entron
INCORPORATED

Service Manual

CHL converter

CHL SPECIFICATIONS

Bandwidth	6 mc
Conversion Gain	80 to 100 db (Varies with Frequency)
Conversion Noise Figure Overall	9 db Maximum
AGC Range	± 1 db for 40 db Input Variation
Maximum Output Level	+ 52 db mv (0.4 volt)
Frequency Response	± 0.5 db over Video Spectrum
* Power Requirements	120 ma at 160V DC Regulated Max. 3 amp at 6.3V AC Unregulated Max.
Impedance	75 ohms Unbalanced Input and Output
Connectors	BNC Input and Output
Tube Complement	2-6AM4 Cascode RF Amplifier 3-5654 RF Amplifier 1-6U8 Oscillator Mixer 4-6CB6 IF Amplifier & AGC
Fusing	None. Fusing Incorporated in Model PSR-2 Power Supply
Mounting	19" Relay Rack
Dimensions	Width 3" Length 19" Depth 4 1/2"
Weight	Net 5 Lbs Shipping 6 1/2 Lbs
Finish	Black Crackle

* Power Requirements for a Maximum of 3 CHL Converters are met by Entron Model PSR-2 Regulated Power Supply.

SERVICE NOTES ON ENTRON MODEL CHL CONVERTERS

GENERAL: The following information and service data is presented for use only by properly qualified and trained tv technicians or engineers. In no case should radical changes in circuit design or incorrect parts replacements be made. Proper performance is greatly dependent upon correct alignment and use of standard replacement parts as specified in the attached parts list.

IDENTIFICATION: Each CHL is identified by two numbers. As an example, CHL 12-6 is the Entron identification of a converter designed to convert information in channel 12 to information in the frequency range of channel 6.

The first number indicates the channel from, and the second number indicates the channel to which conversion is intended.

FUNCTION: The function of the CHL is to select the proper band of frequencies in the high band of the VHF Spectrum required for presentation of the picture and sound information and to reject signals outside the passband; to convert the information to the desired band of frequencies in the low band of the VHF Spectrum; to amplify the video and sound signals for driving the MUE-5 Mixer and to maintain a constant output within 2 db for input signal variations up to 40 db.

GROUNDING: There are three types of grounds to consider: chassis, inter-chassis or rack bonding, and external. If parts in a CHL unit are replaced, be sure to avoid disturbing the wiring as much as possible. Use short direct connections to original factory wired ground points in order to prevent oscillation. Bonding of CHL units in a rack is accomplished using a flexible braid strap supplied and the grounding lugs on each CHL. Allow sufficient slack for a CHL to be removed or to avoid tension, but keep bonding as short and direct as practicable. Be sure lugs are secure since an intermittent contact may cause excessive or annoying noise. An external ground to a pipe sunk in the earth, for protection of personnel in the event of short circuits or lightning, is specified by most Fire Underwriters where equipment is insured. Ground cable of this kind should be a number 8 or larger insulated or bare copper wire.

ALIGNMENT: Full information on alignment is given under "CHL ALIGNMENT PROCEDURE" in this service manual. Alignment should not be attempted without proper equipment, as specified, and proper understanding of alignment techniques.

DESCRIPTION: The CHL Converter consists of four parts:

A. Stagger tuned RF amplifier for high band,

B. Converter (Oscillator and Mixer),

C. Stagger tuned RF amplifier for low band,

D. Automatic Gain Control.

The CHL Converter achieves a 6 mc pass-band characteristic of the type indicated in Fig. 3. The nominal peaking frequency of each stage is specified under "CHL ALIGNMENT PROCEDURE".

The stages may be identified by reference to the various tubes. The tube functions are as follows:

SYMBOL	FUNCTION	TYPE
VT-1	RF Input Triode	6AM4
VT-2	Grounded Grid Triode	6AM4
VT-3	RF Amplifier Pentode	5654
VT-4	RF Amplifier Pentode	5654
VT-5	RF Amplifier Pentode	5654
VT-6	Local Oscillator Triode Mixer Pentode	6U8
VT-7	RF Amplifier Pentode	6CB6
VT-8	RF Amplifier Pentode	6CB6
VT-9	RF Amplifier Pentode (Output)	6CB6
VT-10	RF Amplifier Pentode (AGC Stage)	6CB6

CIRCUIT DESCRIPTION: The input signal is applied via input jack J-1 (See Fig. 1) and a tuned circuit L-12, C-43 (which allows proper impedance matching) to the grid of VT-1.

CASCODE CIRCUITS: VT-1 and VT-2 work together in a special cascode circuit which has very low inherent noise when neutralizer coil L-2 is tuned correctly. The plate of the VT-1 is coupled to the cathode of VT-2 via C-22. VT-2 functions as a grounded grid RF amplifier, the cathode being connected to an R-C combination R-22 C-45 for cathode bias.

STAGGER TUNED RF AMPLIFIER: The stages VT-3, VT-4, VT-5, VT-7, VT-8, VT-9 are conventional stagger tuned RF Amplifiers.

CONVERTER: The triode part of VT-6 is used in a tuned grid oscillator circuit, the output of which is capacitively coupled to the grid of the pentode section of VT-7 via the internal capacity of the tube.

AGC CIRCUIT: The AGC circuit is somewhat unusual and worthy of close examination. Amplified AGC is afforded by the gain of VT-10 which has a high Q plate circuit permitting a sharp selectivity characteristic to be obtained in this AGC stage. The VT-10 stage is sharply tuned to the video carrier output of VT-9.

The output of VT-10 is applied to a series circuit consisting of rectifier 3, rectifier 2 and C-42. The signal output is also applied to the series circuit consisting of C-20, rectifier 1 and C-42. Rectifiers 1 and 2 form a half-wave voltage doubler circuit for development of AGC negative bias. Rectifier 3 is a special type having a very high ratio of front to back resistance. When not conducting, the resistance is 10 megohms or higher, permitting rectifier 3 to serve as a load for the rectifier 2 circuit. When conducting, the resistance of rectifier 3 is very low so that it can function as a positive clamp practically equivalent to a short circuit should the AGC line go positive. This may occur if the channel to which the CHL is tuned goes off the air. The sole function of rectifier 3 is to act as a diode load impedance of very high value for conditions where the AGC line is negative and to act as a short circuit should the positive threshold bias be applied to the line in the absence of an incoming RF signal. Its importance in the circuit should be fully realized since, if omitted or defective, rectifier 3 would cause severe oscillation and instability in the absence of an incoming signal and the lack of development of negative AGC bias.

As a temporary expedient, if an incoming signal is present and rectifier 3 is defective, a 1 megohm resistor may be used as a diode load. To prevent oscillation, a diode of the rectifier 1 or 2 class may be used as a positive clamp temporarily but should be replaced as soon as practicable with a rectifier 3 diode.

