MODEL 24C312

NORTHERN ALBERTA INSTITUTE OF TECHNOLOGY
EDMONTON ALBERTA

ELECTRICAL DEPARTMENT

ALIGNMENT

GENERAL

A complete alignment procedure for the color receiver is more involved than the procedure for Zenith monochrome receivers. The color receiver contains several additional stages over a monochrome receiver which are devoted to color and also require alignment. However, complete realignment of the color receiver should seldom, if ever, become necessary. In most instances, an alignment check may be all that is necessary, or realignment of only a portion of the color receiver. In any case, care must be taken to insure the best possible results from the circuits.

In most instances, the alignment of any specific section of the receiver can be performed separately without interfering with other circuits. Alignment of the receiver sections is presented in the following order.

(1) Tuner RF
(2) Picture IF and Trap
(3) Sound and 4.5 MC Trap
(4) Color Amplifier
(5) Color Sync and Demodulation
(6) Horizontal Sweep

Major test equipment requirements are listed at the top of each section.

TEST EQUIPMENT

In general, the necessary test instruments for alignment of the entire receiver would include the following:

1. VHF (UHF) Sweep and Marker Generator(s).

This equipment must be capable of producing sweep and marker frequencies through the IF and RF ranges. The sweep width must be variable up to at least 8 megacycles for satisfactory display of the various response curves. Attenuation to approximately .1 volt output is also desirable to prevent overload and possible distortion of the patterns during alignment. The output impedance should be 300 ohms, or properly matched to 300 ohms. A typical matching pad and "fixture" is shown in Figure 1.

It is very important that the generator output cable be properly terminated to the receiver, especially during RF alignment procedures. If the output cable is improperly terminated, correct alignment will be impossible to achieve since the degree of attenuation may change the shape as well as the amplitude of the response curve. The generator attenuator should only vary the amplitude and not the shape of the response curve.

2. VTVM (with high voltage probe; 30 KV minimum).

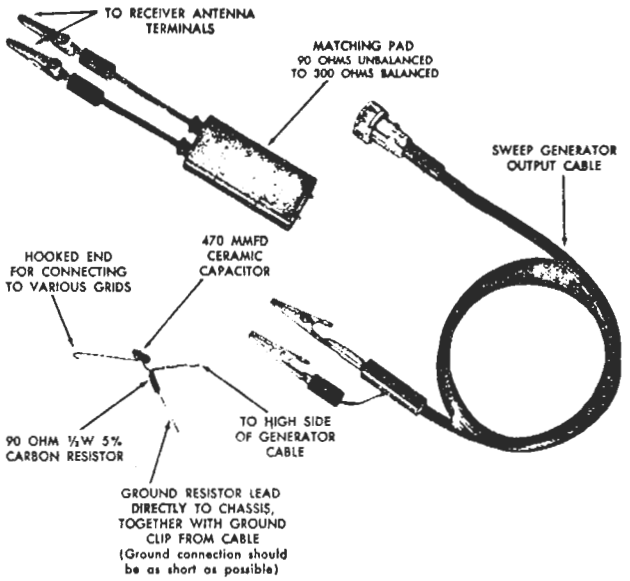


Figure 1 - Typical IF-RF Alignment Fixture

3. Oscilloscope (with detector probe and low capacity probe).

One of the important requirements of the oscilloscope is that it has a flat vertical amplifier frequency response (wideband) to at least 3.6 mc and a horizontal sweep rate of at least 100 KC. A desirable vertical sensitivity would be at least 0.1 volt RMS per inch of deflection.

For Color Amplifier alignment, a detector probe is required. If your oscilloscope is not equipped with this probe, it can easily be constructed according to Figure 2.

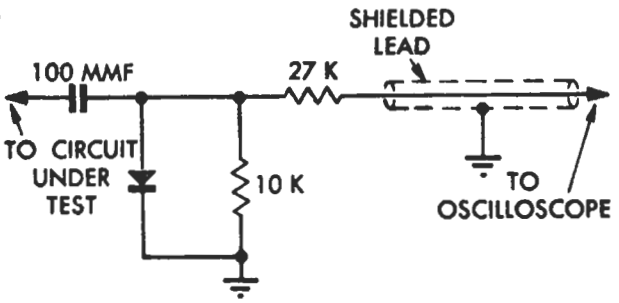


Figure 2- Simplified Circuit Diagram of Detector Probe

4. Color-Bar Generator.

A color-bar generator is necessary for alignment of the receiver color section. The signals produced by the generator should be in accordance with NTSC standards and have provision for both RF and Video outputs. RF output is essential.

5. Bias Supply (Variable 0 to 20 volts).

6. Meter.

(a) 0-3 ma DC (VOM)
Accurate alignment of the horizontal sweep section requires accurate measurement of DC current in the HV Regulator stage. Current measurements usually require "breaking" the circuit and placing a meter in series with the circuit. However, for convenience, a resistor is located in the HV Regulator Stage to permit placing a meter across it to obtain the correct results. The procedure is given under HORIZONTAL SWEEP alignment.

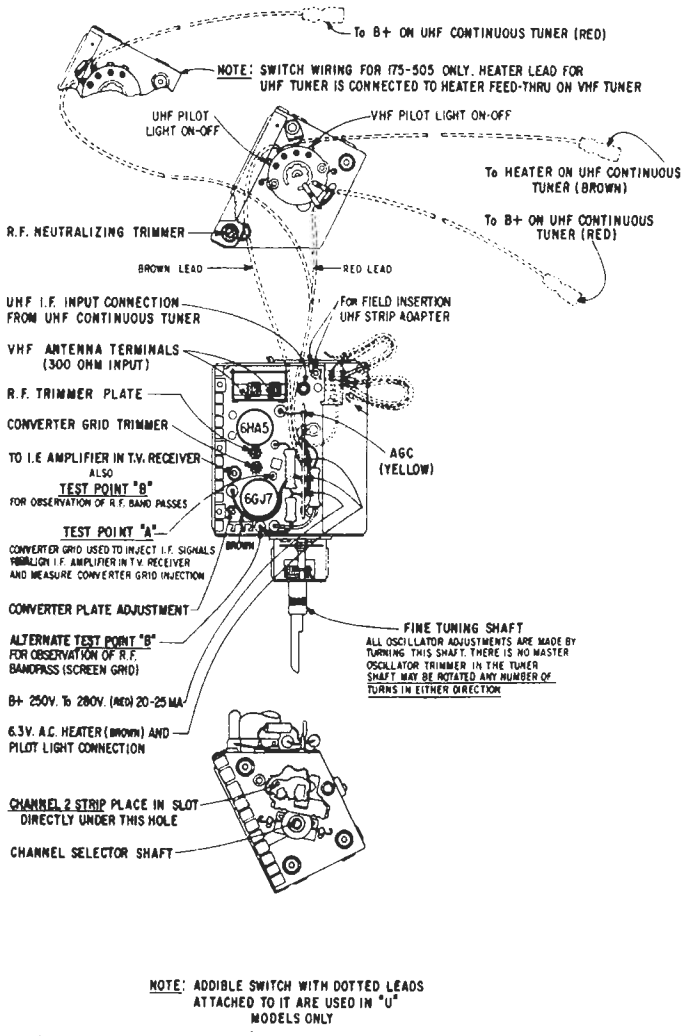


Figure 3 - Tube and Trimmer Location,
Super Gold Video Guard Tuner

TUNER RF ALIGNMENT

TEST EQUIPMENT

Oscilloscope
VHF Sweep Generator (Terminated)
VHF Marker Generator (Terminated)
Bias Supply (Variable 0 to 20 volts)

Connect negative lead of Bias Supply to tuner AGC bus, positive lead to chassis (ground). Connect Oscilloscope through a 10K (isolation) resistor to test point B (on tuner). Connect Sweep and Marker Generator output cable(s) to antenna terminals. Use matching pad similar to that shown in Figure 1 if matching device is not provided.

