ACL

VHF/UHF RECEIVER

TYPE SR-209

INSTRUCTION MANUAL

ASTRO COMMUNICATION LABORATORY
9125 Gaither Road
Gaithersburg, Maryland

VHF/UHF RECEIVER

TYPE SR-209

INSTRUCTION MANUAL

Astro Communication Laboratory
9125 Gaither Road
Gaithersburg, Maryland

FOREWARD

VHF/UHF Receiver Type SR-209 is a basic receiver of modular design and variable arrangement. Plug-in modules and printed circuit assemblies provide the versatility.

This manual is about the basic receiver and its printed circuit assemblies. Plug-in modules are referenced for continuity in presentation. Detailed information is contained in separate instruction manuals.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

Paragraph | Page

SECTION IV
(Cont)

SECTION V

MAINTENANCE

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

TABLE OF CONTENTS

TABLE OF CONTENTS

Figure		Page

LIST OF ILLUSTRATIONS
(Cont)

LIST OF TABLES

TABLE OF CONTENTS

Table		Page

LIST OF TABLES
(Cont)

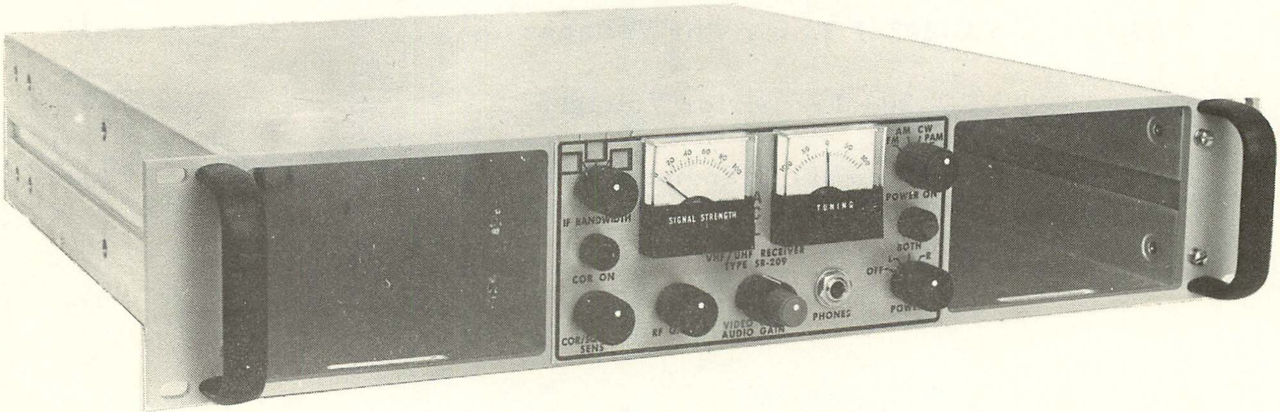


Figure 1-1. VHF/UHF Receiver, SR-209

SECTION I

GENERAL INFORMATION

1. General

The Astro Communication Laboratory (ACL) Type SR-209, Figure 1-1, performs the requirements for general HF/VHF/UHF communication receiver applications. It is completely solid state and features plug-in modules and printed circuit subassemblies for the highest degree of versatility. Plug-in modules are available in electronic swept heads covering 30 to 1000 MHz, in tuning heads covering 2 to 12,000 MHz, in signal display units for panoramic and signal analysis and in a battery pack which will supply power for field and emergency operation. Combinations of plug-in modules are shown in Figure 1-2 in typical receiver configurations.

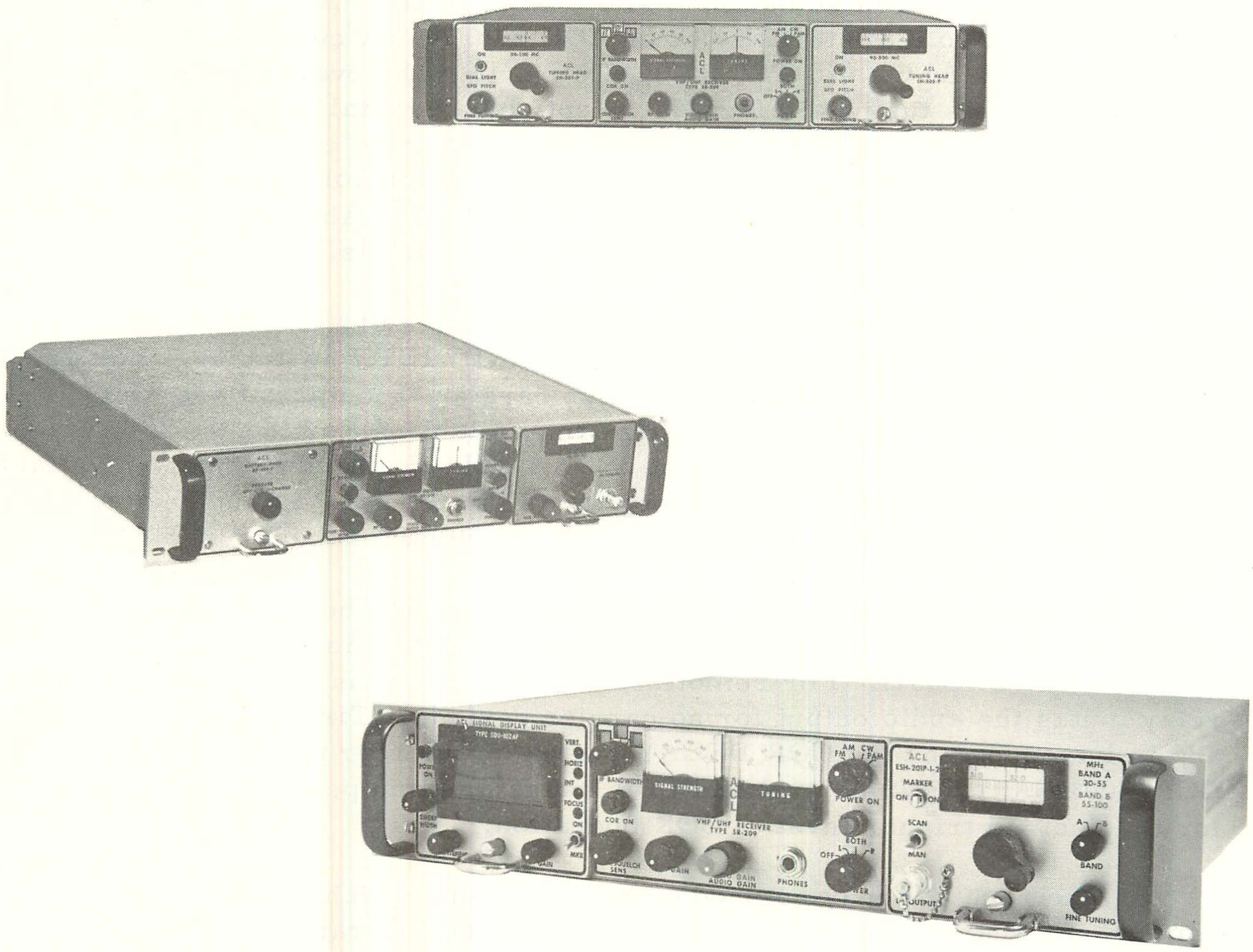


Figure 1-2. Typical Receiver Configurations.

2. Electrical Description

The SR-209 is capable of selection, control, demodulation and processing of FM, CW, AM and PAM (pulse) RF signals. Mounted on the SR-209 (main chassis) are all plug-in printed circuit assemblies essential to plug-in module and receiver performance. On the front panel are all switches, controls and meters relative to proper operation.

Regulated power supply voltages, ±12 and +24 vdc, are derived from an integral power supply which is fed via a power cable from an external 115 or 230 vac source. Power supply circuits are energized by the POWER switch and voltages are applied as selected. The receiver is completely transistorized and cooling is accomplished by natural principles of convection and radiation.

The SR-209 is set for the type of input signal to be processed by the FM, CW, AM and PAM selector. Set at FM, AM and PAM, the gain of the receiver is controlled internally by an AGC source. A customer option for FM reception is AFC. At CW, RF GAIN provides the overall receiver gain adjustment. As a tuning aid for CW reception, a crystal controlled BFO circuit is included on IF amplifier/demodulator printed circuit assemblies with bandwidths of 250 KHz or less. BFO PITCH control on the tuning head provides the beat note adjustment which is supplied as audio to the front panel PHONES jack and to rear panel speaker terminals.

Three IF amplifier/demodulator printed circuit assemblies are acceptable to the receiver with instantaneous IF BANDWIDTH switching. For use with the SH-100 series tuning heads which have an IF output of 455 KHz, IF bandwidths of 1, 5, 10, 20 and 50 KHz are available. For the SH-200 series tuning heads which have an IF output of 21.4 MHz IF, bandwidths are available from 10 KHz to 4000 MHz. The exception is the SH-200P tuning head which cannot be used with an IF amplifier whose bandwidth exceeds 500 KHz.

Meters are on the front panel to indicate when the input signal is centered in the IF passband (TUNING) and the relative input amplitude (SIGNAL STRENGTH). For remote sensing applications a carrier operated relay mutes the audio output for no carrier periods. Time delay is variable and is introduced by the COR DELAY switch on the rear panel. Front panel COR/SQUELCH SENS control and COR indicator lamp permits adjustment for the desired trigger level of COR operation.

The receiver may be used with any antenna which has a 50 ohm nominal impedance, operates in an unbalanced configuration and has a frequency range covering the tuning head in use.

3. Mechanical Description

The receiver is 3-1/2" high, 15-1/16" long, 16-7/8" wide and fits a standard 19" electrical equipment rack. The receiver, with two tuning head modules installed weights approximately 25 pounds. Handles are on the front and rear panel to provide a grip for installation and to protect the meters, controls and connectors from damage. Facilities of the receiver permit the installation of two 3-1/2" high, 4-3/4" wide and 13-3/4" long plug-in modules at the front panel and seven 3-3/4" long by 2-1/2" wide and five 8" long by 2-1/2" wide printed circuit assemblies on the main chassis. Two of the printed circuit assemblies, one large and one small, are supplied as card extenders for testing.

The front, back, side panels and main deck of the receiver are aluminum. An aluminum overlay on the front panel has etch-engraved markings, filled with black enamel. Rear panel and main chassis markings are black, silk screened. Top and bottom dust covers are aluminum and slide off along the side panels to facilitate maintenance. The printed circuit assemblies are exposed when the top cover is removed. Removal of the bottom cover permits access to the printed circuit receptacles, the wiring harness and the power transformer.

A power cable is provided for connection at the rear panel. A type N connector is used for RF INPUT, J1, J2. SDU OUTPUT, J3 and VIDEO OUTPUT, J9 are type BNC. Terminal board TB1 provides connection for audio output and COR contacts. J8, 115 VAC, 50-400 Hz is a Hubbell No. 7486 power receptacle. Switch S4 provides COR DELAY. S5 and S6 permit operation from 115 or 230 VAC. F1 is the 1 AMP SLO-BLOW fuse holder for 115 vac operation. F2 is a 1/2 AMP SLO-BLOW fuse holder for 230 vac operation.

4. Accessories Supplied

The SR-209 receiver is supplied with an instruction manual and a power cord. Alignment tools for general maintenance are mounted on card extenders in spare printed circuit receptacles.

SECTION II

SPECIFICATIONS

1. Receiver

Frequency Tuning Range	
Tuning Heads	2 to 12,000 MHz, refer to paragraph 2
Electronic Swept Heads	30 to 1000 MHz, refer to paragraph 6
Type of Reception	FM, AM, CW and PAM (pulse)
Input Impedance	50 ohms nominal, unbalanced to ground
AM Stability:	
VHF	Less than 6 db output variation for input range of 70 db above 3.5 uv
UHF	Less than 6 db output variation for input range of 70 db above 5 uv
FM Stability:	
IF Bandwidths From 10 to 300 KHz	Less than 2 db output variation for input above 1.5 uv
IF Bandwidths 500 KHz and Wider	Output varies less than 2 db for input above 4 uv
Pulse Stability	Less than 10 db output variation for input range of 70 db above 5 uv
Audio Power Output	100 mw minimum into 600 ohm load for external speaker
Video Amplifier Output	5 volts peak-to-peak into a 93 ohm load
Video Amplifier Response	Less than 3 db variation from 20 Hz to 4 MHz when terminated in a 93 ohm load

Audio Amplifier Response	Less than 3 db variation from 90 Hz to 43 KHz when properly terminated
Video Output Impedance	93 ohms, unbalanced
BFO	Operable with 10 to 250 KHz bandwidths
BFO Pitch	±20 KHz minimum
Signal Display Output:	
HF SDU	455 KHz center frequency
VHF/UHF SDU	21.4 MHz center frequency
Power Supply	115 or 230 vac, 50 to 400 Hz, single-phase
Power Consumption	25 watts approximately with signal display unit
Weight	30 pounds maximum
Dimensions	3-1/2" H x 15-1/16" D x 16-7/8" W
Finish	Gray enamel, MIL-E-15090, Color No. 26329, FED STD 595

2. Tuning Head

NOTE

All tuning heads use the superheterodyne technique. The approximate weight for each tuning head is 5 pounds and the dimensions are 3.5 inches height, 4.75 inches wide, and 13.75 inches deep.

Fine Tuning	Included on all tuning heads
Frequency Readout	Calibrated dial tape
LO Output	Optional, 50 mv min

Model and Range (MHz)	Noise Figure (db max)	IF Rej. Min. (db)	Image Rej. Min. (db)	Oscillator Radiation Max. (uv)
SH-102P (2 to 6)	6.0	60	60	5
SH-103P (6 to 20)	6.0	90	60	5
SH-104P (20 to 45)	6.0	90	60	5
SH-200P (20 to 45)	4.5	90	65	10
SH-270P (20 to 70)	4.5	60	60	10
SH-201P (30 to 100)	4.5 to 90, 5.5 above 90 MHz	60	60	8
SH-271P (55 to 260)	6.5	60	60	15
SH-202P (90 to 300)	6.5	80	50	15 to 260, 25 above 260 MHz
SH-272P (225 to 400)	8.0	100	90	8
SH-203P (250 to 500)	10	90	60	5
SH-204P (490 to 1000)	12	90	80	50
SH-205P (990 to 2000)	14	90	60	300
SH-206P (1990 to 4000)	15	90	60	300
SH-207P-1 (4000 to 7000)	16	80	60	300
SH-208P-1 (7000 to 12000)	18	80	60	300

3. IF Amplifier/Demodulator

Three interchangeable IF amplifier printed circuit assemblies may be installed in the receiver. A BFO is included on those with bandwidths of 250 KHz or less.

Series Tuning Head	IF Ampl Module	3 db BW (KHz)	IF Freq. (MHz)	AM Sensitivity (input for 10 db S+N/N min)	FM Sensitivity (input for 21 db S+N/N min)
SH-100	IF-112-01	1	0.455	.3 uv, mod. 50% at 400 Hz rate	
SH-100	IF-112-05	5	0.455	.7 uv, mod. 50% at 400 Hz rate	
SH-100	IF-112-10	10	0.455	1 uv, mod. 50% at 1 KHz rate	
SH-200 (VHF)	IF-210-20	20	21.4 & 1.65	2 uv, mod. 50% at 1 KHz rate for 17 db S+N/N min	2 uv, mod. at 1 KHz rate, 7 KHz deviation
SH-200 (VHF)	IF-211-60	60	21.4 & 2.5	2 uv, mod. 50% at 1 KHz rate	2 uv, mod. at 1 KHz rate, 20 KHz deviation
SH-200 (VHF)	IF-211-100	100	21.4 & 2.5	3 uv mod. 50% at 1 KHz rate	3 uv, mod. at 1 KHz rate, 30 KHz deviation
SH-200 (UHF)				5 uv, mod. 50% at 1 KHz rate	5 uv mod. at 1 KHz rate, 30 KHz deviation
SH-200 (VHF)	IF-212-300	300	21.4	4 uv, mod 50% at 1 KHz rate	4 uv, mod. at 1 KHz rate, 100 KHz deviation
SH-200 (UHF)				8 uv, mod. 50% at 1 KHz rate	8 uv, mod. at 1 KHz rate, 100 KHz deviation
SH-200 (VHF)	IF-212-500	500	21.4	5 uv, mod. 50% at 1 KHz rate	5 uv, mod. at 1 KHz rate, 170 KHz deviation
SH-200 (UHF)				10 uv, mod. 50% at 1 KHz rate	10 uv, mod. at 1 KHz rate, 170 KHz deviation

Series Tuning Head	IF Ampl Module	3 db BW (KHz)	IF Freq. (MHz)	AM Sensitivity (input for 10 db S+N/N min)	FM Sensitivity (input for 10 db S+N/N min)
SH-200 (VHF)	IF-212-2000	1500 p-p	21.4	13 uv, mod. 50% at 1 KHz rate	13 uv, mod. at 1 KHz rate, 670 KHz deviation
SH-200 (UHF)				26 uv, mod. 50% at 1 KHz rate	26 uv, mod. at 1 KHz rate, 670 KHz deviation
SH-200 (VHF)	IF-212-3000	2500 p-p	21.4	14 uv, mod. 50% at 1 KHz rate	14 uv, mod. at 1 KHz rate, 1 MHz deviation
SH-200 (UHF)				28 uv, mod. 50% at 1 KHz rate	28 uv, mod. at 1 KHz rate, 1000 KHz deviation
SH-200 (UHF)	IF-212-4000	3500 p-p	21.4	30 uv, mod. 50% at 1 KHz rate	30 uv, mod. at 1 KHz rate, 1350 KHz deviation

Other standard IF assemblies provide bandwidths of 10, 25, and 50 KHz for use with SH-100 series tuning units and bandwidths of 10, 75, and 1000 KHz for use with SH-200 series tuning units. Non-standard bandwidths are available to 8 MHz.