AGC FILTERING: The AGC line is filtered by the usual r-c decoupling circuits, such as R-48, R-49, R-55, R-54 and associated capacitors C-52, C-53, C-36C, etc. However, the time constant of the AGC is purposely made rather long to prevent sync suppression and replacements of parts in this circuit should be made using only exact components originally specified. A changed part value would result in incorrect time constant and faulty AGC action.

THRESHOLD BIAS: The AGC is equipped with a threshold bias control which permits setting the level at which the AGC starts operating. Because of this action of R-40, which is controlled by a knob on the chassis, the output level can be adjusted to any desired value within the range of the threshold control.

AGC JACK: An AGC jack (J-2) is provided to permit convenient measurement of AGC voltages and is connected to the AGC line via R-50. This jack also affords a means of applying a fixed bias during alignment as explained under "CHL ALIGNMENT PROCEDURE" in this service manual.

TYPICAL TROUBLES: No matter how carefully designed and produced, electronic equipment may occasionally develop faults. The following is a summary of some usual and unusual troubles, with appropriate remedies.

TYPICAL SERVICE TROUBLES

OUTPUT LEVEL LOWER THAN NORMAL: Check setting of threshold control which may have been changed inadvertently. Check tubes and source voltages. Check input signal level with field strength meter and be sure all cable connections are correct and tight. Normally, the AGC will hold the output at the desired level; if not, the AGC may be at fault and should be checked as described below.

As alignment affects gain, realignment may be required. However, because special alignment equipment is needed, as specified in "CHL ALIGNMENT PROCEDURE", be sure realignment is absolutely necessary before disturbing original alignment. A simple means of testing is to connect a standard, well shielded tv receiver to the CHL output. If the picture is clear and undistorted, alignment is probably correct. If the tv set overloads due to high signal level at the input, use a pad between the CHL and set, adjust the threshold control, or both. If available, by all means use a sweep generator and oscilloscope to get an accurate indication of alignment which should be equivalent to the response curve shown in Fig. 3.

<u>SEVERE OSCILLATION</u>: Make certain all tube shields are firmly in place and that bonding straps to each CHL or APL are in place and properly secured. Check cable connections. Improper grounding of a cable might result in feedback and oscillation. The usual cause of oscillation in a high gain RF amplifier, assuming shielding is correct, is a defective by-pass condenser in a plate return or screen return circuit. In checking condensers in a tv receiver or ordinary radio, suspected units may be shunted and the effect noted; tests are made with the chassis upside down or on edge and power on. In checking CHL units, such tests cannot be made because of the very high gain and high operating frequencies. The cover must be in place while the unit is operating if oscillation is to be prevented. This is particularly true when there is no input signal and no AGC bias since, then, the gain is at maximum.

Suspected condensers should be checked by a replacement method, being certain to place the new condenser in the exact position occupied by the old one, and to use the same grounding point. Occasionally, a heater circuit by-pass may become defective and allow common coupling between stages, inducing oscillation. Such units are best checked by replacement, making one replacement at a time and in that way isolating the defective capacitor.

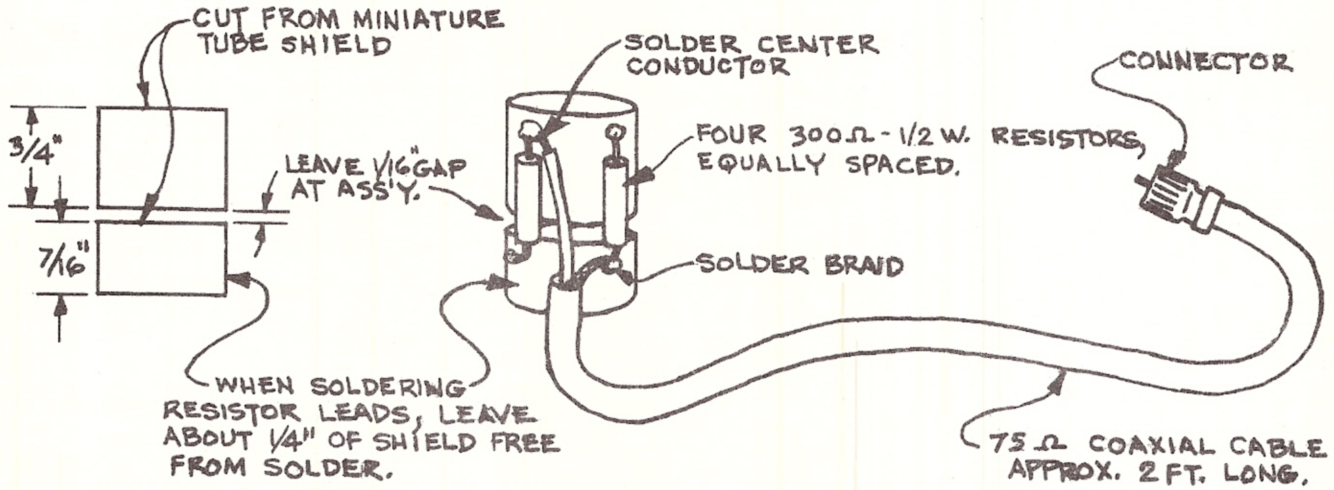
Severe oscillation with no input signal applied may be due to triggering of the RF amplifier by noise pulses when rectifier 3 is defective and does not act as a positive clamp for the positive threshold bias. A sub-normal bias means high gain and a tendency to oscillate, but the condition is severely aggravated by a positive bias due to a faulty clamping diode such as rectifier 3. The rectifier can best be checked by trying another and noting effect on performance of the CHL.

<u>EXCESSIVE NOISE</u>: The first stage in the pre-amplifier is probably most critical in this respect since any noise generated here will be amplified by succeeding stages. VT-1 and VT-2 can be checked by replacement if suspected of being noisy. A weak signal will cause amplifier noise and gain to go up. A result may be an intolerable amount of noise due to a faulty antenna or transmission line input. The level of the signal can be checked with a field strength meter. If the signal input is 50 microvolts or higher and noisy output is obtained from the CHL, there may be a fault in the CHL unit. A better visual indication may be obtained by connecting a good, well shielded, tv receiver to the transmission line that has been disconnected from the CHL input. If a clear, steady picture is obtained, look for a fault in the CHL; if not, check the antenna and transmission line circuit.

A frying or hissing sound may be due to a faulty carbon resistor causing noise modulation of an RF stage. A periodic or intermittent noise occurring at a slow rate may be due to some thermal defect in a poorly soldered joint or in a defective component, such as a tube. Microphonic or ringing noises may also be caused by faulty tubes. Loose trimmers or coils may cause intermittent noise and may be noticeable only when some vibration is present.