GOLD VIDEO GUARD

1. Tune Receiver and Sweep Generator for channel 10. Set Bias for - 2.0 volts. Do not exceed 0.1 volt peak-to-peak output during adjustments.

2. Adjust RF plate and converter grid trimmers for pattern similar to Figure 4. Spread or squeeze antenna coil on channel strip for maximum amplitude of response curve. Check marker locations.

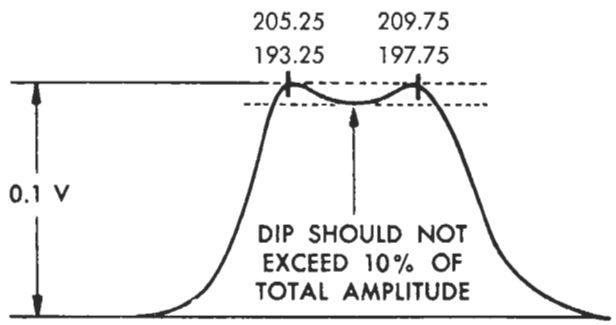


Figure 4 - Channel 10 or 12 RF Response Curve

3. Reconnect Oscilloscope (through 10K resistor) to test point C1 (See Schematic)

Adjust Bias to - 20 volts and adjust RF neutralizing trimmer for minimum output as indicated on the Oscilloscope.

NOTE: Since there is some interaction between the plate trimmer and the neutralizing trimmer, it may be necessary to repeat steps 4, 5 and 6 until correct results are obtained.

4. Reset bias voltage to - 2.0 volts. Reconnect Oscilloscope to test point B. Retune receiver and Sweep Generator for channel 2. Spread or squeeze antenna coil for maximum gain in keeping with the shape of the response curve of Figure 4.

5. Do not adjust the converter plate coil. It is adjusted as part of the "PICTURE IF and TRAP alignment."

The antenna filter is factory adjusted for minimum response at 45.5 mc. Damage to this filter can cause a "suck-out" on channel 2.

NOTE: In the 13 position tuner, adjust the 40 MC input coil (squeeze or spread turns) through hole at rear of tuner to obtain the most satisfactory picture with least noise while receiving a UHF signal.

SUPER BANDSWITCH TUNER

1. Turn the channel selector to channel 13 and adjust the sweep generator to obtain a response curve similar to Fig. 4. Spread or squeeze the channel 13 RF plate inductance (wafer next to metal center shield) and channel 13 mixer grid coil (wafer next to oscillator screws) until response similar to Fig. 4 is obtained.

NOTE: A metal stamped inductance coil is used in the ANTENNA, R.F. plate and Mixer grid circuits of channels 12 thru 7. No adjustment is required.

2. Repeat step 1 on channels 12 down thru 1. Also adjust antenna circuits on channels 6 down thru 2 for proper response curve. (It may be desirable to insert a 68-42 tuning wand in the field of the coil to determine if adjustment is necessary. An increase in amplitude with brass indicates too much inductance necessitating spreading of the turns. An increase in amplitude with iron indicates too little inductance and the coil must be squeezed. At resonance, a reduction in amplitude will be noted with both iron and brass).

The 40 MC input tuneable coil (L2) is accessible thru the hole provided at the side of the tuner.

Adjust for best performance on a weak UHF signal. Do not adjust the smaller shunt coil L1 (from 40 MC IF plug to ground). The L1 shunt coil affects the impedance match between UHF and VHF tuners.

3. To neutralize the R.F. amplifier, increase bias on AGC to - 20 volts. Set sweep generator and tuner to channel 13. With an insulated screw driver adjust the neutralizing trimmer screw (accessible thru hole provided at tuner rear) for minimum output on oscilloscope.

4. The antenna filter is factory adjusted for minimum response at 45.5 Mc. Misadjustment of this filter can cause a "suck out" on Channel 2.

PICTURE IF and TRAP ALIGNMENT

TEST EQUIPMENT — VHF Sweep Generator (Terminated)
Marker Generator (Terminated)
Oscilloscope

1. Slowly turn Channel Selector to rest between two channels.

2. Ground test points "E" and "F". Connect Oscilloscope to test point C1 (picture detector). See Schematic.

3. Couple the sweep and marker signals (using the resistor and capacitor assembly shown in Figure 1), to test point G (input to 3rd IF stage). Adjust Sweep Generator for approximately 6 megacycle sweep (center frequency approximately 43.5 mc). Detector output should not exceed 6 volts peak-to-peak. Sweep pattern should approach that shown in Figure 5.

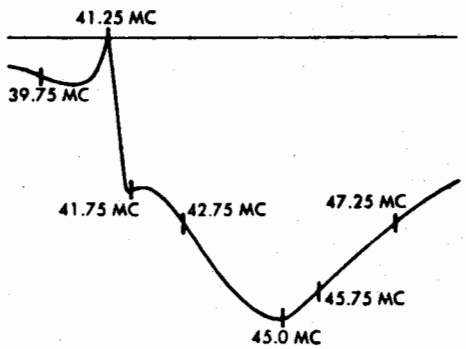


Figure 5 - Typical Response Curve of Last IF Stage Taken at Test Point C1.

4. Set Marker Generator to 41.25 mc. Adjust bottom slug of 41.25 mc trap in Picture Detector circuit for minimum response on Oscilloscope.

   Set top slug of 41.25 mc trap (null adjust) for minimum response at 41.25 mc. Do not change this setting during the remaining alignment procedure.

5. Vary Marker Generator frequency as needed to check marker locations at various points on curve.

6. Connect oscilloscope to test point C2. Adjust primary and secondary slugs of T4 to obtain response similar to Figure 6. Note comparison of response at C2 with response obtained at C1. The response at C2 will only be approximately 1/3 as great as the response at C1 (10 db less than C1 response at 45.75 mc). Increase oscilloscope gain controls accordingly to obtain response as shown in Figure 6. The 41.25 mc marker should be approximately 30% below 45.0 mc at C2. Recheck T4 adjustment if necessary.

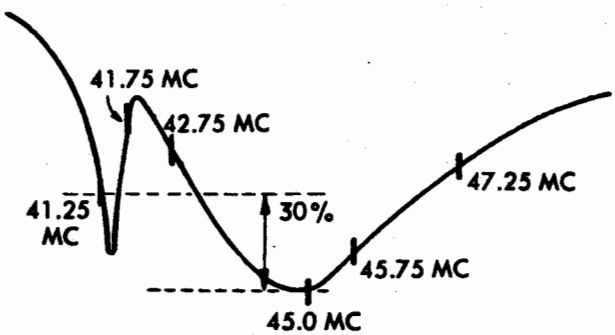


Figure 6 - Typical Response Curve of Last IF Stage, Taken at Test Point C2.

7. Connect sweep and marker signals to Converter control grid (test point A on tuner) and adjust generator accordingly for trap alignment as follows. Note: If necessary, remove ground from test point E and apply sufficient positive voltage (using variable bias supply) for adequate oscilloscope display.

   (a) Adjust traps (at 1st IF input circuit) the 41.25 mc, 47.25 mc and 39.75 mc traps respectively as indicated for minimum response. See Figure 7.

NOTE: The 47.25 mc trap has two slugs within the one coil. The bottom slug (farthest from chassis) is adjusted for minimum 47.25 mc response (null) and the top slug is adjusted (tuned) to 47.25 mc. Some interaction may exist between tuning of these two slugs. Also, recheck tuning of the 41.25 mc and 39.75 mc traps.

8. Connect oscilloscope to test point C1.

   (a) Adjust Converter plate coil (on tuner) to approach response shown in Figure 8.

