JERROLD®

COMMUNITY SYSTEMS DIVISION

JERROLD ELECTRONICS CORPORATION

60972

INSTRUCTION MANUAL
435-392

LSA-410A AND LSA-410AB
DISTRIBUTION SYSTEM MANUAL

JERROLD ELECTRONICS CORPORATION
COMMUNITY SYSTEMS DIVISION
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PHILADELPHIA 32, PENNSYLVANIA

A subsidiary of The Jerrold Corporation

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SECTION I

INTRODUCTION

1-1 SCOPE

This manual describes two similar closed-circuit TV distribution systems for low-sub vhf channels in the 5 to 90 mc band. These systems are known, respectively, as LSA-410A and LSA-410AB depending on which of these Jerrold amplifiers is used in the system. In addition, the manual contains a complete description of system components together with all information necessary to install and maintain these systems.

1-2 GENERAL DESCRIPTION

The LSA-410A distribution system is designed for extremely efficient transportation of low-sub vhf channels in the 5 to 90 mc band via coaxial cable over extremely long distances. The system comprises Jerrold Model LSA-410A distributed line amplifiers, and the required numbers of Jerrold cable equalizers (either fixed or thermatically controlled), Jerrold splitters, and weather cabinets, and the necessary coaxial cable (aerial or buried).

The LSA-410AB distribution system employs an additional amplifier Jerrold Model LSA-410B connected in push-pull with the amplifier section of Model LSA-410A for the express purpose of bettering the second order distortion components by a minimum factor of 25 db to increase the number of cascaded amplifiers.

An additional benefit obtained is the reduction of third order components by 6 db. The lay-outs of the two systems are exactly alike. The only difference in components is the additional LSA-410B amplifier at each location in the LSA-410AB system. The operating input and output levels for the two systems are the same.

*NOTE: When a distribution system includes intercity microwave links of less than broadcast quality, one half the noise objective must be allocated to the radio link, thus reducing the recommended number of amplifiers in cascade in the cable portion of the system.

1-3 MODEL LSA-410A

Model LSA-410A comprises a 12-tube, 2-stage, distributed amplifier section, a 3-tube automatic gain control circuit, and a built-in regulated power supply. The unit covers a frequency range from 5 mc to 90 mc. The minimum full gain of the amplifier is 35 db with 30 db recommended as operating gain.

Each amplifier stage employs six 5654/403B pentodes. The AGC circuit uses a 5654/403B as an rf amplifier, a 5726/6AL5W as a detector and clamp, and another 5654/403B as a dc amplifier. In addition, the gain of the unit can be manually controlled. In both cases, control is exercised over the gain of the input stage, with a maximum change in frequency response of $\frac{1}{2}$ db for a $\pm$6 db variation about the setting of the operating gain.

The AGC is lightly coupled from the amplifier output and tuned to the carrier selected for control purposes. This carrier can be a video, sound or special control carrier, depending on system requirements.

The clamping action in the AGC circuitry prevents the amplifier from exceeding its full rated gain in case of system failure thus assuring that tubes will be held within prescribed ratings.

Input and output impedances are nominally 75 ohms from 6 to 90 mc with a VSWR of 1.2:1 (21 db return loss). The noise figure is essentially constant at all frequencies; 7 db at full gain of 35 db, and 8.5 db at the operating gain of 30 db.

To achieve a system flatness of $\pm\frac{1}{4}$ db over the entire frequency range, equalization of coaxial cable having 30 db attenuation at 90 mc is required.

A built-in metered test circuit permits checking all tubes and supply voltages during operation. This feature is a proven aid in the preventive maintenance of distributed amplifiers.

All variable components are factory-aligned and are not accessible from the chassis top except two (L101 and L102) for tuning the AGC; tube replacements will not require field alignment.

1-4 MODEL LSA-410AB

Jerrold Model LSA-410AB comprises Model LSA-410A and Model LSA-410B. Model LSA-410B provides the necessary push-pull circuitry and an additional 12-tube, 2-stage distributed amplifier which derives its power and AGC control from Model LSA-410A via interconnecting cables. The combined amplifier provides an output remarkably low in distortion due to second order beats.

1-5 CABLE EQUALIZERS - MODELS LSE-1 AND LSE-2

Jerrold Models LSE-1 and LSE-2 are cable equalizers used in systems employing LSA-410AB amplifiers in the main trunk line. These units will provide compensation for varying cable attenuation (tilt) due to variations in frequency. They are used at amplifier locations where temperature fluctuations have a negligible effect on tilt.

Model LSE-1 will compensate for the variation in cable attenuation due to variation in frequency between 5 and 90 mc for 28.5 db of cable measured at 90 mc. Model LSE-2 will perform the same function for 24.5 db of cable. Two trimmer capacitors on each of these models provide respectively for very slight adjustment of the overall tilt and high-frequency response. These adjustments are made only when the swept response of an amplifier at a particular location is being observed on an oscilloscope.

These units have an input and output impedance of 75 ohms with a maximum VSWR of 1.2:1 and are equipped with "N" fittings. They cover the band from 5 to 90 mc and have an insertion loss of less than 2 db at 90 mc. Overall dimensions are 2 3/8" x 2 3/4" x 4 1/8".