FAULTY AGC ACTION: If the signal input to the CHL is steady, the AGC will have relatively little effect and will primarily reduce the gain to a degree dependent on the input. However, a faulty AGC may erratically change the gain of the CHL or fail to smooth out variations in the signal level as the input fluctuates. To check the AGC and gain functions separately, an isolation technique may be used. With the AGC tube removed from its socket and threshold control set for minimum threshold voltage, a 5 volt negative bias is applied to the AGC jack and a 100 microvolt input signal to the CHL input. The output is terminated in the 75 ohm impedance of a field strength meter. If the output remains constant, the CHL is not faulty or intermittent exclusive of the AGC. To check the AGC stage, pull out VT-9 and put back the AGC tube, VT-10. Remove the 5 volt negative bias from the AGC jack and connect a dc vacuum tube voltmeter at this point. Apply a 1 millivolt signal from a generator to the output jack of the CHL and note the reading of the voltmeter. As the generator output is reduced slowly, the AGC voltage should decrease in step with the generator output reduction at a slow rate. If sharp changes are noted or no variation is obtained, there is a fault in the AGC system. VT-10 may be checked by replacement and this also applies to the rectifiers in the clamp and voltage doubler circuits. However, one replacement should be made at a time, to discover the particular element that is faulty.

INTERMITTENT OPERATION: First, be sure the input signal is not intermittent. Check it with a field strength meter. If the fault is in the CHL, attempt to isolate the trouble by using the following technique. (Once the trouble is localized to a specific stage, further localization is an easy matter to discover the defective item.) A useful device for trouble shooting consists of a special tube shield as shown in the following sketch:



The top portion of the shield is held to the bottom portion by four resistors spaced 90° apart around the tube shield circumference. The 300 ohm resistors form a 75 ohm load for the signal generator. Referring to Fig. 1, if it is desired to inject a signal into the VT-4 stage, the device is placed around VT-3 and VT-2 is pulled out. Then, by capacitive coupling to the plate of VT-3, the generator signal is applied to the VT-4 input. If the signal output, then, is normal and does not vary, the trouble is localized to a stage ahead of VT-4. If the signal does cut off or is abnormal, the fault is localized to VT-4 or a succeeding stage. In this way, the device saves time in speeding up a servicing diagnosis.

VOLTAGE TESTS: Voltages cannot be checked at tube sockets because of the high gain and high operating frequencies which make the operation critical. Source voltages may be tested however, preferably at the PSR-2 output terminals. The cover plate must be on the CHL at all times during operation and tests to prevent erroneous readings. Source voltages are indicated directly on the schematic, Fig. 1.

SIGNAL DISTORTION: In general, signal distortion will be caused by multipath transmission, incorrect impedance matching, strong interference from noise sources, misalignment or by any of the conditions which may affect the high gain RF circuits of an ordinary tv receiver. However, the head-end equipment is far more critical than a receiver since it may serve as a source for dozens or hundreds of tv receivers. The experience gained in interpretation of faulty picture presentations in servicing tv receivers may be applied successfully to interpreting service troubles in head-end equipment, bearing in mind essential differences. Signal distortion may be due to an inherent fault in the CHL or to circuits ahead of it such as the antenna and transmission line associated with the CHL input.

This discussion will be limited to CHL faults. System or transmission faults are discussed in the Field Service Manual. The most likely cause of signal distortion would be a change in alignment or misalignment. CHL units must be aligned as described under "CHL ALIGNMENT PROCEDURE". Assuming no interference, misalignment will produce signal distortion. With interference and misalignment or changed alignment, signal distortion will be exceptionally severe.

Adjacent channel interference occurs as the result of beats between carriers or any carrier and any sideband present at the CHL input. The selectivity characteristic of the strip offers discrimination or rejection against carriers and sidebands of adjacent channels. The center frequency of the FM sound is 1.5 mc away from the adjacent channel picture carrier, so that a coarse beat pattern may be developed if sound circuits are not correctly tuned.

If the strip lacks proper selectivity due to misalignment or changed alignment, sidebands of an adjacent channel may beat with the desired carrier and produce an interfering image corresponding to the program not wanted. The most prominent feature of this upper adjacent image is the vertical blanking bar which becomes visible owing to the unequal transmission times from the two stations. The blanking bar moves from side to side when the two programs arise from unsynchronized scanning sources and the motion gives rise to so-called "windshield wiper" interference.

If the sound is not attenuated properly, horizontal dark bars may appear on the picture tube of the tv set used as a monitor. The width of the bars varies with the audio frequency, the intensity of the bars is proportional to the amplitude of the signal and when both frequency and amplitude of sound vary, ripples may appear on the screen of the picture tube.

If beats occur between adjacent channel carriers, and the strip selectivity is poor due to misalignment or faulty shielding, modulation of the beat at the field scanning rate of 60 cps and the line-scanning rate of 15,750 cps may cause a 60 cps buzz and a 15,750 cps hiss in the reproduced sound at the tv receiver. The basic trouble may be phase modulation at the transmitter which is aggravated by the misalignment condition of the strip, and would not be noticeable otherwise.

If the higher frequencies are attenuated, fine detail in the picture may appear blurred. A dip in the mid-band portion of the response curve may show up as a faulty contrast over part of the picture, or a brushed paint effect. Lack of shading may be due to attenuation of the picture carrier due to a dip in the response curve at the picture carrier frequency.

Incorrect background shading of the picture may be caused by 60 cycle hum modulation due to cathode to heater leakage in an RF amplifier tube, or plate modulation of the tube at 120 cycles due to a fault in the PSR-2 filtering action. Such troubles are rather uncommon since the tubes are carefully selected and high quality components are used in the PSR-2.

OUTPUT OFF FREQUENCY: An easy way of checking output frequency and resetting of local oscillator if necessary is described under "CHL ALIGNMENT PROCEDURE" (7.08).

CHL ALIGNMENT PROCEDURE

1. Test Equipment Needed:

   1.01 Mega Sweep 111-A (Kay Electric Co.), or equivalent

   1.02 Dual Mega Marker Sr. (Kay Electric Co.), or equivalent

   1.03 Crystal Detector (Entron VHFD), or equivalent

   1.04 Oscilloscope (DuMont 304-A), or equivalent

   1.05 Field Strength Meter

   1.06 Regulated bias supply with shielded cable and plugs

   1.07 Cable jumpers (RG-6/U with BNC Male Connectors)

   1.08 Attenuator Pads 3, 6, 10 and 20 db (Entron Adapad AD-B)

   1.09 Dual Mega Marker Sr. (Kay Electric Co.) or Signal Generator (General Radio) or equivalent

   1.10 BNC-T (UG 284/U)

   1.11 Test Probe (Fig. 7) or similar

   1.12 Vacuum Tube Voltmeter, (Triplett) or equivalent.

2. Test Equipment Calibration:

   2.01 Warm up all test equipment at least 30 minutes.

   2.02 Connect Marker (1.02) output to low output jack of Model 111-A Sweep Generator (1.01).

2. <u>Test Equipment Calibration:</u> (Cont'd)

2.03 Connect high output of Mega Sweep (1.01) to vertical (Y) input of Oscilloscope (1.04) via Detector (1.03).

2.04 Connect "sweep-out" of Sweep Generator (1.01) to horizontal (X) input of Oscilloscope (1.04).

2.05 Calibrate by setting Marker (1.02) to desired channel (input to CHL) and adjusting Sweep Generator (1.01) and Oscilloscope (1.04).