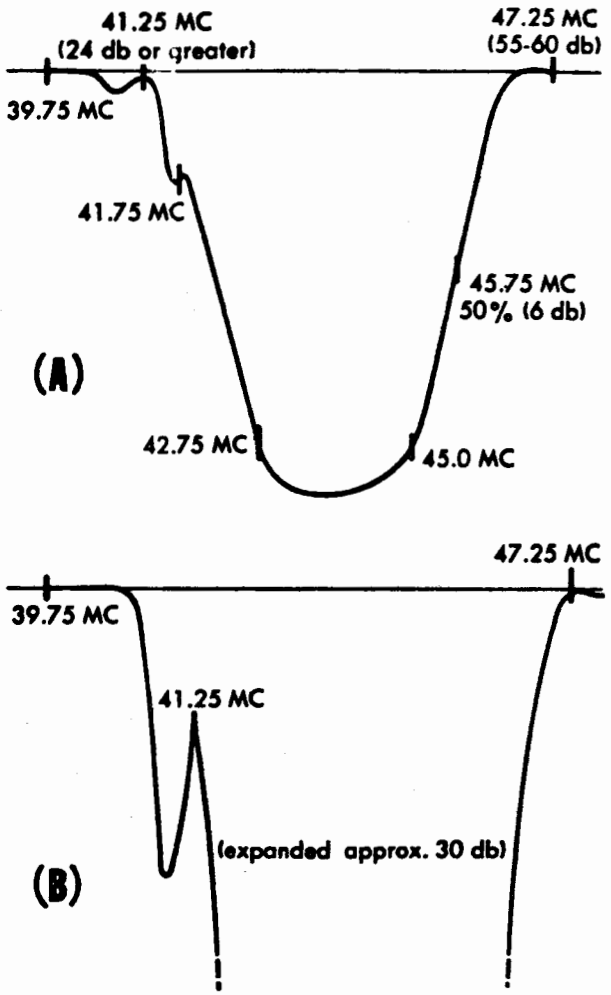


Figure 7 - Overall Response Curve, Taken at Test Point C2.

(b) Tune 1st IF coil (T1) for response shown in Figure 8.

(c) Adjust 2nd IF coil (T2) for maximum response at approximately 45 mc. This adjustment will "rock" the center of the response. Adjust to approximate response shown in Figure 8.

(d) Adjust 3rd IF coil (T3) for maximum response at approximately 43 mc.

This adjustment will affect the lower frequency side of the response. Adjust to approximate response shown in Figure 8.

9. Connect Oscilloscope to test point C2.

(a) Check accuracy of trap attenuation and marker locations according to Figure 7A. The 45.75 mc marker should be at 50%. The 41.25 mc marker should be at 5% or less (24 db). The 47.25 mc marker should be near zero. This marker may not be visible; curve may require expansion by increasing oscilloscope and/or signal generator gain controls, as shown in Figure 12B. The 47.25 mc trap attenuation is at least 55-60 db.

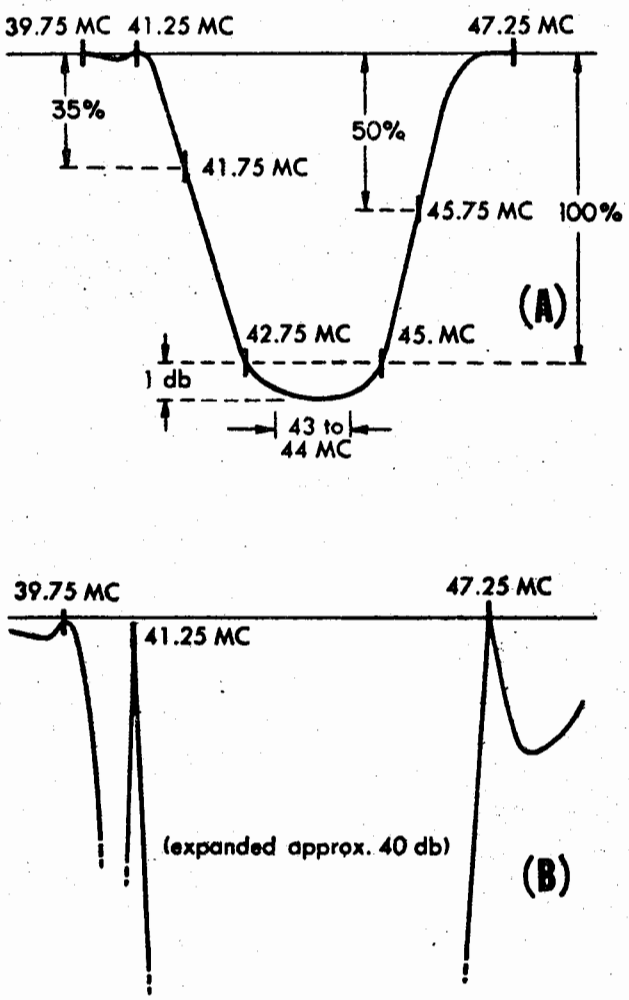


Figure 8 - Overall Response Curve, Taken at Test Point C1.

SOUND AND 4.5 MC TRAP ALIGNMENT

TEST EQUIPMENT — Oscilloscope (for Trap alignment)

SOUND

Proper alignment of the 4.5 mc intercarrier sound channel can be made using a transmitted TV station signal. However, the signal to the receiver antenna terminals must be maintained at a reduced level below the limiting point of the 6BN6 Sound Discriminator. This level can be easily identified by the "hiss" which then accompanies the sound. Various methods may be used to reduce the TV signal level; however, a step attenuator is recommended for most satisfactory results.

1. Connect the step attenuator between the antenna and the receiver antenna terminals.

2. Tune in a TV signal. Adjust the step attenuator until the signal is reduced to a low level where a "hiss" is heard in the sound.

3. Alternately adjust Sound Limiter plate transformer, Sound-Sync Amplifier plate transformer, Quadrature Coil, and Buzz adjustment for the best quality sound and minimum buzz.

   NOTE: Any one of these adjustments may cause the "hiss" to disappear, necessitating a further reduction of the TV signal. The "hiss" must be present for accurate alignment.

4.5 MC TRAP (at test point C1)

4. Connect Oscilloscope (through 10K resistor) to test point R. See Chassis Layout Diagram.

   (a) Tune in receiver to a TV station. If chassis has Color switch, place in ON position.

   (b) Ground test point K to "open" color channel.

   (c) Detune receiver to increase sound carrier level and 920 kc beat in color channel.

   (d) Adjust the 4.5 mc trap, (in grid circuit of Cathode Follower stage) for minimum (null) 920 kc beat as viewed on Oscilloscope.

COLOR AMPLIFIER

TEST EQUIPMENT

Oscilloscope (with detector probe)
Sweep Generator
Marker Generator
Variable Bias Supply
VTVM

1. Set Tuner between channels. Set Color Level control to mid-rotation. If chassis has Color Switch, place on ON position.

2. Connect - 6 volts bias to test point Q. See Schematic and Chassis Layout Diagrams.

3. Ground test point K. This step necessary only on 25MC36(Z) series chassis only.

4. Connect Oscilloscope (through detector probe) to test point R.

5. Connect Sweep Generator (set to approximately 3.6 mc center frequency) and Marker Generator (set to markers accordingly) to test point C1. A fixed 3.58 mc marker will "automatically" appear at this frequency on the response curve due to the local 3.58 mc Color Oscillator in the receiver.

NOTE: It may be necessary to keep oscilloscope and generator gain set near maximum for adequate display. Do not overload.

Adjust 1st Color Amplifier plate coil to approximately 3.1 mc to approach response curve shown in Figure 9.

NOTE: Do not "touch up" the 4.5 mc trap (at test point C1). If trap requires adjustment, see adjustment procedure under "SOUND and 4.5 mc TRAP" alignment.

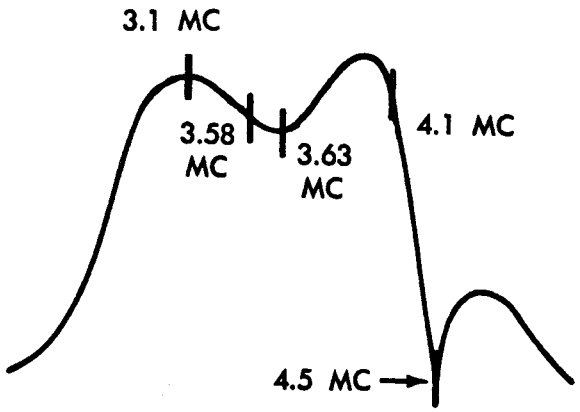


Figure 9 - Overall Color Amplifier Response Curve, Taken at Test Point U.