4. Signal Display Unit

VHF/UHF SDU-102AP

Center Frequency . . . . 21.4 MHz

Sweep Width . . . . DC to 3 MHz

Resolution . . . . 10 KHz

Weight . . . . 5.5 pounds

HF SDU-100P

Center Frequency . . . . 455 KHz

Sweep Width . . . . DC to 10, DC to 50 KHz

Resolution . . . . 400 Hz for 10 KHz, 2 KHz for 50 KHz sweep

Weight . . . . 5.5 pounds

5. Battery Pack

Type BP-201P

Capacity . . . . 1.4 amp hour, 5 hour rate

Output . . . . ±14.4 and 28.8 vdc

Charge Rate . . . . 120 ma, 16 hours

Weight . . . . 8 pounds

6. Electronic Swept Heads

NOTE

Electronic swept heads can be installed in existing receiving systems without adjustment or alignment. They provide identical frequency coverage as the SH-200 series tuners, paragraph 2, with the added feature of electronic tuning. Electronic tuners may be manually tuned to a discrete frequency or electronically tuned to sweep the entire band. They are used with a signal display unit, paragraph 4.

Model and Range(MHz)	Noise Figure (db Max.)	IF Rej. Min. (db)	Image Rej. Min. (db)	Oscillator Radiation Max. (uv)
ESH-201P				
A(30-55)	5.0	80	60	3
B(55-100)	6.0	60	80	8
ESH-202P				
A(100-190)	6.0	60	60	15
B(190-300)	7.0	60	60	25
ESH-203P (300-500	12.0	55	70	25
ESH-204P				
A(500-740)	13.0	55	80	50
B(740-1000)	13.0	55	80	50

SECTION III

INSTALLATION AND OPERATION

1. General

The SR-209 fits a 3-1/2" high space in a standard 19" electrical equipment rack. Ideally, the equipment rack should be located close to the antenna and convenient to an external power source. Any antenna may be used which covers the frequency range of the tuning head(s) installed, has a 50 ohm impedance and operates with an unbalanced line. The external power source requirements are 115 or 230 vac, 50 to 400 Hz, single-phase.

2. Installation

A. Printed Circuit Assemblies

Printed circuit assemblies plug-in receptacles on the main receiver chassis, Figure 3-1. To reach these assemblies remove the top dust cover. Observe the reference designations silk-screened adjacent to each assembly. They are keyed to the interconnection diagram, Figure 7-13. Plug-in printed circuit assemblies slide easily in and out along slots milled in the retaining wall. Reference designated assemblies A3, A4, A5, the IF amplifier/demodulator printed circuits, are interchangeable. Each time one is changed, the tab above the IF BANDWIDTH switch should also be changed to agree with the bandwidth of the assembly installed.

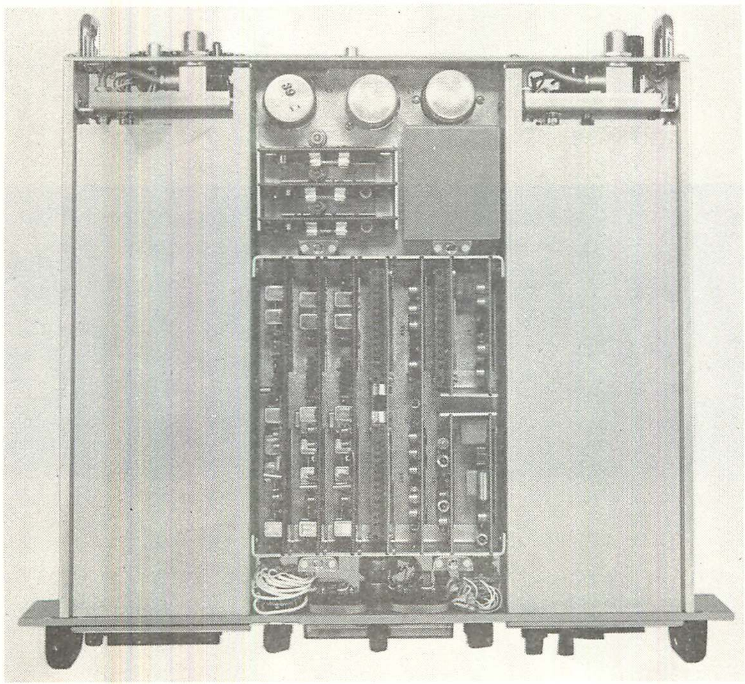


Figure 3-1. SR-209 Receiver, Top View.

B. Plug-in Modules

Facilities are provided on the right and left side of the front panel for plug-in modules. ACL's tuning heads, signal display units and a battery pack are acceptable. One tuning head shall be installed in the right front opening. An additional tuning head, a signal display unit or a battery pack may be installed in the left.

To install a module, push it straight forward into the main chassis. The rear panel plug will automatically mate in a receptacle on the receiver. Secure, by tightening the front panel pawl fastener.

C. Connections

With the exception of the PHONES jack, all connections are made at the rear panel, Figure 3-2, to facilitate rack installation. In addition to the connections, switch S5, S6 should be positioned for available line voltage.

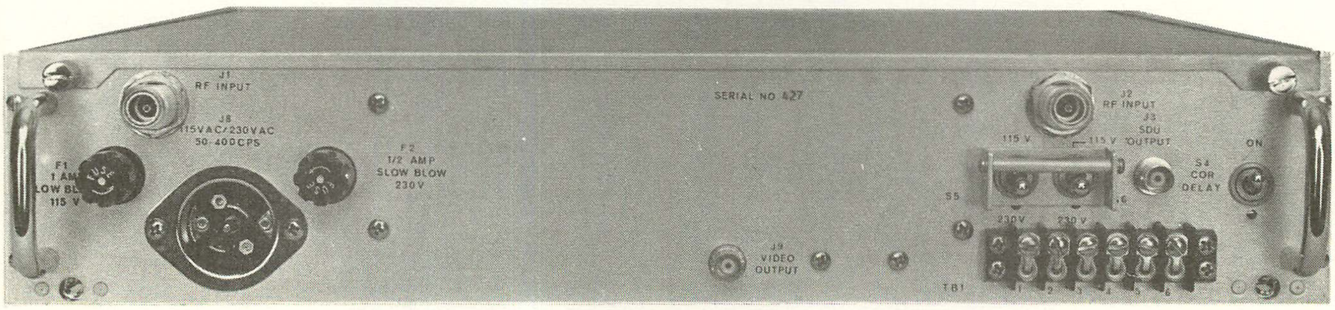


Figure 3-2. SR-209 Receiver, Rear Panel.

(1) S5, S6, 115/230 V Switch: Determine the external power source voltage. Observe switch position. If required, remove locking bar, change switch position and replace locking bar.

(2) J8, POWER Receptacle: Plug one end of the power cable into the receptacle and the other into the voltage source.

(3) J1, RF INPUT: Connect the antenna covering the frequency range of the tuning head installed on the right to this type N connector.

(4) J2, RF INPUT: Connect the antenna covering the frequency range of the tuning head installed on the left to this type N connector.

(5) J3, SDU OUTPUT: Connect an external signal display unit to this type BNC connector. Use an SDU with a 455 KHz input for HF tuning heads and one with a 21.4 MHz input for VHF/UHF tuning heads.

(6) J9, VIDEO OUTPUT: Connect a video recorder to this type BNC connector. The output is 5 volts peak-to-peak into a 93 ohm load.

(7) TB1, Terminals 1, 2 and 3: These are the COR CONTACTS. When the COR is energized 2 and 1 are shorted and 2 and 3 are open. When the COR is not energized 2 and 3 are shorted and 2 and 1 are open.

(8) TB1, Terminals 5 and 6: These are 600 OHM AUDIO OUTPUTS. Use a matching transformer if the impedance of the speaker is not 600 ohms.

(9) TB1, Terminal 4: This terminal is ground.

(10) J10, PHONES: Connect a headset to this front panel jack.

(11) J11, EXT MARKER: Connect to corresponding jack on associated swept equipment.

(12) J12, EXT RAMP: Connect to corresponding jack on associated swept equipment.

3. Operation

Figure 3-3 shows the operators controls and indicators. The equipment is operated as follows:

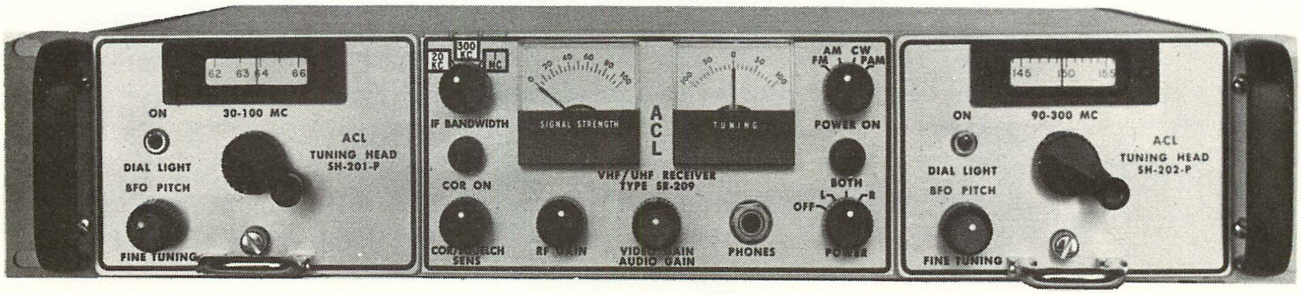


Figure 3-3. Operator's Controls and Indicators.

A. POWER Switch

The POWER switch directs power supply voltages to the plug-in modules and printed circuit assemblies according to its position. In R and BOTH, voltages are applied to both plug-in modules. Use these switch positions for configurations containing a single tuning head, a tuning head and a signal display unit and a tuning head and a battery pack. For configurations containing two tuning heads, set to L to energize the tuning head on the left.

B. FM Operation

(1) Set POWER selector as required. The POWER ON lamp and the dial lamp of the energized tuning head will light.

(2) Set mode selector to FM.

(3) Set IF BANDWIDTH switch to the desired bandwidth position as indicated by the metal tabs for each switch position.

(4) Tune receiver to desired frequency with coarse tuning control while observing SIGNAL STRENGTH meter. Tune for maximum indication.

(5) Adjust FINE TUNING control for more accurate tuning. Tune for center scale indication on TUNING meter and maximum indication on SIGNAL STRENGTH meter.

(6) Adjust AUDIO GAIN control for the desired headset or speaker audio level.

(7) Adjust VIDEO GAIN control for the desired video output level.

C. AM and PAM Operation

(1) Set POWER switch as required. The POWER ON lamp and the dial lamp of the energized tuning head will light.

(2) Set mode selector to AM or PAM.

(3) Set IF BANDWIDTH to the desired bandwidth position as indicated by the metal tabs for each switch position.

(4) Tune receiver to desired frequency with coarse tuning control while observing SIGNAL STRENGTH meter. Tune for maximum indication.

(5) Adjust FINE TUNING control for more accurate tuning. Tune for center scale indication on TUNING meter and maximum indication on SIGNAL STRENGTH meter.

(6) Adjust AUDIO GAIN control for the desired headset or speaker audio level.

(7) Adjust VIDEO GAIN control for the desired video output level.

(8) For manual gain adjustment during AM or PAM reception, set IF BANDWIDTH selector to any position greater than 250 KHz and mode selector to CW.

(9) Adjust RF GAIN control to provide the desired gain.

D. CW Operation

(1) Set POWER switch as required. The POWER ON lamp and the dial lamp of the energized tuning head will light.

(2) Set mode selector to CW.

(3) Set IF BANDWIDTH to a position of 250 KHz or less. The BFO is now in operation.

(4) Tune receiver to desired frequency with coarse tuning control while observing SIGNAL STRENGTH meter. Tune for maximum indication.

(5) Adjust RF GAIN control to prevent receiver saturation.

(6) Adjust BFO PITCH control to vary pitch of audio beat note.

(7) Adjust AUDIO GAIN control for the desired headset or speaker audio level.

(8) Adjust VIDEO GAIN control for the desired video output level.

E. Carrier Operated Relay

The carrier operated relay is energized for normal operation. Associated controls include a COR SENS control, a COR DELAY switch and a COR indicator lamp. These controls function as follows:

(1) The COR SENS control is used to adjust the threshold of operation for the carrier operated relay. For inputs above the COR SENS level the carrier operated relay will remain energized. An input below, will cause the carrier operated relay to de-energize. The audio outputs are controlled by the carrier operated relay and will be instantly cutoff for any input below the COR SENS level. When the COR SENS control is maximum clockwise the carrier operated relay is set for maximum sensitivity.

(2) The COR DELAY switch provides a time delay, in case the RF signal should disappear or fall below the sensitivity level, before the carrier operated relay is de-energized. The delay is set for 5 seconds but may be adjusted by the user for any duration between 5 and 10 seconds by an internal adjustment.

(3) The COR lamp indicates that the carrier operated relay is energized and that there are audio outputs.

F. Turn-Off Procedure

Place the POWER switch to the OFF position.

