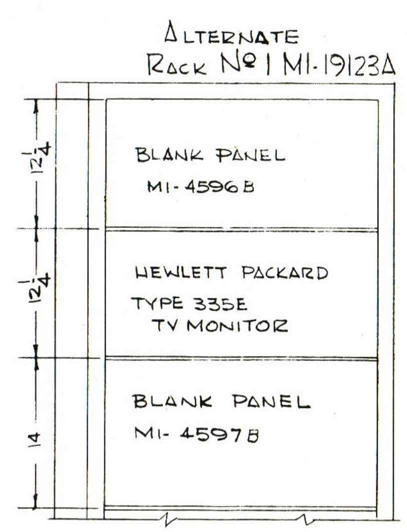


FIG. No 2 (SEE NOTE 4)

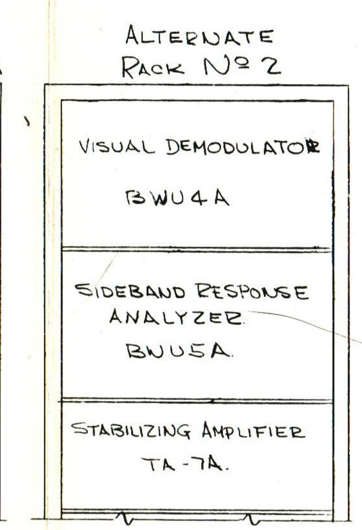


FIG No 3 (SEE NOTE 4)

INSTRUCTIONS

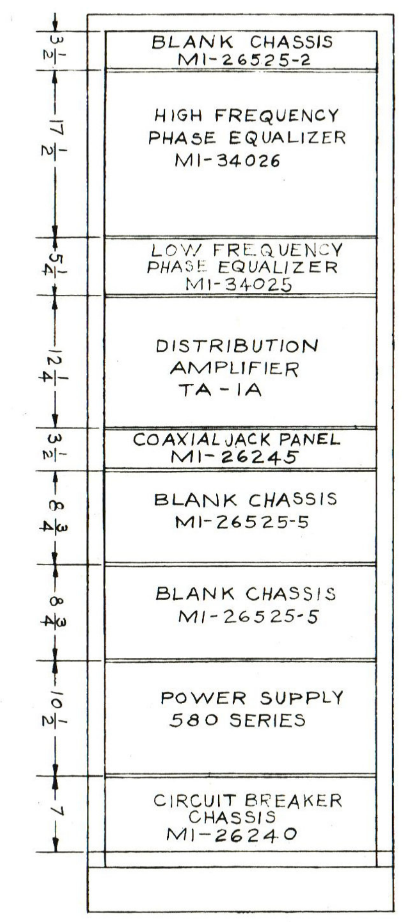
NOTE #1
LOCATE ALL INDIVIDUAL UNITS AS OUTLINED AND SECURE FRAMES USING HARDWARE (SUPPLIED WITH MI-19123A, MI-19124A & MI-27158)

NOTE #2
BOLT CABINETS TOGETHER USING HARDWARE (SUPPLIED WITH MI-19123A, MI-19124A & MI-27158)

NOTE #3
BASE IS PART OF RACK; ENTIRE BOTTOM AREA OF BASE IS OPEN TO RECEIVE EXTERNAL WIRING.

NOTE #4
FOR CHANNELS #2-83 ARRANGE UNITS IN RACK #1 AS SHOWN IN FIG. #1 (GENERAL RADIO MONITOR) OR FIG. #2 (HEWLETT PACKARD MONITOR)
FOR CHANNELS #2-13 ARRANGE UNITS IN RACK #2 AS SHOWN IN FIG. #1
FOR CHANNELS #14-83 ARRANGE UNITS IN TOP PART OF RACK #2 AS SHOWN IN FIG. #3. OTHER UNITS AS SHOWN IN FIG. #1

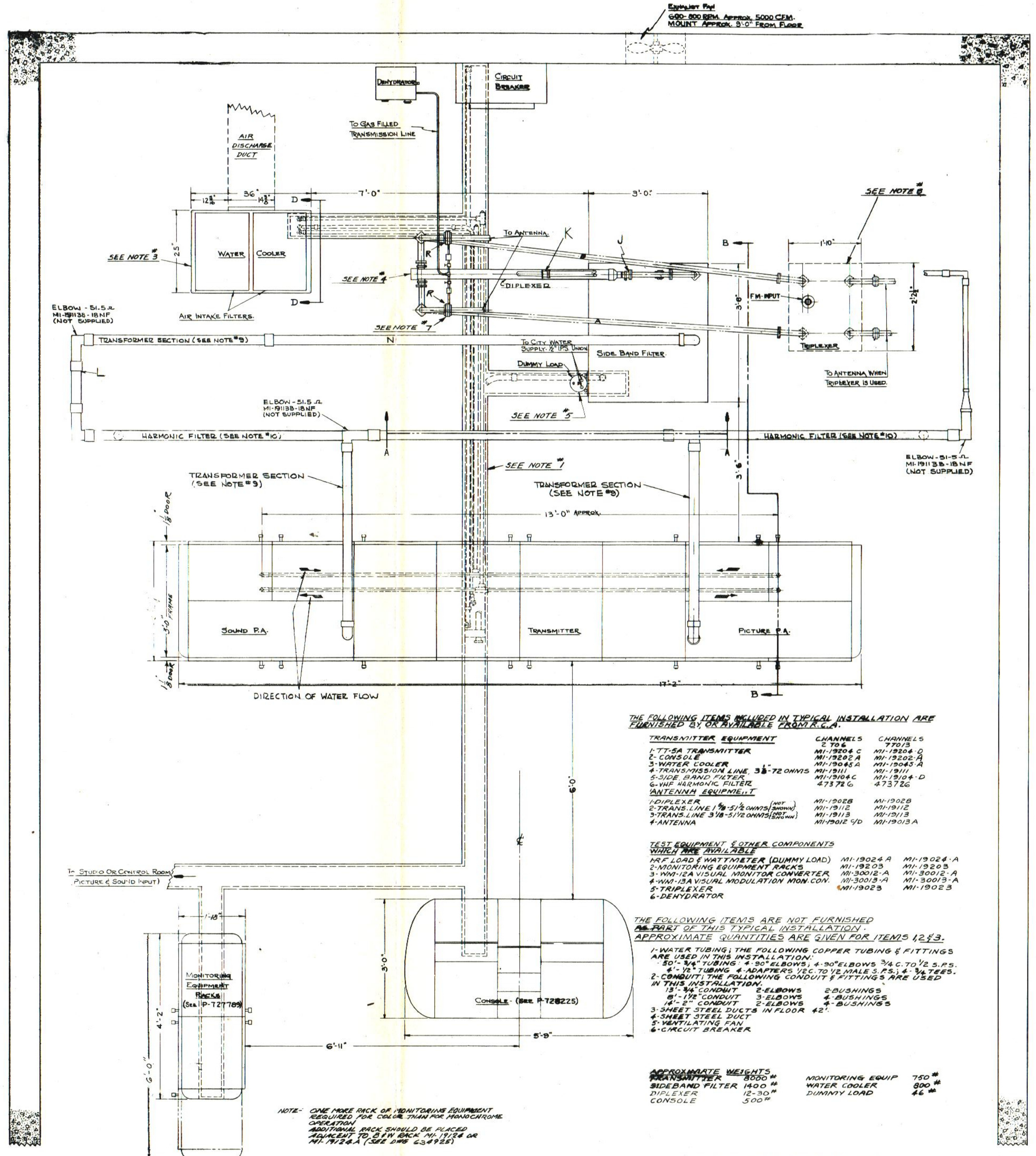
NOTE #5
ELECTRICAL SHIELDS MI-30546-G21 AND MI-30546-G28 MOUNT BETWEEN RACKS MI-19123A & MI-19124A



474378

NOTE–ALTERNATE FOR RACK MI-27158 WHEN TA-1A DISTRIBUTION AMPLIFIERS ARE USED. SEE DWG. D-634925.