Adjust Marker Generator for "zero-beat" with a 3.58 mc "built-in" marker for calibration of Marker Generator.

Detune Marker Generator (from 3.58 mc "calibrated" point) to 3.63 mc (50kc) higher.

NOTE: It is important that the generator be set as accurately as possible for 3.63 mc for step 7. This will insure optimum response characteristics.

6. Disconnect the damping resistor (8200 ohms), located in the trap circuit of the 2nd Color Amplifier plate coil. Using short leads, replace with a 100K resistor soldered in place (this will cause less damping and increase the meter indication in step 7).

   NOTE: The 100K ohm resistor must be substituted for the 8200 ohm resistor to maintain the proper capacity in the circuit for adjustment. If the 8200 ohm resistor was merely removed, the capacity change effect could cause an error in adjustment.

7. Connect VTVM to test point R. Disable sweep signal only and with Marker Generator set at 3.63 mc, adjust 2nd Color Amplifier plate coil for minimum meter reading. Two null points can occur. Correct null is with slug nearest chassis.

8. Remove the 100K ohm resistor and replace with original 8200 ohm value.

COLOR SYNC AND DEMODULATION

Color Amplifier alignment will affect Color Sync alignment. Be sure Color Amplifier response is correct before performing Color Sync and Demodulation alignment.

TEST EQUIPMENT — Color-Bar Generator (gated Rainbow)
VTVM
Oscilloscope (with low capacity probe)

1. If chassis has Color switch, place in ON position. Connect Color Bar Generator output (Color Bar Pattern) to antenna terminals.

2. Ground test points K and W.

   (a) Adjust Reactance-Osc. coil, for zero beat as viewed on the picture tube screen (minimum movement of color bars through picture).

3. Ground test point C1. Connect VTVM (set to +50 V DC range) to test point V. See appropriate Chassis Layout diagram. On some chassis, a 4.7 megohm resistor is incorporated in series with test point V. On chassis without this resistor, use external 4.7 megohm resistor in series with VTVM probe.

   (a) Adjust Quadrature Injection transformer, (top slug) for maximum reading on VTVM, (R-Y injection).

   (b) Adjust Quadrature Injection transformer, (bottom slug) for minimum reading on VTVM, (B-Y injection).

   Recheck (a) and (b) for correct setting as required. Slugs should be on outside of coils; not between coils.

   (c) Remove ground from test points K, W, and C1.

4. If a Gated Rainbow Generator is available, connect to antenna terminals; tune in pattern. Set Color Level and Hue control to mid-rotation.

5. Connect Oscilloscope to test point R. Adjust Burst Amplifier plate coil for pattern shown in Figure 10A.

6. Connect Oscilloscope to test point S. If necessary, touch up quadrature coil, bottom core adjustment, for pattern shown in Figure 10B. (5th and 7th bars equal in amplitude). Slug should require only a minimum amount of adjustment.

COLOR LEVEL ADJUSTMENT
(25MC36Z series chassis only)

7. With Color Bar Generator connected to receiver antenna terminals, tune in color pattern. Connect Oscilloscope to test point R. Set Color Level control to minimum.

8. Adjust coil across Color Level control for minimum color output at test point R (minimum R-Y output). Check pattern on screen. Essentially the picture should be in Black and White only.

RANGE CHECK OF HUE CONTROL

9. With Oscilloscope connected to test point R, set Hue control at maximum counter-clockwise position. 1st and 3rd Color Bars should be equal in amplitude (2nd Color Bar maximum). If not, touch up Birst Amplifier plate coil for equal amplitude of 1st and 3rd color bars.

10. Set Hue control at maximum clockwise position. 4th and 5th color bars should be equal in amplitude. However, if only the 3rd and 5th color bars can be made equal at maximum clockwise setting of Hue control, this is minimum acceptable tolerance.

11. Re-set Hue control for equal amplitude of 2nd and 4th color bars at test point R (3rd color bar maximum). Connect Oscilloscope to test point T. Color pattern should appear as shown in Figure 10C.

DEMODULATOR TRAP ADJUSTMENT

12. With Color Bar Generator connected to receiver, connect Oscilloscope to test point RR. Adjust bottom coil of trap in (R-Y) output for minimum 3.58 mc response. See Chassis Layout Diagram.

13. Connect Oscilloscope to test point TT. Adjust top coil of trap in (G-Y) output for minimum 3.58 mc response.

    NOTE: Some interaction may exist between top and bottom slugs of the trap. Readjust as necessary.

14. Connect Oscilloscope to test point SS. Adjust trap in (B-Y) output for minimum 3.58 mc response.

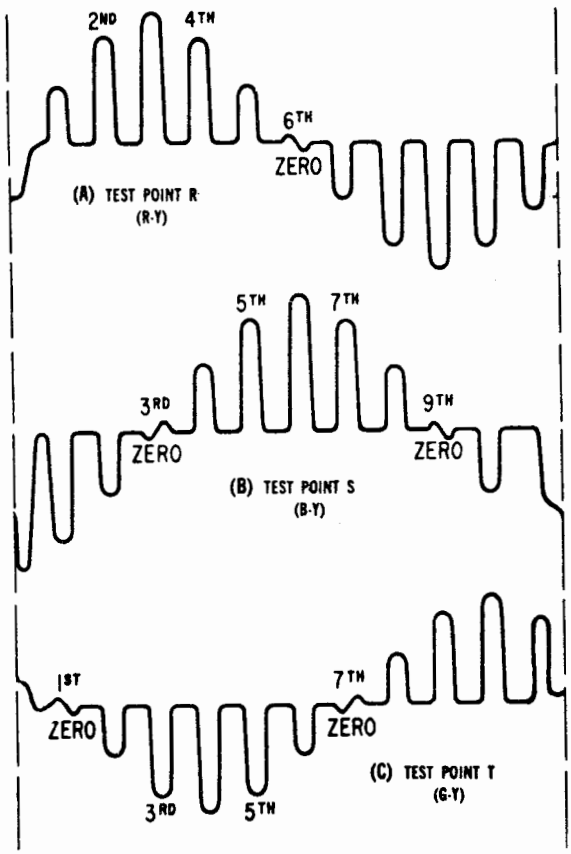


Figure 10 - Color Test Patterns.

With receiver color section aligned correctly and Hue control set for pattern shown in Figure 10A at test point R, patterns at test points S and T should also be shown with same setting of Hue control.

HORIZONTAL SWEEP

TEST EQUIPMENT — VTVM (with High Voltage Probe - 30 KV or higher)
0-3 ma DC Meter (VOM or VTVM)

The high Voltage Adjustment is located in the HV Regulator stage of the receiver. Before setting this adjustment, the receiver must be reasonably preadjusted regarding AGC and Horizontal Hold.

With Receiver OFF . . .

1. Connect 0-3 ma DC meter across metering resistor (test points Y and Z to check Regulator current). Positive lead to test point Z.

   NOTE: If the particular current range(s) available on the instrument being used for this step presents a resistance to the circuit in excess of 100 ohms per volt sensitivity or higher) on a suitable low voltage range and read volts instead of current or, use a VTVM. A reading of 1.0 volt corresponds to a current of 1.0 ma; 0.5 volts corresponds to 0.5 ma, etc.

2. Connect VTVM through 30 KV (or higher) high voltage probe to picture tube anode lead.

With Receiver ON . .

1. Tune in picture (set Horizontal Hold, etc. accordingly). Turn Brightness and Contrast controls to extinguish raster (picture cut-off).

2. For optimum performance, check line voltage and set High Voltage Adjust for reading on VTVM according to the chart below. For example, if the line voltage is 120V, set High Voltage for 25 KV; if line voltage is 110V, set High Voltage for 23.2 KV, etc.