1-6 Thermatic Equalizers - Models LSET-1 and LSET-2

Jerrold Models LSET-1 and LSET-2 are thermatic equalizers used in systems employing LSA-410AB amplifiers in the main trunk line. These units will provide compensation for varying cable attenuation (tilt) due to fluctuations in temperature as well as to variations in frequency.

Model LSET-1 will compensate for the variation in cable attentuation due to variation in frequency between 5 and 90 mc for 28.5 db of cable measured at 90 mc at 80°F. In addition, it will compensate for the variation in cable attenuation due to variation in temperature between 0°F and 120°F for the same length of cable. Model LSET-2 will perform the same functions for 24.5 db of cable. Each has trimmer capacitors which are used exactly as are those on the LSE-1 and 2 models.

These units have an input and output impedance of 75 ohms with a maximum VSWR of 1.22:1 and are equipped with "N" fittings. They cover the band from 5 to 90 mc and have an insertion loss of less than 2 db at 90 mc at 80°F. These thermatic equalizers are always mounted on the pole at the amplifier location outside the weather housing. Overall dimensions are approximately 2 3/8" x 2 3/4" x 4 1/8".

1-7 EQUIVALENT CABLE LENGTHS - MODELS LSC-2, LSC-4, LSC-6, AND LSC-8

Jerrold Models LSC-2, LSC-4, LSC-6, and LSC-8 are equivalent cable lengths used in systems employing LSA-410AB amplifiers in the main trunk line. They are equivalent, respectively to 2, 4, 6, or 8 db of cable measured at 90 mc. They cover the 5 to 90 mc band, have an input and output impedance of 75 ohms with a maximum VSWR of 1.1:1 and are equipped with "N" fittings.

1-8 HYBRID SPLITTER - MODEL LS-92

Jerrold Model LS-92 is a hybrid splitter used to split one 75-ohm line into two 75-ohm lines with only 3 db loss in each leg. The unit covers the 5-90 mc band, has input and output impedance of 75 ohms with a maximum VSWR of 1.2:1, and insertion loss of 3 db,

and is equipped with "N" fittings. The isolation between outputs is 30 db.

1-9 DIRECTIONAL COUPLERS - MODELS LS-8, LS-12, AND LS-16

Jerrold Models LS-8, LS-12, and LS-16 are directional couplers used to tap off a 75-ohm line. These units cover the 5-90 mc band, have input and output impedance of 75 ohms with a VSWR of 1.2:1, and are equipped with "N" fittings. The isolation between output and tap is 30 db minimum.

Model LS-8 has 8 db loss in one leg and less than 1 db in the other. Models LS-12 and LS-16 have, respectively, 12 and 16 db loss in one leg and less than 0.5 db loss in the other.

SECTION II

SPECIFICATIONS

2-1 SYSTEM SPECIFICATIONS

LSA-410A System

Input Level	+8 dbmv
Output Level	+37 dbmv

LSA-410AB System

Input Level	+11 dbmv
Output Level	+40 dbmv

NOTE 1. In either system, either thermatic equalizers Jerrold Models LSET-1 or LSET-2 or regular equalizers Jerrold Models LSE-1 or LSE-2 shall be used at every amplifier location.

NOTE 2. A carrier generator Jerrold Model CGS-73.5 will be used in the head end of the system as an AGC control carrier.

2-2 JERROLD AMPLIFIER SPECIFICATIONS

SPECIFICATIONS

	LSA-410A	LSA-410AB
MINIMUM FULL GAIN	35 db	34 db
OPERATING GAIN	29 db	29 db
BANDWIDTH	5 to 90 mc	5 to 90 mc
FLATNESS WHEN EQUALIZED THRU 30 DB OF CABLE MEASURED AT 90 MC	$\pm\frac{1}{4}$ db	$\pm\frac{1}{4}$db
MINIMUM INPUT	0 dbmv	0 dbmv
OPERATING INPUT	10 dbmv	10 dbmv
IMPEDANCE (OUTPUT AND INPUT)	75 ohms	75 ohms
VSWR	1.2:1	1.2:1
OUTPUT (MAXIMUM 5 CHANNELS)	48 db for -57 db cross mod.	51 db for -57 db cross mod.

	LSA-410A	LSA-410AB
OUTPUT (OPERATING)	40 dbmv	40 dbmv
NOISE FIGURE (FULL GAIN)	7 db	7 db
NOISE FIGURE (OPERATING GAIN)	8.5 db	8.5 db
AGC ACTION	+10 db in = +1 db out - 5 db in = -1 db out	+10 db in = +1 db out - 5 db in = -1 db out
SECOND ORDER BEAT (FOR 40 DBMV)	-45 db	-70 db
SECOND HARMONIC (FOR 40 DBMV)	-51 db	-76 db
TUBE COMPLEMENT	14 403B/5654 1 6AL5W/5726	26 403B/5654 1 6AL5W/5726
POWER SOURCE	117-v 60-cycle ac	117-v 60-cycle ac
POWER CONSUMPTION	100 watts	120 watts
FUSE PROTECTION (B+) (FIL)	$\frac{1}{4}$ amp. 10 amp.	(2) $\frac{1}{4}$ amp. (1)10 amp.
INPUT AND OUTPUT FITTINGS	N TYPE	N TYPE
TEST POINT FITTINGS	2 BNC TYPE	2BNC ON LSA410A
DIMENSIONS	2-1/8" x 19" x 8-3/4"	2-1/8" x 19" x 14"
WEIGHT	18 lbs.	25 lbs.