Figure 17 - Outline, Monitoring Racks (634925)



THE FOLLOWING ITEMS INCLUDED IN TYPICAL INSTALLATION ARE FURNISHED BY, OR AVAILABLE FROM R.C.A.

TRANSMITTER EQUIPMENT	CHANNELS 2 TO 6	CHANNELS 7 TO 13
1-TT-5A TRANSMITTER	MI-19204 C	MI-19204-D
2-CONSOLE	MI-19202 A	MI-19202-A
3-WATER COOLER	MI-19045 A	MI-19045-A
4-TRANSMISSION LINE, 3⅛"-72 OHMS	MI-19111	MI-19111
5-SIDE BAND FILTER	MI-19104 C	MI-19104-D
6-VHF HARMONIC FILTER	473726	473726
ANTENNA EQUIPMENT		
1-DIPLEXER	MI-19028	MI-19028
2-TRANS. LINE 1⅝-51½ OHMS (NOT SHOWN)	MI-19112	MI-19112
3-TRANS. LINE 3⅛-51½ OHMS (NOT SHOWN)	MI-19113	MI-19113
4-ANTENNA	MI-19012 C/D	MI-19013 A

TEST EQUIPMENT & OTHER COMPONENTS WHICH ARE AVAILABLE		
1-RF LOAD & WATTMETER (DUMMY LOAD)	MI-19024 A	MI-19024-A
2-MONITORING EQUIPMENT RACKS	MI-19203	MI-19203
3-WM-12A VISUAL MONITOR CONVERTER	MI-30012-A	MI-30012-A
4-WM-13A VISUAL MODULATION MON. CON.	MI-30013-A	MI-30013-A
5-TRIPLEXER	MI-19023	MI-19023
6-DEHYDRATOR		

THE FOLLOWING ITEMS ARE NOT FURNISHED AS PART OF THIS TYPICAL INSTALLATION. APPROXIMATE QUANTITIES ARE GIVEN FOR ITEMS 1,2 & 3.

1-WATER TUBING; THE FOLLOWING COPPER TUBING & FITTINGS ARE USED IN THIS INSTALLATION:
50'-¾" TUBING: 4-90° ELBOWS; 4-90° ELBOWS ¾ C. TO ½ S.P.S.
4'-½" TUBING 4-ADAPTERS ½ C. TO ½ MALE S.P.S.; 4-¾ TEES.
2-CONDUIT; THE FOLLOWING CONDUIT & FITTINGS ARE USED IN THIS INSTALLATION.

13'-¾" CONDUIT	2-ELBOWS	2-BUSHINGS
8'-1½" CONDUIT	3-ELBOWS	4-BUSHINGS
14'-2" CONDUIT	2-ELBOWS	4-BUSHINGS

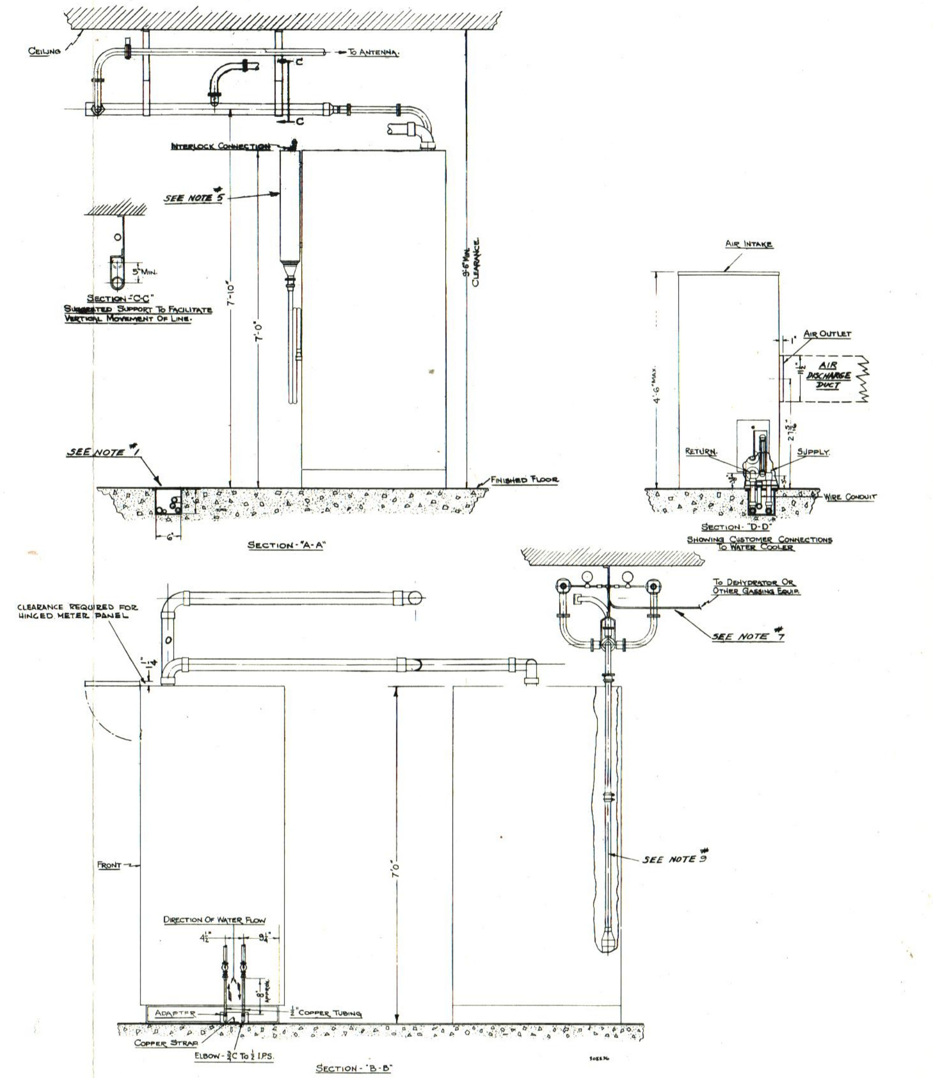
3-SHEET STEEL DUCTS IN FLOOR 42'.
4-SHEET STEEL DUCT
5-VENTILATING FAN
6-CIRCUIT BREAKER

APPROXIMATE WEIGHTS

TRANSMITTER	8000#	MONITORING EQUIP	750#
SIDEBAND FILTER	1400#	WATER COOLER	800#
DIPLEXER	12-30#	DUMMY LOAD	46#
CONSOLE	500#		

APPROXIMATE POWER INPUT REQUIRMENTS
26 KW. @ 208/230 VOLTS 50/60~3φ (TRANSMITTER)
1300 W. @ 115 VOLTS 1φ (MONITORING EQUIP. ETC.)
1800 W @ 115 VOLTS 1φ (CRYSTAL HEATERS, FREQ. MONITORS AND CONVENIENCE OUTLETS ETC.)
TOWER LIGHT POWER INPUT, IF REQUIRED.

BUILDING ENTRANCE REQUIREMENTS
MIN. WIDTH - 36"
MIN. HEIGHT - 80"
MAX. LENGTH OF SINGLE UNIT - 42"



TRENCH

NOTE #1
SUGGESTED TRENCH IS LINED USING 3/16" SHEET STEEL WITH ¼" 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 ROOM FLOOR. THE MAIN TRENCH AND WATER COOLER BRANCH HAVE A 2" FALL TO DRAIN, LOCATED AT THEIR JUNCTION OR AT REAR WALL. AT A POINT JUST UNDER FRONT OF TRANSMITTER, THE MAIN TRENCH IS DECREASED IN DEPTH TO 4" AND BLOCKED OFF FROM DEEP 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 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, USING COPPER STRAP, ITEMS 10, 11, 12 & 13 OF MI-19109-A SEE T-619552 & W-307772.