3. <u>Alignment of CHL:</u>

3.01 First, familiarize yourself with location of each trimmer, adjustable coil, tube location.

Referring to circuit diagram Fig. 1, and top view, Fig. 2, the locations can be found. They are as follows:

C43 Grid input of VT1

L12 Grid input of VT1

L11 Neutralization Coil

L1 Plate Circuit of VT1

L2 Plate Circuit of VT2

L3 Plate Circuit of VT3

L4 Plate Circuit of VT4

L5 Plate Circuit of VT5

L13 Grid Circuit of VT6 (Mixer)

C67 Tuning Capacitor for Oscillator (VT6)

L6 Plate Circuit of VT6 (Mixer)

L14 Grid Circuit of VT7

L7 Plate Circuit of VT7

L8 Plate Circuit of VT8

L9 Plate Circuit of VT9 (Output)

L10 Plate Circuit of VT10 (AGC)

3.02 The alignment procedure of a CHL can be divided into the following steps:

A. Tuning of Oscillator

B. Aligning of high band RF-Section

C. Aligning of low band RF-Section

D. Aligning of the entire CHL

E. Aligning of the AGC-Section

F. Gain Measurement

G. AGC Action Measurement

3.03 Warm up CHL at least 30 minutes

4. Tuning of Oscillator:

4.01 Regardless to which frequencies the three circuits of the low band RF-Section are tuned to, a minute signal from the oscillator will pass through and can be detected at the CHL output jack.

4.02 Connect a Field Strength Meter (1.05) to the output jack of CHL (J3) and tune to oscillator frequency according to table 1.

4.03 Adjust trimmer C67 until maximum deflection on Field Strength Meter (1.05) is noted.

5. Aligning of High Band RF Section:

5.01 To achieve best input matching a simple method, known as Reflectometer method, can be used. (See Fig. 6).

5.02 Connect Sweep Generator (1.01) to BNC-T (1.10).

5.03 Connect a length of approximately 100 Ft. RG-11/U also to the BNC-T (1.10).

5.04 Connect BNC-T (1.10) via Detector (1.03) to Oscilloscope (1.04).

5.05 As long as the other end of the RG-11/U cable is not terminated in its proper impedance a standing wave pattern like the one shown on Fig. 4a can be observed on the screen of the Oscilloscope (1.04).

5.06 Connect the end of the RG-11/U cable to input jack (J1) of the CHL.

5.07 By adjusting L12 and C43 a part of the displayed pattern can be flattened out. Adjustments have to be made in this way so that the flat part of the pattern falls between picture and sound marker of the desired channel. (High channel of CHL). (Fig. 4b).

5.08 After having aligned the input matching network, make sure not to change settings of L12 and C43 thereafter.

5.09 Connect Sweep Generator (1.01) to input jack (J1).

5.10 Apply a negative bias voltage of 4V from bias supply (1.06) to Test Jack (J2).

5.11 Remove VT6 and insert probe (1.11) into the VT6 socket so that the probe pin makes contact with Jack 2.

5.12 Connect probe (1.11) via Detector (1.03) to Oscilloscope (1.04). (Fig. 5a)

5.13 Adjust L1, L2, L3, L4, L5 and L13 to center frequency of high band channel.

5.14 In order to achieve the best noise figure of the input circuitry adjustments on neutralizer coil L11 have to be made.

5.15 Remove VT1 and replace with a tube of the same type from which one filament pin (8 or 7) is cut off.

5.16 Tune L11 until a dip approximately 1 mc above picture carrier is noted.

5.17 Insert original VT1 again and do not change setting of L11 thereafter.

6. <u>Aligning of Low Band RF-Section</u> (Fig. 5b):

6.01 Insert probe (1.11) into VT6 socket so that the probe pin makes contact with Jack 6.

6.02 Connect output of Sweep Generator (1.01) to probe (1.11).

6.03 Connect output Jack (J3) of CHL via Detector (1.03) to Oscilloscope (1.04).

6.04 Tune

L6 to Sound Carrier Frequency
L14 to Picture Carrier Frequency
L7 to Sound Carrier Frequency
L8 to Picture Carrier Frequency
L9 to Center Frequency

} of low band channel

with bias of -4V still applied.

7. Aligning of the Entire CHL (Fig 5c):

7.01 The alignment method described under 5.09 through 6.4 is the one used at the factory to align new converters. In most cases this procedure might not be necessary in the field, where a slight tune up, as after tube changes, will suffice. The alignment procedure of the entire CHL, as described hereunder, may then serve as a simplified method, but even after alignment was made as described under 5.09 through 6.4, alignment of the entire CHL must follow.

7.02 Reinsert VT6 into its socket

7.03 Connect Sweep Generator (1.01) to input Jack (J1).

7.04 Connect Oscilloscope (1.04) to Output Jack (J2) via Detector (1.04).

7.05 Connect Bias Supply (1.06) to test jack (J-2) and apply -4V.

7.06 Due to the gain of the CHL it will be necessary to insert attenuation pads (1.08) between Sweep Generator (1.01) and input jack (J1).

7.07 By tuning

L1 to Center L2 to Center L3 to Center L4 to Center L5 to Center L13 to Center	Frequency	L6 to Sound Carrier L14 to Picture Carrier L7 to Sound Carrier L8 to Picture Carrier L9 to Center	Frequency

a curve similar to the one of Fig. 3 should be obtained.

7.08 After having aligned the CHL as described above, the setting of the Oscillator can be checked by the following method, (Fig. 5d).

7.09 Connect Marker (1.02) to the input jack (J1) and switch to the desired high channel.

7.10 Connect the output jack (J3) and a second marker (1.09), which is switched to the desired low channel to Oscilloscope (1.04) via BNC-T (1.10).

7.11 The pattern observed on the screen of the Oscilloscope (1.04) represents the beat between the signal out of the CHL and the Marker (1.09).

7.12 By adjusting C67 the beat frequency should be adjusted to zero or a very low value.

8. Aligning of AGC Section:

8.01 Remove VT-9

8.02 Insert VTVM probe into test jack and ground other lead of VTVM to chassis.

8.03 Set VTVM to read voltages of the order of -15 volts.

8.04 Set AGC threshold control to approximate mid-point.

8.05 Apply power to CHL.

8.06 Insert proper video carrier frequency into output jack J-3 of CHL from signal generator.

8.07 Tune AGC coil for peak reading on VTVM.

8.08 Rotate threshold control and see if VTVM goes to zero or possibly positive. The positive reading should not exceed .02 volt.

9. Gain Measurement:

9.01 The gain will vary with frequency and according to conditions of bias, alignment, tubes and parts tolerances. The gain for zero bias, without AGC should be between 80 and 100 db.

9.02 The gain setup is shown in Fig. 8. The above figures are for the picture carrier of each channel. Output level can be varied by the adjustment of the threshold control.

10. AGC Action Measurement:

10.01 Set up signal generator to give an unmodulated RF output of 1 millivolt at the center frequency of the high band channel covered by the CHL and apply this signal to the CHL input.