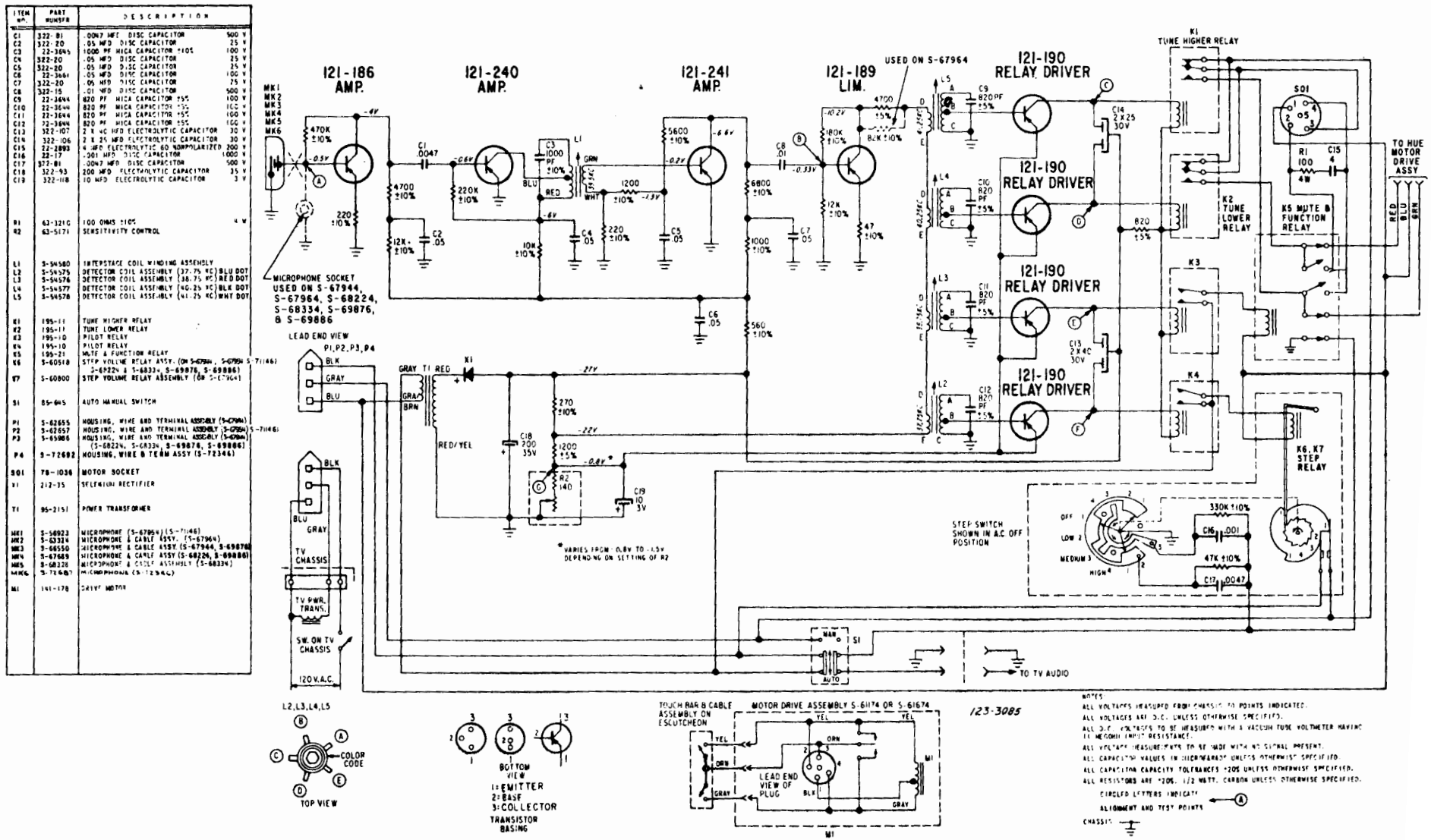
If line voltage is	Set High Voltage for
100 V	20.9 KV
105 V	22.2 KV
110 V	23.2 KV
115 V	24.4 KV
120 V	25.0 KV
125 V	25.6 KV
130 V	26.5 KV
135 V	27.1 KV

High Voltage settings for line voltages between those listed can be approximated accordingly.

Disconnect VTVM. Observe Regulator current reading on milliammeter across points Y and Z.

Final readings should be:

High Voltage	See Chart
Regulator Current	.85 ma to 1.4 ma



ITEM NO.	PART NUMBER	DESCRIPTION	
C1	322-81	.0047 MFD DISC CAPACITOR	500 V
C2	322-20	.05 MFD DISC CAPACITOR	25 V
C3	22-3644	1000 PF MICA CAPACITOR ±10%	100 V
C4	322-20	.05 MFD DISC CAPACITOR	25 V
C5	322-20	.05 MFD DISC CAPACITOR	25 V
C6	22-3661	.05 MFD DISC CAPACITOR	100 V
C7	322-20	.05 MFD DISC CAPACITOR	25 V
C8	322-15	.01 MFD DISC CAPACITOR	500 V
C9	22-3644	820 PF MICA CAPACITOR ±5%	100 V
C10	22-3644	820 PF MICA CAPACITOR ±5%	100 V
C11	22-3644	820 PF MICA CAPACITOR ±5%	100 V
C12	22-3644	820 PF MICA CAPACITOR ±5%	100 V
C13	322-107	2 X 4C MFD ELECTROLYTIC CAPACITOR	30 V
C14	322-106	2 X 25 MFD ELECTROLYTIC CAPACITOR	30 V
C15	22-2893	4 MFD ELECTROLYTIC 60 NONPOLARIZED	200 V
C16	22-17	.001 MFD DISC CAPACITOR	1000 V
C17	373-81	.0047 MFD DISC CAPACITOR	500 V
C18	322-93	200 MFD ELECTROLYTIC CAPACITOR	35 V
C19	322-118	10 MFD ELECTROLYTIC CAPACITOR	3 V
R1	62-3210	100 OHMS ±10%	4 W
R2	63-5171	SENSITIVITY CONTROL	
L1	S-54580	INTERSTAGE COIL WINDING ASSEMBLY	
L2	S-54575	DETECTOR COIL ASSEMBLY (37.75 KC)	BLU DOT
L3	S-54576	DETECTOR COIL ASSEMBLY (38.75 KC)	RED DOT
L4	S-54577	DETECTOR COIL ASSEMBLY (40.25 KC)	BLK DOT
L5	S-54578	DETECTOR COIL ASSEMBLY (41.25 KC)	WHT DOT
K1	195-11	TUNE HIGHER RELAY	
K2	195-17	TUNE LOWER RELAY	
K3	195-10	PILOT RELAY	
K4	195-10	PILOT RELAY	
K5	195-21	MUTE & FUNCTION RELAY	
K6	S-60518	STEP VOLUME RELAY ASSY. (ON S-67944, S-67964 & S-71146; S-68224 & S-68334, S-69876, S-69886)	
K7	S-60800	STEP VOLUME RELAY ASSEMBLY (ON S-67964)	
S1	85-645	AUTO MANUAL SWITCH	
P1	S-62655	HOUSING, WIRE AND TERMINAL ASSEMBLY (S-67944)	
P2	S-62657	HOUSING, WIRE AND TERMINAL ASSEMBLY (S-67964 & S-71146; S-68224 & S-68334, S-69876, S-69886)	
P3	S-65986	HOUSING, WIRE AND TERMINAL ASSEMBLY (S-67944; S-68224, S-68334, S-69876, S-69886)	
P4	S-72692	HOUSING, WIRE & TERM ASSY (S-72346)	
SO1	78-1036	MOTOR SOCKET	
X1	212-35	SELENIUM RECTIFIER	
T1	95-2151	POWER TRANSFORMER	
MK1	S-54923	MICROPHONE (S-67964) (S-71146)	
MK2	S-63324	MICROPHONE & CABLE ASSY. (S-67964)	
MK3	S-66550	MICROPHONE & CABLE ASSY (S-67944, S-69876)	
MK4	S-67689	MICROPHONE & CABLE ASSY (S-68224, S-69886)	
MK5	S-68328	MICROPHONE & CABLE ASSEMBLY (S-68334)	
MK6	S-72687	MICROPHONE (S-72346)	
M1	141-178	DRIVE MOTOR	