SECTION III

INSTALLATION

3-1 GENERAL

This section is concerned with the installation of electronic equipment at the various amplifier locations on either an LSA-410A or LSA-410AB distribution system. It is assumed that the preliminary construction work has been accomplished i.e. the Jerrold weather housings Model WC-410 have been installed, a 117-v ac power connection has been provided within each housing, all system coaxial cable has been run, and the cable ends at the various amplifier locations have been prepared with proper connectors for connection to equipment. It is further assumed that one construction crew will be concerned with the preliminary installation of electronic equipment while a technical crew equipped with the necessary test instruments will follow to set system levels at each amplifier location, to check the response of the amplifier or amplifiers, to make final connections, and to do whatever else is required to leave each location in perfect operating condition.

3-2 CHART OF CONTROLS AND CONNECTIONS FOR JERROLD AMPLIFIERS

This chart is included here to familiarize installation personnel with the functions of the various controls and connections on the LSA-410A and LSA-410AB.

CONTROLS AND FITTINGS

FRONT PANEL LSA-410A

NAME	TYPE	POSITION	FUNCTION
INPUT	N fitting	-	Connection for input cable from LSA-410B or for trunk line in if used independently.
AUX POWER	Jones plug	-	Connection for power cable from LSA-410B.
B+	¼ - amp. fuse	-	Protects B+ supply for LSA-410A.
FIL 10A	10-amp fuse	-	Protects filament supply for LSA-410A or LSA-410AB.
METER	3-scale meter		Measures current or voltage depending on amplifier switch positions.
		Top Scale	Calibrated from 0-4 volts to measure bias on tubes V1 thru V13 in LSA-410A and V1 thru V12 in LSA-410B.

NAME	TYPE	POSITION	FUNCTION
		Middle scale	Calibrated from 0-20 ma to measure cathode current on tubes V1 thru V13 in LSA-410A and V1 thru V12 in LSA-410B.
		Bottom scale	Calibrated from 0-200 volts to measure supply voltages for amplifier stages in LSA-410A and LSA-410B .
CATH CURRENT OR BIAS A B B+ VOLTS	17-pos function switch	V1 thru V13	Selects meter function according to position. Enable meter to read cathode current or bias on tubes V1 thru V13 in LSA-410A and V1 thru V12 in LSA-410B depending upon the positions of the AUX-MAIN and CATH CURRENT switches.
NOTE: Called FUNCTION switch in copy for proper identification.			
		P_A	Enables meter to read plate voltage for the first stage of either amplifier LSA-410A or LSA-410B according to position of AUX-MAIN switch.
		$S_A P_B$	Enables meter to read the screen voltage for the first stage of either amplifier LSA-410A or LSA-410B according to position of AUX-MAIN switch. NOTE: The screen voltage of the first stage of the amplifier is equal to the plate voltage of the second stage.
		S_B	Enables meter to read screen voltage of the second stage of either amplifier according to position of AUX-MAIN switch.
		B-	Enables meter to read B- voltage supply for LSA-410A unit with CATH CURRENT switch in BIAS B-position.
REDUCE FIL 10%	2-pos switch	Normal	Permits Normal filament supply to all tubes.
		Moved down	Reduced filament supply by 10% as a final check on tube condition by observing change in bias reading.
CATH CURRENT	2-pos switch	IK	Enables meter to read cathode current on tubes V1 thru V13 in LSA-410A on V1 thru V12 in LSA-410B depending on position of AUX MAIN switch and respective FUNCTION switch.

NAME	TYPE	POSITION	FUNCTION
		BIAS B-	Enables meter to read bias on tubes.
AUX MAIN	2-pos switch	AUX	Permits voltage or current readings to be taken on LSA-410B.
		MAIN	Permits voltage or current readings to be taken on LSA-410A.
MAN AGC	2-pos switch	MAN	Energizes manual gain control circuit.
		AGC	Energizes automatic gain control circuit.
MAN	pot	--	Regulates level of manual gain control.
AGC	pot	--	Regulates level of automatic gain control.
TPI	BNC fitting	--	Test point for input to LSA-410AB (20 db down)
TPO	BNC fitting	--	Test point for output of LSA-410AB (40 db down)

FRONT PANEL LSA-410B

LINE INPUT	N fitting	--	Input to LSA-410AB from main trunk.
LINE OUTPUT	N fitting	--	Output of LSA-410AB to main trunk.
FUNCTION SWITCH	15-pos function switch		Selects meter function according to position with AUX MAIN switch in AUX position.
		V1 thru V12	Enables meter to read cathode current or bias on tubes V1 thru V12 in LSA-410B depending upon the positions of the AUX MAIN and CATH CURRENT switches.
		P_A $S_A P_B$ S_B	Same function as these positions on LSA-410A FUNCTION switch but for LSA-410B.
BALANCE	pot adjusted at factory	--	To minimize 2nd order distortion.