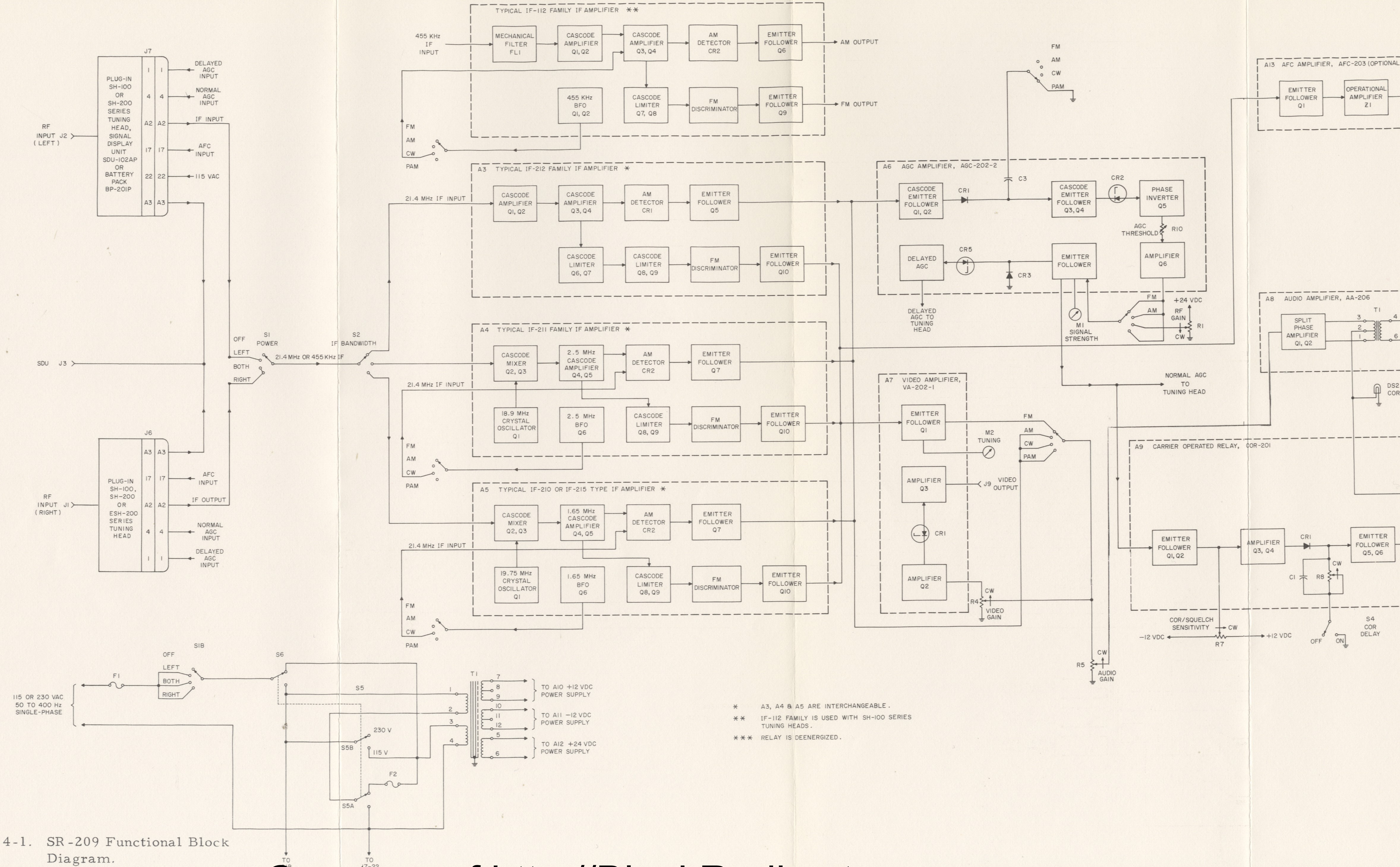
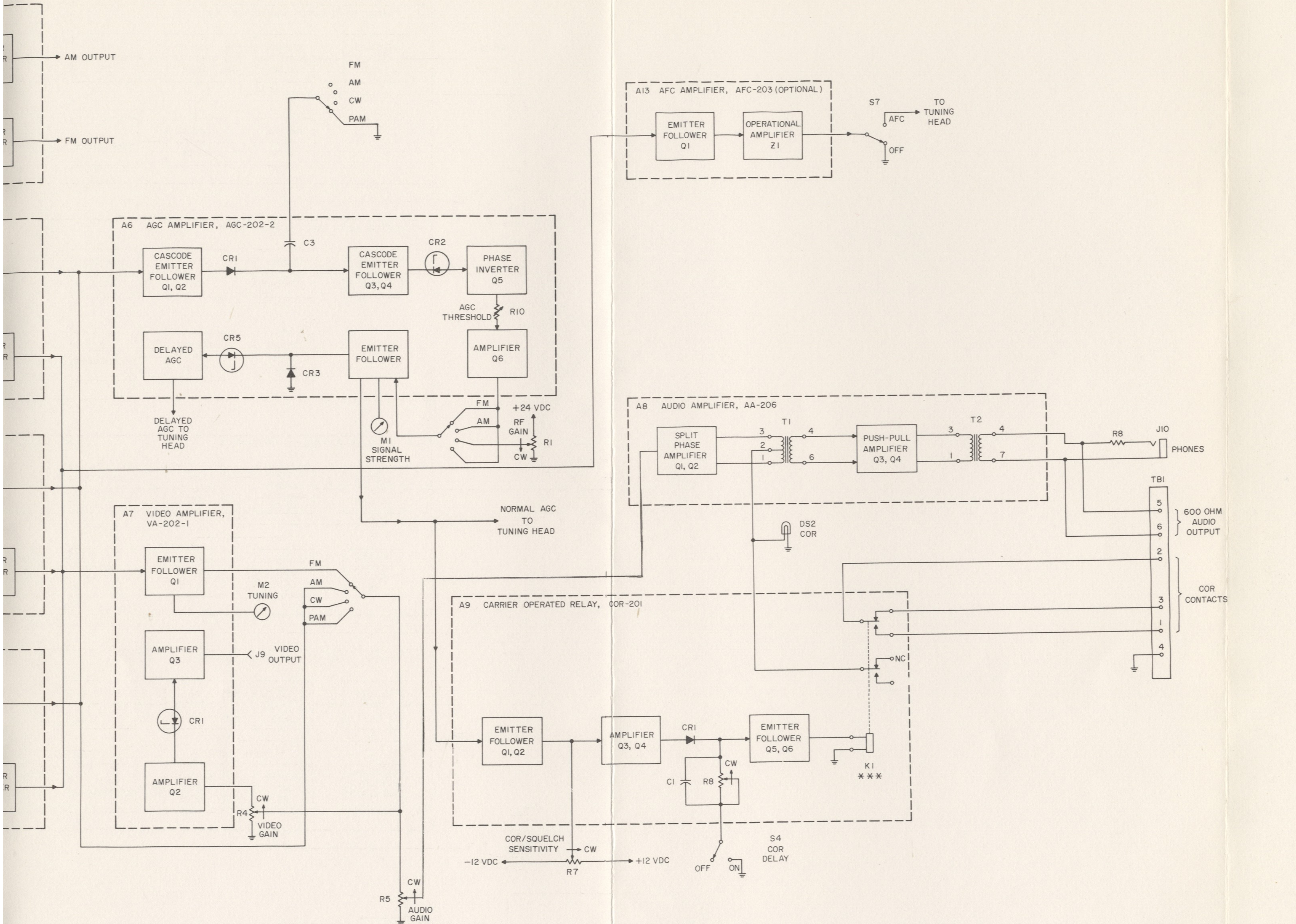


Figure 4-1. SR-209 Functional Block Diagram.



A5 ARE INTERCHANGEABLE.

ILY IS USED WITH SH-100 SERIES
ADS.

DEENERGIZED.

SECTION IV

THEORY OF OPERATION

1. Functional Description

The receiver covers the 1.5 to 4000 MHz frequency range using plug-in tuning heads and is capable of FM, AM, CW and PAM operation. Information on the tuning head(s) and other plug-in modules supplied with your SR-209 receiver are in a separate instruction manual. Depending on the tuning head in operation, an IF signal of 21.4 MHz or 0.455 MHz is applied to the IF amplifier printed circuit assembly on the main receiver chassis. A functional block diagram is shown in Figure 4-1.

Three IF amplifier modules may be installed in the receiver. Available, are modules with bandwidths from 1 KHz to 4000 MHz. For use with the SH-200 series tuning heads, 21.4 MHz IF output, are the IF-212, IF-211 and IF-210 or IF-215 families. The IF-212 (wideband) family includes IF amplifier modules whose bandwidth is greater than 300 KHz. Medium bandwidth IF amplifiers, IF-211 family, provide bandwidths from 50 to 100 KHz. The narrow band IF-210 and IF-215 families provide bandwidths less than 50 KHz. The IF-112 family is used with the SH-100 series tuning heads, 0.455 MHz IF output. Bandwidths from 1 to 10 KHz are in this family.

The complete designation for an IF amplifier module includes the family number (IF-212) followed by a number (-300) which indicates the bandwidth in KHz. Since it would be impractical to include a discussion for all IF amplifier modules in one manual, typical descriptions of those most commonly used are provided in paragraphs 2, 3, 4 and 5.

The IF-212 amplifier family has two stages of 21.4 MHz amplification before the AM detector and FM limiter. The demodulated AM and FM outputs are supplied through emitter followers. In the IF-211 amplifier family, the input 21.4 MHz IF signal is mixed with an 18.9 MHz local oscillator signal and converted to an IF of 2.5 MHz. After amplification, the IF signal is applied to the AM detector and FM limiter. A 2.5 MHz beat frequency oscillator provides CW demodulation. Its output is applied to the AM detector. Like the IF-212 amplifier family the demodulated AM and FM outputs are also through emitter followers. Input signal conversion in the IF-210 and IF-215 amplifier families results in an IF of 1.65 MHz. Obtained by mixing the 21.4 MHz input signal with a local oscillator operating at 19.75 MHz. As in the IF-211 amplifier family, the mixer output is amplified prior to AM detection and FM limiting. Beat frequency oscillator output at 1.65 MHz is applied to the AM detector for CW demodulation. AM and FM outputs are supplied through emitter followers. When a 0.455 MHz IF input is applied to the IF-112 amplifier family, the IF bandwidth is immediately established by an input mechanical filter. After filtering, the signal is applied to two cascode amplifier stages for gain and then to the AM detector and FM limiter which follow.

To provide CW demodulation, the output from a 0.455 MHz beat frequency oscillator is applied to the AM detector through the second cascode amplifier stage. Low impedance emitter follower outputs are employed.

From the IF amplifier, the dc component of the demodulated AM output is applied to the AGC amplifier. The input to the AGC module is amplified for normal AGC output. This signal is used to control the preamplifier and the first to second IF converters and is the input signal to the carrier operated relay and squelch amplifier. A portion of the normal AGC voltage is sampled for SIGNAL STRENGTH meter indications. Delayed AGC outputs are also generated for application to the tuners to prevent deterioration of the signal to noise ratio during low level signal reception. Pulse AGC operation is obtained through modification of the input amplifier circuit characteristics by external switching. RF GAIN, provides a manual gain control adjustment for CW operation.

The demodulated FM, AM, CW or PAM signals are applied to the video amplifier and the audio amplifier modules through the VIDEO GAIN control and the AUDIO GAIN control. The video amplifier module provides gain, impedance matching and center frequency TUNING meter indications. Output is also provided to the rear panel VIDEO OUTPUT connector. The audio amplifier module is operative when the COR/squelch amplifier module is energized. The audio output from this module will drive a 600 ohm load attached to terminals 5 and 6 of TB1 and a headset connected to the front panel PHONES jack.

The AFC amplifier is an operational amplifier and the input signal is derived from the demodulated FM output of the operating IF amplifier. The amplifier is connected in a non-inverting configuration with an emitter follower input. The output from the amplifier is through AFC switch S7 to the local oscillator in the operating tuning head for use during FM reception.

The COR/squelch amplifier module permits operation of remote sensing equipment. TB1 terminals 1, 2 and 3 are the COR contacts.

Power supply circuits for the receiver and plug-in modules are contained on three printed circuit assemblies. The input to these assemblies is from the external power source through power cable W2, 115/230 vac switch S5, S6, line fuse F1, F2 and power transformer T1.

The ±12 volt power supplies are identical except for their ground point connection to the chassis to provide opposite output polarity voltages. Each power supply consists of a bridge rectifier, a control amplifier, a driver and a chassis mounted series regulator.

The +24 volt supply employs a bridge rectifier, an emitter follower, two Zener diode regulators and a chassis mounted series regulator.

Each power supply bridge rectifier output contains a 1/2 ampere fuse, for protection.

2. Typical Wideband IF Amplifier, IF-212-300

A. Similarities and Differences Between IF-212-300 and Other Wideband Amplifiers

All IF amplifiers of the IF-212 family employ an identical number of stages mounted on a standard plug-in printed circuit assembly which measures 8 inches by 2-1/2 inches. Standard component symbol sequences are followed through out. The FM output emitter follower for both the IF-212-300 and the IF-212-4000 module is always Q10. The differences between IF-212-300 and other IF amplifier modules of the same family (which are IF-212-500, IF-212-1000, IF-212-2000, IF-212-3000 and IF-212-4000) are listed as follows: the bandwidths are different, therefore, the components associated with the coupling circuits change in value. The overall gain of the module decreases as the bandwidth increases. The overall gain (AM output) of the IF amplifier module with the widest bandwidth, 4 MHz is approximately 55 db.

B. IF-212-300, Functional Circuit Description

(1) Introduction: The 300 KHz IF amplifier consists of two 21.4 MHz cascode amplifier stages (each stage followed by an LC type double tuned circuit), an AM detector and video amplifier, two cascode limiter stages, a demodulator and an FM video amplifier.

(2) 21.4 MHz Amplifier: The 21.4 MHz output from the tuning head is applied to Q1 via an impedance matching network consisting of R1, R2 and R3. Two stages of amplification at 21.4 MHz are before the AM detector and FM limiter. Q1 and Q2, in cascode, form the first 21.4 MHz amplifier; Q3 and Q4, another cascode, the second. A double tuned circuit between the first and second amplifiers and another double tuned circuit at the output provide a 3 db bandwidth of 300 KHz. AM detector input is derived from the high side of L4. FM limiter input is tapped from the junction of C18 and C19.

(3) AM Detector and Video Amplifier: CR1, whose input is from the 21.4 MHz IF amplifiers, operates as the AM detector. The filter network for modulation recovery is provided by R24 and C20. The detected output is developed across the input of AM video amplifier, Q5 operated as an emitter follower. The low impedance output is coupled through L5, which filters out the IF signals, to the AGC, video and audio amplifier modules.

(4) FM Limiters and Demodulator: Limiting for the FM demodulator is provided by Q6 and Q7, the first, and by Q8 and Q9, the second limiter. The demodulator circuit consists of diodes CR2, CR3 and associated circuits. Q6 and Q7 and Q8 and Q9 are connected in cascode. A broad-band single tuned circuit consisting of L6 and C27 couples the 21.4 MHz signal from the first to the second limiter. As a result of the two stage limiting action, a constant drive to the demodulator is maintained throughout the dynamic range of the receiver. The FM demodulator is a Travis type, a variation of the popular Foster-Seely discriminator. Second limiter output is developed across a 21.4 MHz single tuned circuit and is simultaneously coupled to two secondary circuits via C36 and C37. The demodulator output response is that of an S curve. L8 tunes to the center, or zero crossing point and L10 and L11 tune to the two peaks. Peak separation is about 750 KHz. CR2 and CR3 are for phase detection. RC networks, R46 and C40 at CR2 output and R47 and C41 at CR3 output provide modulation recovery. The demodulated FM signal is applied to Q10 for impedance transformation and then to the video and audio amplifiers.

(5) FM Video Amplifiers: Demodulator output is applied to FM video amplifier Q10, an emitter follower. The emitter of Q10 is filtered through L12. L12, a 21.4 MHz self resonant choke prevents IF signal application to the FM output. FM video signals are delivered to the audio and video amplifier modules through front panel switching. Signal output nearly equals the input, although its impedance is at a much lower level.

3. Typical Medium Bandwidth IF Amplifier, IF-211-100

A. Similarities and Differences Between IF-211 and Other Medium Bandwidth Amplifiers.

All IF modules of the IF-211 family employ an identical number of stages mounted on a standard plug-in printed circuit assembly which measures 8 inches by 2-1/2 inches. Identical component symbol sequences are followed throughout. The FM output emitter follower for both the IF-211-100 and the IF-211-75 and other LC type medium bandwidth IF modules (such as IF-211-50 and IF-211-250) is always Q10. The basic difference between the IF-211-100 and other IF-211 amplifiers are as follows: the bandwidths are different, therefore, the values of the components associated with the coupling circuits increase as the bandwidth increases. The overall gain (AM output) of the IF amplifier module with the widest bandwidth, 250 KHz, is approximately 60 db.

B. IF-211-100, Functional Circuit Analysis

(1) Introduction: The 100 KHz IF amplifier consists of a mixer, an 18.9 MHz crystal controlled local oscillator, a 2.5 MHz IF amplifier and AM detector, a 2.5 MHz beat frequency oscillator, an AM video amplifier, an FM limiter, a demodulator, and an FM video amplifier.

(2) Mixer: The 100 KHz IF amplifier input to Q2 is through a resistive network and a double tuned circuit. R1, R2, and R3, presents a 50 ohm impedance for the tuning head output. Both primary and secondary of the input double tuned circuit have the pi configuration to provide impedance step up in the primary and impedance step down in the secondary. Q2 and Q3 form a cascode mixer. The incoming 21.4 MHz signal and the 18.9 MHz signal from crystal oscillator, Q1, are simultaneously applied to the base of Q2 to produce the final IF, 2.5 MHz signal. Q3 output is to Q4 via a double tuned circuit centered at 2.5 MHz. L3 and C13 make up the primary; L4, resonated by C15, C16, and C50, the secondary. The output from this circuit is applied to the 2.5 MHz IF amplifier Q4.

(3) 18.9 MHz Crystal Controlled Local Oscillator: To convert the incoming 21.4 MHz signal to the final IF of 2.5 MHz, a 18.9 MHz local oscillator signal is generated by Q1 and applied to the mixer for heterodyning action. Y1, a parallel mode fundamental crystal is connected across C6 and C7. The ratio of C6 to C7 determines the amount of feedback to sustain oscillation. Oscillator output to the mixer is through C9.

(4) 2.5 MHz IF Amplifier and AM Detector: The 2.5 MHz IF signal is coupled to amplifier Q4 through attenuator R12. Q4 and Q5 are connected in cascode. Q5 output is developed across a double tuned circuit, L5 and L6 being the two windings. Input to the AM detector is derived from the secondary, and the input to the FM limiter is tapped from the secondary at the junction of C23 and C24. When the receiver is operated in CW mode, a beat frequency oscillator signal is applied to this circuit through C22. Diode CR2 is the AM detector with filtering by C28, R20, and C31. L7 in parallel with C29 resonates at the IF frequency of 2.5 MHz, assuring that the IF signals are not coupled into the video amplifier circuits. AM detector output is developed across the input of emitter follower, Q7.

(5) 2.5 MHz Beat Frequency Oscillator: Q6, the beat frequency oscillator, is crystal controlled at 2.5 MHz. Y2, a parallel mode fundamental crystal, is connected across C25 and C26. The ratio of C25 and C26 determines the amount of feedback for oscillation. When the receiver mode is switched to CW, +12 volts is applied to the collector of Q6 through CR3, and the oscillator becomes energized. At this time, CR1 is reverse biased. When not in the CW mode, -12 volts is applied to reverse bias CR3 and protect Q6. Now, CR1 is forward biased, effectively shorting out crystal, Y2, so that it will not create a "hole" in the passband of the signal path. Since the beat frequency oscillator is crystal controlled, the beat frequency is obtained by varying the first local oscillator of the tuning unit with the front panel BFO PITCH control.

(6) AM Video Amplifier: AM video amplifier Q7 operates as a dc coupled emitter follower. The output from AM detector CR2 is coupled directly to the base. The collector of Q7 is bypassed by C33. Low impedance output is coupled through switching circuits to the AGC amplifier and the video and audio amplifiers modules.

(7) FM Limiter, Demodulator and Video Amplifier: Signal tapped from the secondary of the 2.5 MHz double tuned circuit is input to the limiter, Q8 and Q9 in cascode. Both are biased to limit when the incoming signal to the tuning heads barely rises above noise level. Regardless of input level, the limiter output delivers constant drive to the FM demodulator. The FM demodulator is a Travis type, a variation of the Foster-Seely discriminator. Q9 output is developed across a tuned circuit centered at 2.5 MHz and coupled to two secondary circuits via C38 and C39. L8 tunes to 2.5 MHz, and L9 and L10 tune to the two peaks of the demodulator S curve. The separation between the two peaks is about 200 KHz. CR5 and CR6 are for phase detection. FM demodulator output is coupled to the FM video amplifier via a filtering network consisting of L11, C44, R32, and C46. L11, in parallel with C44 resonates at the IF frequency of 2.5 MHz to avoid application of the IF signal to the video circuits. Q10, an emitter follower supplies direct coupled FM dc video output.