10.02 Set threshold control for maximum AGC action (Full counter-clockwise).

10.03 Connect FSM to CHL output and adjust it to give an output level indication of zero db.

10.04 Reduce RF input from 1 millivolt reference down to 50 microvolts, observing level of CHL output as this is down. The AGC should hold the output level constant within 2 db over the above specified range.

TABLE 1

OSCILLATOR FREQUENCIES
FOR CHL CONVERTERS

CHL	MC	CHL	MC
7 - 2	120	11-2	144
7 - 3	114	11-3	138
7 - 4	108	11-4	132
7 - 5	98	11-5	122
7 - 6	92	11-6	116
8 - 2	126	12-2	150
8 - 3	120	12-3	144
8 - 4	114	12-4	138
8 - 5	104	12-5	128
8 - 6	98	12-6	122
9 - 2	132	13-2	156
9 - 3	126	13-3	150
9 - 4	120	13-4	144
9 - 5	110	13-5	134
9 - 6	104	13-6	128
10-2	138		
10-3	132		
10-4	126		
10-5	116		
10-6	110		

CHL PARTS LIST

Electrical

Circuit Designation	Description
C1, C2, C3, C4, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C30, C32, C33, C42, C44, C45, C46, C47, C48, C50, C51, C54, C55, C56, C57, C59, C60, C61, C62, C63, C65, C69	Insulated radial lead Ceramions 1000 mmf
C5, C49, C58, C64	Feed Thru 1000 mmf
C22	3 mmf $\pm$ 10%
C23, C26, C27, C35, C37	Non-Insulated Radial Lead Ceramions 300 mmf
C24, C25, C28, C34, C36, C39, C41	Ring Capacitors 4X6000 mmf
C29	.24 mmf 10%
C31	.43 mmf 10%
C38, C40	5 mmf 10%
C43, C67	Trimmer .5 to 15 mmf
C52, C53	.1 mf 200V
C66	See Attached List
C68	20 mmf $\pm$ 10% Zero Temp. Coeff.
J1, J3	BNC Receptacle
J2	Phone Tip Jack
L1, L2, L3, L4, L5, L6, L7, L8, L9, L10, L11, L12, L13, L14	Coils
L15, L16, L17, L18	RF Choke
L19, L20, L21, L22, L23	RF Choke
L24	Oscillator Coil
P1	Power Plug

Circuit Designation	Description
R1, R2, R3, R4, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R21, R22	100 ohms 1/2W 10%
R5, R6, R7, R8	100 ohms 1W 10%
R19	150K ohms 1/2W 10%
R20	680 ohms 1/2W 10%
R23, R25, R27, R39	180 ohms 1/2W 10%
R24, R26, R28, R33, R36, R38, R41	100K ohms 1/2W 20%
R29	68 ohms 1/2W 10%
R30	To be determined; might be unnecessary
R31, R34	33 ohms 1/2W 10%
R32, R35	150 ohms 1/2W 10%
R37	300 ohms 1/2W 10%
R40	100K ohms 2W Variable
R42, R43, R44, R45, R46, R47, R56	33 ohms 1/2W 10%
R48, R49	1M ohms 1/2W 10%
R50, R51, R52, R53, R54, R55, R58	4.7K ohms 1/2W 10%
R57	390 ohms 2W 10%
VT1, VT2	6AM4
VT3, VT4, VT5	5654
VT6	6U8
VT7, VT8, V9, VT10	6CB6
Rect. 1, Rect. 2	IN 54A
Rect. 3	CK 739

Values for C66
for Different Converters

Conversion	Capacitance MMF	Conversion	Capacitance MMF
7-2	6.8	11-2	6.8
7-3	7.5	11-3	7.5
7-4	5.6	11-4	5.6
7-5	6.8	11-5	6.2
7-6	7.5	11-6	7.5
8-2	6.2	12-2	6.2
8-3	6.8	12-3	6.8
8-4	7.5	12-4	7.5
8-5	6.2	12-5	6.2
8-6	6.8	12-6	6.2
9-2	5.6	13-2	6.2
9-3	6.2	13-3	6.2
9-4	6.8	13-4	6.8
9-5	7.5	13-5	8.2
9-6	6.2	13-6	6.2
10-2	7.5		
10-3	5.6		
10-4	6.2		
10-5	7.5		
10-6	7.5		

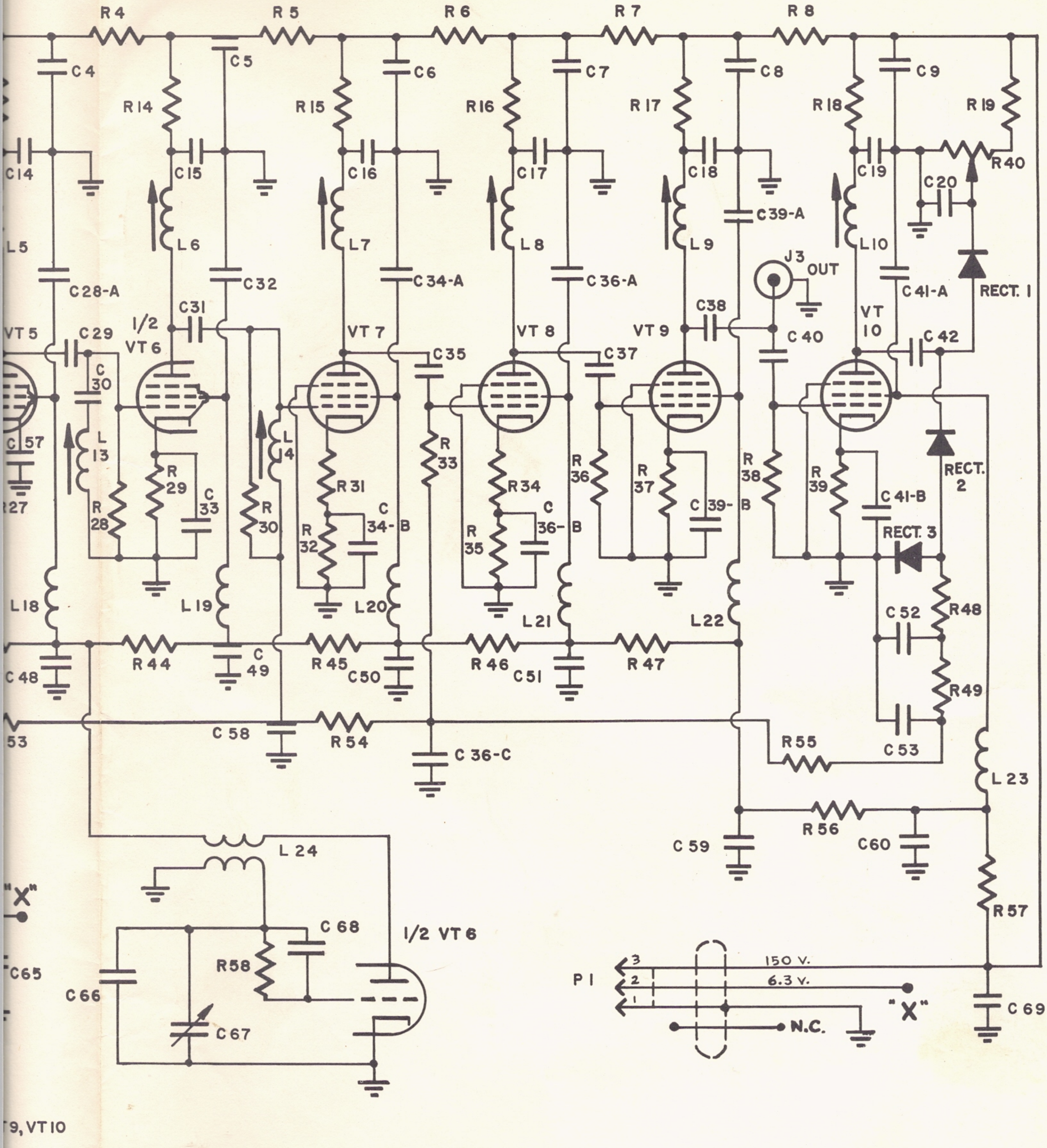
Example:

For A CHL 12-5

C66 should be Erie Type 331

N1400 ± 250

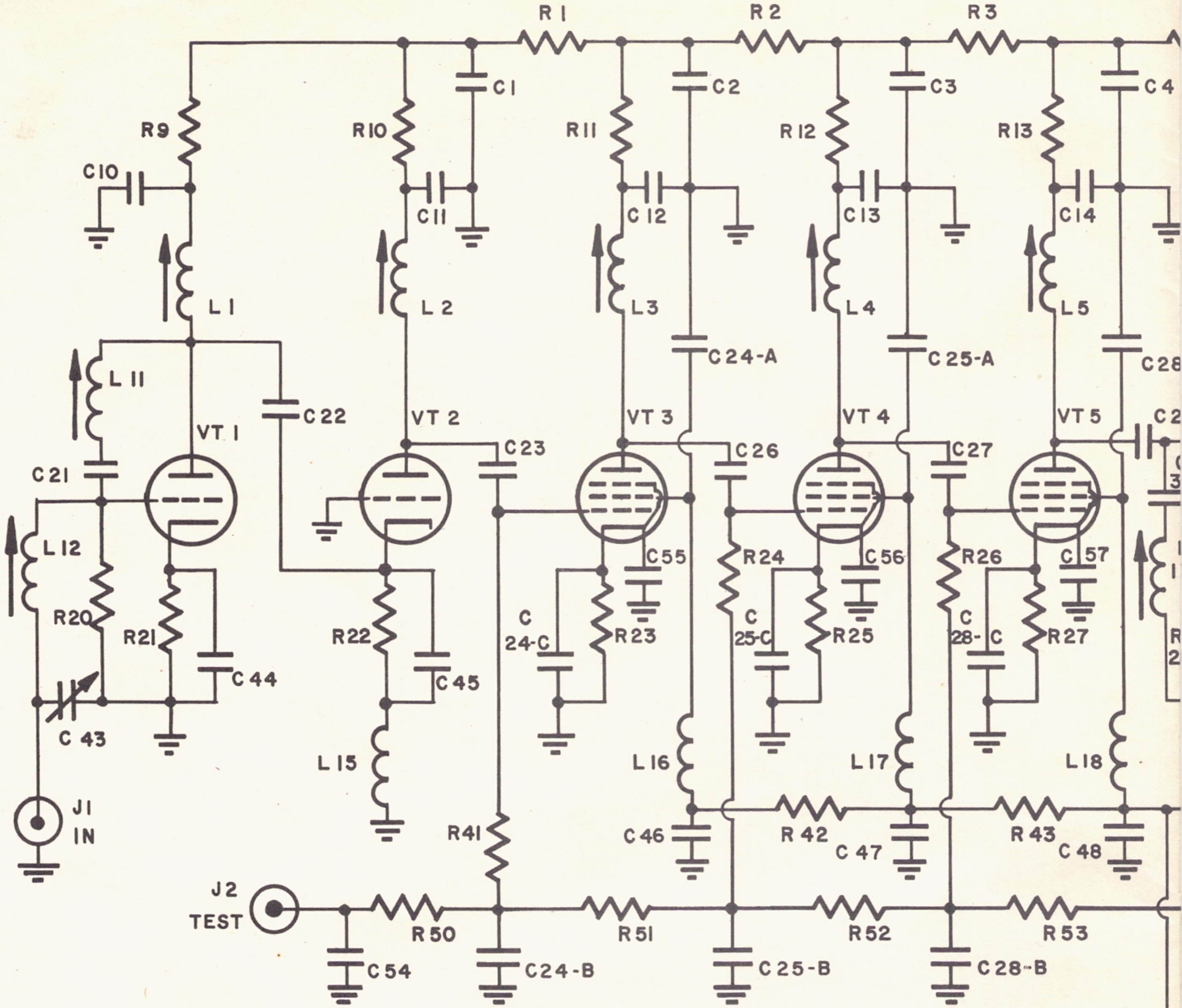
6.2 ± 0.62 MMF
(331)