NAME	TYPE	POSITION	FUNCTION
ALIGNMENT	F fittings	-	For use in observing the response of LSA-410B amplifier with push-pull circuit disconnected.
FUSE	¼ amp fuse	-	Protects B+ for LSA-410B.

3-3 PRELIMINARY INSTALLATION OF ELECTRONIC EQUIPMENT

The electronic equipment at each amplifier location will vary according to the particular system. This equipment will have been selected by those concerned with making the original lay-out and will have been properly marked for installation in the particular location.

Step-by-step Procedure

1. Mount LSA-410A or LSA-410AB in weather housing.

2. Connect other electronic equipment to either LSA-410A or LSA-410AB.

   NOTE: All equipment except thermatic equalizers LSET-1 or LSET-2 is located within the enclosure. No cable connections will be made at this time.

   a. If LSE-1 or LSE-2 is used, connect OUTPUT of equalizer to INPUT fitting of either LSA-410A (LSA-410A system) or LSA-410B (LSA-410AB system).

   b. If LSET-1 or LSET-2 is used, break cable outside WC-410 enclosure and mount unit in the line.

   c. If LSC-2, 4, 6, or 8 is used with LSE-1 or LSE-2, connect OUTPUT of build-out unit to INPUT of LSE-1 or LSE-2.

   d. If LSC-2, 4, 6, or 8 is used with LSET-1 or LSET-2 (located outside enclosure), connect OUTPUT of build-out unit to INPUT of LSA-410A or LSA-410AB.

3. Set controls on Jerrold Amplifier

   a. LSA-410A

CATH CURRENT	IK
AUX MAIN	MAIN
FUNCTION	VI
MAN AGC	MAN

b. LSA-410B

FUNCTION VI

4. Plug amplifier into 117-v ac source.

NOTE: If LSA-410B is used, plug unit into LSA-410A and interconnect the amplifiers with the jumper cables provided.

5. Observe that green light on LSA-410A lights and wait approximately one minute.

6. Adjust manual GAIN control (to the left of MAN AGC switch) until the meter reads 3 MA.

7. Proceed to next amplifier until preliminary installation work is complete.

3-4 FINAL INSTALLATION AND SYSTEM CHECK

It is assumed that the levels of the channels at the head end have been adjusted to provide the proper tilt between the lowest video carrier and the highest, and that sound carriers are approximately 15 db below video carriers. During the initial check of the system only the lowest and highest video carrier and the AGC control carrier should be fed to the system. This will permit accurate setting of AGC levels throughout the system and when the other channels are added they will be maintained at the proper levels.

Step-by-step Procedure

1. Connect Jerrold Field Strength Meter Model FSM-704B to OUTPUT fitting on either LSA-410A or LSA-410B (depending on amplifier used) and tune to the control carrier for AGC.

2. Read output on 704-B and adjust manual GAIN control on LSA-410A to give the desired output (usually 40 dbmv) as read on 704-B.

3. Place MAN AGC switch in AGC position and adjust AGC control (to right of MAN AGC switch) to obtain desired output as read on 704-B.

4. Adjust L-102 for minimum reading on LSA-410A meter or FSM-704B.

5. Adjust L-101 for minimum reading on LSA-410A meter or FSM-704B.

6. Re-adjust AGC control to obtain desired output as read on 704-B.

7. Note cathode current as read on meter of LSA-410A when the desired output is read on 704-B. The reading should be between 2 and 4 millivolts at normal (60°F) temperature. The reading will be slightly higher at higher temperatures and lower with lower temperatures.

8. Place FUNCTION switch on LSA-410A, in turn, to positions V1 thru V6 and observe LSA-410A meter reading at each position. Each reading should be approximately the same as for V1. Record average reading on a card for reference when performing periodic maintenance or trouble-shooting.

9. Place FUNCTION switch on LSA-410A, in turn, to position V7 thru V13 and observe LSA-410A meter reading at each position. Each reading should be approximately the same (between 9 and 11 milliamps). Record average reading on card.

NOTE: If LSA-410B is used, turn AUX MAIN switch on LSA-410A to AUX position and FUNCTION switch on LSA-410B, in turn, to positions V1 thru V12. The readings on the LSA-410A meter should be approximately the same as those obtained in steps 8 and 9.

10. Place CATH CURRENT switch on LSA-410A in BIAS B- position, MAN AGC switch in MAN position, and AUX MAIN switch in MAIN position.

11. Place FUNCTION switch on LSA-410A, in turn, to positions V1 thru V6 and read top scale on LSA-410A meter to measure bias. The meter should read between 2.5 v and 4 volts for all positions. Record average reading on card.

12. Place FUNCTION switch on LSA-410A, in turn, to positions V7 thru V13 and read meter as in step 13. Meter should read between 1 and 2 volts for all positions. Record average reading on card.

NOTE: If LSA-410B is used, turn AUX MAIN switch on LSA-410A to AUX position and FUNCTION switch on LSA-410B, in turn, to positions V1 thru V12. The readings on the LSA-410A meter should be approximately the same as those obtained in steps 11 and 12.

13. Place CATHODE CURRENT switch in BIAS B- position, FUNCTION switch in B- position, MAN AGC switch in MAN position and AUX MAIN switch in MAIN position. Meter on LSA-410A should read between 160 and 180 volts. Record reading on card.