4. Typical Narrow Bandwidth IF Amplifiers IF-210-20 and IF-215-10

IF amplifiers IF-210 and IF-215 employ an identical number of stages as that of the IF-211 family. The difference is that the 21.4 MHz IF is converted to 1.65 instead of 2.5 MHz. Therefore, the crystal frequencies of Y1 and Y2 are 19.75 and 1.65 MHz respectively. Circuit theory, Section IV, paragraph 3, is applicable to these amplifiers. Electrically they are identical, except for the type of material employed in the tuning circuits.

5. Typical Narrow Bandwidth IF Amplifier, IF-112-10

A. Similarities and Differences Between IF-112-10 and Other Narrow Bandwidth Amplifiers

All IF amplifier Modules of the IF-112 family employ an identical number of stages mounted on a standard plug-in printed circuit assembly which measures 8 by 2-1/2 inches. Standard component symbol sequences are followed throughout. The input filter for the IF-112-10, IF-112-05 and the IF-112-01 is always labeled FL1. The basic difference between the IF-112-10 and other IF-112 amplifiers are as follows: The bandwidths are different, therefore, the input mechanical filter, FL1, which establishes the bandwidth is different for each amplifier. The overall gain (to AM output) of the IF amplifier with the widest bandwidth, 10 KHz, is 62.5 db. The input center frequency is 0.455 MHz.

B. IF-112-10, Functional Circuit Description

(1) Introduction: The 10 KHz IF amplifier consists of a 10 KHz bandwidth mechanical filter, two 455 KHz amplifier stages in cascode, an AM detector and output video amplifier, a beat frequency oscillator, a cascode limiter, a demodulator and an FM video amplifier.

(2) Input Mechanical Filter: The input to the 10 KHz IF amplifier is 0.455 MHz and is applied to filter FL1. R1 provides a static discharge path to ground for the input coaxial line and also the proper loading impedance. FL1 is internally terminated and requires a minimum input and output impedance termination of 50,000 ohms for proper operation. The input impedance network consists of L1 and capacitors C1 through C4 with C3 providing an input 0.455 MHz center frequency adjustment. Terminating the filter output is a network consisting of C5, C6 and L2. Output frequency adjustment is by C5. C7 provides a low impedance path to match Q1 base input. The mechanical filter consists of a series of highly selective resonant nickle-alloy discs with Q's from 8,000 to 12,000, the disc coupling rods and transducers to convert electrical oscillations into mechanical oscillations and vice versa. In addition to the electrical and mechanical conversion, the transducer provides termination for the mechanical network. The overall bandwidth of the filter is directly proportional to the size of the coupling rods. The 60 to 6 db bandwidth shape factor is as low as 1.2 to 1 and the passband ripple is 1.5 db or less.

(3) 0.455 MHz Cascode Amplifier: From the filter, the IF signal undergoes two stages of amplification prior to AM detection and FM limiting. Q1 and Q2 in cascode form the first 0.455 MHz amplifier stage, and Q3 and Q4, another cascode the second. Both stages operate as a linear Class A high gain amplifier. There is a single tuned circuit between the first and second amplifiers and a double tuned circuit at the output. L3 and L4 permit a 0.455 MHz center frequency adjustment with R6 and R14 providing a damping effect on the tuned circuits and a bandwidth of approximately 60 KHz. R12 in Q3 emitter is adjusted to standardize the gain of the IF amplifier. The resistor has a gain control range of ±6 db and is adjusted for 62.5 db as measured between the IF amplifier input pin A3 and AM output pin B4. When the receiver is operated in the CW mode, a beat frequency oscillator signal is applied to the base of Q3 through C17. The input to the AM detector is derived from the low side of L4 and the input to the FM limiters is tapped from the junction of C18 and C19.

(4) AM Detector and Output Video Amplifier: Diode CR2 is the AM detector with filtering provided by C22, C26 and R20. C23 in parallel with L6 resonates at the IF frequency of 0.455 MHz to prevent the IF carrier from being coupled into the video amplifier circuit. The detected output of CR2 is developed across the input of emitter follower Q6 whose output is directly coupled to pin B4 AM output.

(5) 0.455 MHz Beat Frequency Oscillator: Q5, the beat frequency oscillator is crystal controlled at 0.455 MHz. The resonant tank circuit consists of Y1, a parallel mode fundamental crystal connected across C20 and C21. The tank circuit is tapped at the junction of C20 and C21, whose ratio determines the feedback for oscillation. When the receiver mode is switched to CW, +12 volts is applied to the collector of Q5 through CR3, and the oscillator becomes energized. At this time CR1 is reversed biased. In other modes of operation, -12 volts is applied to reverse bias CR3 which protects Q5. Now CR1 is forward biased, effectively shorting out crystal Y1 so that it will not create a "hole" in the passband of the signal path. During CW operation the beat frequency is obtained by varying the first local oscillator of the tuning head with the front panel BFO PITCH control.

(6) FM Limiter Demodulator and Video Amplifier: Signal tapped from the junction of C18 and C19 is fed to the limiter which consists of Q7 and Q8 in cascode. Q7 and Q8 are biased to limit when the incoming signal to the tuning head barely rises

above noise level. Regardless of the input level, the limiter supplies a constant drive to the FM demodulator. The FM demodulator is a Travis type, a variation of the Foster-Seely discriminator. The output of Q8 is developed across a single tuned circuit centered at 0.455 MHz and is simultaneously coupled to two secondary circuits via C32 and C35. L7 tunes to 0.455 MHz and L8 and L9 tune to the two peaks of the demodulator S curve. The separation between the two peaks is approximately 60 KHz. CR4 and CR5 are for phase detection. FM demodulator output to the FM video amplifier via a filtering network consisting of L10, C41, R31 and C42. C41 across L10 resonates at the IF frequency of 0.455 MHz to avoid application of this frequency to the video amplifier. Q9 operates as an emitter follower. R32 in Q9 base is adjusted to set a reference level for the FM dc video of 0 volts in Q9 emitter.

6. AGC Amplifier, AGC-202-2

Nine transistors comprise the AGC amplifier module. Signal source is detected AM output of the operating IF amplifier module. During PAM mode of operation, C3 is grounded and Q1 through Q4 form a pulse stretcher network. During other modes of operation, C3 is not grounded, and Q1 through Q4 function as cascaded emitter followers. Q5 and Q6 are dc amplifiers. Together with the two modulation filters and the AGC threshold control potentiometer, R10, they supply the required AGC voltage to the base input of Q7 for FM, AM and PAM modes of operation. In the CW mode of operation, pins B5 and B6 are no longer electrically shorted and a dc voltage from the RF GAIN control is applied to the base of Q7.

Q7 and Q8 are cascoded emitter followers which produce the AGC output voltage at a low impedance level. The output of Q8 supplies the normal AGC voltage to the IF amplifier in the tuning head, the voltage to drive the SIGNAL STRENGTH meter, and the signal to the delayed AGC circuit.

The delayed AGC circuit consists of a Zener diode providing a 3 volt delay and emitter follower, Q9. The output of Q9 supplies delayed AGC to the tuning head to prevent deterioration of the signal-to-noise ratio during low signal level reception.

7. Video Amplifier, VA-202-1

The video amplifier board consists of two separate circuits. Q1 is an emitter follower which obtains its input signal from the demodulated FM output from the operating IF strip. The output of Q1 is directly coupled to the TUNING meter. The demodulated AM or FM signal is fed to the input of Q2 through various switch and control paths. Amplifiers Q2 and Q3 form a feedback pair. Current feedback is accomplished from the unbypassed emitter of Q3 to the base of Q2 through R5 which determines the amount of feedback. The overall gain of the amplifier-pair is approximately 20 db. The maximum video output is a 5 volt peak-to-peak signal when terminated in a 93 ohm load. The overall frequency response is approximately 20 Hz to 4 MHz.

8. Audio Amplifier, AA-206

The audio amplifier consists of a split phase amplifier, a push-pull amplifier and two audio transformers. Input from AUDIO GAIN control is supplied amplifier Q1 through C1, R1. Floating paraphase inversion by Q1, Q2 stage produces balanced dc current for input transformer T1. Q1 emitter current changes at audio frequency causes an audio voltage drop across C5 which is reflected as inverted input to Q2. Push-pull (balanced) output is supplied T1 and primary dc saturation is prevented. T1 output drives push-pull amplifier Q3, Q4. Negative feedback through C5, R9 around Q3 and C6, R12 around Q4 reduces distortion and further enhances gain in the Q3, Q4 stage. Bias is adjusted by R13 during alignment. Push-pull output transformer T2 provides impedance transfer to the 600 ohm speaker line. A 150 ohm tap is also available.

9. Carrier Operated Relay, COR-201

The carrier operated relay input is derived from the normal AGC voltage supply line. Transistors Q1 and Q2 are cascoded emitter followers. From Q2, the output is coupled to amplifier Q3, which serves as a phase inverter. A variable DC voltage, derived from front panel COR control potentiometer, is applied to pin 3 and controls the COR amplifier trigger threshold. The output of Q3 is directly coupled to amplifier Q4 whose output is coupled to cascode emitter followers, Q5 and Q6, via diode detector, CR1. When the COR delay is used, pin 5 is shorted to ground, and the circuit composed of CR1, R7, R8, and C1 functions as a pulse stretcher. Potentiometer R8, mounted on the plug-in module is adjusted to provide from 3 to 10 seconds of delay.

The +24 vdc power supply of audio amplifier module (AA-206) is controlled by the COR. The audio amplifier is in operation when the COR is energized.

10. ±12 VDC Power Supplies, PS-103

The same plug-in type circuit board is used for either polarity supply, with different external ground connections. In addition to the components on the module, each supply has its associated series regulator transistor and filter capacitor located on the main chassis adjacent to the plug-in boards.

Z1 consists of four diodes which form a full wave rectifier bridge circuit. The rectifier output is approximately 18 vdc unregulated. Regulation to ±12 vdc is obtained in the circuitry consisting of Q2, the control amplifier, Q1 the driver, and the main chassis mounted series regulator. Resistor divider network R4, R5, R6 and R7 form the sensing circuit of the regulator. R5 is initially adjusted to provide 12 vdc at the supply output under full load conditions. With a change in line or load conditions, any increase in voltage is coupled to the base of Q2 by the sensing network. At the base of Q2 the level is increasing with respect to its reference diode in the emitter circuit, therefore, the current through Q2 increases. This increase in collector current decreases the voltage at the collector of Q2 and at the base of Q1 decreasing the collector current of Q1. Since the emitter of Q1 is connected to the base of the series regulator, the series regulator is driven toward cutoff. The ac hum and ripple content in the power supply output is less than 10 millivolts rms. Due to the high gain and stability of the regulator circuit, the power output regulation is better than ± 5% of the normal output voltage for an input line voltage variation of ±10%.

11. 24 VDC Power Supply, PS-104

The +24 volt power supply is a simple Zener controlled circuit with no error voltage amplification included. Z1, which contains four diodes, serves as a full wave rectifier bridge circuit. A filter capacitor, located on the receiver main chassis and connected to the output of the bridge rectifier, together with board components R1, R2, C1 and C2 provide the filtering action. The combination of Zener diodes CR1 and CR2 provides a 25 volt reference source and is connected directly to the base of the emitter follower Q1. The emitter of Q1 is then clamped at 24.4 volts which, in turn, is the base voltage of the series regulator transistor located on the main chassis. The 24.4 volt base voltage, after subtraction of the base to emitter voltage drop of the series regulator establishes the +24 volt output from the supply.

The +24 volt power supply circuit board, PS-104, also contains a 1/2 ampere fuse, F1, which is designed to protect the transistor Q1 in the event that a diode failure occurs in Z1 or a short circuit appears in the +24 vdc power supply wiring.

12. AFC Amplifier, AFC-203 (Optional)

An optional AFC capability by AFC amplifier AFC-203 provides a reference level to automatically control local oscillator frequency (tuning head) for FM reception.

AFC amplifier input is FM video applied through R1 to emitter follower Q1. Q1 output across R4 to ground feeds + IN terminal of operational amplifier Z1 whose - IN terminal is identical, across R6 to ground. The operational amplifier has two identical input channels which function in push-pull. A single ended output represents the amplified difference between the two input channels. This cancels hum or other internal interferences, since those common mode signals appear in phase to the amplifier inputs. The operational amplifier uses negative feedback and a gain factor of 20 is determined by the ratio of R6 and R7.

Z1 output is coupled through RC filter R9, C1 and C2 and AFC switch S7 to the local oscillator circuit in the tuning head. The AFC output signal will cause the local oscillator frequency to change according to polarity and amplitude of AFC signal; maintaining on-station tuning automatically.

SECTION V

MAINTENANCE

1. General

VHF/UHF Receiver SR-209, prior to its release from the factory, was carefully aligned and tested to a rigid set of specifications. Consequently, upon receipt of the receiver there should be few, if any, reasons for repair. In the event however, during the operating life time of the receiver, that a malfunction does occur, this section of the manual provides alignment instructions as well as normal transistor operating voltages.

Maintenance procedures for the plug-in tuning head modules are contained in the instruction manual for the tuning head.

2. Troubleshooting

For troubleshooting, a thorough knowledge of the theory of operation given in Section IV and familiarity with the schematics contained in Section VII are essential. Considering the modular construction, troubleshooting techniques are different from those used on conventional non-modular type receivers. In modular receivers, it is more practical to isolate the difficulty to a particular module than to a particular component. As a first step, check the condition of all connectors and cables used in delivering signals to, or outputs from the receiver. Use of the front panel controls and meters will also provide indications of module malfunction. When a malfunction has been isolated to a module, the module should be replaced with one in known working order, and the receiver replaced in service. The defective module may then be returned to the factory repair facility, or, the user may elect to repair the module himself.

Variable circuit components have only a limited range of adjustment, and provide means for setting the bias levels and aligning the receiver. If a module, or the complete receiver is inoperative, adjustment of these controls will seldom, if ever, restore normal operation. Downtime of the receiver can be minimized by locating and correcting the cause before any internal adjustments are made.

When a module shows up faulty, refer to the paragraph in this section of the manual about the module to affect repair. Faulty circuit components can be located by the normal operating transistor voltage tables. Voltage measurements which deviate significantly from those shown, indicate a source of trouble. After the faulty component is replaced, the module is restored to normal operation by the alignment procedure.

When the receiver is completely inoperative, troubleshoot the power supplies first. Check line cord, fuses, and the output voltages. Components in the power supply can usually be replaced without effecting circuit alignment. After component replacement, check the output voltage to assure that it is within the specified limits. If the voltage is within the specified limits, do not attempt to align these adjustments, because no improvement in the operating performance of the receiver can be expected.

A card extender facilitates voltage measurements. It positions the printed circuit module above the main receiver chassis to permit access to the component being measured. Encapsulated component voltage measurements are made on the pins of the printed circuit board receptacle.

3. Test Equipment

Test equipment required for maintenance and troubleshooting is shown in Table 5-1. The test frequencies, output voltages and response curves presented in this section, result from the use of this test equipment. In the event of test equipment substitution, it may be found necessary to alter the test procedure accordingly. Of importance in the selection of equivalent test equipment is that it has equal or greater accuracy.

In addition to the major items of test equipment listed in Table 5-1, other items required include interconnecting cables and an adequate supply of connectors and adapters.

Table 5-1. Test Equipment Required.

Equipment	Model	Mfg.	Required Characteristics
Sweep Generator	SM-2000 with L-1 and L-4 plug-in heads	Telonic	Freq Range: L-1 Head 400 KHz to 1.8 MHz, L-4 Head 10 MHz to 40 MHz Sweep Rate: 0.01 to 100 Hz RF Attenuation: 0 to 60 db in 1 db steps Mkr System: Crystal plug-in, 1 and 10 MHz harmonics Sweep Output: 50 ohms, typically 1 vrms Scope Horizontal Output: 15 volts p-to-p

Table 5-1. Test Equipment Required. (Cont)

Equipment	Model	Mfg.	Required Characteristics
Signal Generator	606A	Hewlett-Packard	Freq. Range: 50 KHz to 65 MHz in six bands RF Output: 0.1 uv to 3 volts Modulation: AM, 0 to 100%, 400 and 1000 Hz; external 0 to 100%, dc to 20 KHz Output Impedance: 50 ohms
Oscilloscope	503	Tektronix	Freq. Range: dc to 450 KHz Vertical Sensitivity: 1 mv/cm to 20 volt/cm Sweep Range: 1 microsecond/cm to 5 sec/cm Input Impedance: 1 meg ohm shunted by 47 pf
VTVM	WV-98C	RCA	Range: 0 to 1500 volts, ac and dc, 0 to 1000 meg ohms Input Resistance: 11 meg ohms dc Freq. Range: 30 Hz to 3 MHz Accuracy: ±3%

4. Preliminary Procedures for Measurement and Alignment

Place the receiver on a workbench adjacent to the test equipment being used. Remove top and bottom covers from the receiver. Use a card extender to position the module above the main receiver chassis. Set the front panel controls as follows:

POWER	BOTH
FM-AM-CW-PAM	AM
IF BANDWIDTH	As required
RF GAIN	Fully clockwise
VIDEO GAIN	Centered
AUDIO GAIN	Centered
COR SQUELCH SENS	Counter clockwise

5. ±12 Volt Power Supply, PS-103

A. Normal Operating Voltages

Two PS-103 Power Supply modules provide the ±12 volt dc voltages. Table 5-2 is a tabulation of the dc voltages measured on the transistor elements. Measurements were made with an RCA Senior Voltohmyst Model WV-98C and are referenced to chassis ground. Refer to paragraph 4 for control settings.