WATER COOLER

NOTE #3
AIR REQUIRED FOR WATER COOLER UNIT 1600 C.F.M. AIR DISCHARGE IS LOCATED ON THE SIDE OF THE UNIT AND HAS A FLANGE TO WHICH CUSTOMER MAY CONNECT A DUCT. IF DISCHARGE DUCT IS EXHAUSTED 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 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
TO USE DUMMY LOAD TO MEASURE TRANSMITTER POWER OUTPUT OR TO TERMINATE THE TRANSMITTER DISCONNECT LINE AT POINT "J" FOR PICTURE TRANSMITTER AND AT POINT "K" FOR SOUND TRANSMITTER. FOR MEASURING POWER OUTPUT BEFORE ENTERING SIDEBAND FILTER DISCONNECT TRANSMISSION LINE AT POINT "L". WHEN CONNECTING DUMMY LOAD AT THIS POINT MATCHING TRANSFORMER SECTION MI-19111-10 MUST BE USED BETWEEN TRANSMISSION LINE & DUMMY LOAD.
SUPPORTS 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 #6
PICTURE MONITOR WM-12-A HAS ONE PROBE. WAVEFORM 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 #7
TRANSMISSION LINE LENGTHS "N" AND "O" ARE 3⅛" 72 OHM AND ARE COUPLED WITH SLOTTED FITTINGS AND CLAMPS. THE 1⅝", 51.5 OHM LINE WITHIN THE STATION BETWEEN THE 3⅛" LINE AND THE GAS-STOPS CAN BE EITHER THE FLANGED TYPE OR THE UNFLANGED TYPE USING SLEEVE CONNECTORS. IF FLANGES ARE USED SHORT LENGTHS OF LINE CAN BE CONNECTED WITH FLANGE ADAPTERS (MI-19112-16). IF UNFLANGED LINE AND FITTINGS ARE USED SLEEVE COUPLINGS (MI 19112-8) ARE REQUIRED. FOR FURTHER DETAILS ON LINE AND COUPLINGS SEE SPEC. AS-5991. THE GAS STOP & GAS ADMISSION COUPLING "R" ARE PLACED 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.

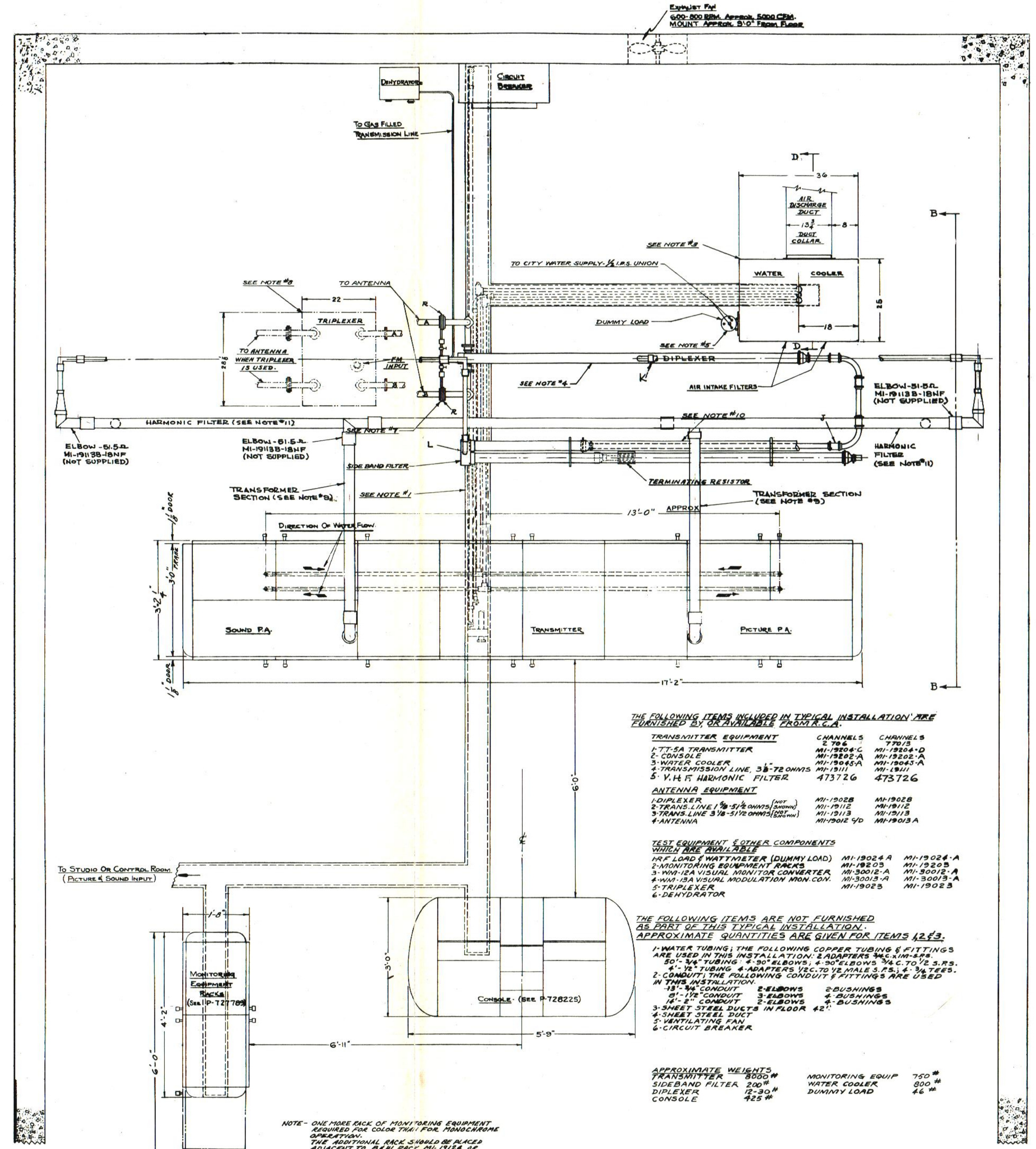
TRIPLEXER

NOTE #8
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.

NOTE #9 TRANSFORMER SECTION
QUARTER WAVE TRANSFORMER SECTION IS REQUIRED TO MATCH 72 OHM OUTPUT OF AURAL PA. TO 51.5 OHM HARMONIC FILTER INPUT; 51.5 OHM HARMONIC FILTER OUTPUT TO SIDEBAND FILTER INPUT & TO MATCH 72 OHM SIDE BAND FILTER OUTPUT TO 51.5 OHM VISUAL INPUT OF DIPLEXER. QUARTER WAVE TRANSFORMER SECTION IS REQUIRED TO MATCH 72 OHM OUTPUT OF VISUAL PA. TO 51.5 OHM HARMONIC FILTER INPUT. THE TRANSFORMER SECTION CHANGES IN LTH. FROM APPROX. 60" ON CHANNEL 2 TO 13" ON CHANNEL 13

NOTE #10 HARMONIC FILTER
THE HARMONIC FILTER CHANGES IN LENGTH FROM APPROXIMATLY 175" ON CHANNEL 2 TO 55½" ON CHANNEL 3

Figure 18 - Typical Installation Layout A (308836)



THE FOLLOWING ITEMS INCLUDED IN TYPICAL INSTALLATION ARE FURNISHED BY, OR AVAILABLE FROM R.C.A.

TRANSMITTER EQUIPMENT	CHANNELS 2 TO 6	CHANNELS 7 TO 13
1-TT-5A TRANSMITTER	MI-19204-C	MI-19204-D
2-CONSOLE	MI-19202-A	MI-19202-A
3-WATER COOLER	MI-19045-A	MI-19045-A
4-TRANSMISSION LINE, 3 1/8"-72 OHMS	MI-19111	MI-19111
5-V.H.F. HARMONIC FILTER	473726	473726
ANTENNA EQUIPMENT		
1-DIPLEXER	MI-19028	MI-19028
2-TRANS. LINE 1 5/8-51 1/2 OHMS (NOT SHOWN)	MI-19112	MI-19112
3-TRANS. LINE 3 1/8-51 1/2 OHMS (NOT SHOWN)	MI-19113	MI-19113
4-ANTENNA	MI-19012 C/D	MI-19013 A
TEST EQUIPMENT & OTHER COMPONENTS WHICH ARE AVAILABLE		
1-RF LOAD & WATTMETER (DUMMY LOAD)	MI-19024 A	MI-19024-A
2-MONITORING EQUIPMENT RACKS	MI-19203	MI-19203
3-WM-12A VISUAL MONITOR CONVERTER	MI-30012-A	MI-30012-A
4-WM-13A VISUAL MODULATION MON. CON.	MI-30013-A	MI-30013-A
5-TRIPLEXER	MI-19023	MI-19023
6-DEHYDRATOR		

THE FOLLOWING ITEMS ARE NOT FURNISHED AS PART OF THIS TYPICAL INSTALLATION. APPROXIMATE QUANTITIES ARE GIVEN FOR ITEMS 1,2 & 3.

