PART III

TESTING PROCEDURES FOR SYNTHESIZED EXCITER MODEL SBG-1/2

(AN/URA-30)

III-6-1: SYSTEM CHECKOUT PROCEDURES (figure III-6-1)

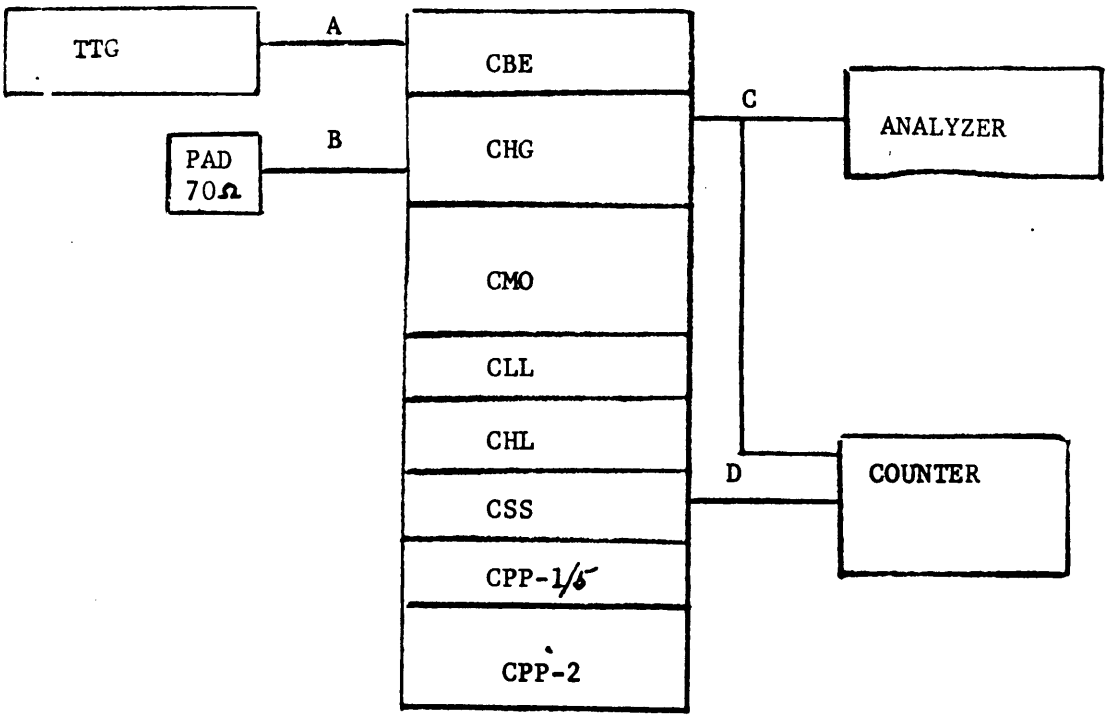


Figure III-6-1: TEST EQUIPMENT SETUP FOR SYNTHESIZED EXCITER

1 Test Equipment Required:

(a) 1 70 ohm, non inductive, 5 watt resistance.
(b) 1 electronic counter, H.P. 524C or equivalent.
(c) 1 RF VTVM, H.P. 410B or equivalent.
(d) 1 Panoramic analyzor Model SB-12A.
(e) 1 Model TTG, two-tone generator or equivalent.

2 Preliminary:

(a) Connect RF and power cables to units as shown in CK-468.
(b) Inspect rack for mechanical imperfections.
    (1) Insure that cables are free when separate.

(2) Units should line up in rack together; th re should not be any contact between front panel edges.
(3) Units should slide freely.

(c) Connect power to rack input J909.

(d) Set CPP-2 and CHG power switches to "ON". CHG and CMO over lights should be on. Because of the delay tube in the CPP-2, a 60 second wait is necessary before B+ is applied to its associated units. This should be observed.

(e) CBE and CSS power switches should be turned to their "ON" positions.

(f) SBG system should have at least a 36 hour warm-up period before testing. This will allow ovens to warm-up and cycle.

AT A: Supply a two-tone audio from TTG to channel 1 or channel 2 to the CBE. A single conductor shielded wire can be used for this purpose. TTG connections are as follows: Shield of wire to terminal 2 or E 500, audio out strip, E 500. The remaining end of the shielded wire should be connected to the CBE in the following manner. For channel 1, connect shield of wore to terminals 1 and 2 of E 201. Insulated wire should be connected to terminal 4. For channel 2, connect shield of wire to terminals 8 and 9. Insulated wire should be connected to terminals 6.

Either one of the two channels can be used. A check should be made, with the channel that is not going to be used throughout the complete frequency test, with at least one of the test frequencies. This is to insure that the channel is functioning properly, and the channel switch is wired properly.

AT B: CHG J-1104 output connected to load.

AT C: CHG J-1105 monitor connected to analyzor and counter signal input connectors.

AT D: CSS J-1602 IMC out to counter frequency standard input; set counter standard switch to external. This is to eliminate any error in the output frequency readout on the counter due to a difference in frequency between the SBG standard (CSS) and the standard in the counter.

3. GENERAL CHECK-OUT

This can only be accomplished after the completion of a 24 hour warm up.

(a) Observe if ovens are cycling in CMO and CHG (i.e. oven lights should go on and off).

(b) The CMO drive control should be turned approximately mid-range. This is to prevent pinning the CHG MF meter.

(c) A square should appear on the scope in the L-1, L-2, and L-3 positions of the CLL. This should be true for all the positions on the KCS and CPS switches.

(d) The CHG sync indicator light should remain on in each of the band switch positions.

(e) Connect test equipment as shown in Figure III-6-1.

(f) Set CMO counter dial to 1750 KCS,function switch in calibrated position. Beat should be observed on calibrate indicator light. If not, alignment of the oscillator ends is necessary.

(1) OSCILLATOR ALIGNMENT

a. Set CMO counter to 1750 KCS. 1750 KCS should be approached from the lower frequency side (i.e. 1650 KCS to 1750 KCS). This will prevent any error due to backlash.

b. Rotate calibrate indicator light is observed. As an additional check, the output of the CMO through a 20 db pad, can be read on the counter.

c. Set CMO counter to 3750 KCS. Again, as in the 1750 KCS case, 3750 KCS should be approached from the lower frequency side (i.e. 3650 KCS to 3750 KCS).

d. Rotate MO "High End" trimmer until beat on calibrate

indicator light is observed. This trimmer is located behind the front panel hole adjacent to the calibrate knob.

e. Repeat step a. through d. until beat is observed at 1750 KCS and 3750 KCS without fruther adjustments. This completes the oscillator alignment.

(g) Output of the TTG should be adjusted to .015 volts at the terminals of the CBE.

(h) Set CBE channel swithces to 1 or 2, depending on terminal connections. Carrier control to "OFF" position; TTG set for two tones audio.

4. SYSTEM SYNCHRONIZATION CHECKOUT PROCEDURE

(a) DETERMINING OUTPUT FREQUENCY

The output frequency is determined by adding the bandswitch numeral which is in MCS, to the CMO output frequency. Take for example, that a frequency of 12,751,200 cycles is desired. Bandswitch is set to 11.750-13.750, number 10 position.

10,000,000 cycles + 2,751,200 cycles=12,751,200 cycles.

(b) CMO AND CLL ADJUSTMENT (DESIRED FREQUENCY 12,751,200)

(1) Turn CMO function switch to operate and MO counter to 2750 KCS.

(2) Vary Tuning KCS control for maximum reading on output tune meter. This will occur at approximately 2.75 on the panel dial.

(3) The KCS switch is set to (1) one, and the CPS switch at (2) two. This is because the synthesizer only controls the 100 cps and 1000 cps digits of the MO. We depend on the MO accuracy for the thousand, hundred, and ten digits on the MO counter. Note the color coding and CLL and CMO panels.

(4) Synchronizing of CMO at 2750 KCS.

a. Vary the MO control approximately 2 KC above and below 2750 KCS. The sync meter will follow in the same direction as this control is varied (i.e. when the MO control is varied to the right the sync meter pointer will move to the right). At the same time the sync indicator will ignite.

b. Vary the MO control 1KC above and below 2750 KCS (i.e. 2751 KCS-2749 KCS). The sync indicator light should remain on. The sync meter should follow the variation of the MO control through the green range of the sync meter face. This is regarded as the lock-in range.

c. As a final check on sync action, vary the MO control slowly approximately 3 KCS above and below 2750 KCS. As the loop drops out of sync, (sync meter will fail to center scale position) the sync indicator light will go off.

(c) CHG ADJUSTMENT

(1) Bandswitch is set to the output frequency desired. In the case of the example, it is set at 11.750-13.750, Band Switch NO. (10) ten.

(2) Vary the MF tuning control for maximum indication on the CHG MF tuning meter. Care should be taken as in Part 4(b). This will occur at approximately 2.75 on the panel dial in the example. MF tuning meter must never be operated in the red region.

(3) Turn B+ switch to "ON" position.

(4) Peak output meter at 1750 KCS with the main tuning control.

(5) Rotate output control to on output meter reading of approximately 8 or 9.

(6) The counter will read the output frequency $\pm$ one count. In the case of the example it will read 12,751,200 cycles.

(7) Set up frequencies 25,200,400 cycles and 30,800,900 cycles.

Note the read out on the counter. It can be seen in the Test Equipment set-up, figure 1, that the CSS is also used as the standard for the counter. Therefore, any error in the counter read-out is due to the CSS IMC STANDARD.

(8) With the output control fully clockwise, the output voltage across the 70 ohm load should be 8.5 volts or better

5. DISTORTION TEST

(a) Panalyzor adjustment for measuring distortion.