Table 5-2. PS-103 Transistor Voltages.

Transistor Symbol Number	Emitter	Base	Collector
12 Volt Power Supply			
Q1 Q2	12.8 6.6	13.5 7.2	21.8 13.5
-12 Volt Power Supply			
Q3 Q4	12.8 6.6	13.5 7.2	21.8 13.5

B. Power Supply Adjustment

Measure the output voltage to determine if it is within tolerance. Use an RCA Senior Voltohmyst Model WV-98C or equivalent. Measure output of plus 12 volt power supply at pin 10 module A12; minus 12 volts is measured at pin 5 module A13. Measured voltage should be 12 ±0.5 volts. Adjust resistor R5 on the printed circuit assembly to provide a normal voltage.

6. 24 Volt DC Power Supply, PS-104

A. Normal Operating Voltages

Table 5-3 is a tabulation of the dc voltages measured on the transistor elements. Measurements were made with an RCA Senior Voltohmyst Model WV-98C and are referenced to chassis ground. Front panel controls were positioned as indicated in paragraph 5, A.

B. Power Supply Adjustment

The output of the 24 volt power supply is measured at pin 3 module A14. No provision has been made to permit adjustment. When this voltage, measured with an RCA Senior Voltohmyst Model WV-98C varies more than 24 ±1 volt, the power supply should be replaced or repaired.

Table 5-3. PS-104 Transistor Voltages.

Transistor Symbol Number	Emitter	Base	Collector
Q1	37.5	24.2	25

7. IF-212 Family IF Amplifiers

A. Normal Operating Voltages

The IF-212 family of IF amplifiers utilize the same circuit board configuration. Transistor voltages in Table 5-4 are applicable to the IF-212 family. Voltages were measured to chassis ground using an RCA Senior Voltohmyst, Model WV-98C. Refer to paragraph 4 for control settings.

Table 5-4. IF-212 Family Transistor Voltages.

Transistor Symbol Number	Emitter	Base	Collector
Q1	-4.6	-3.9	-0.7
Q2	-0.7	GRD	7.3
Q3	-4.8	-4.1	-0.7
Q4	-0.7	GRD	7.9
Q5	-0.7	0.2	11.4
Q6	-2.5	-1.8	-0.7
Q7	-0.7	GRD	4.9
Q8	-2.6	-2.2	0.5
Q9	-0.5	GRD	8.0
Q10	-0.5	0.2	12.0

B. Module Alignment

The alignment procedures for IF-212 family are identical with exception of bandwidth and overall gain, Table 5-5. Prior to actual alignment, refer to paragraph 4.

Table 5-5. IF-212 Family Amplifier Characteristics.

IF Amplifier	3 DB Bandwidth (KHz)	Gain (db)
IF-212-300	300 ±10%	56 ±3
IF-212-500	500 ±10%	56 ±3
IF-212-1000	1000 ±10%	48 ±3
IF-212-2000	1500 p-to-p ±10%	46 ±3
IF-212-3000	2500 p-to-p ±10%	48 ±3
IF-212-4000	3500 p-to-p ±10%	47 ±3
IF-212-8000	7500 p-to-p ±10%	42 ±3

C. AM Alignment

(1) Connect the test setup as shown in Figure 5-1.

(2) Set and calibrate the 606A signal generator for 21.4 MHz.

(3) Set oscilloscope for full scale horizontal sensitivity and 0.5 volt/cm vertical sensitivity.

(4) Adjust sweep generator frequency to 21.4 MHz and the output to display a 4 cm oscilloscope response. Adjust marker gain control to display a 21.4 MHz center frequency marker on the response.

(5) Adjust L1, L2, L3 and L4 for optimum symmetrical response centered around the 21.4 MHz marker, Figure 5-2.

D. FM Alignment

(1) Maintain test equipment setup and control settings used for AM alignment.

(2) Move probe to FM test point, Figure 5-1. Position mode selector to FM.

(3) Adjust L10 and L11 to center the discriminator response around the 21.4 MHz marker.

(4) Adjust L6 and L8 for maximum linearity of response for the bandwidth indicated, Table 5-6 and Figure 5-3.

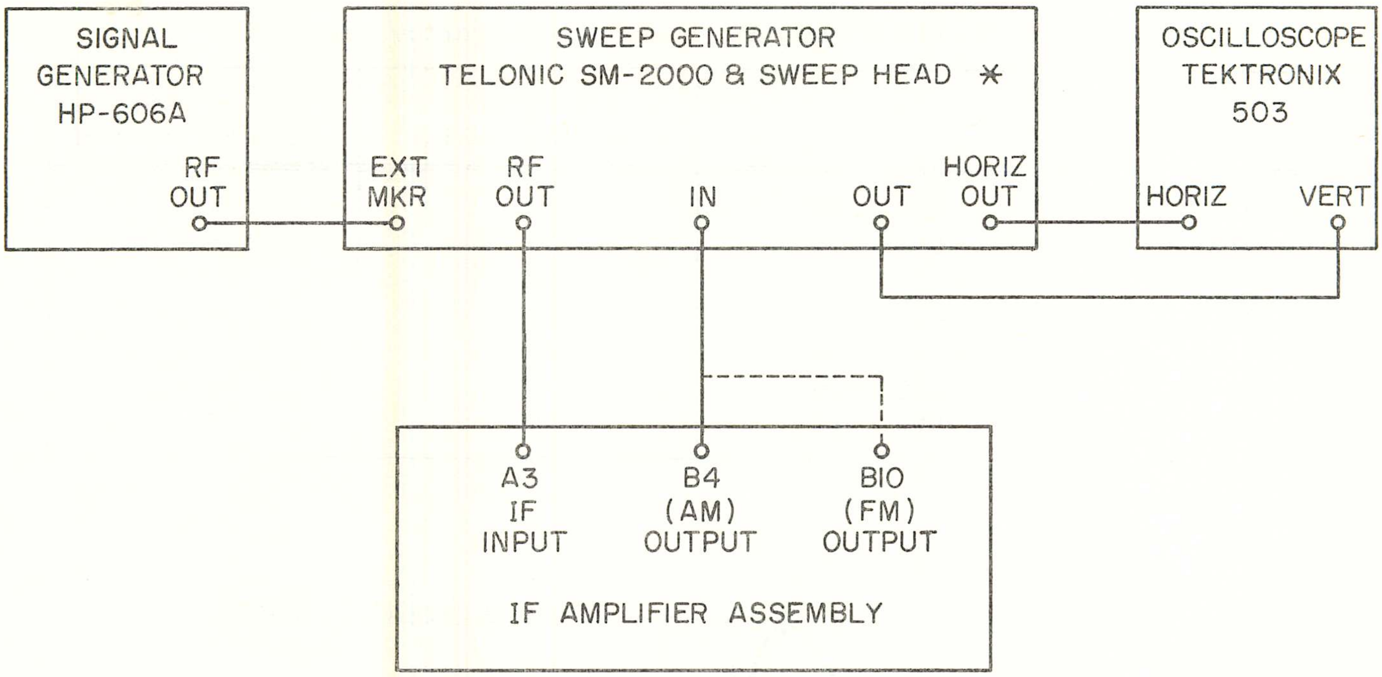


Figure 5-1. IF Amplifier Alignment Test Setup.

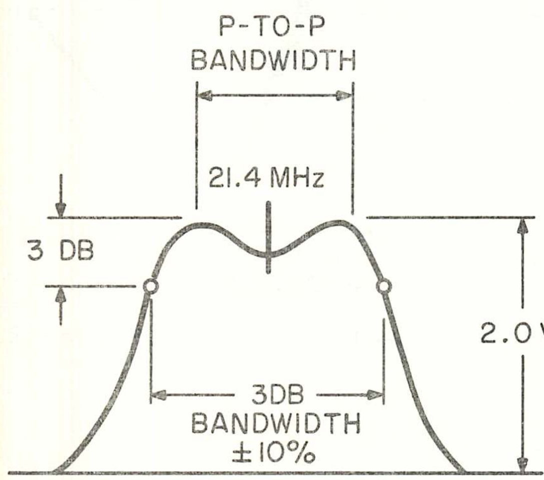


Figure 5-2. IF-212 Family AM Response.

NOTE: * L-1 sweep head should be used for IF-112 type IF amplifier alignment; L4 sweep head should be used for IF-210, IF-211, IF-212, and IF-215 type IF amplifier alignment.

Table 5-6. IF-212 Family FM Response Characteristics.

IF Amplifier	p-to-p Separation (KHz)	Maximum Linearity (KHz)	p-to-p 1/3 bw from cf
IF-212-300	600 ±10%	±100	3.3
IF-212-500	950 ±10%	±160	3.5
IF-212-1000	2000 ±10%	±330	1.2
IF-212-2000	2500 ±10%	±660	1.2
IF-212-3000	4000 ±10%	±1000	1.3
IF-212-4000	5000 ±10%	±1330	2.0
IF-212-8000	7500 ±10%	±2660	2.0

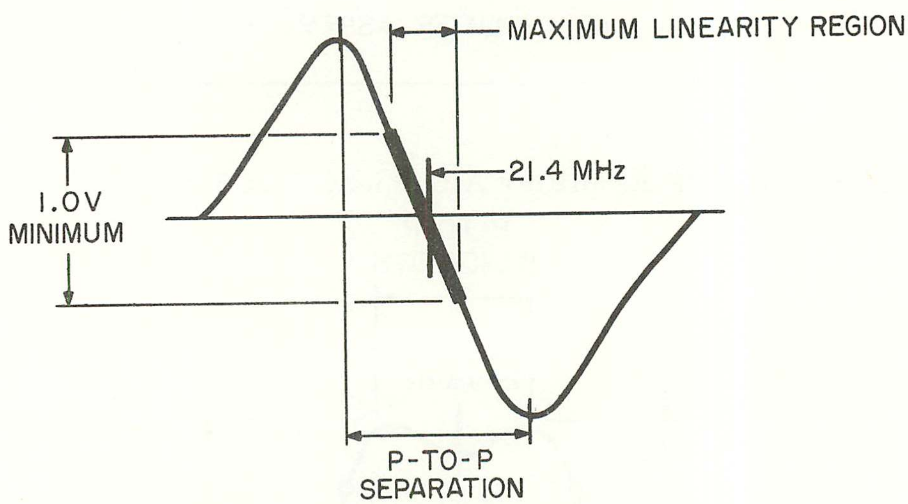


Figure 5-3. IF-212 Family FM Discriminator Response.

8. IF-211 Family IF Amplifiers

A. Normal Operating Voltages

The IF-211 family of IF amplifiers utilize the same circuit board configuration. Transistor voltages are in Table 5-7. Voltages were measured to chassis ground using an RCA Senior Voltohmyst Model WV-98C. Refer to paragraph 4 for control settings.

Table 5-7. IF-211 Family Transistor Voltages.

Transistor Symbol Number	Emitter	Base	Collector
Q1	5.8	5.8	9.7
Q2	-5.8	-5.2	-0.61
Q3	-0.61	GRD	9.7
Q4	-5.8	-5.2	-0.64
Q5	-0.64	GRD	9.8
Q6*	6.4	5.1	11.4
Q7	-0.77	-0.15	10.1
Q8	-2.6	-2.0	-0.68
Q9	-0.68	GRD	4.2
Q10	-1.0	-0.4	11.2

* Mode selector in CW

B. Module Alignment

The alignment procedures for IF-211 family are identical with exception of bandwidth and overall gain, Table 5-8. Prior to actual alignment, refer to paragraph 4 for control settings.

Table 5-8. IF-211 Family Amplifier Characteristics.

IF Amplifier	3 DB Bandwidth (KHz)	Gain (db)
IF-211-60	60 ±10%	62 ±3
IF-211-75	75 ±10%	62 ±3
IF-211-100	100 ±10%	60 ±3
IF-211-150	150 ±10%	59 ±3

C. AM Alignment

(1) Connect the test equipment, Figure 5-1.

(2) Set and calibrate the 606A signal generator for 21.4 MHz.

(3) Adjust oscilloscope for full scale horizontal sensitivity. Set vertical sensitivity to 0.5 volt/cm.

(4) Adjust sweep generator to 21.4 MHz and the output to display a 4 cm oscilloscope response. Adjust marker gain control to display a 21.4 MHz marker on the response.

(5) Begin with inductor L6 and work back to L1. Adjust for maximum symmetrical response centered around the 21.4 MHz marker, Figure 5-4.

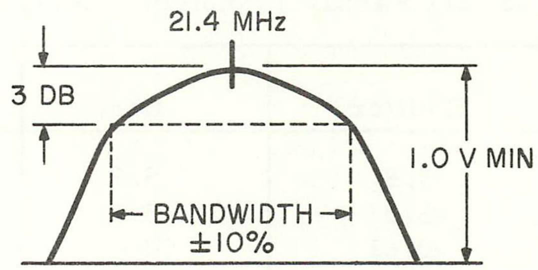


Figure 5-4. IF-211 Family AM Response.

D. FM Alignment

(1) Maintain test equipment setup and control settings used for AM alignment.

(2) Move probe to FM test point, Figure 5-1. Position mode selector to FM.

(3) Adjust L8 for maximum amplitude and L9 and L10 for maximum linearity of response, refer to Table 5-9 and Figure 5-5.

Table 5-9. IF-211 Family FM Response Characteristics.

IF Amplifier	p-to-p Separation (KHz)	Maximum Linearity (KHz)	p-to-p 1/3 bw from cf
IF-211-60	120	20	3
IF-211-75	150	25	3
IF-211-100	150	30	3
IF-211-150	300	50	4

9. IF-210 or IF-215 IF Amplifier

A. Normal Operating Voltages

Table 5-10 is a list of the dc voltages normally encountered. Voltages were measured to chassis ground using an RCA Senior Voltohmyst Model WV-98C. Refer to paragraph 4 for control settings.

B. Module Alignment

Alignment procedures are the same for the IF-210 and IF-215 except for bandwidth and overall gain, Table 5-11. Prior to alignment refer to paragraph 4 for control settings.

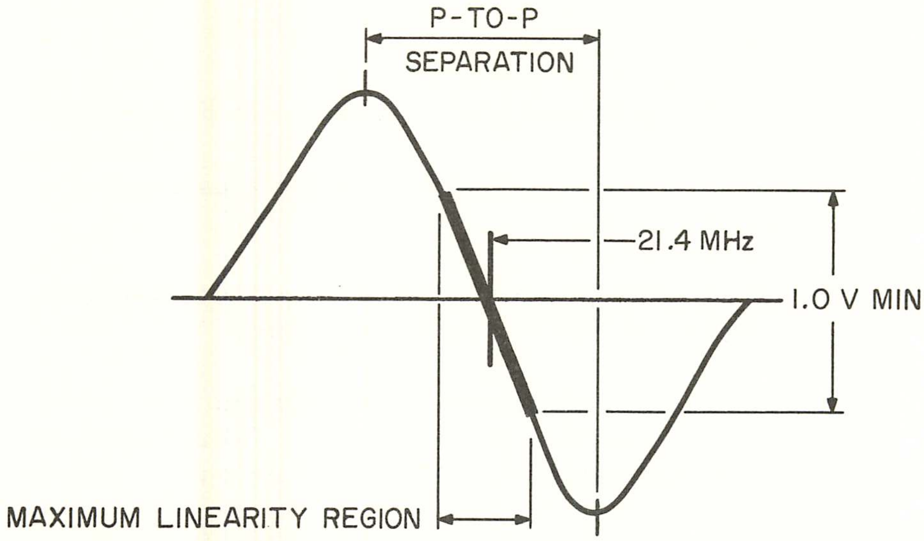


Figure 5-5. IF-211 Family Discriminator Response.

Table 5-10. IF-210 or IF-215 Transistor Voltages.

Transistor Symbol Number	Emitter	Base	Collector
Q1	6.18	6.18	9.6
Q2	-5.9	-5.2	-0.64
Q3	-0.64	GRD	9.6
Q4	-5.6	-5.3	-0.8
Q5	-0.8	GRD	9.8
Q6*	5.2	5.1	11.4
Q7	-0.78	-0.16	10.0
Q8	-2.8	-2.1	-0.78
Q9	-0.78	GRD	3.4
Q10	-1.0	-0.4	11.0

* Mode selector in CW.

Table 5-11. IF-210 and IF-215 Amplifier Characteristics.

IF Amplifier	3 DB Bandwidth	Gain (db)
IF-210-20	20 ±10%	65 ±3
IF-215-10	10 ±10%	67 ±3

C. AM Alignment

(1) Connect the test equipment as shown in Figure 5-1.

(2) Adjust the 606A signal generator for a calibrated 21.4 MHz output signal.