14. Turn MAN AGC switch to AGC position, place CATHODE CURRENT in IK position, place FUNCTION switch, in turn, to P_A, S_AP_B, and S_B positions and observe LSA-410A meter readings at each position. The meter should read 180 to 200 volts in P_A position, 130 to 150 volts in S_AP_B position, and 120 to 140 volts in S_B position. Record readings on card.

NOTE: Approximately the same readings will be obtained for the LSA-410B by placing AUX MAIN switch in AUX position and making the same check.

15. Place CATHODE CURRENT switch in IK position, AUX MAIN switch in MAIN position, MAN AGC switch in AGC position and disconnect 704-B from OUTPUT fitting of either LSA-410A or LSA-410AB.

16. Connect outgoing trunk to OUTPUT fitting of either LSA-410A or LSA-410AB and proceed to next amplifier location.

When steps 1 thru 16 have been finished at all amplifier locations, the system levels will have been established. The response of each amplifier must now be checked and the trimmers on the equalizer used at each location adjusted.

17. Connect a Jerrold Sweep Generator Model 601 (or equivalent) and a Jerrold Marker Generator Model CM-6 (or equivalent) into the output of the system head-end. Set sweep generator to sweep between 0 and 95 mc.

18. At each amplifier location disconnect output cable from LSA-410A or LSA-410AB and connect the output of the LSA-410A or LSA-410AB via a Jerrold D-86 detector (or equivalent) to an oscilloscope. Observe the detected response of the amplifier. The response should be flat within $\pm\frac{1}{4}$db from 6 to 90 mc.

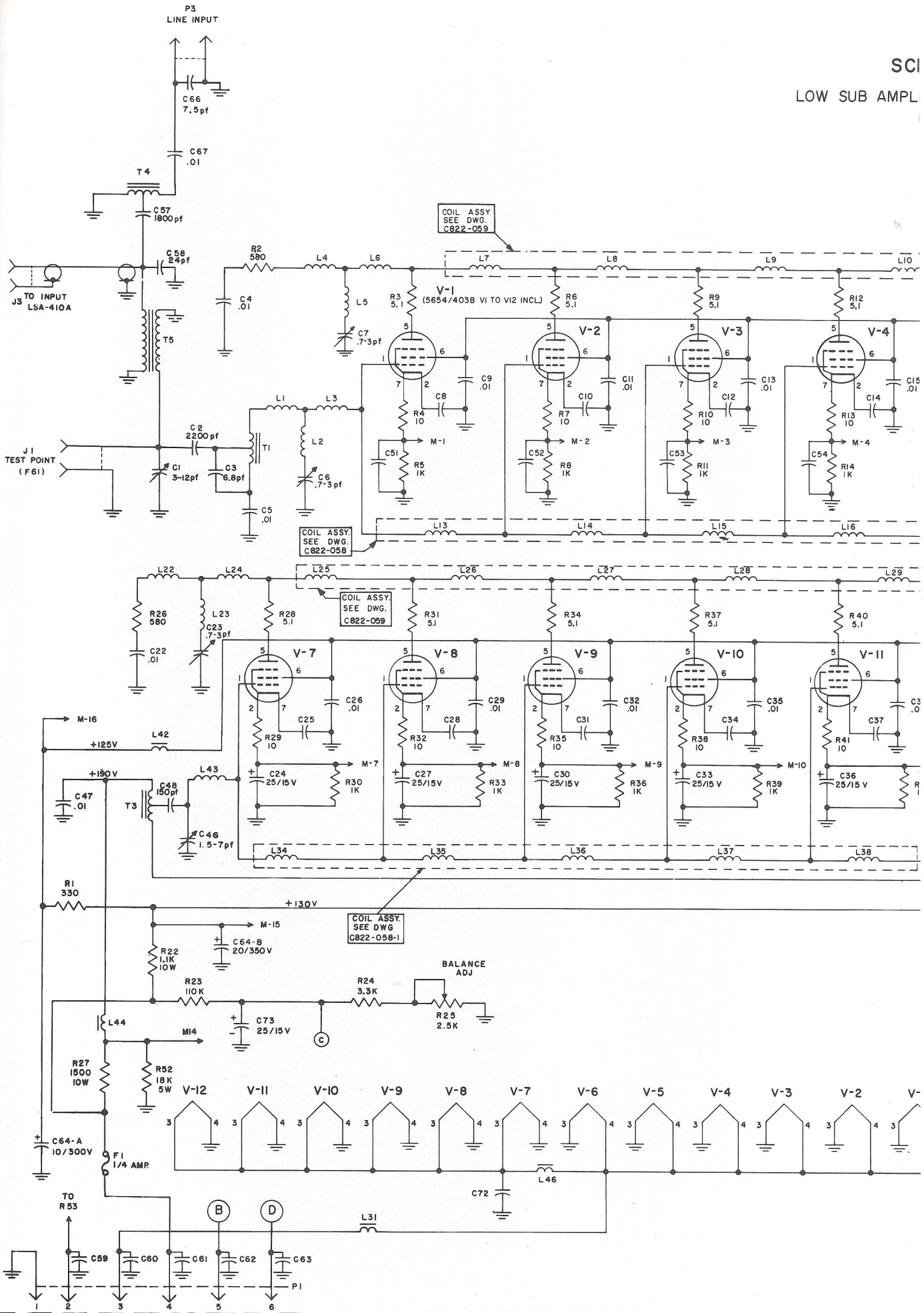
19. Adjust trimmers on the equalizer used at the location (LSE-1, LSE-2, LSET-1, or LSET-2) for best response.