(1) Gain- full clockwise position.
(2) Amplitude scale switch-LOG.
(3) Cal. OSC level-OFF.
(4) Input Attenuator-OFF.
(5) I.F. Attenuation-20 db.
(6) Sweep width selector-10KC .
(7) AFC-OFF.
(8) The VOX should be set at 500 KC above the fequency being measured. In the case of the example, 12,751,200 cycles, the VOX frequency should be set at approximately 13,251,200 cycles.

(b) Distortion measurements should be taken at the frequencies indicated on Chart 1. In each case, the distortion products must be at least 40 db down on two tone test.

6. SPURIOUS

(a) Set CBE channels to "OFF". Carrier should be inserted to maximum of (0) zero position.
(b) Analyzor sweep should be set on 500 cycles.
(c) Distortion measurements should be taken at the frequencies indicated on Chart 1. In each case, spurious should be down 60 db or better.
(d) It is important that the spurious check should be made through the complete lock-in range of the CMO.

7. CARRIER SUPPRESSION

(a) Set analyzor IF attenuator to the 20 db position.
(b) With the carrier adjusted as above, set the carrier represention on the analyzor screen to the (0) zero DB line.
(c) Switch IF attenuator to (0) zero db position.
(d) Carrier should be down 55 db or better.

8. SIDE BAND CHECK

(a) Set carrier to OFF position.
(b) TTG AUDIO TONE SELECTOR set to TONE 1 position.
(c) SetCBE USB switch to channel 1 or 2 depending on terminal connections to E 201, LSB Switch to OFF.
(d) Read frequency on counter.
(e) Set CBE KSB switch to channel 1 or 2 depending on terminal connections to E 201, USB switch to OFF.
(f) Read frequency on counter. This frequency should be 1870 CPS lower than first, reading it a 935 CPS tone is used from the TTG. If this second reading is not lower in frequency, check for proper filter placement in the CBE or cable connections.

CHART 1

TEST FREQUENCIES			BAND SW. NO.	Output tuning Dial Band
1.750	2.750	3.750	0	A
3.750	4.750	5.750	2	B
	4.000		2	B
	5.000		2	B
5.750	6.750	7.750	4	C
7.750	8.750	9.750	6	C
9.750	10.750	11.750	8	C
11.750	12.750	13.750	10	C
13.750	14.750	15.750	12	D
15.750	16.750	17.750	14	D
17.750	18.750	19.570	16	D
19.750	20.750	21.750	18	D
21.750	22.750	23.750	20	D
23.750	24.750	25.750	22	D
25.750	26.750	27.750	24	D
27.750	28.750	29.750	26	D
29.750	30.750	31.750	28	D
31.750	32.750	33.750	30	D

III-6-2: Test Procedure for Regenerative Divider Section of CHG

1. FUNCTION & DESCRIPTION

(a) The function of the Regenerative Divider is to convert a 1 Mc standard signal into a standard 250 Kc source for the operation of the CBE. This is accomplished by tuning the plate circuit of the 6U8 triode (pin 1) to the 750 Kc component of the noise spectrum present in the tube. This 750 Kc signal is then fed to the signal grid of the mixer tube, 6BE6 pin 7, where it beats with the 1 Mc input signal thereby generating a 250 Kc signal which is tuned in the mixer Plate circuit and then fed into the output pentode stage of the 6U8 where it is further amplified and fed to an output jack (J2602).

2. TEST EQUIPMENT REQUIRED:

(a) Oscilloscope, Tektronics Type 545 A.
(b) Signal Generator, Measurements Model 82.
(c) R.F. Voltmeter, Hewlett-Packard 41 OB.
(d) Power Supply, Lambda Model 25 and Cable Ass'y.
(e) Multimeter, Simpson #260 or equivalent.
(f) Pulse Transformer (10:1 step up) cable assembly.

3. D.C. VOLTAGE

(a) Inspect unit carefully. See if unit is clear of short circuits, loose parts, etc.
(b) Check B+ line pin H of J2603 to ground with ohm meter--reading should be infinite.
(c) Connect to power supply through power cable ass'y.
(d) Connect 68 ohm ½W. load across output jack J2602.
(e) Turn AC on, set DC output voltage to 200V, then turn DC switch on.
(f) Measure D.C. voltages as per chart. Voltages should be within ± 10%.

D.C. VOLTAGE CHART

SYMB.	TYPE	1	2	3	4	5	6	7	8	9
V2601	6BE6	-2	+1.7	6.3 AC	0	+170	+85	app. 0		
V2602	6U8	+195*	6 app.	+50V	6.3 AC	0	+200V	+.8V	+5.3	0

*This voltage varies with the noise present in tube. By pass plate pin 1 with .01 Mf. capacitor to obtain voltages shown.

3. ALIGNMENT

(a) 750 Kc circuit, L2602
  (1) Connect Signal Generator to Pin 9 of V2602, 6U8 tube.
  (2) Set Generator frequency to 750 Kc. Output to .2V rms.
  (3) Connect Oscilloscope to pin 1 of V2602, 6U8 tube.
  (4) Tune L2602 for maximum output on oscillograph (1.8V PP Approx.).

(b) 250 Kc Circuit, L2601
  (1) Connect Signal Generator to input, J2601.
  (2) Set Generator frequency to 250 Kc. Output to 50MV rms.
  (3) Connect Oscilloscope to pin 5 of V2601, 6BE6 tube.
  (4) Tune L2601 for maximum output on Oscilloscope, 3.3V PP Approx.

(c) Final Alignment and Gain Measurement

(1) Connect Signal Generator through 10:1 step-up transformer and cable assembly to input J2601.

(2) Set Generator frequency to 1 Mc.

(3) Set Generator Attenuator to produce 6 volts rms at J2601.

(d) Measure with RF Meter

(1) Connect Oscilloscope to output jack J2602 across 68 ohm load.

(2) Tune L2603 for maximum output on Oscillograph, 3.3V PP approx.

(3) Retune (touch up) L2601, L2602, L2603 and lock tuning adjustments carefully.

(4) Measure output voltage with RF voltmeter--output shall be 1 to 1.5V rms across 68 ohms at J2602.

(5) Signal voltages as per table below for reference.

SYMBOL	TYPE	1	2	5	6	7	9	J2602
V2601	6BE6	INPUT 6V		21.5		6		
V2602	6U8		4.2		17		20	1.2

III-6-3: Test Procedure For Power Supply Unit CPP-1/5

1. INTRODUCTION

This is a conventional power supply using 4 IN1084's as a full wave rectifier and an OA2 as a voltage regulator.

2. TEST EQUIPMENT REQUIRED

(a) Multimeter - Simpson 260
(b) AC V.T.V.M. - Ballantine.

3. PRELIMINARY

(a) Inspect the unit for mechanical imperfections.
(b) Inspect for obvious wiring errors.
(c) Check for B+ shorts with ohm meter. Check for 0 ohm between pin M of J402 and chassis with ohmmeter.
(d) Check tube, diodes and fuses as to correct kind.
(e) Attach jumpers between pins E&L, J&M of J402.
(f) Plug AC cable into outlet.
(g) I401 should be light now.

4. TESTING OF CPP-1/5

(a) Check out voltages at J402.

Voltage at J402 - No Load

On J 402 Pins	Voltages
A - J	6.3 VAC
B - F	6.3 VAC
D,E - L	115 VAC
G - Ground	150 VDC
H - Ground	210 - 280 VDC
C - N	6.3 VAC
Ripple	Max..002 V

(b) Should any trouble be experience in the voltages check of J402 then the following points should be checked.

C401	Pin 5	210-280 VDC
C402	Pin 5	210-280 VDC
V402	Pin 1	150 VDC
V402	Pin 5	150 VDC

(c) If any of these voltages do not appear, check the components concerned.

5. RIPPLE TEST

(a) Place AC probe of Ballantine of Pin 5 of C402.
(b) Measure the amount of AC ripple presetn.
No more than .002 V VMS.

III-6-4: Test Procedure For Power Supply CPP-2

1. GENERAL INSPECTION
   (a) Inspect the unit for obvious mechanical errors.
   (b) Inspect the unit for obvious electrical errors.
   (c) Check if CR 501 and CR 502 have been properly inserted.
   (d) Set Voltage Adjust Potentiometer, R 514, approximately in center.

2. Regulation Transformer T 502
   (a) Check all terminal connections at the transformer.
   NOTE: For the test purpose it must be wired for 60 cps. Damage to the transformer will otherwise result.

3. Oven Circuitry
   (a) Place CPP's POWER switch in power position.
   (b) Observe that CMO's OVEN pilot light is lit.

4. 6.3 VDC
   (a) Observe that the following tubes are lit.

Unit	Tube
CHL	V 105 (100 to 10 Kc divider)
CLL	V 708 (510-520 Kc oscillator)
CMO	V 301,V303 (MO and Reactance Tube)

5. 6.3 VAC
   (a) Observe that the remaining tubes in the CHL,CLL and CMO are lit.

6. B+ Voltage Regulation
   (a) If CPP's +160 V (REGULATED) voltage is outside limits (160 $\pm$ 4), trouble shoot the CPP's regulating circuit. As a last resort, vary the 115 VAC input voltage with a variac and observe the performance of the regulated voltage.

7. Power Amplifier B+ Voltage
   (a) Connect voltmeter to terminals 8 and 3 at J 502; the voltage must be 200 - 250 VDC.

8. Scope B+ Voltage
   (a) Connect voltmeter to terminals 8 and 3 at J 501; the voltage must be 270 - 400 VDC.

9. Scope B- Voltage
   (a) Connect voltmeter to terminals 5 and 3 at J 501; the voltage must be 400 - 500 VDC.
   (b) Remove Scope fuse, F 504; the voltage must disappear.
   (c) Replace the fuse.

9 A. B- Regulated Voltage
   (a) Connect voltmeter to terminals 4 and 3 at J 501 the voltage must be in the range of 70 - 80 VDC (Usually about 7.3).