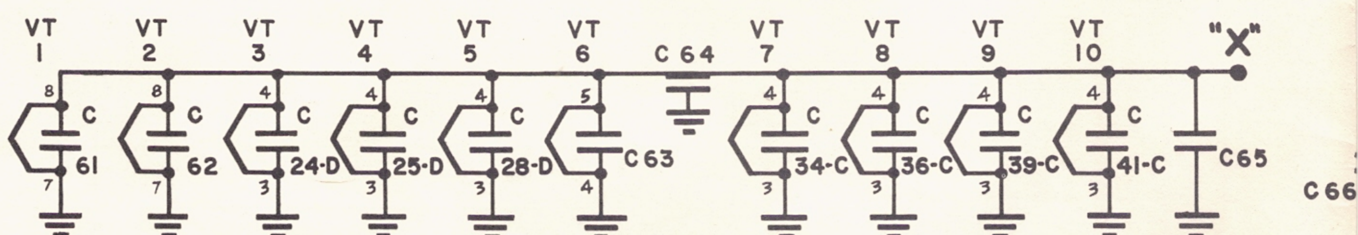


SCHEMATIC

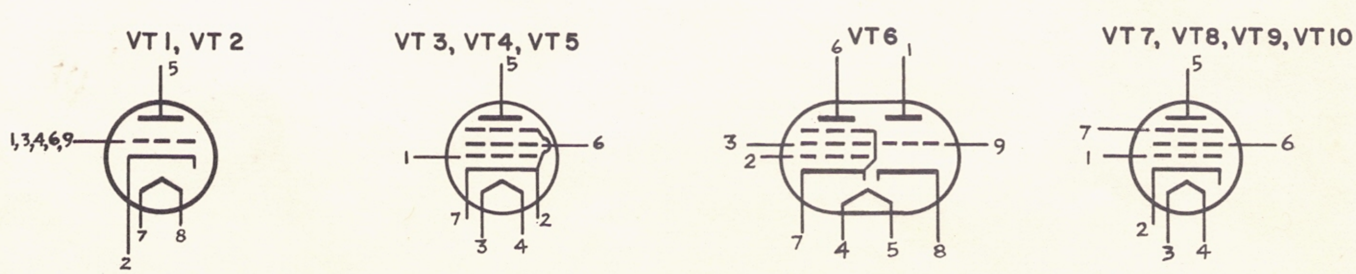
HIGH TO LOW BAND CONVERTER-MODEL CHL

FIG. 1

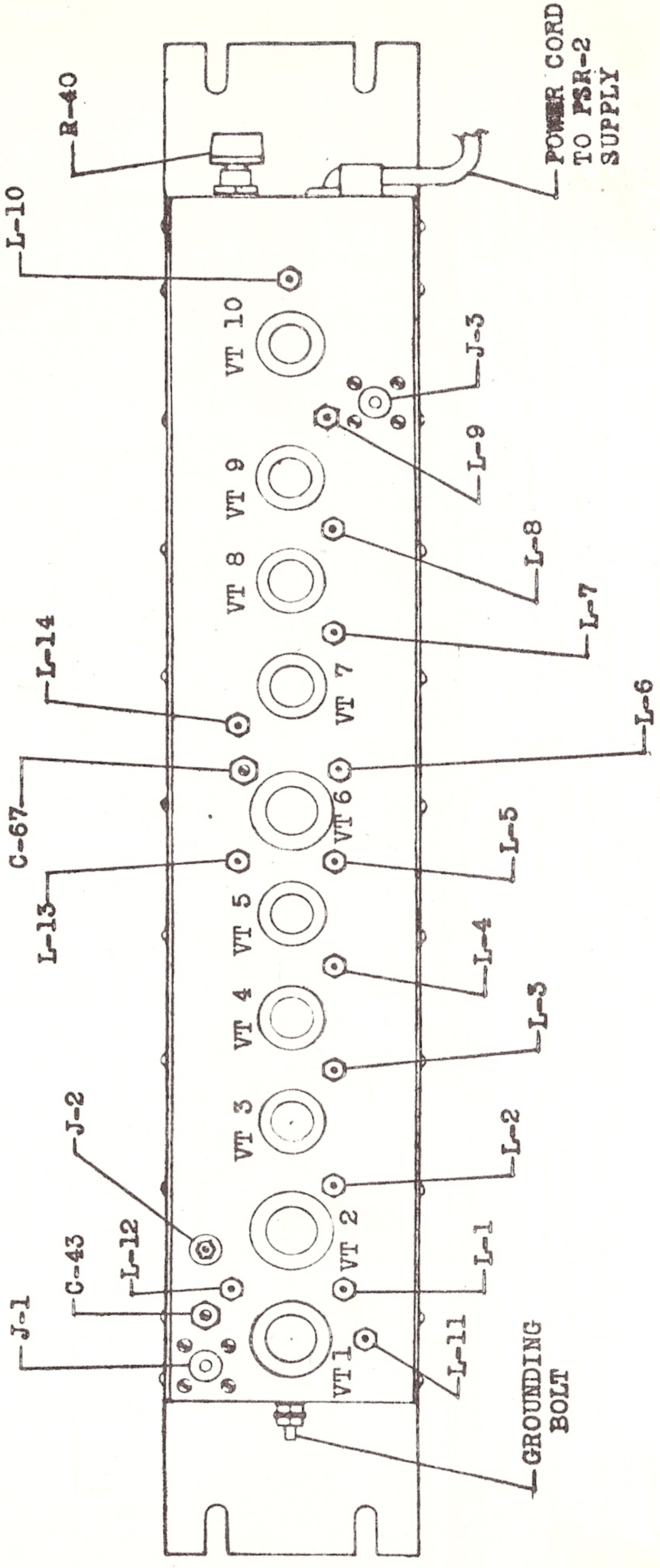




FILAMENTS



TUBE BASE CONNECTIONS



TOP VIEW

HIGH TO LOW BAND CONVERTER MODEL CHL

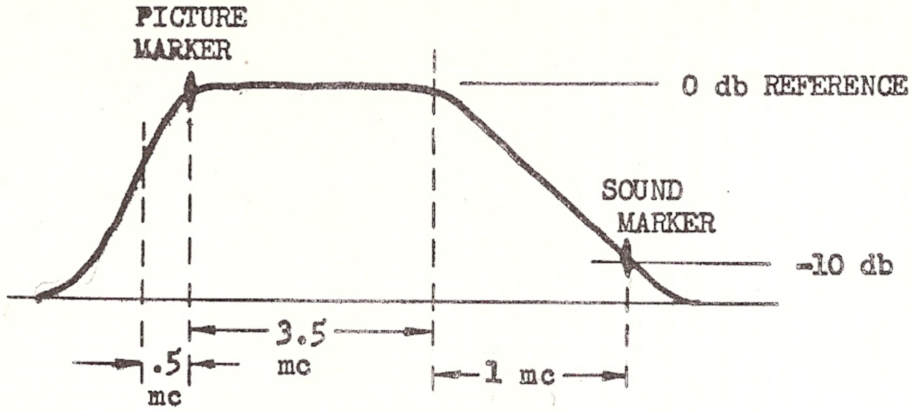


FIG. 3 CHL RESPONSE CURVE

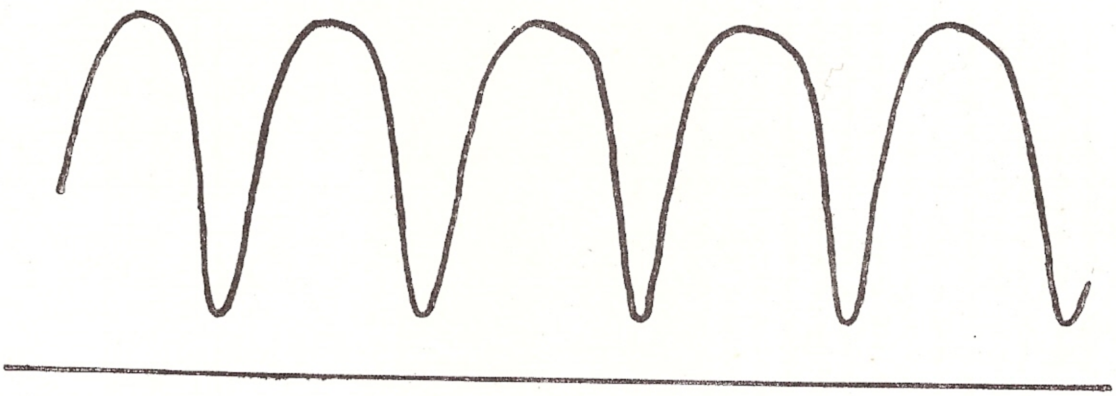


FIG. 4 a RG-11/U CABLE NOT TERMINATED.