NOTE: The tilt adjustment provides a small change in the tilt of the whole response while the frequency adjustment provides for peaking at 90 mc.

20. Disconnect detector and scope and re-connect output cable to LSA-410A or LSA-410AB.

When steps 17 thru 20 have been completed, the response of the system has been checked out. It may be necessary to repeat steps 1 thru 16 as a final touch-up of signal levels.

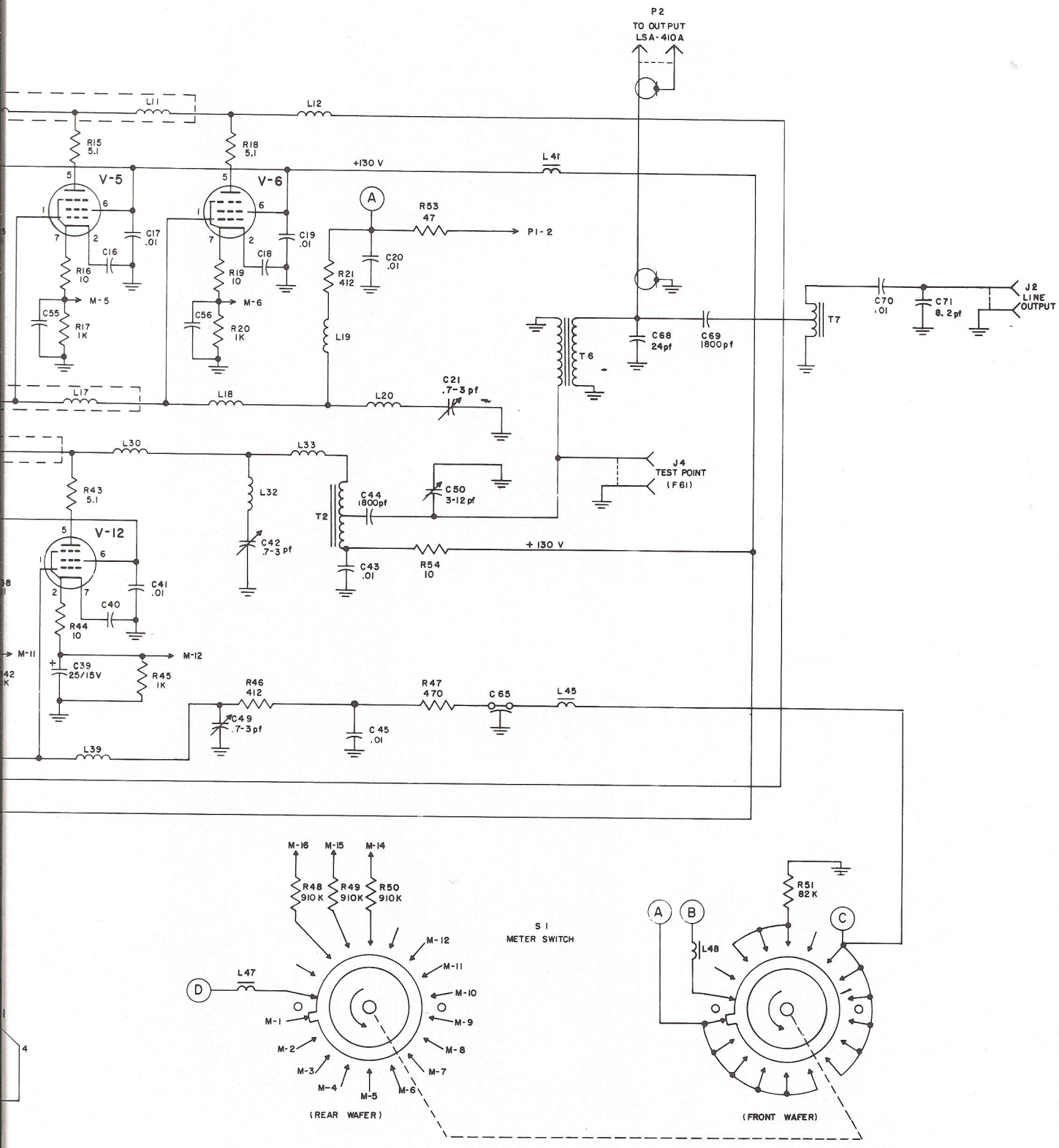
This completes the system installation.