10. Scope Filament Voltage
   (a) With AC voltmeter measure voltage between terminals 1 and 2 at J 501. It must be in the range of 6.0 - 7.0 VAC (Usually about 6.4).

11. Ripple Test
   (a) With AC Mili-voltmeter measure following voltages in respect to terminal 3.

Terminal	AC Ripple Voltage (less than)
16	.02 VAC
9	.1 VAC
8	.1 VAC
5	.12 VAC
4	.02 VAC

NO LOAD

	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V 501	5.4	380	160	5.4	380	160	6.3 VAC	6.3 VAC
V 502	5.4	380	160	5.4	380	160	6.3 VAC	6.3 VAC
V 503	___	380	___	450 VAC	___	450 VAC	_____	380
V 504	-1.6	0	6.3 VAC	6.3 VAC	5.2	160	0	_____
V 505	0	-70	___	-70	0	___	-70	_____

FULL LOAD

	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8
V 501	115	300	165	115	300	165	6.3 VAC	6.3 VAC
V 502	115	300	165	115	300	165	6.3 VAC	6.3 VAC
V 503	_____	310	___	415 VAC	___	415 VAC	_____	310
V 504	-3.6	0	6.3 VAC	6.3 VAC	110	160	0	_____
V 505	0	-70	___	-70	0	___	-70	_____

ALL VOLTAGES EXCEPT FILAMENT VOLTAGES MEASURED TO CHASSIS GROUND ALL VOLTAGES ARE +10%.

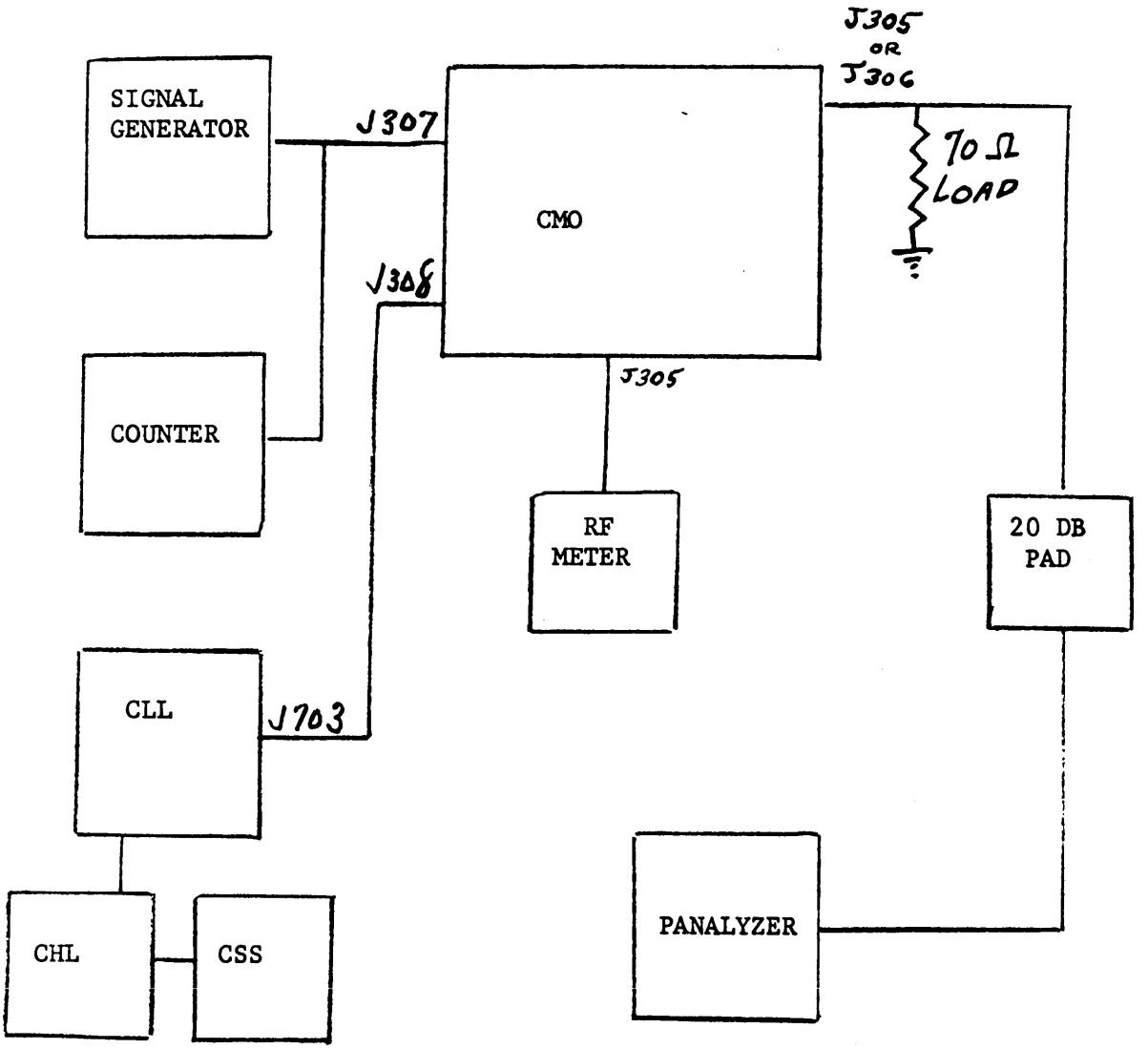


Figure III-6-2: Test Set Up for CMO

1. Test Equipment Required
   (a) 1-RF Generator (Model 82).
   (b) 1-70 ohm, non-inductive, 5 watt resistance.
   (c) 1-RF VTVM, H.P. 410B or equivalent.
   (d) 1-Counter, H.P. 524C or equivalent.
   (e) 1-CLL
   (f) 1-CPP-2
   (g) Panalyzor SB-12A.
   (h) 1-CSS
   (i) 1-CHL

2. Preliminary
   (a) Inspect the unit for mechanical imperfections.
   (b) Inspect for obvious wiring errors.
   (c) Check for B+ shorts with ohm meter.
   (d) Attach jumper between pins of E 303.
   (e) Connect 70 ohm load to J 306.
   (f) Check oven heater resistance by placing meter between pins 9 and 10. A reading of approximately 700 ohms should be obtained.
   (g) Attach cable from power supply (CPP-2) to CMO. Turn AC power ON. Oven indicator should light and cycle after approximately 36 hours.
   (h) Measure the DC voltage at C 333, C 337, C 346 and C 328. There should be 160 volts at these points. 22o volts should be measured at C 345.

3. 100 KC Oscillator Calibration
   (a) Set function switch to CAL position and connect counter to pin 1 of V 312.
   (b) Adjust C 311 for a 100,000 cycle reading on the counter. C 311 is coupled to a bakelite shaft in the rear of the shock mounted oven assembly. A slot is provided on the end of this shaft for screw driver adjustment.

4. Testing of the High Frequency Deck
   (a) IF STRIP
      (1) Remove the 510-519.9 Kc, 10 Kc, and 2-4 Mc inputs from the CMO.
      (2) Connect the signal generator to pin 2 of V 309. Set the signal generator to 515 Kcs at 1 volt. Connect the RF meter to pin 7 of V 310.
      (3) Adjust T 308, T 307 and T 306 for maximum amplitude. Voltage should read approximately 11 volts.
      (4) Remove signal generator from pin 2 of V 309.
   (b) 2 to 4 MC First RF Amplifier (V 304) and Power Amplifier (V 305).
      (1) Set drive control, R 321, in full clockwise position.
      (2) Connect the signal generator or MO to J 302.
      (3) Connect RF meter to J 305 RF out.
      (4) Set signal generator to 2 Mc at 1 volt.
      (5) Set Tuning KCS control to the 2 Mc (CMO-2) or 1.750 MC (CMO-1) position (full mesh). Adjust T 301 and T 302 for maximum Amplitude.
      (6) Set Tuning KCS control to the 4 Mc (CMO-2) or 3.750 Mc (CMO-1) position (full open). Adjust C 329 and C 331 for maximum Amplitude.
      (7) Repeat steps 5 and 6 until selected signal is at maximum in both positions without further adjustment.
      (8) Voltage across 70 ohm should be 8.5 volts or better. Output meter should be at approximately 8.
   (c) Harmonic Selector
      (1) Connect the signal generator to the 10 Kcs input jack, J-307.
      (2) Connect the counter and RF meter to R 327.
      (3) Connect the 2-4 Mcs input from MO to J-302 on HF deck.
      (4) Set trimmers C 332 and C 336 to mid range.

(5) Set the MO counter and the Tuning KCS control to the 2000 KCS position (full mesh on Tuning KCS capacitor). In the case of the CMO-1, it would be on 1750 KCS.
(6) Vary the signal generator around 1.485 mcs at approximately 1 volt until a reading of 515 Kcs is obtained on the counter.
(7) Adjust the T 303 and T 304 for maximum amplitude.
(8) Set the MO counter and the Tuning KCS control to the 4000 KCS position (full open on Tuning KCS capacitor). In the case of the CMO-1, it would be 3750 KCS.
(9) Vary the signal generator around 3.485 mcs at approximately .5 volts until a reading of 515 KCS is obtained on the counter.
(10) Adjust C 332 and C 336 for maximum amplitude.
(11) Repeat steps 5 through 10 until the selected signal is at maximum in both positions, high and low ends, without further adjustment.

(d) HF Phase Detector
(1) Set the tuning kcs control to a frequency differing at least 100 Kcs from the MO frequency. This will insure that the high frequency loop is not synchronized.
(2) Remove the MO INPUT (to P 302 or J 302) and adjust R 328 for center scale on the sync meter.