Figure 11

Schematic Diagram, 600 Space Command Chassis, S-69876 and S-72346

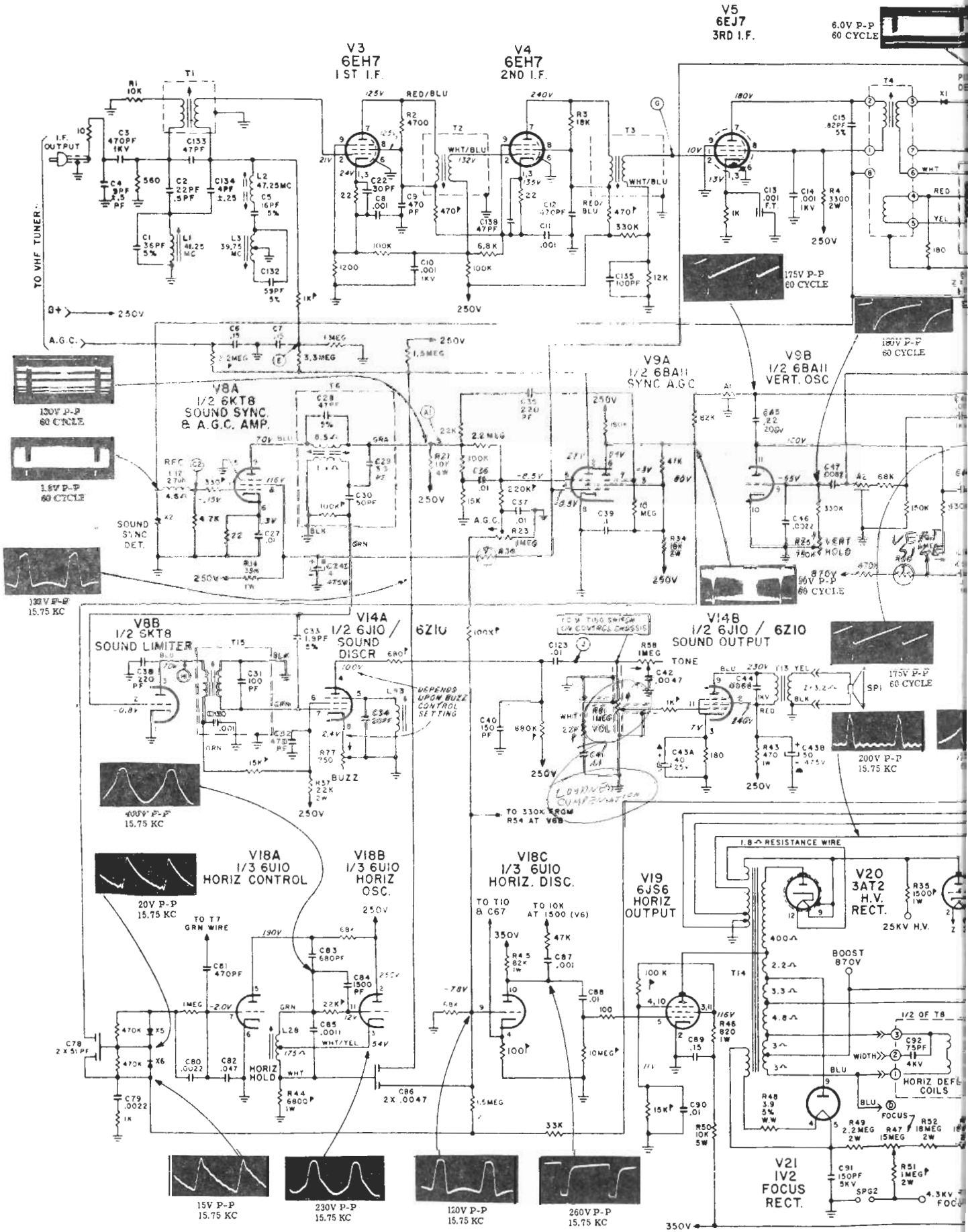


Figure 23—Schematic Diagram, 2