(3) Adjust oscilloscope for full scale horizontal sensitivity and set vertical sensitivity to 0.5 volt/cm.

(4) Adjust sweep generator to 21.4 MHz and the output to display a 4 cm oscilloscope response. Adjust marker gain control to display a 21.4 MHz marker on the response.

(5) Adjust L1 and L2 for maximum amplitude and L5, L6, C13 and C15 for maximum symmetrical response centered around the 21.4 MHz marker, Figure 5-6.

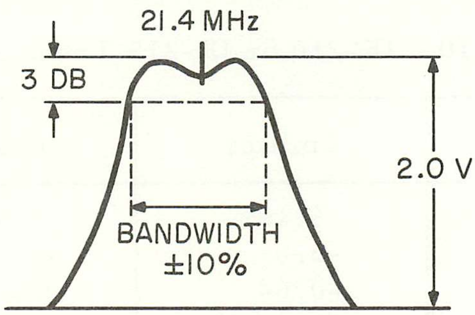


Figure 5-6. IF-210 and IF-215 AM Response.

D. FM Alignment

(1) Maintain test equipment setup and control settings for AM alignment.

(2) Position mode selector to FM.

(3) Move probe to FM test point, Figure 5-1.

(4) Adjust L8 for maximum amplitude and L9 and L10 for maximum linearity of response. When L10 is adjusted correctly the 21.4 MHz crossover point will occur at the center of the response. Refer to Table 5-12 and Figure 5-7.

Table 5-12. IF-210 and IF-215 FM Response Characteristics.

IF Amplifier	Peak-To-Peak Separation (KHz)	Maximum Linearity (KHz)
IF-210-20	20 ±10%	±5
IF-215-10	10 ±10%	±2.5

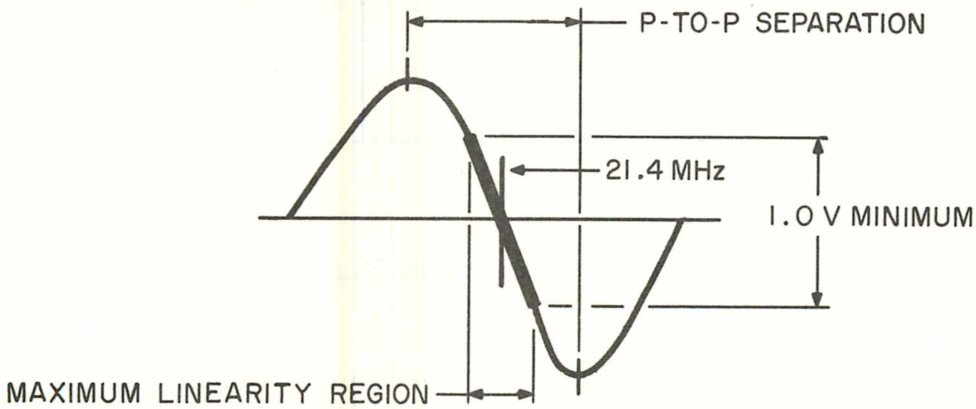


Figure 5-7. IF-210 and IF-215 FM Discriminator Response.

10. IF-112 Family IF Amplifiers

A. Normal Operating Voltages

The IF-112 family of IF amplifiers utilize the same circuit board configuration. Transistor voltages are in Table 5-13. Voltages were measured to chassis ground using an RCA Senior Voltohmyst Model WV-98C.

Table 5-13. IF-112 Family Transistor Voltages.

Transistor Symbol Number	Emitter	Base	Collector
Q1	-7.4	-6.8	-0.7
Q2	-0.7	0	+9.6
Q3	-7.0	-6.4	-0.7
Q4	-0.7	0	+11.6
Q5*	+9.0	+9.2	+11.2
Q6	-0.7	0	+11.8
Q7	-3.6	-3	-0.7
Q8	-0.7	0	+8.2
Q9	0	+0.7	+12.0

* Mode selector at CW

B. Module Alignment

The alignment procedures for the IF-112 family are identical with exception of bandwidth an overall gain Table 5-14. Prior to alignment refer to paragraph 4.

Table 5-14. IF-112 Family Amplifier Characteristics.

IF Amplifier	3 DB Bandwidth (KHz)	Gain (db)
IF-112-01	1 ±10%	72
IF-112-05	5 ±10%	68
IF-112-10	10 ±10%	62

C. AM Alignment

(1) Connect the test setup as shown in Figure 5-1. Use an L-1 plug-in head.

(2) Set oscilloscope for full scale horizontal sensitivity and 0.5 v/cm vertical sensitivity.

(3) Adjust sweep generator frequency to 455 KHz and sweep rate to 15 Hz. Adjust output to display a 3 cm unsaturated oscilloscope response.

(4) Adjust L3, L4 and L5 to achieve optimum amplitude of the response.

(5) Turn mode selector to CW, a marker should appear on top of the response.

(6) Turn mode selector to AM. Adjust C3 and C5 for minimum ripple on top of the response. The response should be similar to Figure 5-8.

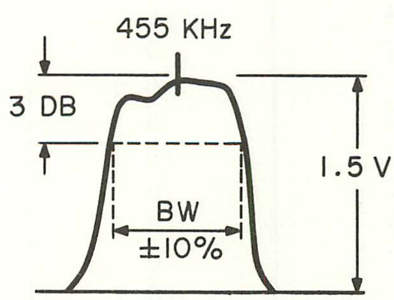


Figure 5-8. IF-112 Family AM Response.

D. FM Alignment

(1) Maintain test equipment setup and control settings for AM alignment. Position mode selector to FM.

(2) Move probe to FM test point, Figure 5-1. Connect a .01 uf capacitor between Q8 collector and GRD to remove noise in previous stage.

(3) Connect the sweep generator output to the base of Q7 through a 0.01 uf capacitor.

(4) Increase the sweep generator output until limiter stage (Q7, Q8) is fully saturated.

(5) Adjust L7, L8, and L9 for maximum linearity, Figure 5-9. Peak-to-peak separation should be between 50 and 60 KHz.

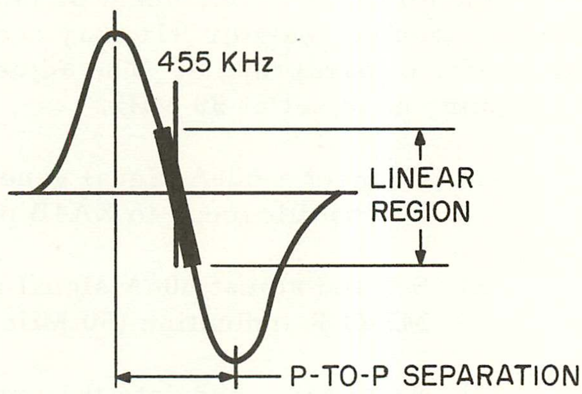


Figure 5-9. IF-112 Family FM Discriminator Response.

(6) Remove the 0.01 uf capacitor and insert 60 db attenuation at sweep generator output. Connect sweep generator output to pin A3 (IF input).

(7) Adjust L7, L8, and L9 slightly for best discriminator response.

11. AGC Amplifier, AGC-202-2

A. Normal Operating Voltages

Table 5-15 is a list of the dc voltages normally encountered. Voltages were measured to chassis ground using an RCA Senior Voltohmyst Model WV-98C. Refer to paragraph 4 for control settings.

Table 5-15. AGC-202-2 Transistor Voltages.

Transistor Symbol Number	Emitter	Base	Collector
Q1	-1.06	-0.59	12.0
Q2	-1.7	-1.06	12.0
Q3	-2.4	-1.85	12.0
Q4	-2.9	-2.4	12.0
Q5	-7.4	-6.8	10.8
Q6	GRD	0.58	0.10
Q7	-0.03	0.09	24.0
Q8	-0.36	-0.03	15.0
Q9	0.27	-0.11	12.0

B. Module Adjustment

Should parts replacement or other maintenance operations upset the AGC module, resistor R10 may require adjustment. Prior to adjustment, refer to paragraph 4. The adjustment may be performed using an SH-201P tuning head set at 50 MHz.

(1) Connect a 606A signal generator to J1 RF INPUT and a 503 oscilloscope to XA4B pin 4 (AM out).

(2) Set and adjust 606A signal generator for a zero TUNING METER indication (50 MHz), at 2000 microvolts.

(3) Amplitude modulate the input signal 50 percent at 1000 Hz.

(4) Adjust oscilloscope to display the demodulated AM signal and R10 for a 2 volt peak-to-peak response.

12. Audio Amplifier, AA-206

A. Normal Operating Voltages

Table 5-16 is a list of the dc voltages for the audio amplifier. Voltages were measured to chassis ground using an RCA Senior Voltohmyst Model WV-98C. Refer to paragraph 4 for control setting. Set AUDIO GAIN fully clockwise.

B. Module Adjustment

Adjust R13 to obtain -7.6 vac across C7. This bias adjustment sets the correct operating current through the transistors.

Table 5-16. AA-206 Transistor Voltages.

Transistor Symbol Number	Emitter	Base	Collector
Q1	+2.3	+3	+24
Q2	+2.3	+3	+24
Q3	-8.4	-7.8	0
Q4	-8.4	-7.8	0

13. COR Amplifier, COR-201

A. Normal Operating Voltages

DC voltages normally encountered on the elements of transistors in an operating COR-201 are tabulated in Table 5-17. Measurements are to chassis ground using an RCA Senior Voltohmyst Model WV-98C. Refer to paragraph 4 for control settings. Set COR SENS control maximum CW and COR DELAY to ON.

Table 5-17. COR-201 Transistor Voltages.

Transistor Symbol Number	Emitter	Base	Collector
Q1	-0.6	0.35	24.0
Q2	-1.5	-0.6	24.0
Q3	0	0.7	0.4
Q4	0	0.4	24.0 *
Q5	23.0	24.0 *	24.0
Q6	23.0	24.0	24.0

* Affected by COR delay potentiometer, R8.

B. Module Adjustment

(1) Set S4 COR DELAY switch on rear panel to ON.

(2) Turn front panel COR SQUELCH SENS control clockwise until COR ON light illuminates.

(3) Turn COR SQUELCH SENS control fully counter clockwise. Count time in seconds for the COR ON lamp to go off (approximately 4).

(4) Adjust R8 on COR-201 module A9 for this condition. R8 provides a range of adjustment from 3 to 10 seconds.

14. Other Measurements

No adjustments are provided on the video and audio amplifier modules. Troubleshooting is limited to voltage measurements, Table 5-18 and 5-19, and component replacement. Table 5-20 shows main chassis power supply regulator voltages. Measurements were made with an RCA Senior Volt-ohmyst Model WV-98C. Refer to paragraph 4 for control settings.

Table 5-18. VA-202-1 Transistor Voltages.

Transistor Symbol Number	Emitter	Base	Collector
Q1 *	-0.7	0	12.0
Q2 *	-12.0	-11.2	-5.0
Q3 *	-11.0	-10.4	-4.7

* VIDEO GAIN

Table 5-19. AFC-203 Transistor Voltages.

Transistor Symbol Number	Emitter	Base	Collector
Q1	0.8	-1.5	-12

Table 5-20. Main Chassis Transistor Voltages.

Transistor Symbol Number	Emitter	Base	Collector
Q1	12	13	25.2
Q2	GRD	0.8	13.4
Q3	24.2	25.0	42.0

SECTION VI

PARTS AND MANUFACTURER'S LISTS

1. Parts Lists

NOTE

Any changes in the Parts Lists will be listed on the Addendum sheets at the front of this manual.

When ordering replacement parts from the manufacturer, always include the following information:

1. Instrument model number
2. Instrument serial number
3. Module number
4. Module serial number
5. Component circuit symbol number (Q1, C13, etc.)
6. Component description
7. Component part number
8. Component manufacturer's name
9. Quantity desired

SURVEILLANCE RECEIVER, SR-209

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
A1& A2	2 to 6 MHz Tuning Head	ACL	SH-102P	
	6 to 20 MHz Tuning Head	ACL	SH-103P	
	20 to 45 MHz Tuning Head	ACL	SH-104P	
	20 to 45 MHz Tuning Head	ACL	SH-200P-1	
	30 to 100 MHz Tuning Head	ACL	SH-201P	
	90 to 300 MHz Tuning Head	ACL	SH-202P	
	250 to 500 MHz Tuning Head	ACL	SH-203P	
	490 to 1000 MHz Tuning Head	ACL	SH-204P	
	990 to 2000 MHz Tuning Head	ACL	SH-205P	

SURVEILLANCE RECEIVER, SR-209

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
A1& A2	1990 to 4000 MHz Tuning Head	ACL	SH-206P-1	
	4000 to 7000 MHz Tuning Head	ACL	SH-207P-1	
	7000 to 12000 MHz Tuning Head	ACL	SH-208P-1	
	30 to 100 MHz Electronic Swept Head	ACL	ESH-201P	
	100 to 300 MHz Electronic Swept Head	ACL	ESH-202P	
	300 to 500 MHz Electronic Swept Head	ACL	ESH-203P	
	500 to 1000 MHz Electronic Swept Head	ACL	ESH-204P	
	Spectrum Display Unit	ACL	SDU-102AP	
	Battery Pack			
A3, A4 A5	IF Amplifiers	ACL	IF-112, IF-210 IF-215, 211, 212	
A6	AGC Amplifier	ACL	AGC-202-2	1
A7	Video Amplifier	ACL	VA-202-1	1
A8	Audio Amplifier	ACL	AA-206	1
A9	Carrier Operated Relay	ACL	COR-201	1
A10	+12 Volt Power Supply	ACL	PS-103	2
A11	-12 Volt Power Supply Same as A10			
A12	+24 Volt Power Supply	ACL	PS-104	1
A13	AFC Amplifier (Optional)	ACL	AFC-203	1

SURVEILLANCE RECEIVER, SR-209

(AFC MOD)

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C1	Capacitor, Fixed Disc. 0.01 uf GMV 1600 V	Centralab	DD16103	2
C2	Same as C1			
C3	Capacitor, Fixed, Electrolytic 1000 uf 35 vdc	Sprague	D39324	2
C4	Same as C3			
C5	Capacitor, Fxd, Electrolytic 500 uf 50 vdc	Sprague	D40449	1
DS1	Lamp, Incandescent (Red)	Dialco	507-3917-1472-600	1
DS2	Lamp, Incandescent (Green)	Dialco	507-3917-1471-600	1
F1	Fuse Cartridge 1 amp SLO-BLO	Littlefuse	313001	1
F2	Fuse Cartridge 1/2 amp SLO-BLO	Littlefuse	MDL 1/2	1
J1	Connector, Receptacle, Electrical P/O W1	AM	101-N4170A-85	2
J2	Same as J1 P/O W3			
J3	Connector, Receptacle, Electrical	FXR/ RF	UG-1094/U	2
J4	Connector, Receptacle, Electrical P/O W1	Gremar	8212A	2
J5	Same as J4 P/O W3			
J6	Connector, Receptacle, Electrical	Cannon	DCMF25W3S	2
J7	Same as J6			
J8	Connector, Receptacle, Electrical	Hubbell	7486	1
J9	Same as J3			
J10	Jack, Telephone	Swcrft	C11	1

SURVEILLANCE RECEIVER, SR-209

(AFC MOD)

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
M1	Meter, Signal Strength 0-100 UA	ACL	SB1032	1
M2	Meter, Tuning, Arbitrary Scale 100-1-100 UA	ACL	SB208	1
Q1	Transistor	TI	TI487	3
Q2	Same as Q1			
Q3	Same as Q1			
R1	Resistor, Variable 10K 2W	AB	JA1N048P103UA	2
R2	Resistor, Fixed, Composition 4.7 K ohms ±5% 1/4W	AB	CB4725	1
R3	Resistor, Fixed, Composition 330 ohms ±5% 1/4W	AB	CB3315	1
R4	Resistor, Variable (Concentric) R4 10K ohms 2 W, R5 10 K ohms 2W	AB	JJC90998	1
R6	Resistor, Fixed, Composition 22K ±5% 1/4W	AB	CB2235	1
R7	Same as R1			
R8	Resistor, Fxd, Composition 2.2 K ohms ±5% 1/4W	AB	CB2225	1
R9	Resistor, Fxd, Composition 82K ohms, ±5% 1/4W	AB	CB8235	1
S1	Switch, Rotary 10 poles, 5 Sections, 6 positions	Oak	AB-284	1
S2	Switch, Rotary 8 poles, 4 sections, 6 positions	Oak	AB-283	1
S3	Switch, Rotary 6 poles, 4 sections, 6 positions	Oak	399-227-A	1
S4	Switch, Toggle, SPST	Cut-Hamm	8280K16	1
S5	Switch, Toggle dpdt	Cut-Hamm	8363K7	3
S6	Same as S5			
S7	Same as S5			

SURVEILLANCE RECEIVER, SR-209
(AFC MOD)