1-WATER TUBING; THE FOLLOWING COPPER TUBING & FITTINGS ARE USED IN THIS INSTALLATION: 2 ADAPTERS 3/4 C. x 1M-S.P.S.
50'-3/4" TUBING 4-90° ELBOWS; 4-90° ELBOWS 3/4 C. TO 1/2 S.P.S.
4'-1/2" TUBING 4-ADAPTERS 1/2 C. TO 1/2 MALE S.P.S.; 4-3/4 TEES.
2-CONDUIT; THE FOLLOWING CONDUIT & FITTINGS ARE USED IN THIS INSTALLATION.

13'-3/4" CONDUIT	2-ELBOWS	2-BUSHINGS
8'-1 1/2" CONDUIT	3-ELBOWS	4-BUSHINGS
14'-2" CONDUIT	2-ELBOWS	4-BUSHINGS

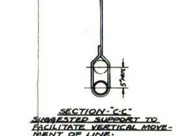
3-SHEET STEEL DUCTS IN FLOOR 42'.
4-SHEET STEEL DUCT
5-VENTILATING FAN
6-CIRCUIT BREAKER

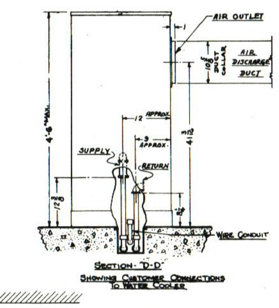
APPROXIMATE WEIGHTS

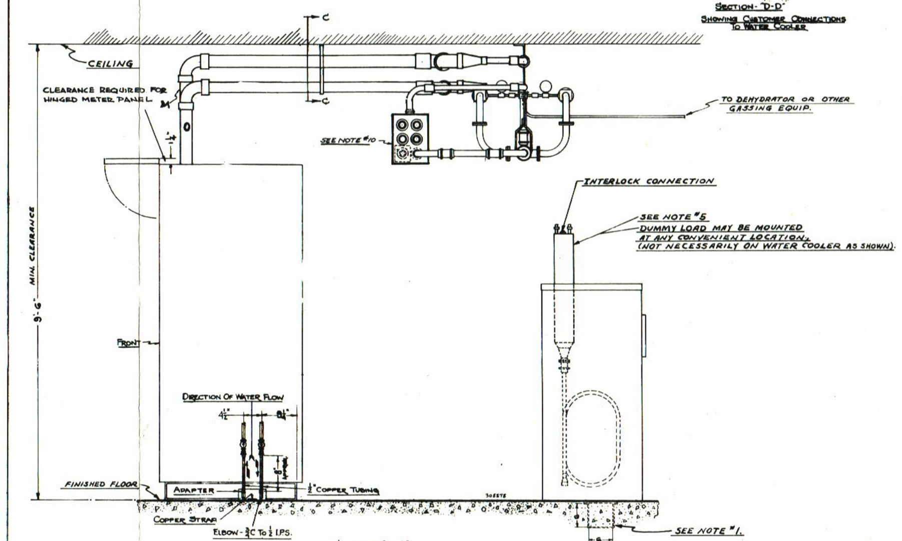
TRANSMITTER	8000 #	MONITORING EQUIP	750 #
SIDEBAND FILTER	200 #	WATER COOLER	800 #
DIPLEXER	12-30 #	DUMMY LOAD	46 #
CONSOLE	425 #		

APPROXIMATE POWER INPUT REQUIRMENTS
26 KW. @ 208/230 VOLTS 50/60~3ϕ (TRANSMITTER)
1500 W. @ 115 VOLTS 1ϕ (MONITORING EQUIP. ETC.)
1800 W @ 115 VOLTS 1ϕ (CRYSTAL HEATERS, FREQ. MONITORS AND CONVENIENCE OUTLETS ETC.)
TOWER LIGHT POWER INPUT, IF REQUIRED.

BUILDING ENTRANCE REQUIREMENTS
MIN. WIDTH - 36"
MIN. HEIGHT - 80"
MAX. LENGTH OF SINGLE UNIT - 51"







TRENCH

NOTE #1
SUGGESTED TRENCH IS LINED USING 3/16" SHEET STEEL WITH 1/4" 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 ROOM FLOOR. THE MAIN TRENCH AND WATER COOLER BRANCH HAVE A 2" FALL TO DRAIN, LOCATED AT THEIR JUNCTION OR AT REAR WALL. AT A POINT JUST UNDER FRONT OF TRANSMITTER, THE MAIN TRENCH IS DECREASED IN DEPTH TO 4" AND BLOCKED OFF FROM DEEP 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 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, USING COPPER STRAP, ITEMS 10, 11, 12 & 13 OF MI-19109-A. SEE T-619552 & W-307772.

WATER COOLER

NOTE #3
AIR REQUIRED FOR WATER COOLER UNIT 1600 C.F.M. AIR DISCHARGE IS LOCATED ON THE SIDE OF THE UNIT AND HAS A FLANGE TO WHICH CUSTOMER MAY CONNECT A DUCT. IF DISCHARGE DUCT IS EXHAUSTED 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 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
TO USE DUMMY LOAD TO MEASURE TRANSMITTER POWER OUTPUT OR TO TERMINATE THE TRANSMITTER DISCONNECT LINE AT POINT "J" FOR PICTURE TRANSMITTER AND AT POINT "K" FOR SOUND TRANSMITTER. FOR MEASURING POWER OUTPUT BEFORE ENTERING SIDEBAND FILTER DISCONNECT TRANSMISSION LINE AT POINT "L". WHEN CONNECTING DUMMY LOAD AT THIS POINT MATCHING TRANSFORMER SECTION MI-19111-10 MUST BE USED BETWEEN TRANSMISSION LINE & DUMMY LOAD.
SUPPORTS 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 #6
PICTURE MONITOR WM-12-A HAS ONE PROBE. WAVEFORM 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 ARE RUN THROUGH A CONDUIT TO TOP OF CONTROL RACK & THEN INTO TRENCH.

TRANSMISSION LINE

NOTE #7
TRANSMISSION LINE LENGTHS "M" AND "O" ARE 3 1/8" 72 OHM AND ARE COUPLED WITH SLOTTED FITTINGS AND CLAMPS. THE 1 5/8", 51.5 OHM LINE WITHIN THE STATION BETWEEN THE 3 1/8" LINE AND THE GAS-STOPS CAN BE EITHER THE FLANGED TYPE OR THE UNFLANGED TYPE USING SLEEVE CONNECTORS. IF FLANGES ARE USED SHORT LENGTHS OF LINE CAN BE CONNECTED WITH FLANGE ADAPTERS (MI-19112-16). IF UNFLANGED LINE AND FITTINGS ARE USED SLEEVE COUPLINGS (MI 19112-8) ARE REQUIRED. FOR FURTHER DETAILS ON LINE AND COUPLINGS SEE SPEC. AS-5991. THE GAS STOP & GAS ADMISSION COUPLING "R" ARE PLACED 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 #8
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