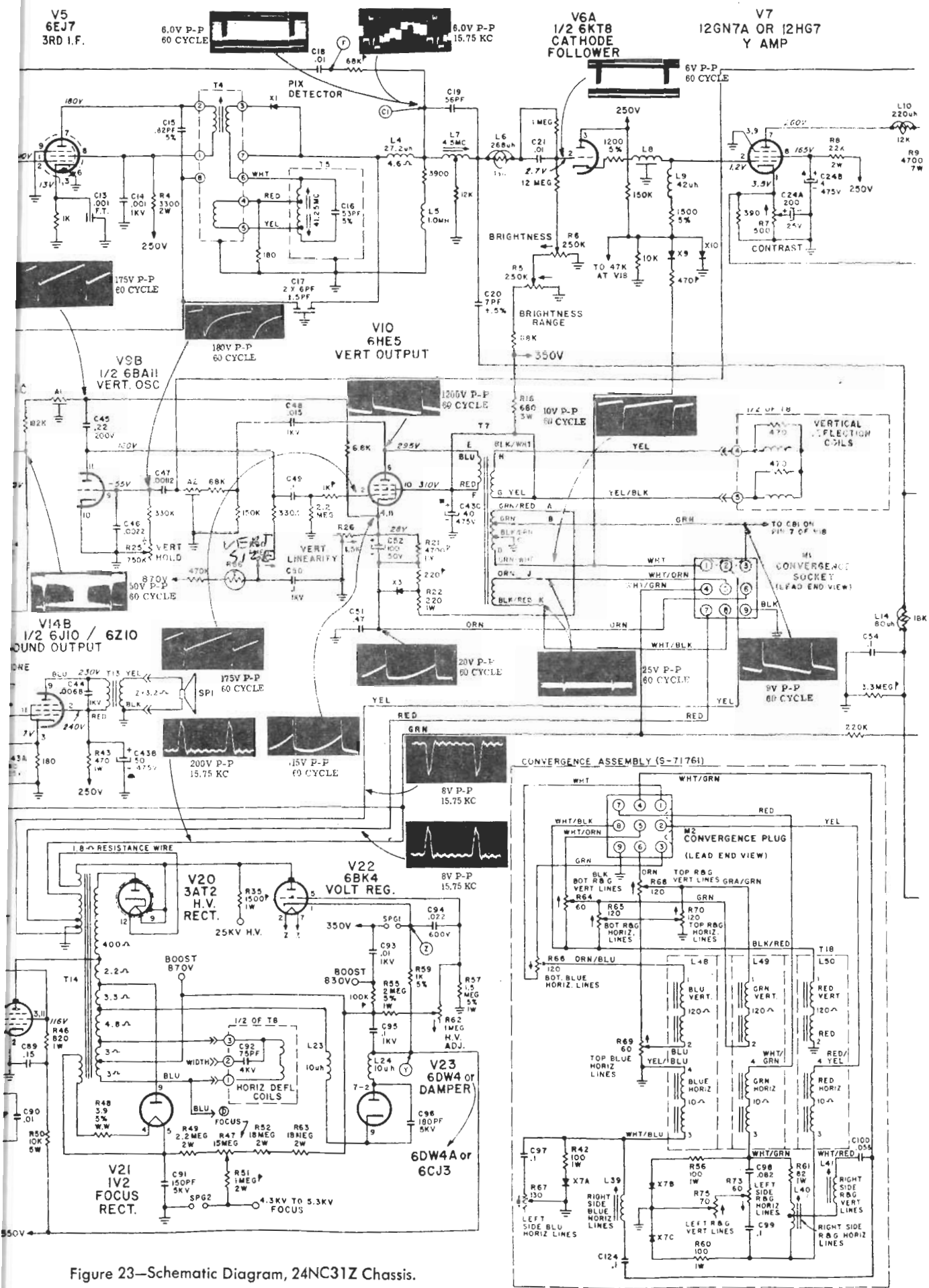
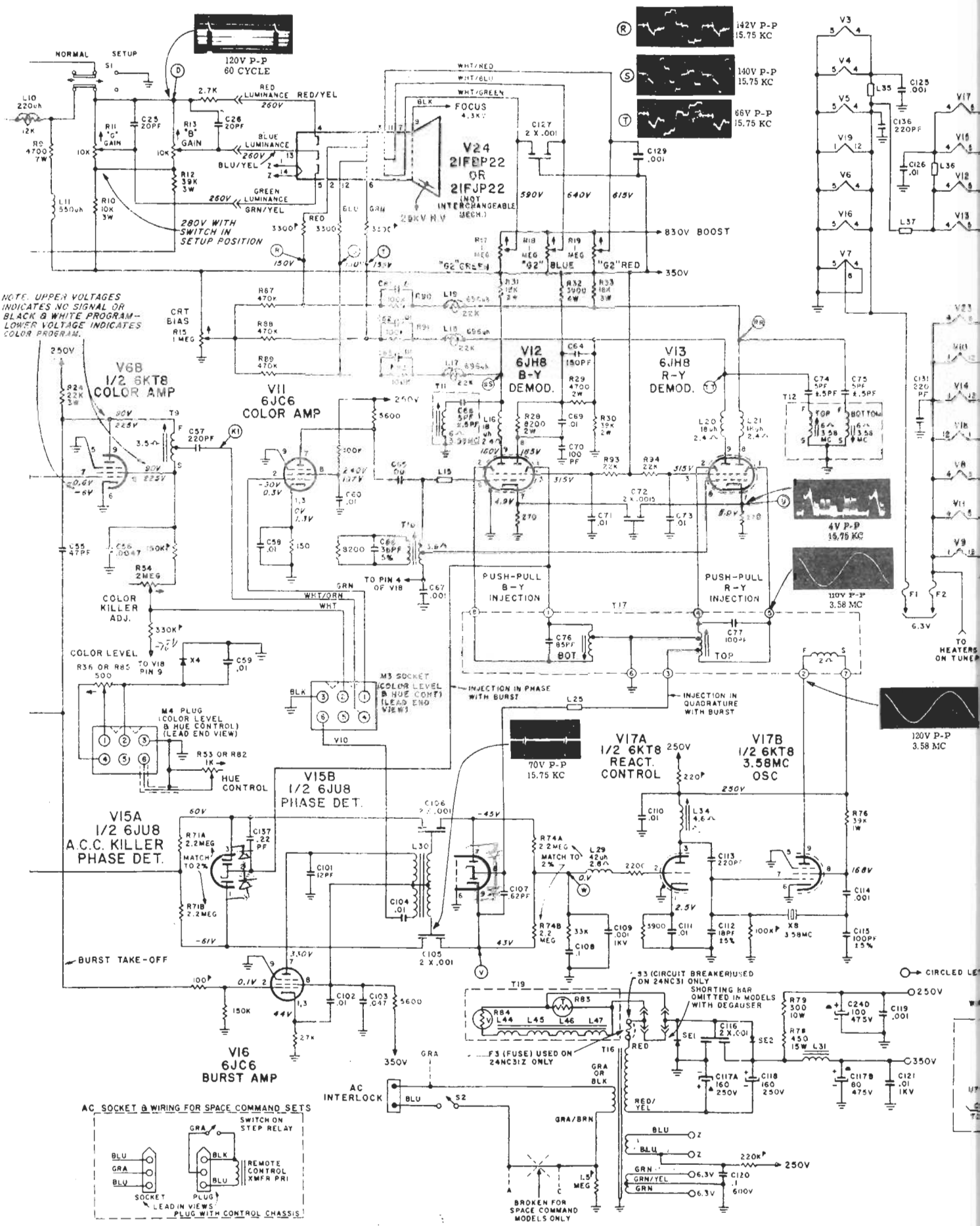
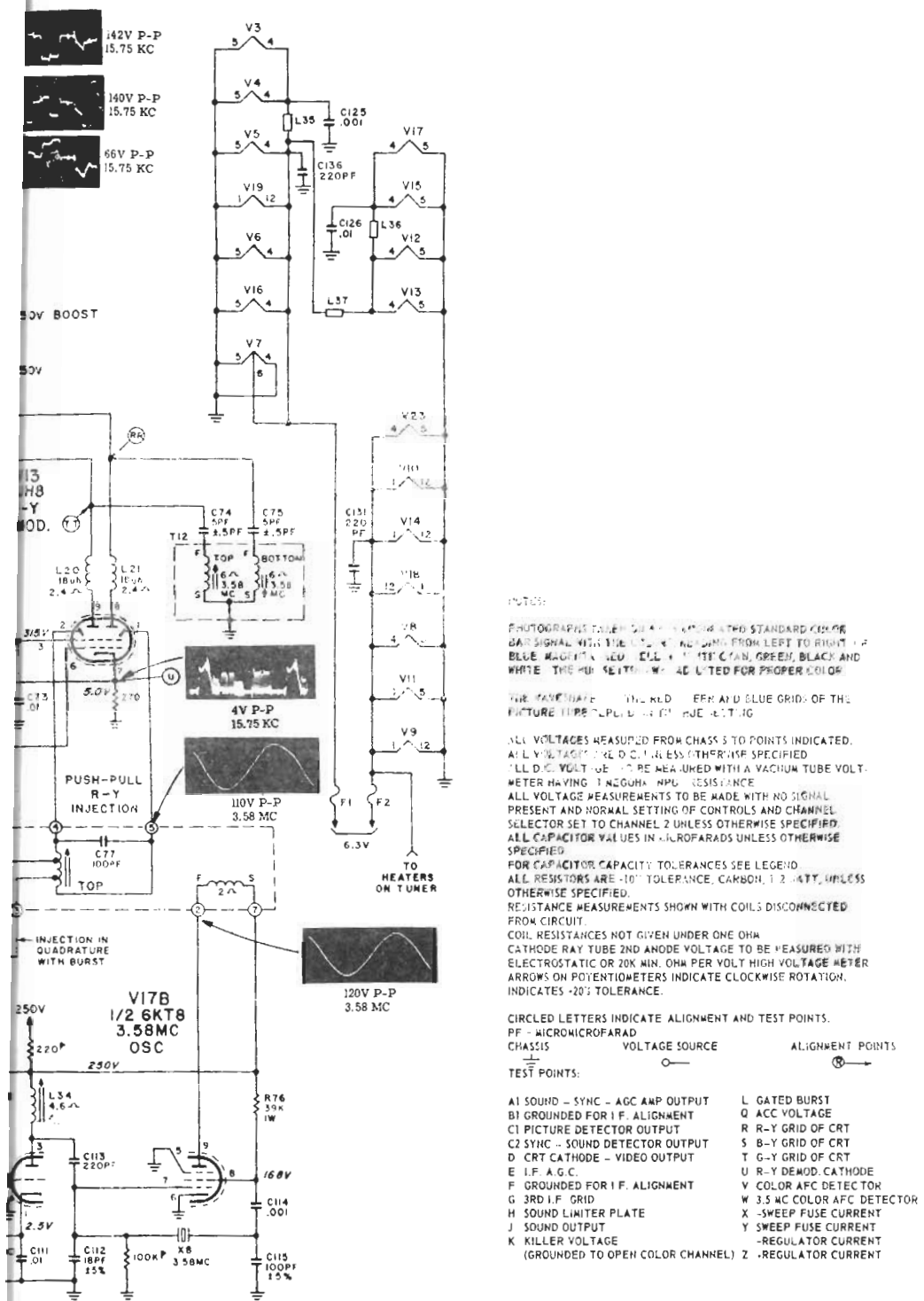


Figure 23—Schematic Diagram, 24NC31Z Chassis.