(e) Sync Indicator
(1) Connect 10 kcs from the CHL to J 307.
(2) Set CLL kcs and cps control to zero position.
(3) Set MO to 3 mc (CMO-2) or 2.750 mc (CMO-1) and peak "tune" meter with tuning kcs control.
(4) Vary MO control 500 cps above and below 3 mc. The sync meter will follow in the same direction as this control is varied. This indicates that the H.F. loop is sync-ed.
(5) With the loop in sync. and the meter in center postion, vary R 340 to the point where I 304, the sync indicator light, ignites.
(6) Vary the Mo control 1 Kc above and below 3 mc (i.e. 2999 Kc-3001 Kc). The sync indicator light should remain on, and the sync meter should follow the variation of the MO control.
(7) As a final check, vary the MO control slowly 1 Kc above and below 2,3 and 4 mc. As the loop drops out of sync, (sync meter will fall to center scale position) The sync indicator light will go off.
(8) Operations (2) through (7) apply when CLL's kcs and cps controls are on zero position; concurrently CMO's frequency control is exactly 3000 (kcs) 0 (cps) for CMO-1 or 2750 (kcs) o (cps) for CMO-2. Similiar operations should be made when CLL's kcs dial is on 5 position and cps dial is on zero position; concurrently CMO's frequency control is exactly 3500 (kcs) 0 (cps) for CMO-1 or 3250 (kcs) 0 (cps) for CMO-2. Once again, similar operations should be made when CLL's kcs dial is on 9 position and cps dial is on zero position; concurrently CMO's frequency control is exactly 3900 (kcs) 0 (cps) for CMO-1 or 3750 (kcs) 0 (cps) for CMO-2.

(f) Master Oscillator Alignment
(1) Set CMO counter to 1750 KCS. 1750 KCS should be approached from the lower frequency side (i.e. 1650 KCS to 1750 KCS). This will prevent any error due to backlash.
(2) Rotate calibrate knob until beat on calibrate indicator light is observed. As an additional check, the output of the CMO through a 20 db pad, can be read on the counter.

(3) Set CMO counter to 3750 KCS. Again, as in the 1750 KCS case, 3750 KCS should be approached from the lower frequency side (i.e. 3650 KCS to 3750 KCS).

(4) Rotate MO "High End" trimmer until beat on calibrate indicator light is observed. This trimmer is located behind the front panel. hole adjacent knob.

(5) Repeat step 1 through 4 until beat is observed at 1750 KCS and 2750 KCS without further adjustment. This completes the oscillator alignment.

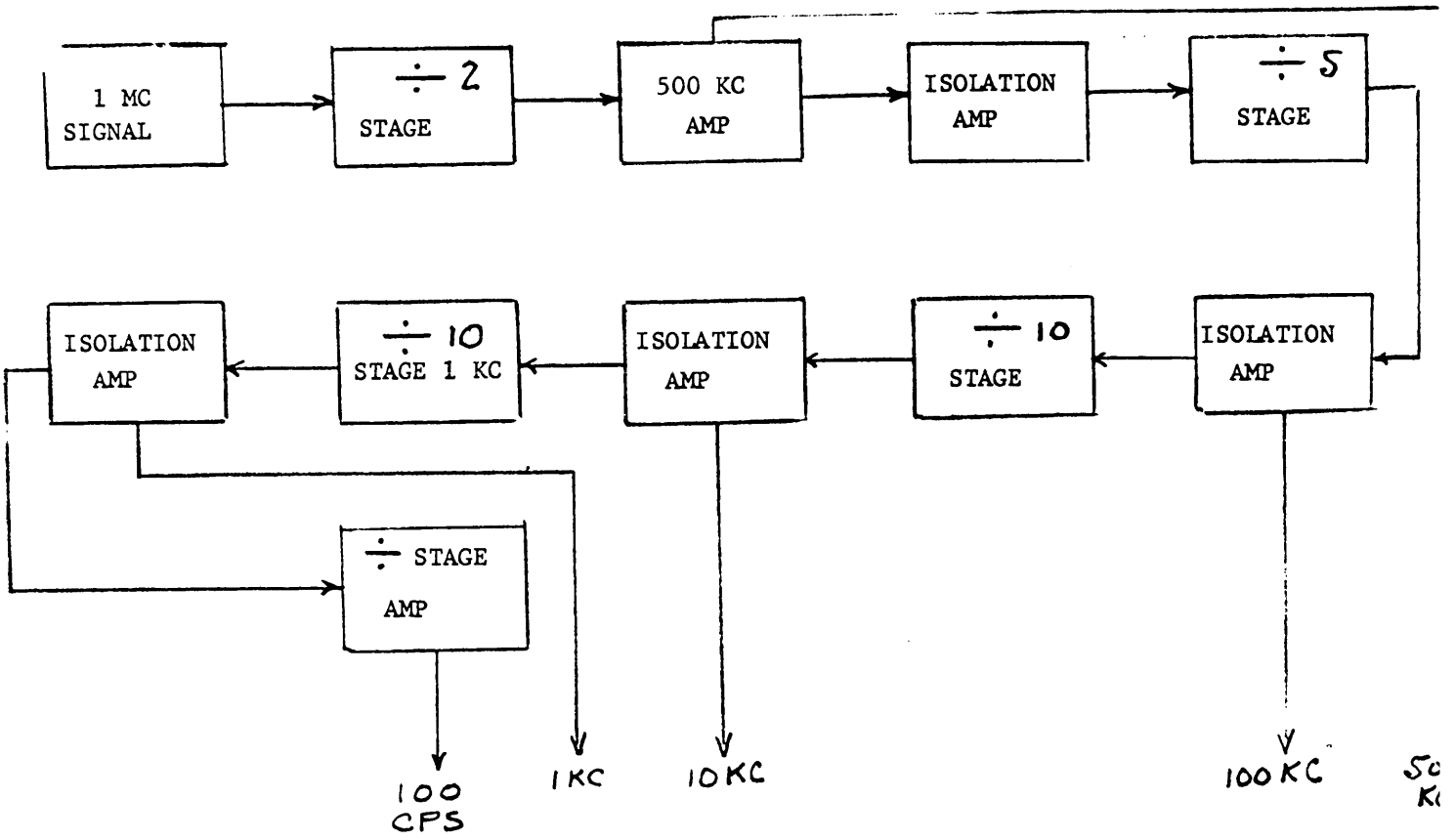
(g) Master Oscillator Calibration

(1) Without touching either adjustment controls, record the amount of error in the MO dial against the 100 KCS standard at every 100 Kcs point between 2 and 4 Mcs. A form has been provided for this purpose. No unit may be passed where an error exceeds 200 cps.

5. SPURIOUS CHECK

(a) Connect analyzer as shown in test set-up diagram.
(b) Turn drive control, R 321, fully clockwise.
(c) Set MO at 2 mcs.
(d) Set function switch to calibrate.
(e) Adjust tuning kcs control for maximum indication on output meter
(f) Panalyzor adjustment for measuring distortion gain-fully clockwise.
Amplitude scale
Cal. OSC level-OFF
I.F. Attenuation-20db
Sweep width selector-2 kc.
AFC-OFF
The VOX should be set at 500 Kc above the frequency being analyzed. In this case, it would be approximately 2500 Kc.
The output is set at approximately .2 MA.
(g) Using the "INPUT Attenuator" swithces on the analyzer, adjust the amplitude on the screen as close as possible to the zero (0) line, then line adjust it with gain control.
(h) Any spurious should be 60-db or more below the carrier.
(i) Set function switch to operate position.
(j) Sync MO in accordance withsection 4-(e).
(k) Vary the MO withing the boundayr of the lock-in range. As this is done observe the analyzer screen. Spurious should be 60-db or more below the carrier.
(l) A check of D through K should also be made on 3 MC and 4 MC.

III-6-6 Test Procedure for Divider Chain Model CHL (Figure III-6-3)



TEST EQUIPMENT NEEDED

1. Regulated power supply (Lambda).
2. 1 Mc source CSS or equivalent.
3. Frequency counter (H.P. 524 C).
4. A.C. VTVM (HP 410B).

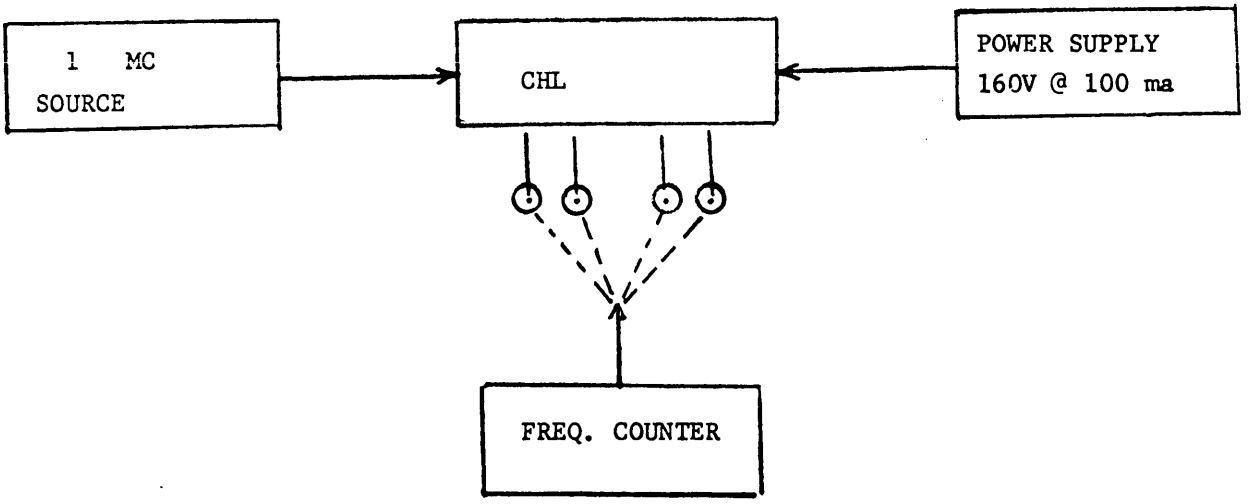


Figure III-6-3: Test Set Up For Divider Chain CHL

1. PROCEDURE

Use a H.P. VTVM (# 410B) or equivalent.