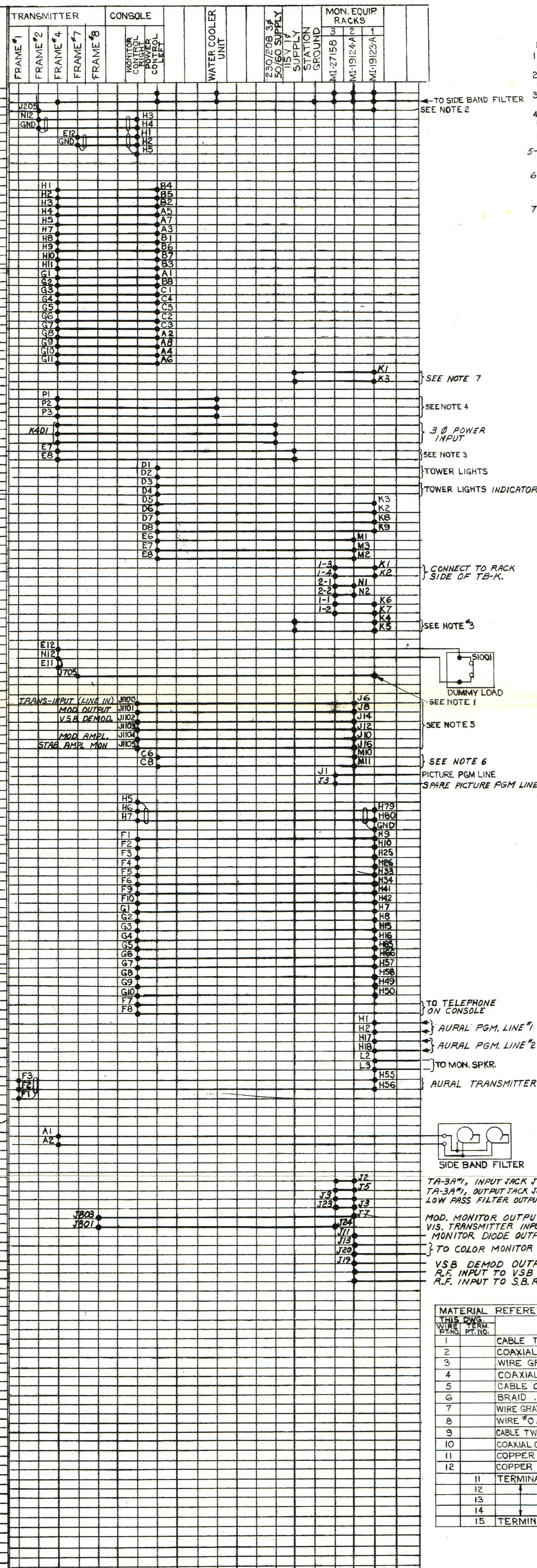
NOTE #9
QUARTER WAVE TRANSFORMER SECTION IS REQUIRED TO MATCH 72 OHM OUTPUT OF SOUND PA TO 51.5 OHM HARMONIC FILTER INPUT & TO MATCH 72 OHM VISUAL P.A. OUTPUT TO 51.5 OHM HARMONIC FILTER INPUT. THE TRANSFORMER SECTION CHANGES IN LENGTH FROM APPROXIMATELY 60" ON CHANNEL 2 TO 13" ON CHANNEL 13.

NOTE #10 VESTIGIAL 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)

NOTE #11 HARMONIC FILTER
THE HARMONIC FILTER CHANGES IN LENGTH FROM APPROXIMATELY 175" ON CHANNEL 2 TO 55 1/2" ON CHANNEL 13.

Figure 19 - Typical Installation Layout B (308878)

LINE NUMBER	CIRCUIT	WIRE TERMINATION	WIRE DESCRIPTION PT.NO.	CURRENT AMPERES	TERMINAL K880047-501 PT.NO.
1	GND		11		
2	GND		12		
3	RF	B-J	2		
4	M	L-M	1		11
5	M	L-M			12-11
6	M	P-M	1		11
7	M	P-M			12-11
8	GND		6		11
9					
10					
11					
12	C	N-M	3		13
13	C	N-M	3		13
14	C	N-M	3		13
15	C	N-M	3		13
16	C	N-M	3		13
17	C	N-M	3		13
18	C	N-M	3		13
19	C	N-M	3		13
20	C	N-M	3		13
21	C	N-M	3		13
22	C	N-M	3		13
23	C	N-M	3		13
24	C	N-M	3		13
25	C	N-M	3		13
26	C	N-M	3		13
27	C	N-M	3		13
28	C	N-M	3		13
29	C	N-M	3		13
30	C	N-M	3		13
31	C	N-M	3		13
32	C	N-M	3		13
33	W	K	3		13
34	W	K	3		13
35					
36	C	R	3		
37	C	R	3		
38	C	R	3		
39	W	N	8		15-15
40	W	N	8		15-15
41	W	N	8		15-15
42	W	E	7		
43	W	E	7		
44	C	M	7		13
45	C	M	7		13
46	C	M	7		13
47	C	M	7		13
48	W	M-G	3		13-13
49	W	M-G	3		13-13
50	W	M-G	3		13-13
51	W	M-G	3		13-13
52	W	M-G	3		13-13
53	W	M-G	3		13-13
54	W	M-G	3		13-13
55	W	T-K	3		13-13
56	W	T-K	3		13-13
57	W	T-G	3		13-13
58	W	T-G	3		13-13
59	W	T-K	3		13-13
60	W	T-K	3		13-13
61	W	K	3		13
62	W	K	3		13
63					
64	C	N	3		13
65	C	R	3		13
66	C	N	3		14
67	RF	B-H	2		
68					
69					
70	P	M-F	4		
71	P	M-F	4		
72	P	M-F	4		
73	S	M-F	4		
74	P	M-F	4		
75	S	M-F	4		
76	C	M-G	3		13-13
77	C	M-G	3		13-13
78	P	F	10		
79	P	F	10		
80					
81	GND		6		11
82	A	M-K	5		11
83	A	M-K	5		11
84	GND				11
85	A	M-K	1		11
86	A	M-K			11
87	A	M-K	1		11
88	A	M-K			11
89	A	M-K	1		11
90	A	M-K			11
91	A	M-K	1		11
92	A	M-K			11
93	S	M-K	1		11
94	S	M-K			11
95	A	M-K	1		11
96	A	M-K			11
97	A	M-K	1		11
98	A	M-K			11
99	A	M-K	1		11
100	A	M-K			11
101	A	M-K			11
102	A	M-K			11
103	A	M			11
104	A	M			11
105	A	K	9		
106	A	K			
107	A	K	9		
108	A	K			
109	A	K	9		11
110	A	K			11
111	A	A-K	1		11
112	A	A-K			11
113	GND		6		11
114					
115					
116					
117	W	N	3		
118	W	N	3		
119					
120					
121					
122	P	F	4		
123	P	F	4		
124	P	S-G	4		
125	P	F-S	4		
126	P	D-F	4		
127	P	C-F	4		
128	P	F	4		
129	P	F	4		
130	P	F	4		
131	P	F	4		
132	RF	H	2		
133	RF	H	2		



NOTES

1- RF INPUT TO VISUAL FREQUENCY MONITOR GR1171-AT SERIES OR HP MODEL 335E.

2- RF INPUT TO AURAL FREQUENCY MONITOR GR1170-BT SERIES OR HP MODEL 335E.

3- LINE NUMBER 42, 43, 61 & 62 OPERATE CRYSTAL HEATERS & MUST BE ENERGIZED 24HRS A DAY.

4- CONNECT PUMP & BLOWER MOTORS IN PARALELL. CUSTOMER TO FURNISH & INSTALL ADDITIONAL CUTOUT BREAKERS IN ACCORDANCE WITH LOCAL CODE REQUIREMENTS.

5- J6, J8, J10, J12, J14 & J16 ON RACK #2 JACK PANEL ARE MONITOR LINES TO CONSOLE.

6- REMOTE GAIN CONTROL FOR STABILIZING AMPLIFIER. (REPLACES REMOTE CONTROL FOR TRANSMITTER GAIN.)

7- DISCONNECT LEADS #301, 302, 303 AND 304 ON TB-K (OF MI-19123A RACK) AND TAPE. CONNECT 115V SUPPLY TO TB-K TERMS 1 & 3.