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
T1	Transformer, Power, Stepdown	ACL	B-004	1
TB1	Terminal Board	Cinch	6-140-Y	1
W1	Cable Assy	ACL	AA-351	2
W2	Cable Power Electrical	ACL	AB-270	1
W3	Same as W1			
W2P1	Integral Part of W2		For reference only	
W2P2	Part of W2	Hubbell	7484	1
Spare	Same as XA3A			
Spare	Same as XA3A			
XA3A	Connector, Receptacle, Electrical	Elco	00-5009-012-146-001	17
XA3B	Same as XA3A			
XA4A	Same as XA3A			
XA4B	Same as XA3A			
XA5A	Same as XA3A			
XA5B	Same as XA3A			
XA6A	Same as XA3A			
XA6B	Same as XA3A			
XA7	Same as XA3A			
XA8	Same as XA3A			
XA9	Same as XA3A			
XA10	Same as XA3A			
XA11	Same as XA3A			
XA12	Same as XA3A			

SURVEILLANCE RECEIVER, SR-209

(AFC MOD)

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
XA13	Same as XA3A			
XDS1	Lampholder	Drake	4428-001	2
XDS2	Same as XDS1			
XF1	Fuseholder	Littlefuse	342014	2
XF2	Same as XF1			

IF AMPLIFIER, IF-212-300

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C1	Capacitor, Fixed, Ceramic Dielectric 0.001 uf ±20% 1000 vdcw	MIL	CK60AW102M	3
C2	Capacitor, Fixed, Ceramic Dielectric 0.01 uf +80-20% 50 v	Sprague	19C214	23
C3	Same as C2			
C4	Same as C2			
C5	Same as C2			
C6	Capacitor, Fixed, Mica Dielectric 33 pf ±5% 500 vdcw	Elmenco	DM10-330J	4
C7 *	Capacitor, Fixed, Composition 0.18 pf ± 10% 500 vdcw	QC	MC-0.18	1
C8	Same as C2			
C9	Same as C6			
C10	Capacitor, Fixed, Mica Dielectric 500 pf ±5% 500 vdcw	Elmenco	DM15-501J	1
C11	Same as C2			
C12	Same as C2			
C13	Same as C2			
C14	Same as C2			
C15	Same as C2			
C16	Same as C6			
C17	Capacitor, Fixed, Composition 0.43pf ±10% 500 vdcw	QC	MC-0.43	1
C18	Same as C6			
C19	Capacitor, Fixed, Mica Dielectric 390 pf ±5% 500 v dcw	Elmenco	DM10-391J	1
C20	Capacitor, Fixed, Mica Dielectric 18 pf ±5% 500 vdcw	Elemnco	DM10-180J	1
C21	Same as C2			
C22	Same as C2			
C23	Same as C2			
C24	Same as C1			

*Nominal Installed Value, Actual Value TBD by Test

IF AMPLIFIER, IF-212-300

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C25	Same as C2			
C26	Same as C2			
C27	Capacitor, Fixed, Composition 4.7 pf ±10% 500 VDCW	QC	MC-4.7	1
C28	Capacitor, Fixed, Ceramic, Dielectric NPO ±60 ppm 8.2 pf ±.25 pf	Erie	301-COH-829C	1
C29	Same as C2			
C30	Same as C2			
C31	Same as C2			
C32	Capacitor, Fxd, Mica Die 12 pf ±5% 500 vdcw	Elmenco	DM10-120J	1
C33	Same as C1			
C34	Same as C2			
C35	Same as C2			
C36	Capacitor, Fixed, Composition 1.5 pf ±10% 500 VDCW	QC	MC-1.5	2
C37	Same as C36			
C38	Capacitor, Fixed, Mica Dielectric 15 pf ±500 vdcw	Elmenco	DM10-150J	2
C39	Same as C38			
C40	Capacitor, Fixed, Mica Dielectric 100 pf ±5% 500 VDCW	Elmenco	DM10-101J	2
C41	Same as C40			
C42	Same as C2			
C43	Same as C2			
C44	Same as C2			
CR1	Semiconductor Device, Diode	Sylvania	1N198A	3
CR2	Same as CR1			

IF AMPLIFIER, IF-212-300

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
CR3	Same as CR1			
L1	Inductance Standard, Variable	ACL	C-257-2	4
L2	Same as L1			
L3	Same as L1			
L4	Same as L1			
L5	Inductance Standard, Fixed 5.6 mh	CTC	2960-37-2	1
L6	Inductance Standard, Variable	ACL	C-257-3	4
L7	Inductance Standard, Fixed 12 mh	CTC	2960-41-2	3
L8	Same as L6			
L9	Same as L7			
L10	Same as L6			
L11	Same as L6			
L12	Same as L7			
Q1	Transistor	ACL	A-395	10
Q2	Same as Q1			
Q3	Same as Q1			
Q4	Same as Q1			
Q5	Same as Q1			
Q6	Same as Q1			
Q7	Same as Q1			
Q8	Same as Q1			
Q9	Same as Q1			

IF AMPLIFIER, IF-212-300

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
Q10	Same as Q1			
R1	Resistor, Fixed, Composition 100 ohms ±5% 1/4 w	AB	CB1015	16
R2	Resistor, Fixed, Composition 68 ohms ±5% 1/4 w	AB	CB6805	2
R3	Same as R1			
R4	Resistor, Fixed, Composition 10 k ohm ±5% 1/4 w	AB	CB1035	7
R5	Same as R4			
R6	Same as R1			
R7	Resistor, Fixed, Composition 10 ohms ±5% 1/4 w	AB	CB1005	1
R8	Resistor, Fixed, Composition 680 ohm ±5% 1/4 w	AB	CB6815	1
R9	Resistor, Fixed, Composition 1 k ohm ±5% 1/4 w	AB	CB1025	2
R10	Same as R1			
R11	Not Used			
R12	Same as R1			
R13	Same as R2			
R14	Same as R4			
R15	Same as R4			
R16	Same as R1			
R17	Not Used			
R18	Same as R9			
R19	Resistor Fixed, Composition 220 ohms ±5% 1/4 w	AB	CB2215	2
R20	Same as R1			
R21	Not Used			
R22	Same as R1			

*Nominal Value

IF AMPLIFIER, IF-212-300

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
R23	Same as R1			
R24	Resistor, Fixed, Composition 33 K ohm ±5% 1/4W	AB	CB3335	1
R25	Same as R1			
R26	Same as R4			
R27	Same as R19			
R28	Same as R1			
R29	Same as R1			
R30	Resistor, Fixed, Composition 4.7 K ohm ±5% 1/4W	AB	CB4725	3
R31	Resistor, Fixed, Composition 22 K ohm ±5% 1/4W	AB	CB2235	2
R32	Same as R30			
R33	Same as R1			
R34	Resistor, Fixed, Composition 1.8 K ohm ±5% 1/4W	AB	CB1825	1
R35	Same as R4			
R36	Resistor, Fixed, Composition 560 ohm ±5% 1/4W	AB	CB5615	1
R37	Same as R30			
R38	Same as R31			
R39	Resistor, Fixed, Composition 2.2 k ohms ±5% 1/4 w	AB	CB2225	1
R40	Same as R1			
R41	Resistor, Fixed, Composition 20 K ohm ±5% 1/4W	AB	CB2035	1
R42	Resistor, Fixed, Composition 680 ohm ±5% 1/4W	AB	CB6815	1
R43	Resistor, Fixed, Composition 470 ohm ±5% 1/4W	AB	CB4715	1
R44	Not Used			
R45	Not Used			
R46	Resistor, Fixed, Composition 47 K ohm ±5% 1/4W	AB	CB4735	2

IF AMPLIFIER, IF-212-300

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
R47	Same as R46			
R48	Same as R1			
R49	Resistor, Fixed, Composition 820 k ohms ±5% 1/4 w	AB	CB8245	1
R50	Same as R4			
R51	Same as R1			

IF AMPLIFIER IF-211-100

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C1	Capacitor, Fxd, Mica Die. 560 pf ±5% 500 vdcw	Elmenco	DM15-561J	2
C2	Capacitor, Fxd, Mica Die. 33 pf ±5% 500 vdcw	Elmenco	DM10-330J	2
C3	Capacitor, Fxd, Composition .51 pf ±10% 500 vdcw	QC	MC-0.51	1
C4	Same as C2			
C5	Capacitor, Fxd, Ceramic Die. .01 µf ±20% 50 vdc	Sprague	19C214	17
C6	Capacitor, Fxd, Mica Die. 62 pf ±5% 500 vdcw	Elmenco	DM10-620J	2
C7	Capacitor, Fxd, Mica Die. 43 pf ±5% 500 vdcw	Elmenco	DM10-430J	2
C8	Capacitor, Fxd, Mica Die. 470 pf ±5% 500 vdcw	Elmenco	DM15-471J	1
C9	Capacitor, Fxd, Composition 2.2 pf ±10% 500 vdcw	QC	MC-2.2	1
C10	Same as C5			
C11	Same as C5			
C12	Same as C5			
C13	Capacitor, Fxd, Mica Die. 91 pf ±5% 500 vdcw	Elmenco	DM10-910J	4
C14	Capacitor, Fxd, Ceramic Die. 6.0 pf ±.25pf NPO ±60ppm	Erie	301-COH-609C	1
C15	Capacitor, Fxd, Mica Die. 270 pf ±5% 500 vdcw	Elmenco	DM10-271J	2
C16	Capacitor, Fxd, Mica Die. 2000 pf ±5% 500 vdcw	Elmenco	DM19-202J	1
C17	Same as C5			
C18	Same as C5			
C19	Same as C5			
C20	Capacitor, Fxdm Dica Die. 82 pf ±5% 500 vdec	Elmenco	DM10-820J	2
C21	Capacitor, Fxd, Ceramic Die. 6.8 pf ±.25 pf NPO ±60 ppm	Erie	301-COH-689C	1
C22	Capacitor, Fxd, Ceramic Die. 3.3 pf ±.25 pf NPO ±120 ppm	Erie	301-COJ-339C	1
C23	Same as C15			
C24	Same as C15			

IF AMPLIFIER IF-211-100

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C25	Same as C6			
C26	Same as C7			
C27	Same as C5			
C28	Capacitor, Fixed, Mica Dielectric 22 pf ± 5% 500 VDCW	Elmenco	DM10-220J	2
C29	Capacitor, Fixed, Composition 3.3 pf ± 10% 500 VDCW	QC	MC-3.3	2
C30	Same as C5			
C31	Capacitor, Fixed, Mica Dielectric 47 pf ± 5% 500 VDCW	Elmenco	DM10-470J	1
C32	Same as C5			
C33	Same as C5			
C34	Same as C5			
C35	Same as C5			
C36	Same as C5			
C37	Same as C28			
C38	Capacitor, Fixed, Composition 2.0 pf ± 10% 500 VDCW	QC	MC-2.0	1
C39	Capacitor, Fixed, Composition 2.7 pf ± 10% 500 VDCW	QC	MC-2.7	1
C40	Same as C13			
C41	Same as C20			
C42	Same as C13			
C43	Same as C13			
C44	Same as C29			
C45	Same as C5			
C46	Capacitor, Fixed, Mica Dielectric 100 pf ± 5% 500 VDCW	Elmenco	DM10-101J	1
C47	Same as C5			
C48	Same as C5			

IF AMPLIFIER IF-211-100				
SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
CR1	Semiconductor Device, Diode	Sylvania	IN462	2
CR2	Semiconductor Device, Diode	Sylvania	IN87A	3
CR3	Same as CR1			
CR4	Same as CR2			
CR5	Same as CR2			
L1	Inductance Standard, Variable	ACL	AC257-2	2
L2	Same as L1			
L3	Inductance Standard, Variable	ACL	AC257-7	4
L4	Inductance Standard, Variable	ACL	AC257-6	2
L5	Same as L3			
L6	Same as L4			
L7	Inductance Standard, Fixed 1.0 mh	Nytronics	WEE-1000	2
L8	Inductance Standard, Variable	ACL	AC257-8	1
L9	Same as L3			
L10	Same as L3			
L11	Same as L7			
Q1	Transistor	ACL	A395	10
Q2	Same as Q1			
Q3	Same as Q1			
Q4	Same as Q1			
Q5	Same as Q1			
Q6	Same as Q1			

IF AMPLIFIER IF-211-100

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
Q7	Same as Q1			
Q8	Same as Q1			
Q9	Same as Q1			
Q10	Same as Q1			
R1	Resistor, Fixed, Composition 150 ohms ± 5% 1/4 watt	AB	CB1515	2
R2	Resistor, Fixed, Composition 36 ohms ±5% 1/4 watt	AB	CB3605	1
R3	Same as R1			
R4	Resistor, Fixed, Composition 10 K ohms ±5% 1/4 watt	AB	CB1035	8
R5	Resistor, Fixed Composition 100 ohms ± 5% 1/4 watt	AB	CB1015	9
R6	Resistor, Fixed, Composition 220K ohms ±5% 1/4 watt	AB	CB2245	2
R7	Same as R4			
R8	Resistor, Fixed, Composition 68 ohms ±5% 1/4 watt	AB	CB6805	5
R9	Resistor, Fixed, Composition 2.2K ohms ±5% 1/4 watt	AB	CB2225	2
R10	Same as R8			
R11	Same as R5			
R12	Same as R5 *			
R13	Same as R4			
R14	Resistor, Fixed, Composition 2K ohms ± 5% 1/4 watt	AB	CB2025	2
R15	Same as R6			
R16	Same as R5			
R17	Same as R8			
R18	Same as R4			
R19	Same as R5			

*Nominal Value

IF AMPLIFIER IF-211-100

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
R20	Resistor, Fixed, Composition 4.7 K ohms ±5% 1/4 watt	AB	CB4725	2
R21	Same as R5			
R22	Same as R4			
R23	Same as R8			
R24	Resistor, Fixed, Composition 4.3 K ohms ±5% 1/4 watt	AB	CB4325	1
R25	Same as R5			
R26	Same as R9			
R27	Same as R14			
R28	Same as R8			
R29	Same as R5			
R30	Resistor, Fixed, Composition 47 K ohms ±5% 1/4 watt	AB	CB4735	2
R31	Same as R30			
R32	Same as R20			
R33	Resistor, Fixed, Composition 910 K ohms ±5% 1/4 watt	AB	CB9145	1
R34	Same as R4			
R35	Same as R5			
R36	Same as R4			
R37	Resistor, Fixed, Composition 22 K ohms ±5% 1/4 watt	AB	CB2235	1
R38	Same as R4			
R39	NOT USED			
R40	Resistor, Fixed, Composition 24K ohms ±5% 1/4 watt	AB	CB2435	1
Y1	Crystal Unit, Quartz 18.9 mc	Piezo	CR 64/U	1
Y2	Crystal Unit, Quartz 2.5 mc	McCoy	M25	1

20 KC IF AMPLIFIER, IF-210-20

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C1	Capacitor, Fixed Mica Dielectric 560 pf ±5% 500 VDCW	Elmenco	DM15-561J	2
C2	Capacitor, Fixed Mica Dielectric 33 pf ±5% 500 VDCW	Elmenco	DM10-330J	2
C3	Capacitor, Fixed Composition 0.51 pf ±10% 500 VDCW	QC	MC-0.51	1
C4	Same as C2			
C5	Capacitor, Fixed Ceramic Dielectric .01 uf ±20% 50 WVDC	Sprague	19C214	12
C6	Capacitor, Fixed Mica Dielectric 62 pf ±5% 500 VDCW	Elmenco	DM10-620J	3
C7	Capacitor, Fixed, Mica Dielectric 43 pf ±5% 500 VDCW	Elmenco	DM10-430J	2
C8	Capacitor, Fixed, Mica Dielectric 470 pf ±5% 500 VDCW	Elmenco	DM15-471J	2
C9	Capacitor, Fixed, Composition 2.2 pf ±10% 500 VDCW	QC	MC-2.2	1
C10	Capacitor, Fixed, Tantalum .47 uf ±20% 35 VDCW	Sprague	150D474X0035A2	5
C11	Same as C5			
C12	Same as C10			
C13	Capacitor, Variable, 15-60 pf	Erie	539-002-N1500	2
C14	Capacitor, Fixed, Composition 1.2 pf ±10% 500 VDCW	QC	MC 1.2	1
C15	Same as C13			
C16	Capacitor, Fixed, Mica Dielectric 3300 pf ±5% 500 VDCW	Elmenco	DM19-332J	1
C17	Same as C5			
C18	Same as C10			
C19	Same as C10			
C20	Same as C6			
C21	Capacitor, Fixed, Ceramic Dielectric NPO ±60 ppm 4.7 pf ±.25 pf	Erie	301-COH-479C	3
C22	Capacitor, Fixed, Ceramic Dielectric NPO ±120 ppm 3.3 pf ±25 pf	Erie	301-COJ-339C	1
C23	Capacitor, Fixed, Mica 120 pf ±5% 500VDCW	Elmenco	DM10-121J	1
C24	Same as C8			

20 KC IF AMPLIFIER, IF-210-20

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C25	Capacitor, Fixed, Mica Dielectric 220 pf ±5 % 500 VDCW	Elmenco	DM10-221J	1
C26	Same as C7			
C27	Same as C5			
C28	Capacitor, Fixed, Mica Dielectric 22 pf ±5% 500 VDCW	Elmenco	DM10-220J	1
C29	Capacitor, Fixed, Mica Dielectric 10 pf ±5% 500 VDCW	Elmenco	DM10-100J	2
C30	Same as C10			
C31	Capacitor, Fixed, Mica Dielectric 47 pf ±5% 500 VDCW	Elmenco	DM10-470J	3
C32	Same as C5			
C33	Same as C5			
C34	Same as C5			
C35	Same as C5			
C36	Same as C5			
C37	Same as C6			
C38	Same as C21			
C39	Same as C21			
C40	Capacitor, Fixed, Mica Dielectric 91 pf ±5% 500 VDCW	Elmenco	DM10-910J	1
C41	Capacitor, Fixed, Mica Dielectric 82 pf ±5% 500 VDCW	Elmenco	DM10-820J	1
C42	Same as C31			
C43	Same as C31			
C44	Same as C29			
C45	Same as C5			
C46	Same as C1			
C47	Same as C5			
C48	Same as C5			