P3
LINE INPUT
C66
7.5pf
C67
.01
T4
C57
1800pf
C56
24pf
J3
TO INPUT
LSA-410A
T5
C4
.01
R2
580
L4
L6
L5
C7
.7-3pf
COIL ASSY
SEE DWG.
C822-059
L7
L8
L9
L10
R3
5.1
V-1
(5654/403B VI TO VI2 INCL.)
R6
5.1
R9
5.1
R12
5.1
V-2
V-3
V-4
C9
.01
C11
.01
C13
.01
C15
.01
C8
C10
C12
C14
R4
10
R7
10
R10
10
R13
10
M-1
M-2
M-3
M-4
C51
R5
1K
C52
R8
1K
C53
R11
1K
C54
R14
1K
L1
L3
L2
C2
2200pf
T1
J1
TEST POINT
(F61)
C1
3-12pf
C3
6.8pf
C6
.7-3pf
C5
.01
COIL ASSY.
SEE DWG.
C822-058
L13
L14
L15
L16
L22
L24
L25
L26
L27
L28
L29
R26
580
C22
.01
L23
C23
.7-3pf
R28
5.1
COIL ASSY.
SEE DWG.
C822-059
R31
5.1
R34
5.1
R37
5.1
R40
5.1
V-7
V-8
V-9
V-10
V-11
C26
.01
C29
.01
C32
.01
C35
.01
C25
C28
C31
C34
C37
R29
10
R32
10
R35
10
R38
10
R41
10
M-7
M-8
M-9
M-10
C24
25/15V
C27
25/15V
C30
25/15V
C33
25/15 V
C36
25/15 V
R30
1K
R33
1K
R36
1K
R39
1K
M-16
+125V
L42
+190V
L43
C47
.01
T3
C48
150pf
C46
1.5-7pf
L34
L35
L36
L37
L38
R1
330
+130V
COIL ASSY.
SEE DWG
C822-058-1
M-15
C64-B
20/350V
R22
1.1K
10W
BALANCE
ADJ
R23
110K
R24
3.3K
R25
2.5K
C73
25/15V
L44
MI4
R27
1500
10W
R52
18K
5W
V-12
V-11
V-10
V-9
V-8
V-7
V-6
V-5
V-4
V-3
V-2
C64-A
10/300V
F1
1/4 AMP.
L46
C72
TO
R53
B
D
L31
C59
C60
C61
C62
C63
P1
1
2
3
4
5
6