CIRCUIT LEGEND	
A	AUDIO CIRCUIT 600Ω
RF	RADIO FREQUENCY 50Ω
C	CONTROL
M	METERING CIRCUIT
P	PICTURE SIGNAL CIRCUIT 75Ω
S	SPARE
W	POWER

WIRE TERMINATION	
A	FM EXCITER INPUT FR#1
B	TOP SEC OF P.A. FRAME OR END OF BALUN
C	MODULATOR FR#8
D	REFLECTOMETER CONTROL & MON. ASSY.
E	LOWER SECTION OF CENTER PNL.
F	JACK PANEL OF NO. 2 MON. RACK
G	LOWER SECTION OF NO. 2 MON RACK
H	TOP SECTION OF NO. 2 MON RACK
J	TOP SECTION OF SOUND MON RACK
K	LOWER SECTION OF SOUND MON RACK
L	FRAME #2 LOWER RIGHT HAND SIDE
M	CONTROL CONSOLE
N	FRAME #4 LOWER LEFT HAND SIDE
P	FRAME #7 LOWER RIGHT HAND SIDE
R	FRAME #4 LOWER RIGHT HAND SIDE
S	JACK PANEL OF NO. 3 MON RACK
T	CKT BKR PNL OF NO. 3 MON RACK

WIRE DESCRIPTION *	
PT. NO.	SIZE OF WIRE
1	TWISTED PAIR SHIELDED
2	50Ω COAX RG 8/U
3	#12-600V. GE FLAMENOL SNA-YK4180
4	75Ω COAX RG 11/U
5	ONE CONDUCTOR SHIELDED
6	TINNED COPPER BRAID 1/4 W
7	#12 AWG 600V. GRAY GE SNA-YK4180
8	#0 AWG 600V.
9	TWISTED PAIR SHIELDED #20 AWG. 300V. (RCA REF. K832463-3)
10	COAX. CABLE 75Ω IMP. TYPE RG 11/U
11	COPPER STRIP .0253 X 1 1/2
12	COPPER STRIP .0253 X 3

* EXCEPTING PARTS 7, 8, 9 & 10; WIRE DESCRIBED IN ABOVE TABLE IS SUPPLIED IN MI-19109 (INSTALLATION WIRING MATERIAL KIT) CUSTOMER SHOULD PROCURE WIRE FOR ITEMS 7, 8, 9 & 10 (INCOMING POWER, PROGRAM ETC.) IN ACCORDANCE WITH HIS REQUIREMENTS

MATERIAL REFERENCE TABLE FOR CUSTOMER USE ONLY			
THIS DWG. WIRE PT. NO.	THIS DWG. TERM. PT. NO.	DESCRIPTION	MI-19109A ITEM NO.
1		CABLE TWISTED PAIR SHEILDED	2
2		COAXIAL CABLE RG-8/U 52Ω	4
3		WIRE GRAY #12 AWG. 600V	1
4		COAXIAL CABLE RG-11/U 75Ω	5
5		CABLE ONE CONDUCTOR SHIELDED	3
6		BRAID .005 TINNED COPPER 1/4 WIDE	14
7		WIRE GRAY #12 AWG 600V G.E. SNA YK 4180	
8		WIRE #0 AWG 600V.	
9		CABLE TW. PR. SHIELDED #20 RCA REF. K832463-3	
10		COAXIAL CABLE RG-11/U 75Ω	
11		COPPER STRIP SOFT .0253 THK X 1 1/2 WIDE	10
12		COPPER STRIP SOFT .0253 THK X 3 WIDE	11
	11	TERMINAL EYE TYPE	16(D)
	12		16(E)
	13		16(F)
	14	EYE TYPE	16(I)
	15	TERMINAL TUBULAR EYE TYPE	16(C)

Figure 20 - Wire Chart (636406)

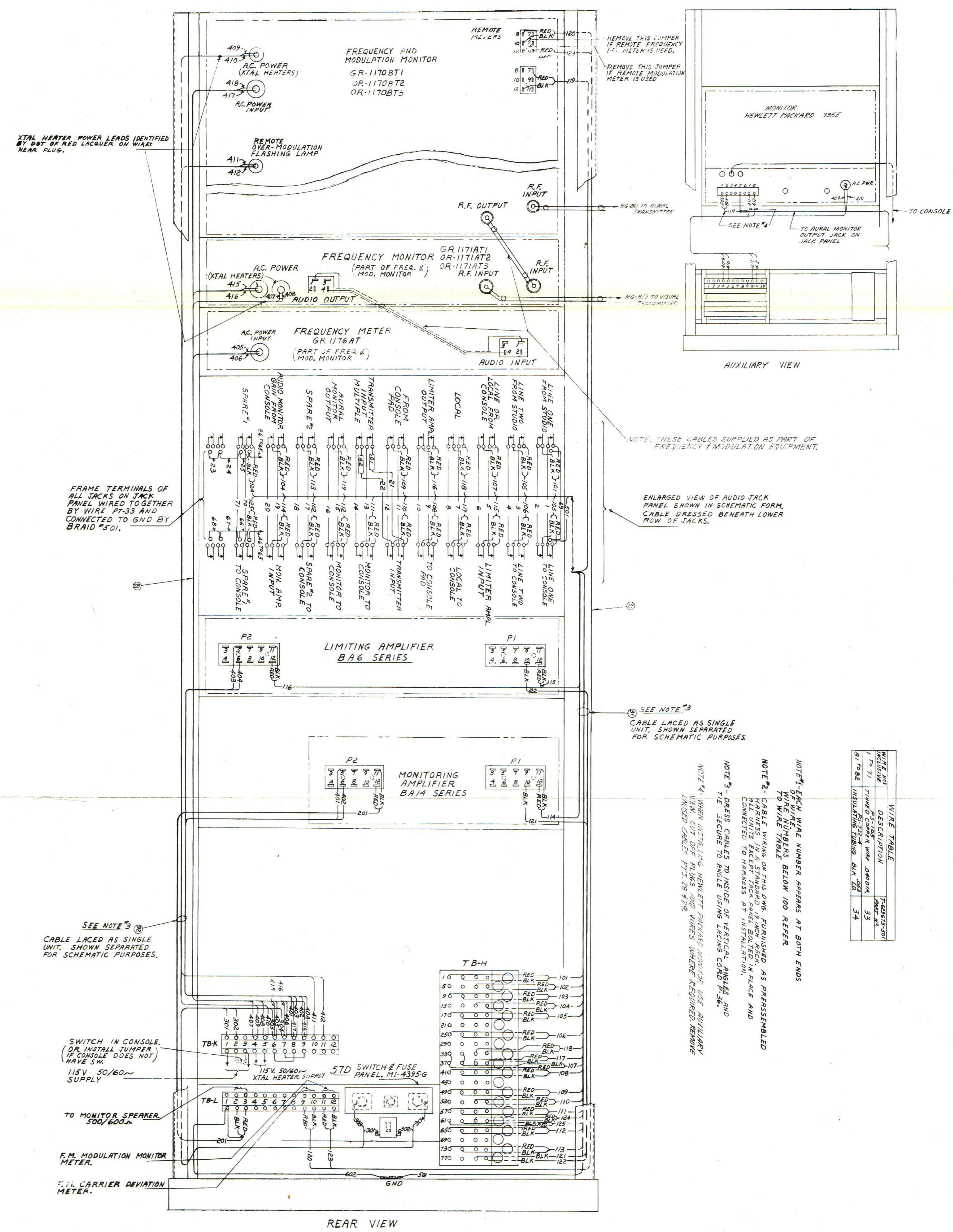


Figure 21 - Interconnection Diagram, Rack One (31385)