NORMAL
SETUP
S1
120V P-P
60 CYCLE
142V P-P
15.75 KC
140V P-P
15.75 KC
66V P-P
15.75 KC
V24
21FBP22
OR
21FJP22
(NOT
INTERCHANGEABLE
MECH.)
FOCUS
4.3KV
29KV H.V.
280V WITH
SWITCH IN
SETUP POSITION
830V BOOST
350V
"G2" GREEN
"G2" RED
"G2" BLUE
RED
LUMINANCE
BLUE
LUMINANCE
GREEN
LUMINANCE
R11
"G"
GAIN
R13
"B"
GAIN
R12
39K
3W
R10
10K
3W
R9
4700
7W
L10
220uh
L11
550uh
C25
20PF
C26
20PF
2.7K
NOTE: UPPER VOLTAGES
INDICATES NO SIGNAL OR
BLACK & WHITE PROGRAM—
LOWER VOLTAGE INDICATES
COLOR PROGRAM.
CRT
BIAS
R15
1 MEG
R87
470K
R88
470K
R89
470K
V6B
1/2 6KT8
COLOR AMP
V11
6JC6
COLOR AMP
V12
6JH8
B-Y
DEMOD.
V13
6JH8
R-Y
DEMOD.
C57
220PF
C58
.0047
150K
R54
2MEG
COLOR
KILLER
ADJ.
330K
COLOR LEVEL
R36 OR R85
500
TO V18
PIN 9
X4
C59
.01
M4 PLUG
(COLOR LEVEL
& HUE CONTROL)
(LEAD END VIEW)
R53 OR R82
1K
HUE
CONTROL
M3 SOCKET
(COLOR LEVEL
& HUE CONT.)
(LEAD END
VIEWS)
C55
47PF
C56
.0047
150K
C60
.01
C61
.01
C62
.01
C63
.01
C64
180PF
R29
4700
2W
R28
8200
2W
R30
39K
2W
C69
.01
C70
100
PF
C71
.01
C72
2 X .0015
C73
.01
R93
22K
R94
22K
L16
18 uh
L17
L18
L19
L20
18uh
L21
18uh
T12
C74
5PF
C75
5PF
TOP
BOT TOM
3.58
MC
4V P-P
15.75 KC
110V P-P
3.58 MC
6.3V
TO
HEATERS
ON TUNER
PUSH-PULL
B-Y
INJECTION
PUSH-PULL
R-Y
INJECTION
T17
C76
85PF
BOT
C77
100PF
TOP
TO PIN 4
OF V18
INJECTION IN PHASE
WITH BURST
INJECTION IN
QUADRATURE
WITH BURST
L25
70V P-P
15.75 KC
V17A
1/2 6KT8
REACT.
CONTROL
V17B
1/2 6KT8
3.58MC
OSC
V15B
1/2 6JU8
PHASE DET.
V15A
1/2 6JU8
A.C.C. KILLER
PHASE DET.
C106
2 X .001
C107
.62PF
C104
.01
C105
2 X .001
C101
12PF
C102
.01
C103
.047
5600
R71A
2.2MEG
MATCH
TO 2%
R71B
2.2MEG
C137
.22
PF
R74A
2.2MEG
MATCH TO
2%
R74B
2.2
MEG
L29
42uh
2.6Ω
L30
L34
4.6
C108
.1
C109
.001
1KV
C110
.01
C111
.01
C112
18PF
2%
C113
220PF
C114
.001
C115
100PF
5%
X8
3.58MC
R76
39K
1W
BURST TAKE-OFF
150K
27K
100
T19
R83
R84
L44
L45
L46
L47
F3 (FUSE) USED ON
24NC31Z ONLY
S3 (CIRCUIT BREAKER) USED
ON 24NC31 ONLY
SHORTING BAR
OMITTED IN MODELS
WITH DEGAUSER
SE1
SE2
C116
2 X .01
C117A
160
250V
C118
160
250V
C117B
80
475V
C240
100
475V
C119
.001
R79
300
10W
R78
450
15W
L31
C121
.01
1KV
C120
.1
600V
220K
L5
MEG
AC
INTERLOCK
S2
BLU
GRA
GRA/BRN
GRA
OR
BLK
RED/
YEL
BLU
GRN
GRN/YEL
6.3V
250V
350V
BROKEN FOR
SPACE COMMAND
MODELS ONLY
AC SOCKET & WIRING FOR SPACE COMMAND SETS
SWITCH ON
STEP RELAY
REMOTE
CONTROL
XMFR PRI
SOCKET
PLUG
LEAD IN VIEWS
PLUG WITH CONTROL CHASSIS
CIRCLED LE



NOTES:

PHOTOGRAPHS TAKEN ON A COLOR-CALIBRATED STANDARD COLOR BAR SIGNAL WITH THE [illegible] KEYING FROM LEFT TO RIGHT: BLUE, MAGENTA, RED, [illegible], CYAN, GREEN, BLACK AND WHITE. THE HUE SETTING WAS ADJUSTED FOR PROPER COLOR.

THE WAVEFORMS ON THE RED, GREEN AND BLUE GRIDS OF THE PICTURE TUBE [illegible] HUE SETTING.

ALL VOLTAGES MEASURED FROM CHASSIS TO POINTS INDICATED.
ALL VOLTAGES ARE D.C. UNLESS OTHERWISE SPECIFIED.
ALL D.C. VOLTAGES TO BE MEASURED WITH A VACUUM TUBE VOLTMETER HAVING 11 MEGOHMS INPUT RESISTANCE.
ALL VOLTAGE MEASUREMENTS TO BE MADE WITH NO SIGNAL PRESENT AND NORMAL SETTING OF CONTROLS AND CHANNEL SELECTOR SET TO CHANNEL 2 UNLESS OTHERWISE SPECIFIED.
ALL CAPACITOR VALUES IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
FOR CAPACITOR CAPACITY TOLERANCES SEE LEGEND.
ALL RESISTORS ARE ±10% TOLERANCE, CARBON, 1/2 WATT, UNLESS OTHERWISE SPECIFIED.
RESISTANCE MEASUREMENTS SHOWN WITH COILS DISCONNECTED FROM CIRCUIT.
COIL RESISTANCES NOT GIVEN UNDER ONE OHM.
CATHODE RAY TUBE 2ND ANODE VOLTAGE TO BE MEASURED WITH ELECTROSTATIC OR 20K MIN. OHM PER VOLT HIGH VOLTAGE METER.
ARROWS ON POTENTIOMETERS INDICATE CLOCKWISE ROTATION.
INDICATES ±20% TOLERANCE.

CIRCLED LETTERS INDICATE ALIGNMENT AND TEST POINTS.
PF = MICROMICROFARAD

CHASSIS — TEST POINTS: — VOLTAGE SOURCE — ALIGNMENT POINTS

A1 SOUND – SYNC – AGC AMP OUTPUT	L GATED BURST
B1 GROUNDED FOR I.F. ALIGNMENT	Q ACC VOLTAGE
C1 PICTURE DETECTOR OUTPUT	R R-Y GRID OF CRT
C2 SYNC – SOUND DETECTOR OUTPUT	S B-Y GRID OF CRT
D CRT CATHODE – VIDEO OUTPUT	T G-Y GRID OF CRT
E I.F. A.G.C.	U R-Y DEMOD. CATHODE
F GROUNDED FOR I.F. ALIGNMENT	V COLOR AFC DETECTOR
G 3RD I.F. GRID	W 3.5 MC COLOR AFC DETECTOR
H SOUND LIMITER PLATE	X -SWEEP FUSE CURRENT
J SOUND OUTPUT	Y SWEEP FUSE CURRENT
K KILLER VOLTAGE (GROUNDED TO OPEN COLOR CHANNEL)	Z -REGULATOR CURRENT

CIRCLED LETTERS INDICATE ALIGNMENT & TEST POINT.

123-3138