CHEMATIC

LIFIER, PUSH-PULL UNIT

LSA-410B



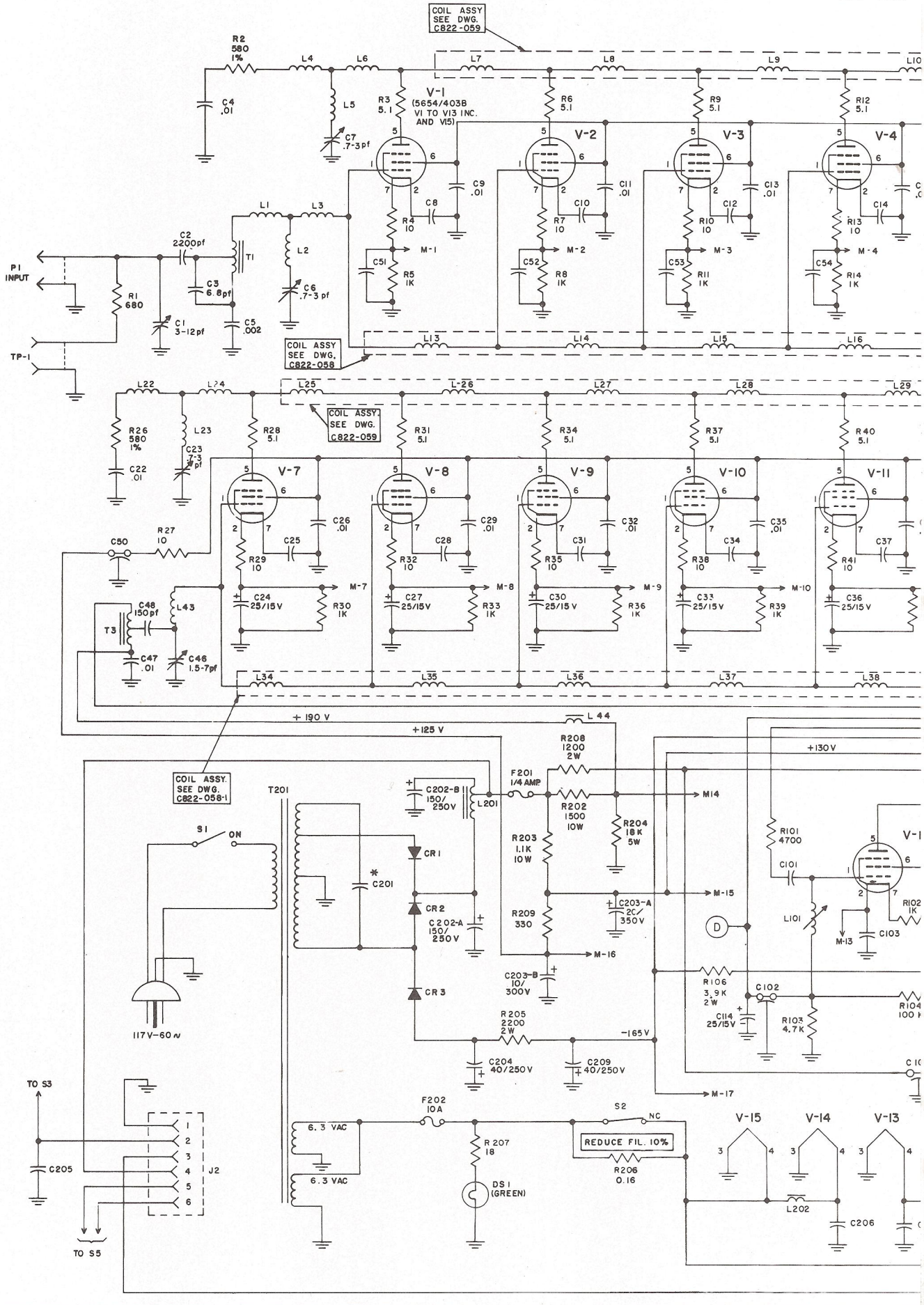
NOTES

1. ALL RESISTOR VALUES GIVEN IN OHMS.
2. ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED.
3. ALL MARKED CAPACITOR VALUES GIVEN IN MF UNLESS OTHERWISE SPECIFIED.
4. ALL UNMARKED CAPACITORS ARE 1000 PF.

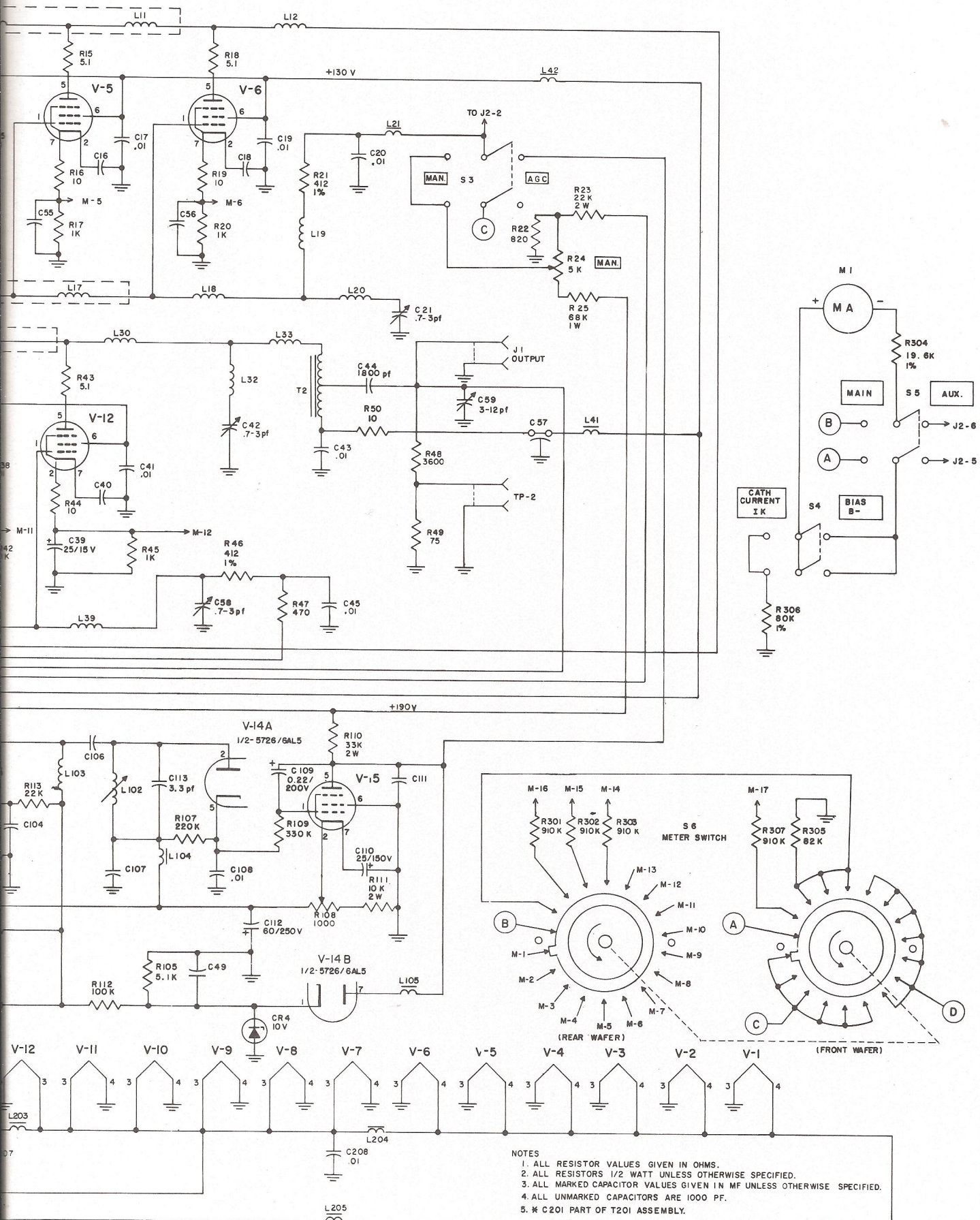
SCHEMATIC

LOW SUB AMPLIFIER

LSA-410A



W/ AGC



NOTES
1. ALL RESISTOR VALUES GIVEN IN OHMS.
2. ALL RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED.
3. ALL MARKED CAPACITOR VALUES GIVEN IN MF UNLESS OTHERWISE SPECIFIED.
4. ALL UNMARKED CAPACITORS ARE 1000 PF.
5. * C201 PART OF T201 ASSEMBLY.

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