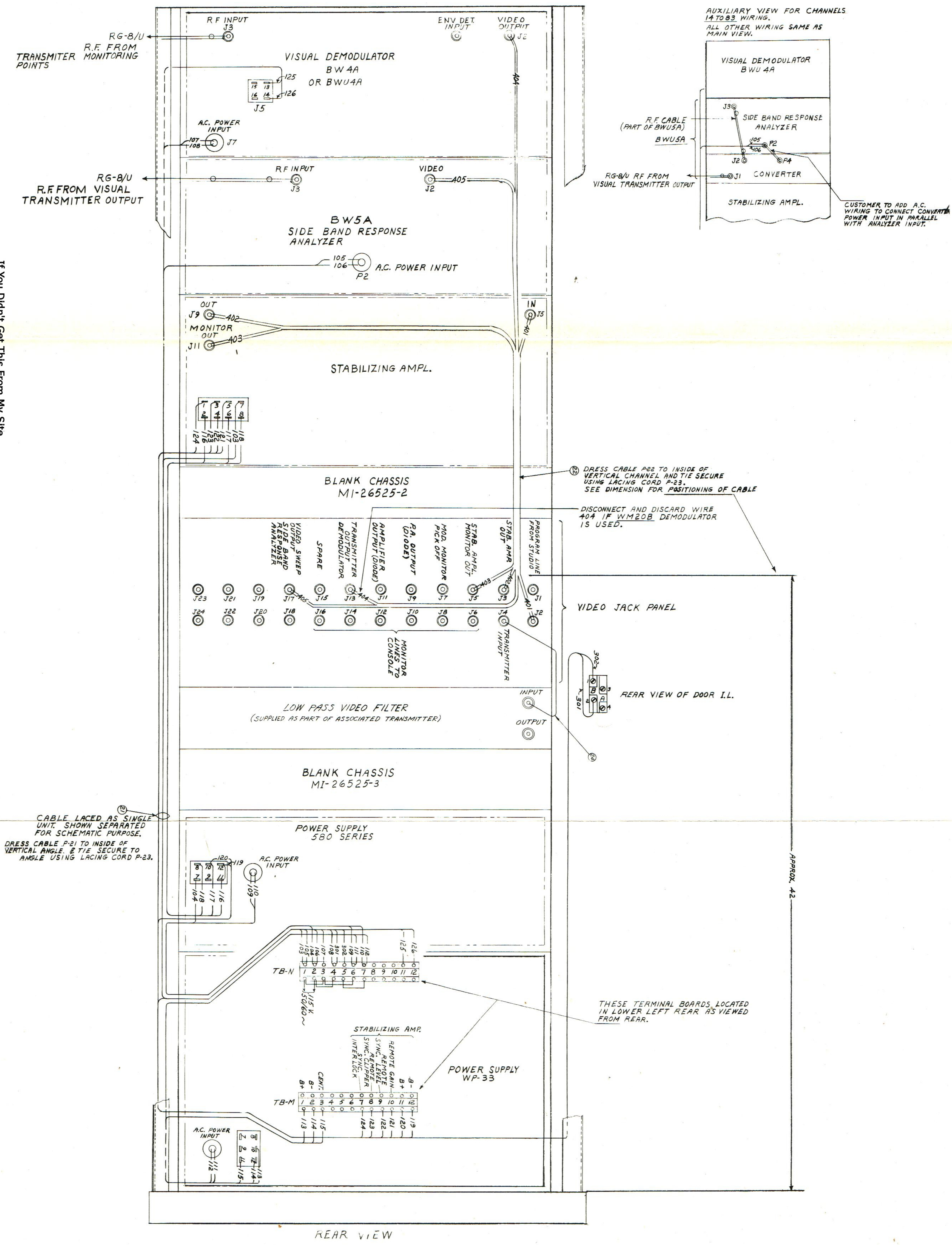


Figure 22 - Interconnection Diagram, Rack Two (Monochrome, 311386)