(a) Set the divider chain as shown in figure III-6-3.

(b) Adjust the 1 mc input signal to 1.0V at T 101 primary to ground.

(c) Connect the VTVM and counter to the 500 KC output jack. Tune L 102 for maximum output. Output should be approximately 2-½ to 3-½ volts.

(d) Connect frequency counter at the 100 KC test jact. Adjust R 114 until 100 KC is indicated on the counter.

(e) Connect frequency counter at the 10 KC test jack. Adjust R 124 until 10 KC is indicated on the counter.

(f) Connect the frequency counter at the 1 KC test jack. Adjust R 135 until 1 KC is indicated on the counter.

(g) Connect the frequency counter at 100 cps test point. Adjust R 147 until 100 cps is indicated on the counter.

(h) NOTE: that no frequency deviation is expected in the alignment procedure. The frequency should be "locked" in at 500 KC, 100 KC, 1 KC and 100 cps. Any deviation in frequency indicates an error in the circuit. A voltage chart is provided for indicating all AC & DC voltages with and without the 1 mc input signal.

VOLTAGE CHARTS

DC VOLTAGE

Without 1 mc Input Signal_____ Ebb = 160V

PINS	1	2	3	4	5	6	7	8	9
V 102, 5814A, ÷ 2.	141	53	61	0	0	139	53	61	0
V 101A, 6U8, 500 KC Amp.	0	-.9	90	0	0	132	1.35	0	0
½ V 103A, 5814A Isolation Amp	125	-3.3	0	0	0	-	-	-	0
V 104 5725 ÷ 5.	5.3	8	0	0	125	105	5	None	None
V 103B, 5814A Isolation Amp.	-	-	-	0	0	158	-10.0	68	0
V 105, 5725, ÷10	4.6	7.7	0	6.3	115	120	5	None	None
V 106A, 5814A Isolation Amp.	-	--	-	0	0	160	-16	.58	0
V 107, 5725, ÷ 10	2.8	7.3	0	0	98	138	5	None	None
V 106B, 5814A, Isolation Amp.	160	-36	.25	0	0	-	-	-	0
V 108, 5725, ÷ 10	1.3	5.7	0	0	90	137	5.5	None	None

VOLTAGE CHARTS

DC VOLTAGE

With 1 mc Input Signal_____ Ebb = 160V

PINS	1	2	3	4	5	6	7	8	9
V 102 5814 A, ÷ 2	120	61	68	0	0	125	59	68	0
V 101A, 6U8, 500 KC Amp	0	0	110	0	0	109	1.7	0	0
½ V 103A, 5814A, Isolation Amp	105	-66	0	0	0	-	-	-	0
V 104, 5725, ÷ 5	12	11.8	0	0	159	145	5	None	None
V 103B, 5814A, Isolation Amp	--	-	-	0	0	150	0	2.7	0
V 105, 5725 ÷ 10	14	13.9	0	6.3	159	60	5	None	None
V 106A, 5814A, Isolation Amp	-	-	-	0	0	145	0	2.7	0
V 107, 5725, ÷ 10	19	18.5	0	0	150	75	5.2	None	None
V 106B, 5814A, Isolation Amp	145	0	2.7	0	0	-	-	-	0
V 108, 5725 ÷ 10	14.3	14.2	0	0	156	60	5.3	None	None

VOLTAGE CHART
AC VOLTAGE

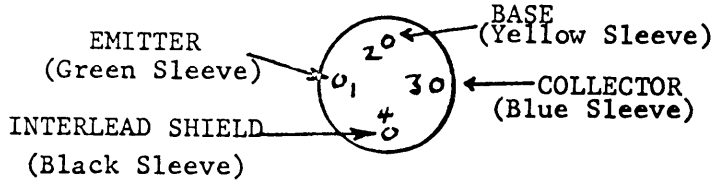
PINS	1	2	3	4	5	6	7	8 9	9
V 102, 5814A,-2	8.2	6.2	.12	-	-	8.4	5.8	.12	-
V 101A, 6U8, 500 KC Amp	None	1.3	0	-	-	87	.14	none	none
½ V 103A, 5814A, Isolation Amp	22	2.2	0	-	-	-	-	-	-
V 104, 5725, - 5	10	8.3	-	-	18.5	23.5	.7	none	none
V 103, 5814A, Isolation Amp	-	-	-	-	-	1.8	11	3	-
V 105, 5725, - 10	16	13.5	-	-	30	19.5	.02	none	none
V 106A, 5814A, Isolation Amp	-	-	-	-	-	1.6	16	3	-
V 107, 5725, - 10	16	12	-	-	38	14	.32	none	none
V 106B, 5814A, Isolation Amp	1.2	32	4.1	-	-	-	-	-	-
V 108, 5725, - 10	11.8	8	-	-	52	17.5	.27	none	none

NOTE: The filament voltages have been omitted

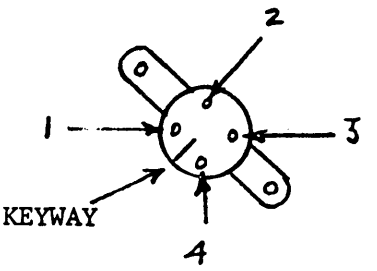
III-6-7 Test Procedure For Primary Standard Model CSS

1. TEST EQUIPMENT REQUIRED
   - (a) Counter - 1 MC
   - (b) AC VTVM (Heath)
   - (c) 70 ohm non inductive resistance

2. PRELIMINARY
   - (a) Inspect unit for mechanical imperfection.
   - (b) Inspect for obvious wiring errors.
   - (c) Check for B+ shorts with ohm meter.
   - (d) Check for proper orientation of transistor. Correct wiring (very improtant) The index tab on the transistor should match the keyway on the socket.



BOTTOM VIEW
TRANSISTOR 2N1224



TOP VIEW SOCKET

   - (e) Connect 70 ohm load to J 602.
   - (f) Make sure that the terminal board is screwed down, otherwise unit will not function.
   - (g) Plug unit into AC and check operation of pilot lights I 601 and I 602 are functioning when S 601 is in the respective position.
   - (h) Allow a 6-hour warm up period before making the tests in following paragraph 3.

3. TESTING OF CSS
   - (a) See that there is a minimum of 25 volts dc at the junction of R 618, CR 601 and R 619.
   - (b) Turn R 617 "Output Adjust" to maximum output.
   - (c) Place probe of VTVM at Pin 6 of Z 602, the voltage at this point should be 2.3 VAC at least.
   - (d) Measure the output of T 604 (blue terminal) with the VTVM and tune the slug for a peak reading on the meter .6VAC Min.
   - (e) At points B_1 Q 601 and B_2 Q 602, E_1 Q 601 and E_2 Q 60s. These voltages should be the same within .5 volt B_1 & B_2, E_1 & E_2.

     If trouble ti encountered then the transistor should be checked. The method of checking should be done by substitiution. The transistor should not be discarded. If the symptoms still exist aster replacement, then the components in the amplifier circuit have to be checked.
   - (f) Place probe of VTVM on the output jack (J 602). Tune T 603 for maximum indication on meter.
   - (g) Z 601 Place probe on one of the yellow terminals of Z 601. Peak Z 601.
   - (h) With R 616 in maximum senditivity position proceed to balance out Z 601 using R 614 bring the meter (M 601) to center scale reading when this has been accomplished the modulators are balance.
   - (i) M 601 If step 8 is correctly performed then with R 616 @ minimum sens: The meter will read) (center Scale).
   - (j) The output for the CSS-1 should be 1.0 VAC. (min).

III-6-8 Test Procedure for Low Frequency Loop (Controlled Oscillator) Model CLL (Figure III-6-4).