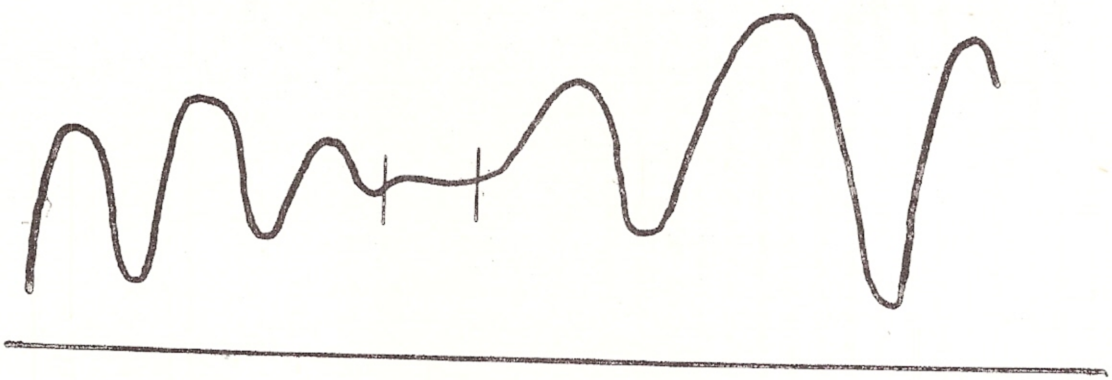


FIG. 4 b RG-11/U CABLE TERMINATED BY CHL INPUT WITH CHL MATCHING NETWORK ALIGNED PROPERLY.

FIG. 4 OSCILLOSCOPE PATTERNS OBTAINED WHEN USING REFLECTOMETER METHOD.

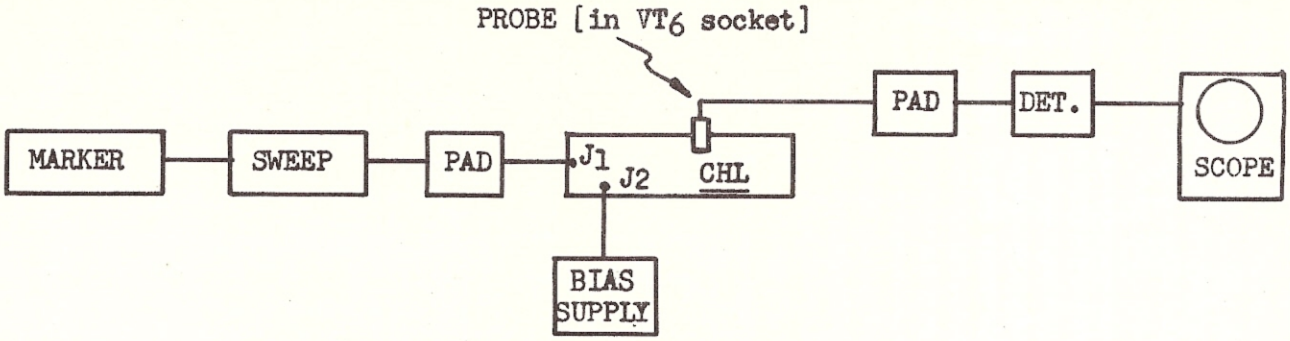
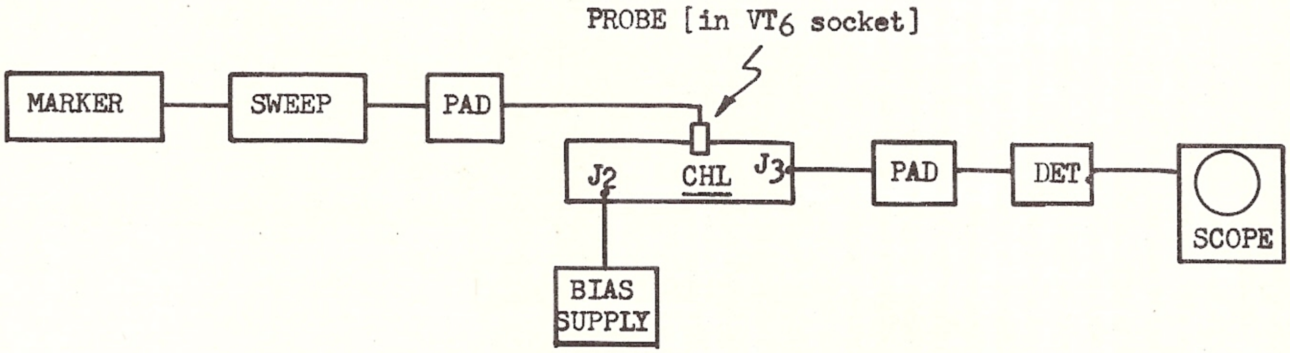


FIG. 5 a.



FIB. 5 b.

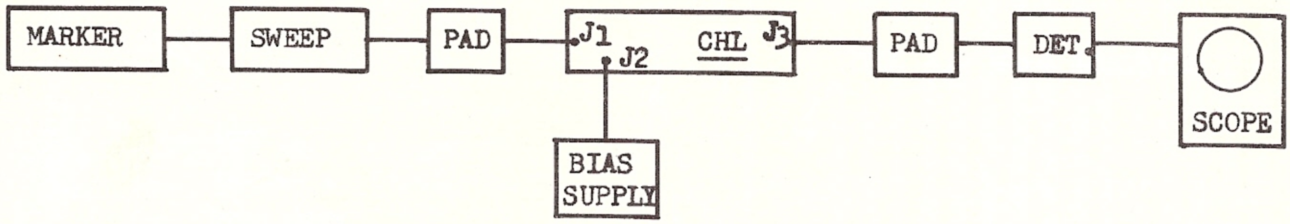


FIG. 5 c.

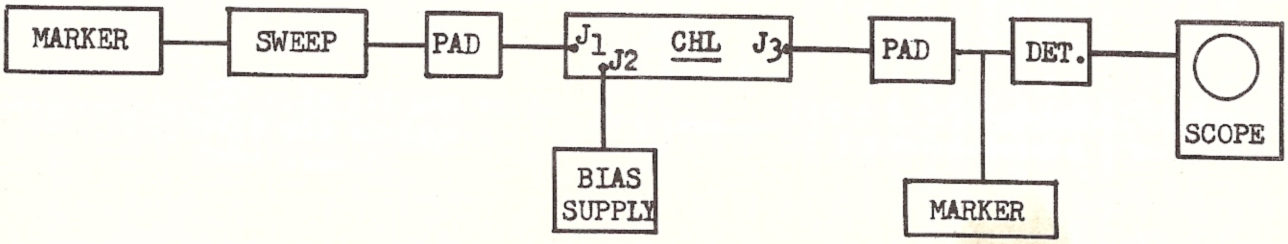


FIG. 5 d.

CHL CONVERTER ALIGNMENT SET-UP