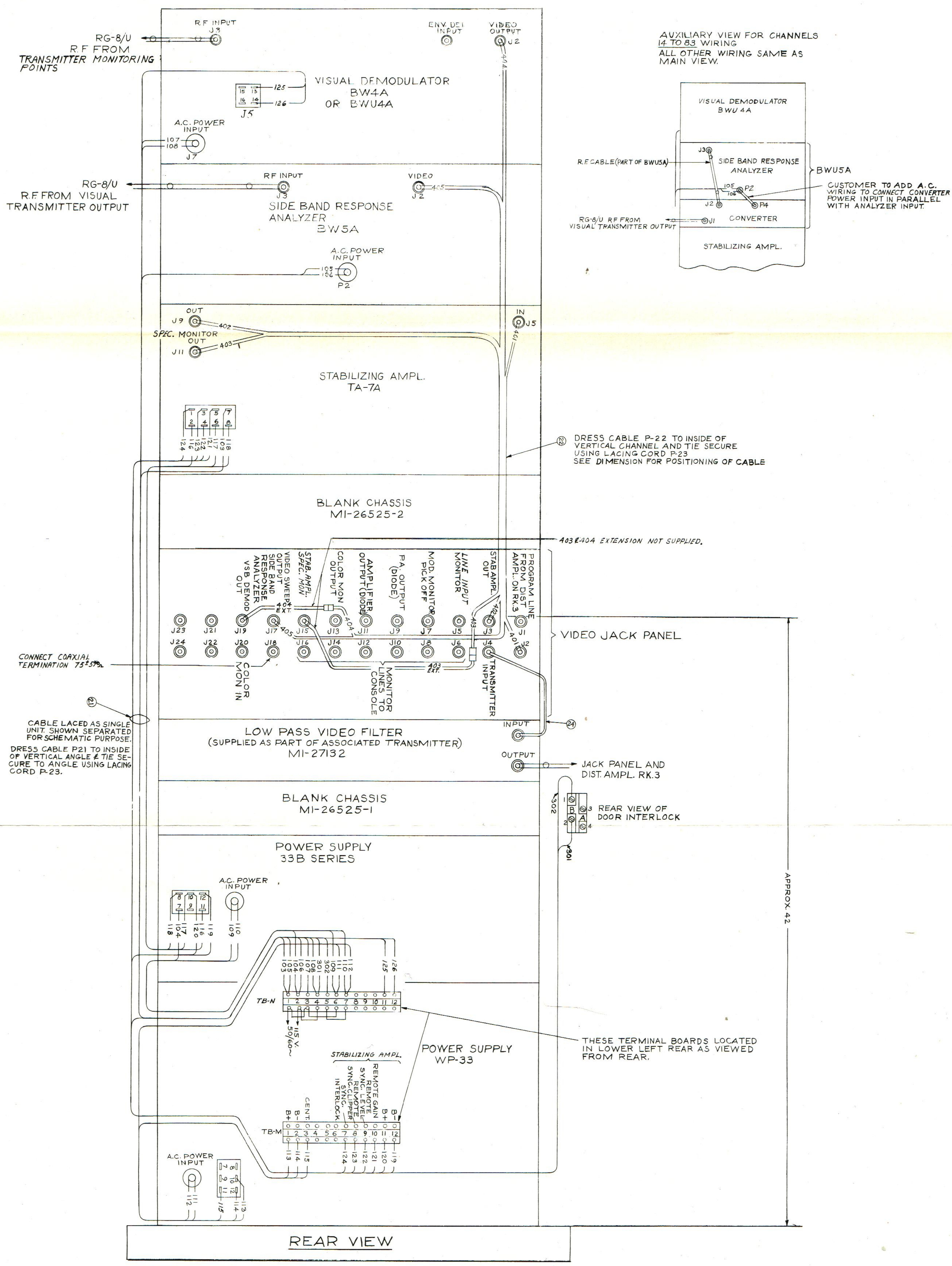
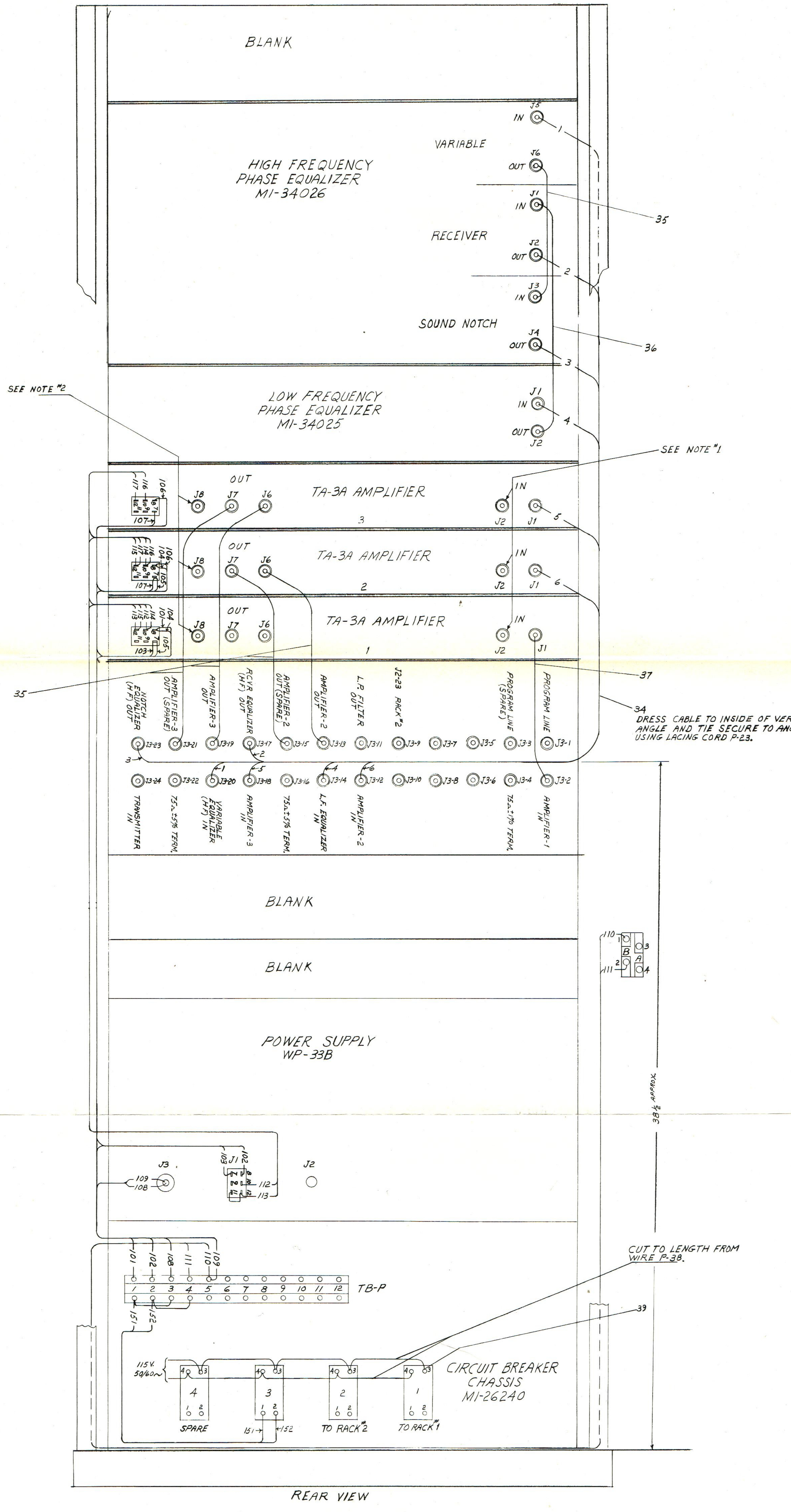
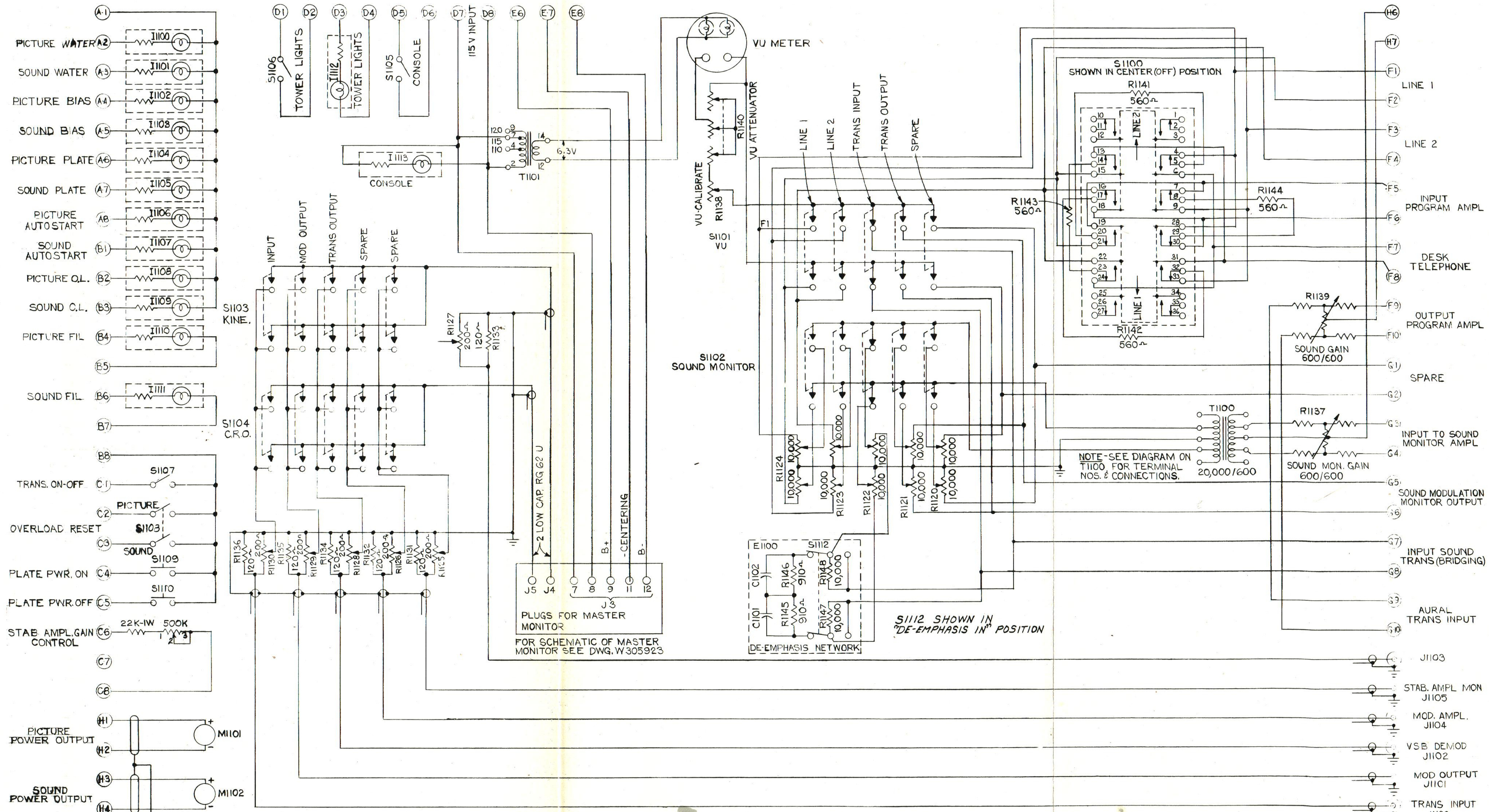


Figure 23 - Interconnection Diagram, Rack Two (Color, 318026)



NOTE 1 - USE 75Ω ±1% COAXIAL TERMINATION
NOTE 2 - USE 75Ω ±5% COAXIAL TERMINATION

Figure 24 - Interconnection Diagram, Rack Three (318023)



NOTE; THIS DRAWING SHOWS MINOR MODIFICATIONS OF T-619545 RECOMMENDED FOR COLOR OPERATION.
THE FOLLOWING CHANGES HAVE BEEN MADE.

#1- AT TERMINALS C6, C7 & C8, A 22KΩ RESISTOR AND 500KΩ POT. REPLACE SW. (S1111) AND 115V. A.C. CONNECTIONS.

#2- LEAD FROM R1127 (ARM) TO S1103 (TRANS OUT POS.) REPLACED WITH CONNECTION BETWEEN S1103 AND S1104. (SAME POS.).

#3- VIDEO MONITORING JACKS LABELED TO CORRESPOND WITH COLOR FUNCTIONAL DIAGRAMS, J1103 NOT USED.

Figure 25 - Schematic Diagram, TT-5A Control Console (636413)

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