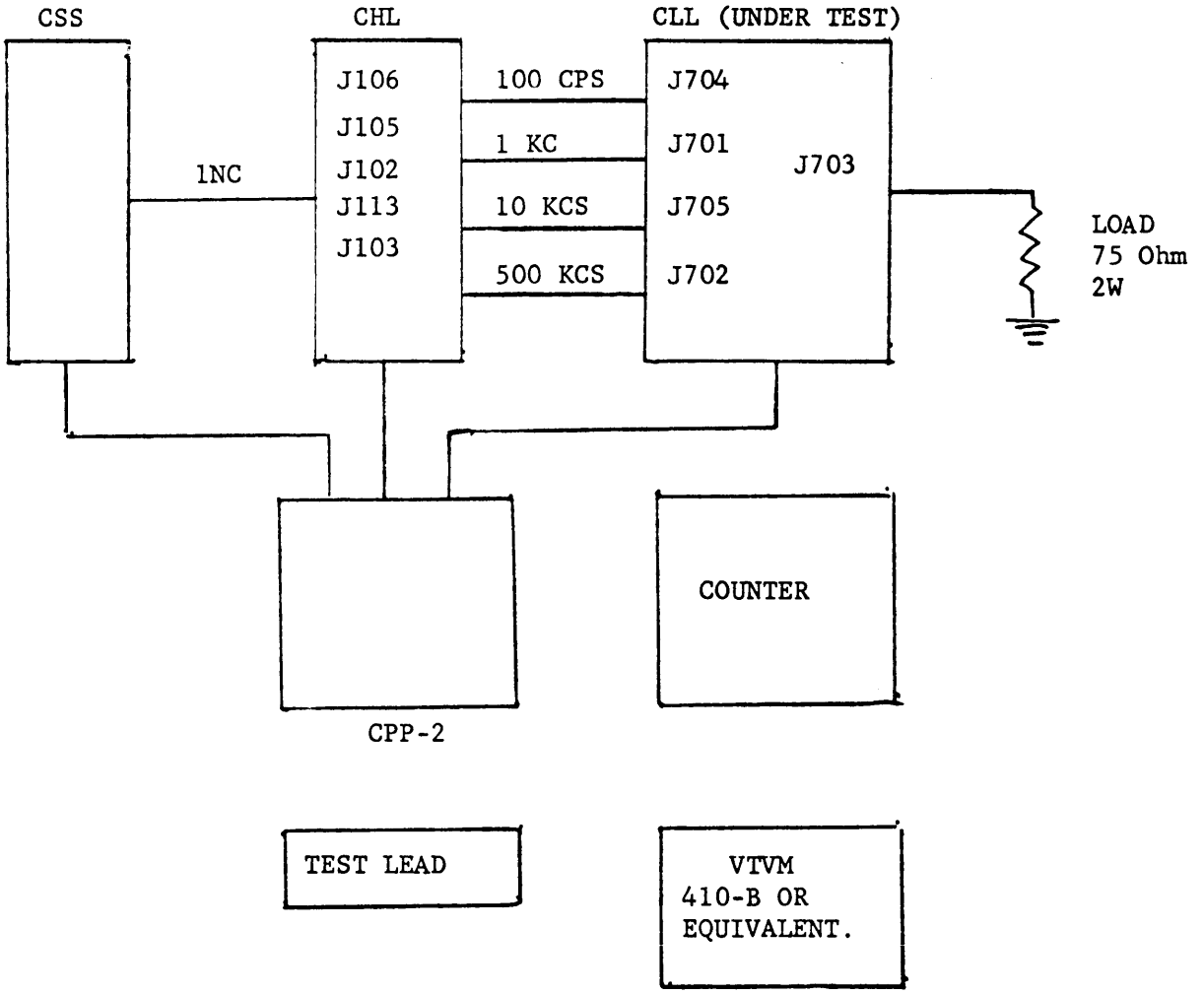


Figure III-6-4: Test Set Up

(NOTE: See also figure I-4-9 for block diagram layout of CLL)

1. GENERAL INSPECTION

(a) Inspect the unit for obvious mechanical and electrical errors.

(b) Inspect carefully the 510-520 kcs compartment for shorts and layout of oscillator wires. The solid oscillator wires may not touch the chassis even though they are insulated.

(c) Check wiring and jumper at E 701. Check oven heaters and theromstat.

(d) Check switches S 701 and S 702 for proper alignment e.g. The wiper must touch their respective contacts and correspond to the proper position on the detent and dial.

(e) Replace all covers except top and bottom outer covers.

2. INITIAL CHECK-UP

(a) Set-up all equipment as shown in figure III-6-6.

(b) Turn on the power and measure B+. It must be 160 VDC; if not re-adjust R 514 on CPP-2.

(c) Measure filament voltage V 708; it must be approximately 6.3 VDC (Not AC).

(d) Using counter check following frequencies:

a)	AT J 701	1 KCS
b)	AT J 702	500 KCS
c)	AT J 704	100 CPS
d)	AT J 705	10 KCS

(e) Let the unit warm up for at least 2 hours before proceeding with the the rest of the test.

3. SCOPE V-713

(a) Set scope switch S 703 in position "L-1".

(b) Adjust intensity R 783 and focus R 781 for optimum operation.

(c) Adjust deflection controls R 773 and R 774 so that the square will appear approximately in the middle of the screen.

(d) Set scope switch to position "L-2"; a square must appear.

(e) Set scope switch to position "L-3"; a square must appear.

(f) Set scope switch to position "off" there must be no light on the screen.

4. LOW FREQUENCY LOOP, L-1

(a) Alignment

(1) Place the test lead from J 713 (TP7) to ground.

(2) Place the hundreds of cycles switch S 702 in position 5.

(3) Measure voltage with AC VTVM at J 714 (TP8) it must be $4,6^{V}$

(4) Connect counter to J 714 (TP8).

(5) Adjust C 815 for 11500 $\pm$ 4 cps on the counter and lock C 815.

(6) Disconnect counter to J 714 (TP8)

(b) Phase Detector

(1) Set DC VTVM on 3V scale and set zero adj. on VTVM so that the pointer is in the middle of the scale; note the reading e.g. 1.5 V.

(2) Connect the DC VTVM to J 711 (TP5).

(3) Remove 100 cps input from J 704.

(4) Turn balance control R 755 from one extreme to the other; the DC VTVM must follow from at least -1.5 V to + 1.5 V.

(5) Adjust balance control R 755 for (zero) OV. and lock it. (or, as in example in step 6, set to the noted reading e.g. 1.5 V.)

(6) Replace 100 cps input to J 704.

(7) Remove test lead from J 713 (TP7).

(8) Set the scope switch S 703 to "L-1".

(9) Observe the scope; it must show a stationary square pattern.

(10) Observing the scope and VTVM for stationary pattern, rotate the hundreds of cycles switch S 702 through all positions. In no position the DC VTVM must show a greator deviation then $\pm$ 5 V.

5. MID FREQUENCY LOOP, L-2

(a) Alignment

(1) Place the test lead from J 708 (TP2) to ground.
(2) Place the kilocycles switch S 701 in position 9.
(3) Measure voltage with AC VTVM at J 709 (TP3) it must be 7 V.
(4) Connect counter to J 709 (TP3).
(5) Align following trimmers:

S 701 in Position	Trimmer	Frequency
9	C 739	18,000 ± 6 cps
8	C 735	17,000 ± 6 cps
7	C 733	16,000 ± 5 cps
6	C 731	15,000 ± 5 cps
5	C 729	14,000 ± 5 cps
4	C 727	13,000 ± 4 cps
3	C 725	12,000 ± 4 cps
2	C 723	11,000 ± 4 cps
1	C 721	10,000 ± 4 cps
0	C 719	9,000 ± 4 cps

(b) Phase Detector

(1) With VTVM set for phase detector alignment, connect it to J 707 (TP1).
(2) Remove 1 Kcs input from J 701.
(3) Turn balance control R 712 from one extreme to the other; the DC VTVM must follow from at least -1.5 V to + 1.5 V.
(4) Adjust R 712 for OV and lock it.
(5) Replace 1 Kcs input to J 701.
(6) Remove test lead from TP2.
(7) Set the scope switch to position "L-2"
(8) Observe the scope for stationary square pattern.
(9) In position "9", adjust L 701 for clearest square pattern obtainable.
(10) Observing the scope and VTVM for stationary pattern, rotate the kilocycles switch S 701 through all positions. In no postion the DC VTVM must show a greater deviation then ± .5V.

6. OUTPUT FREQUENCY LOOP, L-3

(a) Alignment

(1) Place the test lead from J 710 (TP4) to ground.
(2) Place the "Kilocycles" switch S 701 in position 9.
(3) Place the "Hundred of cycles" switch S 702 in position 9.
(4) Connect 70 ohm load to J 703.
(5) Place AC VTVM to J 703 and adjust T 702 for maximum output the voltage must be approximately 1.5 VRF.
(6) Connect counter to J 703.
(7) Set L 707 to its mid position.
(8) Set L 708 to frequency 520 ± 5 Kcs, and Lock the coil.
NOTE: The frequency must be 519900 ± cps, otherwise re-alignment of L-3 will be necessary.
(9) Re-Adjust L 707 to frequency 519900 ± cps. and lock the coil.
(10) Align the following trimmers.
NOTE: Leave hundreds of cycles switch in position 9; the sequenc of alignment must be followed as per chart.

S 701 in Position (Kilocycles Switch)	Trimmer	Frequency ± 10 cps
9	-----	519900 cps
8	C·780	518900 cps
7	C 779	517900 cps
6	C 778	516900 cps
5	C 777	515900 cps
4	C 776	514900 cps
3	C 775	513900 cps
2	C 774	512900 cps
1	C 773	511900 cps
0	C 772	510900 cps

(11) Rotate S 701 through all postions and recheck the frequencies.
(12) Place S 701 in position 5, and adjust following; the sequence of alignment must be followed as per chart below.

S 702 in Position Hundreds of Cycles Switch	Trimmer	Frequency ± 10 CPS
9	-----	515900 cps
8	C 790	515800 cps
7	C 789	515700 cps
6	C 788	515600 cps
5	C 787	515500 cps
4	C 786	515400 cps
3	C 785	515300 cps
2	C 784	515200 cps
1	C 783	515100 cps
0	C 782	515000 cps

(13) Rotate S 702 throug all position and receck the frequencies.
(14) Check 510000 cps position, it must be within ± 30 cps.
(15) Check 519900 cps position, it must now be within ± 30 cps.
(16) Set in frequency output of 515500 cps and re-adjust T 702 for maximum output.

(b) Phase Detector
(1) With VTVM set for phase detector alignment, connect it to J 712 (TP6).
(2) Remove 10 Kcs input from J 705.
(3) Turn balance control R 763 from one extreme to the other; the DC VTVM must follow from at least -1.5V to + 1.5V.
(4) Adjust R 763 for OV and lock it.
(5) Replace 10 Kcs input to J 705.
(6) Remove test lead from J 710 (TP4).
(7) Set the scope switch to "L-3".
(8) Observe the scope, it must show a stationary square pattern.
(9) Check following position, in each position scope must show stationary square pattern and the counter must read as follows.

S 701 in Position (Kilocycles Switch)	S 702 in Position (Hundreds of Cycles Switches)	Counter
0	0	510,000 ± 1 cps
0	9	510,900 ± 1 cps
6	9	516,900 ± 1 cps
6	0	516,900 ± 1 cps
9	0	519,900 ± 1 cps
9	9	519,900 ± 1 cps

Units which have passed specifications above must be prepared for alignment. Fill out two report sheets for each unit and adjust them to your impression.

* With CHL DISCONNECTED D.C. VOLTAGES

	pin 1	pin 2	pin 3	pin 4	pin 5	pin 6	pin 7	pin 8	pin 9	pin 10	pin 11
½ V 701A (6U8)	-	- 5	90	A.C.	A.C.	90	0	-	-	xxxxx	xxxxx
½ V 701V (6U8)	160	-	-	A.C.	A.C.	-	-	2.8	.3	xxxxx	xxxxx
½ V 702A (6U8)	-	0	130	A.C.	A.C.	130	2.8	-	-	xxxxx	xxxxx
½ V 702B (6U8)	130	-	-	A.C.	A.C.	-	-	5.6	-28	xxxxx	xxxxx
½ V 703A (6U8)	-	.4	130	A.C.	A.C.	115	1.8	-	-	xxxxx	xxxxx
V 704 (6BA7)	100	-15	2.7	A.C.	A.C.	2.7	0	xxx	95	xxxxx	xxxxx
V 709 (6BA7)	90	-16	1.8	A.C.	A.C.	1.8	0	xxx	135	xxxxx	xxxxx
V 708A (6U8)	-	-.1	26	-6.3	0	130	1.8	-	-	xxxxx	xxxxx
V 708B (6U8)	130	-	-	-6.3	0	-	-	.2	-2.5	xxxxx	xxxxx
V 710 (6AU6)	.15	1.6	A.C.	A.C.	144	120	1.6	xxx	xxx	xxxxx	xxxxx
V 705 (6AU6)	-.7	0	A.C.	A.C.	136	136	0	xxx	xxx	xxxxx	xxxxx
½ 706A (6U8)	-	-	132	A.C.	A.C.	132	2.2	-	-	xxxxx	xxxxx
½ 706B (6U8)	132	-	-	A.C.	A.C.	-	-	.5	-4.6	xxxxx	xxxxx
V 707 (6BA7)	100	.5	2.9	A.C.	A.C.	2.9	0	xxx	100	xxxxx	xxxxx
½ 703B (6U8)	85	-	-	A.C.	A.C.	-	-	0	-.5	xxxxx	xxxxx
V 711 (6AB4)	100	-	-	A.C.	A.C.	-.4	0	xxx	xxx	xxxxx	xxxxx
V 712A (12AT7)	220	0	3	A.C.	A.C.	-	-	-	A.C.	xxxxx	xxxxx
V 712B (12AT7)	-	-	-	A.C.	A.C.	230	-.25	2.7	A.C.	xxxxx	xxxxx
V 713 (1EP1)	A.C.	A.C.	-480	-420	-300	180	180	180	180	180	0
V 713 (1EP1)	A.C	A.C	-340	-320	-215	210	210	210	210	210	0

*ALL VOLTAGES MEASURED WITH RESPECT TO CHASSIS GROUND
**SCope Selector Switch Off
t-Scope Selector Switch In Position L-1

* WITH CHL CONNECTED D.C. VOLTAGES

	pin 1	pin 2	pin 3	pin 4	pin 5	pin 6	pin 7	pin 8	pin 9	pin 10	pin 11
½ V 701 A (6U8)	-	-6	150	A.C.	A.C.	150	0	-	-	xxxxx	xxxxx
½ V 701 B (6U8)	160	-	-	A.C.	A.C.	-	-	2.8	-.05	xxxxx	xxxxx
½ V 702 B (6U8)	134	-	-	A.C.	A.C.	134	2.8	-	-	xxxxx	xxxxx
½ V 703 A (6U8)	-	.4	134	A.C.	A.C.	128	1.8	-	-	xxxxx	xxxxx
V 704 (6 BA7)	106	-15	3	A.C.	A.C.	3	-1	xxx	130	xxxxx	xxxxx
V 709 (6BA7)	92	-15	1.8	A.C.	A.C.	1.8	-1	xxx	136	xxxxx	xxxxx
V 708 A (6U8)	-	-.2	25	-6.3	0	120	.4	-	-	xxxxx	xxxxx
V 708 V (6U8)	122	-	-	-6.3	0	-	-	.25	-2	xxxxx	xxxxx
V 710 (6AU6)	.25	1.6	A.C.	A.C.	146	120	1.6	xxx	xxx	xxxxx	xxxxx
V 705 (6AU6)	-16	0	A.C.	A.C.	155	153	0	xxx	xxx	xxxxx	xxxxx
½ 706 A (6U8)	-	.06	134	A.C.	A.C.	134	2.3	-	-	xxxxx	xxxxx
½ 706 B (6U8)	134	-	-	A.C.	A.C.	-	-	2.8	-3.8	xxxxx	xxxxx
V 707 (6BA7)	108	.9	3.1	A.C.	A.C.	3.1	-6.5	xxx	108	xxxxx	xxxxx
½ V 703B (6U8)	102	-	-	A.C.	A.C.	-	-	0	-1.8	xxxxx	xxxxx
V 711 (6AB4)	108	-	-	A.C.	A.C.	-3.8	0	xxx	xxx	xxxxx	xxxxx
V 712A (12AT7)	230	0	3	A.C.	A.C.	-	-	-	A.C.	xxxxx	xxxxx
V 712B (12AT7)	-	-	-	A.C.	A.C.	240	-.2	3	A.C.	xxxxx	xxxxx
V 713 (1EP1)	A.C.	A.C.	-480	-425	-320	180	180	180	180	180	0
V 713 (1EP1)	A.C.	A.C.	0325	-320	-220	215	215	215	215	215	0

* All Voltages Measured With Respect to Chassis Ground
** Scope Selector Switch Off
t- Scope Selector Switch In Position L-1

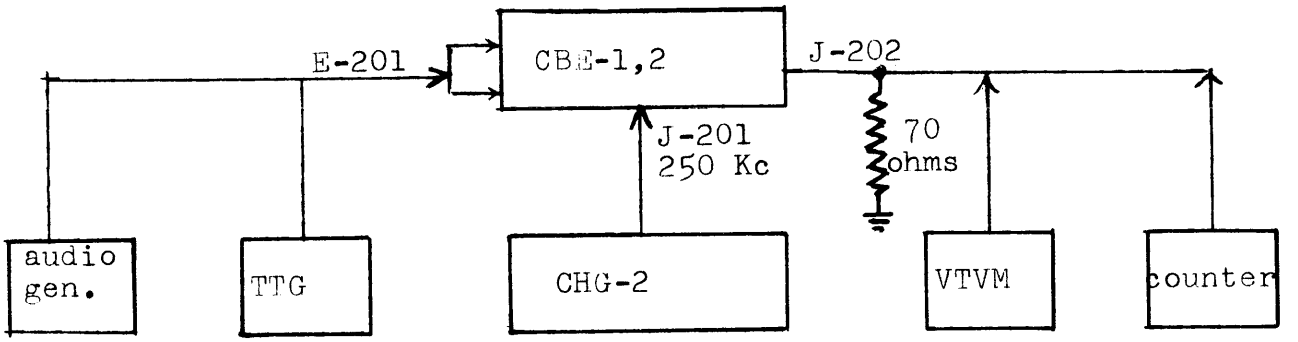
WITH CHL CONNECTE' .C. VOLTAGES

	pin 1	pin 2	pin 3	pin 4	pin 5	pin 6	pin 7	pin 8	pin 9	pin 10	pin 11
½ V 701 A (6U8)	-	4.3	0	6.3	6.3	23	0	-	-	-	-
½ V 701 B (6U8)	0	-	-	6.3	6.3	-	-	0	0	-	-
½ V 702 A (6U8)	-	.48	0	6.3	6.3	25	0	-	-	-	-
½ V 702 B (6U8)	0	-	-	6.3	6.3	-	-	11	15	--	-
½ V 703 A (6U8)	-	.8	0	6.3	6.3	18	.4	-	-	-	-
V 704 (6BA7)	0	8	0	6.3	6.3	0	3.2	xxx	1.6	-	-
V 709 (6BA7)	1	16.5	0	6.3	6.3	0	3	xxx	3.5	-	-
V 708 A (6U8)	-	.06	0	D.C.	D.C.	7.4	0	-	-	-	-
V 708 B (6U8)	0	-	-	D.C.	D.C.	-	-	1.4	3.6	-	-
V 710 (6AU6)	1.7	.04	6.3	6.3	46	0	.04	xxx	xxx	-	-
V 705 (6AU6)	11	0	6.3	6.3	10	4	0	xxx	xxx	-	-
½ 706 A (6U8)	-	.4	.03	6.3	6.3	25	0	-	-	-	-
½ 706 A (6U8)	0	-	-	6.3	6.3	-	-	4.4	8.3	-	-
V 707 (6BA7)	.02	4.3	.06	6.3	6.3	.06		xxx	23	-	-
½ 703 B (6U8)	42	-	-	6.3	6.3	-	-	0	1.1	-	-
V 711 (6BA4)	9.8	-	-	6.3	6.3	2.9	0	xxx	xxx	-	-
V 712A(12AT)	15	.55	0	6.3	6.3	-	-	-	6.3	-	-
V 712 B(12AT)	-	-	-	6.3	6.3	24	.6	0	6.3	-	-
V 713 (1EP)	6.3	6.3	2	2	3	0	24	0	0	17	-

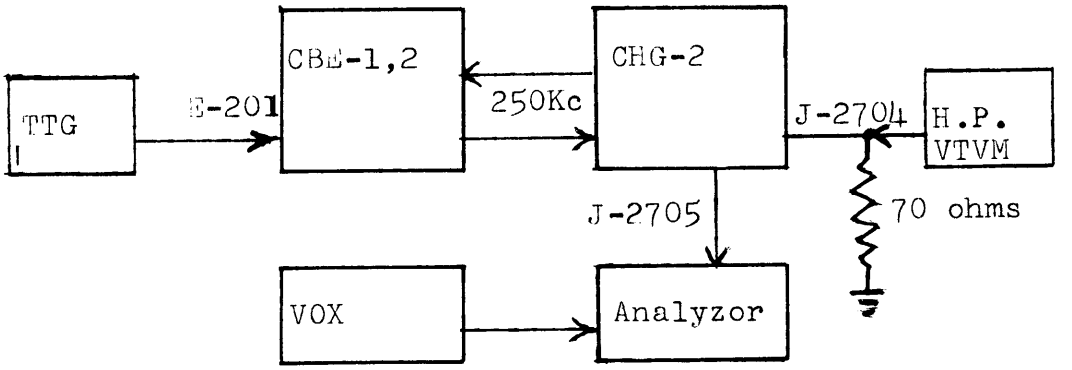
III-6-9 Test Procedure for Sideband Exciter Model CBE-1 or CBE-2 as used with the SBG sideband generator.

Figure III-6-5

Alignment test setup for sections 1 and 2.



Distortion Test setup for section 3.



Note: The CBE-1 and the CBE-2 differ in one respect, the USB and LSB filter for the CBE-1 has a bandwidth of 7.5 Kc and the CBE-2 a 3.5 Kc bandwidth.

CBE-1,2 Alignment Procedure as used with CHG-1.

Test Equipment Required

1. Frequency Counter: H.P. 524c, or equivalent.
2. A.C. VTVM (Ballantine Model 314 or equivalent).
3. 70 Ohm Non-Inductive Resistance.
4. Panalyzer Model SB-12 A.
5. Variable Frequency Oscillator: Model VOX.
6. Audio Generator: H.P. Model 200cb.
7. Two Tone Generator.
8. AC VTVM (H.P. Model 410c).

Preliminary

(a) Remove Unit from the frame using the top of the CHG-1 as support.
(b) Connect the 70 ohm non-inductive resistor to J-202.
(c) Turn USB and LSB selector switches to OFF.
(d) Turn carrier level control OFF (Max. CCW).
(e) Connect and turn AC power ON.
(f) Connect 250 Kc from CHG-1 to J-201. Insure that it is 1 to 1.5 Vrms. (2.8 to 4.2V Peak to Peak)

Alignment

(a) Set the Two Tone Generator for a single tone.
(b) Connect the TTG (Two Tone Gen.) output to E-201, Terminals 2 and 4. (Balanced or Unbalanced depending upon output of the TTG.), Insure that the USB and LSB switches are OFF.
(c) Adjust the output level of TTG for 0.025 V Unbalanced, or 0.012 V Balanced.(-30 DBM).
(d) Turn R-213 Max. CW to feed 250 Kc to T-203.
(e) Connect the probe of the VTVM (Ball.) to pin 1 of V-204, plate of the RF amplifier. (Approx. 1 to 2 Volts).
(f) Adjust the top and bottom slugs of T-203 for Max. Indication.
(g) Adjust R-213 and C-216 for Min. Indication on VTVM.
(h) Turn R-244 Max. CW to feed 250 Kc to T-206.
(i) Connect the probe of the VTVM (Ball.) to pin 1 of V-208, plate of the RF amp. (approx. 1 to 2 Volts).
(j) Adjust the top and bottom slugs of T-206 for Max. Indication.
(k) Adjust R-244 and C-233 for Min. on the VTVM.

Adjustment of Combining Network

(a) Connect Ball. VTVM to the out terminal of Z-201; set USB switch to Channel 1, Adjust USB gain for a 0.1 V on the VTVM.

Adjustment of Combining Network - (Continued)

(b) Turn USB switch to OFF (DO NOT touch USB gain Control).
(c) Turn LSB switch to Channel 1, connect VTVM to OUT terminal of Z-203.
(d) Adjust LSB gain control for 0.1 V on the VTVM.
(e) Connect the VTVM to the IN terminal of Z-202: Note VTVM indication. Turn OFF LSB switch and turn USB switch to channel 1, both indications should be the same.
(f) Adjust R-237 until both Sidebands read the same when switching from USB to LSB.

Checking Sensitivity Of USB and LSB Channels

(a) Put the LSB selector switch to Channel 1, put the USB selector switch to OFF, carrier level control to OFF(Max.CCW), LSB gain to Max. CW.
(b) Check with the VTVM that there is 0.05 V at the grid of the first audio amplifier V-207, pin 6.
(c) Connect the VTVM to the 70 ohm resistor connected to J-202, indication should be greater than 0.12 volts(.12 - .2 V).
(d) Put the LSB selector switch to OFF, USB selector switch to Channel 1, USB gain control Max. CW. The VTVM connected to J-202 should again indicate greater than 0.12 Volts.

Meter Adjustments and Carrier Level

(a) USB selector switch to Channel 1, LSB switch OFF, carrier level control to OFF, adjust USB gain control so that the VTVM connected to the dummy load at J-202 indicates 0.12 V.
(b) Adjust R-216 (USB meter adjust) so that the USB meter indicates 100%.
(c) Set LSB selector switch to Channel 1, USB switch to OFF, Carrier level to OFF, adjust LSB gain control so that VTVM connected to J-202 indicates 0.12 Volts.
(d) Adjust R-247 (LSB meter adjust) so that LSB meter indicates 100%.
(e) LSB and USB selector switches to OFF, Carrier level control to 0 DB (Max. CW).
(f) Adjust R-236 (carrier insert) so that VTVM connected to J-202 indicates 0.12 volts.

2. CHECK FOR BANDWIDTH

(a) Connect an audio oscillator across a 600 ohm resistor to terminals 2 and 4 of E-201.
(b) Set the oscillator to have an output of .05 volts at 1Kc.
(c) Set the USB selector switch to OFF.
(d) Set the LSB selector switch to Channel 1.

2. CHECK FOR BANDWIDTH -(Continued)

(e) Connect the probe of the Ballantine meter to output of filter Z-201.
(f) Connect counter to the output of filter (same point as previous step).
(g) Vary the audio generator between 250-7500 cycles for the CBE-1, or 250-3500 for the CBE-2 to obtain the peak reading on the meter. Adjust the meter to any convenient reference point. This will appear at approximately 2000 cycles for both units. CBE-1 and CBE-2.
(h) Vary the audio generator towards the lower frequency side 250 cycles for the CBE-1 or 250 cycles for the CBE-2. Note and record the frequency when the meter indicates a reduction of 1db, 2db, and 3db. Now tune the generator towards 7500 cps. Note and record the second frequency at the 1db, 2db, and 3db points. While tuning the generator to 7500 cycles from 250 cycles for the CBE-1, 3500 from 250 cycles for CBE-2, watch the meter for any variation greater than 3db below the point which has been set as a reference point.
(i) Subtract the two frequencies at the 3 db points. This should be less then 7250 cycles for the CBE-1 and 3250 cycles for the CBE-2.
(j) Set the LSB selector switch to OFF.
(k) Set the USB selector switch to Channel 1.
(l) Connect the probe of the Ballantine meter to the output of the USB filter Z-203.
(m) Connect counter to the output of filter (same point as previous step).
(n) Vary the audio generator between 250-7500 cycles for the CBE-1, or 250-3500 for the SBE-2 to obtain the peak reading on the meter. Adjust the meter to any convenient reference point. This will appear at approximately 2000 cycles for both units. CBE-1 and 2.
(o) Vary the audio generator towards the lower frequency side, 250 cycles for the SBE-1 or 250 cycles for the SBE-2. Note and record the frequency when the meter indicates a reduction of 1 db, 2 db and 3 db. Now tune the generator towards 7500 cps. Note and record the second frequency at the 1 db, 2 db and 3 db points. While tuning the generator to 7500 cycles from 250 cycles for the SBE-1, 3500 cycles from 250 cycles for the SBE-2, watch the meter for any variation greater than 3 db below the point which has been set as a reference point.
(p) Subtract the two frequencies at the 3 db points. This should be less than 7250 cycles for the CBE-1 and 3250 cycles for the CBE-2.

3. DISTORTION TEST

After having aligned the unit as per 1 and 2 and completed the

3. DISTORTION TEST - (Continued)

alignment of the CHG-2, the distortion test can be made.

Preliminary:

1. Input from TTG to CBE - 0.012 volts (Balanced) o.025 volts (Unbalanced).
2. Output of CBE to CHG should NEVER exceed 0.12 volts.(PEV).
3. Output from CHG(250 Kc) to CBE 1 to 1.3 volts RMS.
4. Set up Panalizer as follows to measure distortion:
   a. gain--Fully clockwise.
   b. Amplitude scale switch to LOG.
   c. Cal. Osc. Level to OFF.
   d. Input attenuation as needed.
   e. Sweep width selector to 10 Kc.
   f. AFC---OFF.
   g. The VOX should be set 500 Kc higher than the output of the CHG-2 output Freq.
   h. VOX Output 0.1 ma.
   i. TTG audio selector switch set for two tones.
5. CHG properly tuned and H.P. VTVM connected as per fig. 2.

TEST

a. Connect the equipment as shown in Fig. 2.
b. Turn the carrier level control OFF.
c. Turn LSB to OFF.
d. Turn USB to channel that audio is coming in on.
e. Adjust USB gain until USB meter indicates 100%, then turn selector switch to OFF.
f. Turn LSB to channel that audio is coming in on.
g. Adjust LSB gain until LSB meter indicates 100%, then turn selector switch to OFF.
h. Adjust carrier level control to 0 DB(Max. Cw).
i. Tune the CHG and set the output level control so that the VTVM connected to J-2704 indicates 8.5 volts.
j. Using the input attenuator switches on the analyzer adjust the amplitude on the screen as close as possible to the zero(0) DB line, then adjust the gain control so that the indication is zero(0) DB.
k. Now turn the Carrier level control OFF(Max. CCW). The carrier should be down on the analyzer screen a - 55 DB. If anything else appears on the screen it should be down - 60 DB.

TEST -(Continued)

1. Turn USB selector switch to appropriate channel, two tones should appear on the screen at - 6 DB and intermodulation distortion should be down - 45 DB from the two tones or - 51 DB from original setting.

m. Check the LSB by the same method as above with the USB OFF and using the appropriate controls.