20 KC IF AMPLIFIER, IF-210-20

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C49	Capacitor, Fxd, Mica Die. 100 pf ±5% 500 vdc	Arco	DM10-101J	1
C50	Capacitor, Fixed, Mica Dielectric 110 pf ±5% 500 VDC	Elmenco	DM10-111J	1
CR1	Semiconductor, Device, Diode	Sylvania	1N462	2
CR2	Semiconductor Device, Diode	Sylvania	1N87A	3
CR3	Same as CR1			
CR4	Same as CR2			
CR5	Same as CR2			
L1	Inductance Standard, Variable	ACL	C-257-2	2
L2	Same as L1			
L3	Inductance Stnadard, Fixed	ACL	AC-188-3	2
L4	Same as L3			
L5	Inductance Standard, Variable	ACL	C-257-8	5
L6	Same as L5			
L7	Inductance Standard, Fixed 1.0 mh	Nytronic	WEE-1000	2
L8	Same as L5			
L9	Same as L5			
L10	Same as L5			
L11	Same as L7			
Q1	Transistor	ACL	A-395	10
Q2	Same as Q1			

20 KC IF AMPLIFIER, IF-210-20

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
Q3	Same as Q1			
Q4	Same as Q1			
Q5	Same as Q1			
Q6	Same as Q1			
Q7	Same as Q1			
Q8	Same as Q1			
Q9	Same as Q1			
Q10	Same as Q1			
R1	Resistor, Fixed, Composition 150 ohm ±5% 1/4W	AB	CB1515	2
R2	Resistor, Fixed, Composition 36 ohm ±5% 1/4W	AB	CB3605	1
R3	Same as R1			
R4	Resistor, Fixed, Composition 10 K ohm ±5% 1/4W	AB	CB1035	8
R5	Resistor, Fixed, Composition 100 ohm ±5% 1/4W	AB	CB1015	8
R6	Resistor, Fixed, Composition 220 K ohm ±5% 1/4W	AB	CB2245	2
R7	Same as R4			
R8	Resistor, Fixed, Composition 68 ohm ±5% 1/4W	AB	CB6805	5
R9	Resistor, Fixed, Composition 2.2 K ohm ±5% 1/4W	AB	CB2225	2
R10	Same as R8			
R11	Same as R5			
R12	Resistor, Fixed, Composition 1 K ohm* ±5% 1/4W	AB	CB1025	1
R13	Same as R4			
R14	Resistor, Fixed, Composition 2 K ohm ±5% 1/4W	AB	CB2025	2
R15	Same as R6			

*Nominal Value

20 KC IF AMPLIFIER, IF-210-20

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
R16	Same as R5			
R17	Same as R8			
R18	Same as R4			
R19	Same as R5			
R20	Resistor, Fixed, Composition 4.7 K ohms ±5% 1/4W	AB	CB4725	2
R21	Same as R5			
R22	Same as R4			
R23	Same as R8			
R24	Resistor, Fixed, Composition 4.3 K ohm ±5% 1/4W	AB	CB4325	1
R25	Same as R5			
R26	Same as R9			
R27	Same as R14			
R28	Same as R8			
R29	Same as R5			
R30	Resistor, Fixed, Composition 47 K ohm ±5% 1/4W	AB	CB4735	2
R31	Same as R30			
R32	Same as R20			
R33	Resistor, Fixed, Composition 910 K ohm ±5% 1/4W	AB	CB9145	1
R34	Same as R4			
R35	Same as R5			
R36	Same as R4			
R37	Same as R4			
R38	Resistor, Fixed, Composition 24 K ohm ±5% 1/4W	AB	CB2435	1

20 KC IF AMPLIFIER, IF-210-20

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
Y1	Crystal Unit, Quartz 19.75 mc	Peizo	CR-64/U	1
Y2	Crystal Unit, Quartz 1.65 mc	McCoy	M25	1

IF AMPLIFIER, IF-112-10

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C1	Capacitor, Dipped Mica 910 pf ±5% 500 vdc	Arco	DM15-911J	1
C2	Capacitor, Dipped Mica 510 pf ±5% 500 vdc	Arco	DM15-511J	1
C3	Capacitor, Variable, Ceramic N650 9-35 pf	Erie	538-062-941	2
C4	Capacitor, Dipped Mica 160 pf ±5% 500 vdc	Arco	DM10-161J	2
C5	Same as C3			
C6	Capacitor, Dipped Mica 180 pf ±5% 500 vdc	Arco	DM10-181J	1
C7	Capacitor, Dipped Mica 300 pf ±5% 500 vdc	Arco	DM10-301J	1
C8	Capacitor, Electrolytic, Tantalum 0.1 uf ±20% 35 vdc	Sprague	150D104X0035A2	11
C9	Same as C8			
C10	Capacitor, Dipped Mica 360 pf ±5% 500 vdc	Arco	DM10-361J	2
C11	Capacitor, Dipped Mica 270 pf ±5% 500 vdc	Arco	DM10-271J	1
C12	Same as C8			
C13	Same as C8			
C14	Same as C8			
C15	Capacitor, Dipped Mica 150 pf ±5% 500 vdc	Arco	DM10-151J	1
C16	Capacitor, Dipped Mica 15 pf ±5% 500 vdc	Arco	DM10-150J	1
C17	Capacitor, Tubular Composition 2.0 pf	QC	MC-2.0	1
C18	Capacitor, Dipped Mica 240 pf ±5% 500 vdc	Arco	DM10-241J	1
C19	Capacitor, Dipped Mica 390 pf ±5% 500 vdc	Arco	DM10-391J	4
C20	Capacitor, Dipped Mica 200 pf ±5% 500 vdc	Arco	DM10-201J	1
C21	Same as C19			
C22	Capacitor, Dipped Mica 100 pf ±5% 500 vdc	Arco	DM10-101J	2
C23	Capacitor, Dipped Mica 30 pf ±5% 500 vdc	Arco	DM10-300J	1
C24	Capacitor, Monolythic Ceramic 0.1 uf ±20% 25 vdc	Sprague	3C21	1

IF AMPLIFIER, IF-112-10

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C25	Same as C8			
C26	Same as C19			
C27	Same as C8			
C28	Same as C8			
C29	Same as C8			
C30	Same as C8			
C31	Same as C4			
C32	Capacitor, Dipped Mica 22 pf ±5% 500 vdc	Arco	DM10-220J	2
C33	Capacitor, Disc. Ceramic 30 pf 500 vdc N750	Sprague	40C533	2
C34	Same as C33			
C35	Same as C32			
C36	Same as C10			
C37	Capacitor, Dipped Mica 330 pf ±5% 500 vdc	Arco	DM10-331J	1
C38	Same as C8			
C39	Same as C19			
C40	Same as C19			
C41	Same as C22			
C42	Capacitor, Dipped Mica 470 pf ±5% 500 vdc	Arco	DM15-471J	1
CR1	Diode, Silicon		1N462A	2
CR2	Diode, Germanium		1N198A	1
CR3	Same as CR1			
CR4	Diode, Germanium		1N87A	2
CR5	Same as CR4			

IF AMPLIFIER, IF-112-10

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
FL1	Filter, Mechanical	Collins	526-9563-001	1
L1	Inductor, Fixed, Molded 39 uh ±10%	Nytronics	WEE-39	1
L2	Inductor, Fixed, Molded 470 uh ±10%	Nytronics	WEE-470	1
L3	Inductor, Variable	ACL	AC-257-10	4
L4	Same as L3			
L5	Same as L3			
L6	Inductor, Fixed, Molded 4700 uh ±10%	Nytronics	WEE-4700	1
L7	Same as L3			
L8	Inductor, Variable	ACL	AC-257-9	2
L9	Same as L8			
L10	Inductor, Fixed, Molded 1200 uh ±10%	Nytronics	WEE-1200	1
Q1	Transistor, Silicon NPN	Fairchild	SP-8675	7
Q2	Same as Q1			
Q3	Same as Q1			
Q4	Same as Q1			
Q5	Same as Q1			
Q6	Transistor, Silicon NPN		2N-718A	2
Q7	Same as Q1			
Q8	Same as Q1			
Q9	Same as Q6			

IF AMPLIFIER, IF-112-10

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
R1	Resistor, Fixed, Composition 51 ohms ±5% 1/4 Watt	AB	CB5105	1
R2	Resistor, Fixed, Composition 56 K ohm ±5% 1/4 Watt	AB	CB5635	1
R3	Resistor, Fixed, Composition 51 K ohm ±5% 1/4 Watt	AB	CB5135	3
R4	Resistor, Fixed, Composition 220 ohm ±5% 1/4 Watt	AB	CB2215	3
R5	Resistor, Fixed, Composition 2.2 K ohm ±5% 1/4 Watt	AB	CB2225	3
R6	Resistor, Fixed, Composition 47 K ohm ±5% 1/4 Watt	AB	CB4735	5
R7	Resistor, Fixed, Composition 100 ohm ±5% 1/4 Watt	AB	CB1015	6
R8	Resistor, Fixed, Composition 1.5 K ohm ±5% 1/4 Watt	AB	CB1525	1
R9	Same as R6			
R10	Same as R6			
R11	Same as R4			
R12	Resistor, Variable 1 K ohm ±10% 1/2 Watt	Beckman	62P-R1K	1
R13	Same as R5			
R14	Same as R6			
R15	Same as R7			
R16	Same as R7			
R17	Resistor, Fixed, Composition 220 K ±5% 1/4 Watt	AB	CB2245	1
R18	Same as R7			
R19	Resistor, Fixed, Composition 10 K ohm ±5% 1/4 Watt	AB	CB1035	3
R20	Resistor, Fixed, Composition 4.7 K ohm ±5% 1/4 Watt	AB	CB4725	2
R21	Same as R7			
R22	Resistor, Fixed, Composition 6.8k ohm ± 5% 1/4 W	AB	CB6825	1
R23	Same as R19			
R24	Same as R6			

IF AMPLIFIER, IF-112-10

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
R25	Same as R5			
R26	Same as R4			
R27	Resistor, Fixed, Composition 680 ohm ± 5% 1/4Watt	AB	CB6815	1
R28	Resistor, Fixed, Composition 24 K ohm ± 5% 1/4Watt	AB	CB2435	1
R29	Same as R3			
R30	Same as R3			
R31	Same as R20			
R32	Resistor, Variable 1 Meg ohm ± 20%	Beckman	62PR1M	1
R33	Resistor, Fixed, Composition 100 K ohm ± 5% 1/4Watt	AB	CB1045	1
R34	Same as R7			
R35	Same as R19			
R36	Resistor, Fixed, Composition 6.8 750 k ohm ± 5% 1/4Watt	AB	CB7545	1
Y1	Crystal 455.000 KHz	Perrot	CR-63A/U	1

AGC AMPLIFIER AGC-202-2

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C1	Capacitor, Tantalum Electrolytic 22 uf, 20%, 35v	Sprague	150D226X0035R2	2
C2	Same as C1			
C3	Capacitor, Ceramic Disc .01 uf, +80% -20%, 50v	Sprague	19C214	1
C4	Capacitor, Tantalum Electrolytic 2.2 uf, 20% 35 vdcw	81349	CS13AF2R2M	1
C5	Capacitor, Tantalum Electrolytic 10 uf, 20%, 35v	81349	CS13AF100M	1
C6	Capacitor, Tantalum Electrolytic 0.1 uf, 20%, 35v	Sprague	150D104X0035A2	1
C7	Capacitor, Tantalum Electrolytic 1 uf, 20%, 35v	Sprague	150D105X0035A2	1
CR1	Diode, Silicon	Sylvania	1N462	1
CR2	Diode, Zener	PSI	1N751A	1
CR3	Diode, Germanium	Sylvania	1N198A	1
CR4	Diode, Zener	PSI	1N754A	1
CR5	Diode, Zener	PSI	1N746A	1
CR6	Diode Zener	PSI	1N758A	1
Q1	Transistor	TI	2N697	6
Q2	Same as Q1			
Q3	Transistor	TI	2N335	3
Q4	Same as Q3			
Q5	Same as Q3			
Q6	Same as Q1			
Q7	Same as Q1			
Q8	Same as Q1			
Q9	Same as Q1			

AGC AMPLIFIER, AGC-202-2

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
R1	Resistor, Fxd Composition 330 K ohms ±5% 1/4W	AB	CB3345	1
R2	Resistor, Fxd, Composition 10 K ohms ±5% 1/4W	AB	CB1035	2
R3	Resistor, Fxd, Composition 2.2 K ohms ±5% 1/4W	AB	CB2225	2
R4	Resistor, Fxd, Composition 5.6 K ohms ±5% 1/4W	AB	CB5625	1
R5	Same as R3			
R6	Resistor, Fxd, Composition 47 K ohms ±5% 1/4W	AB	CB4735	3
R7	Same as R6			
R8	Resistor, Fxd Composition 6.2 K ohms ±5% 1/4W	AB	CB6225	1
R9	Resistor, Fxd Composition 82 K ohms ±5% 1/4W	AB	CB8235	2
R10	Resistor, Variable 50 K ohms ±20%	Bourns	3068P-1-503	1
R11	Same as R6			
R12	Resistor, Fxd, Composition 100 K ± 5% 1/4W	AB	CB1045	1
R13	Resistor, Fxd, Composition 8.2 K ohms ±5% 1/4W	AB	CB8225	1
R14	Resistor, Fxd, Composition 47 ohms ±5% 1/4W	AB	CB4705	2
R15	Same as R2			
R16	Resistor, Fxd, Composition 300 K ohms ±5% 1/4W	AB	CB3045	1
R17	Same as R14			
R18	Resistor, Fxd, Composition 1 K ohm ±5% 1/4W	AB	CB1025	1
R19	Same as R9			

VIDEO AMPLIFIER, VA-202-1				
SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C1	Capacitor, Fixed, Ceramic Dielectric 0.01 uf ±20% 50 VDCW	Sprague	19C214	1
C2	Not Used			
C3	Capacitor, Fixed, Tantalum 47 uf 35W VDC ±20%	Sprague	150D476X0035S2	3
C4	Same as C3			
C5	Same as C3			
C6	Capacitor, Fixed, Tantalum 100 uf 20 W VDC ±20%	Sprague	150D107X0020S2	1
CR1	Semiconductor Device, Diode	PSI	IN753A	1
Q1	Transistor	TI	2N335	1
Q2	Transistor	TI	2N708	1
Q3	Transistor	TI	2N697	1
R1	Resistor, Fixed, Composition 30 K ohms ±5% 1/4W	AB	CB3035	1
R2	Resistor, Fixed, Composition 4.7 K ohms ±5% 1/4W	AB	CB4725	1
R3	Resistor, Fixed, Composition 270 K ohms ±5% 1/4W	AB	CB2745	1
R4	Resistor, Fixed, Composition 2 K ohms ±5% 1/4W	AB	CB2025	1
R5	Resistor, Fixed, Composition 1.8 K ohms ±5% 1/4W	AB	CB1825	1
R6	Resistor, Fixed, Composition 3K ohms ±5% 1/4W	AB	CB3025	1
R7	Resistor, Fixed, Composition 390 ohms ±5% 1W	AB	GB3915	1
R8	Resistor, Fixed, Composition 20 ohms ±5% 1/4W	AB	CB2005	1
R9	Resistor, Fixed, Composition 10 K ohms ±5% 1/4W	AB	CB1035	1

AUDIO AMPLIFIER, AA-206

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C1	Capacitor, Fixed, Electrolytic 4.7 uf ± 20% 35 vdc	Sprague	CS13AF4R7M 150D475X0035B2	1
C2	Capacitor, Fixed, Electrolytic 47 uf ± 20% 6 wvdc	Sprague	CS13BB476M 150D476X006B2	1
C3	Capacitor, Fixed, Electrolytic 150 uf ± 20% 15 wvdc	Sprague	CS13AD151M 150D157X0015S2	2
C4	Same as C3			
C5	Capacitor, Fixed, Electrolytic 47 uf ± 20% 20 wvdc	Sprague	CS13AF470M 150D476X0020R2	3
C6	Same as C5			
C7	Same as C5			
Q1	Transistor	TI	2N697	4
Q2	Same as Q1			
Q3	Same as Q1			
Q4	Same as Q1			
R1	Resistor, Fixed Composition 2 K ohms, ±5% 1/4w	AB	CB2025	1
R2	Resistor, Fixed Composition 68 K ohms, ±5%, 1/4w	AB	CB6835	2
R3	Resistor, Fixed Composition 12 K ohms, ±5%, 1/4w	AB	CB1235	2
R4	Resistor, Fixed Composition 100 ohms, ±5%, 1/4w	AB	CB1015	2
R5	Resistor, Fixed Composition 510 ohms, ±5%, 1/4w	AB	CB5115	1
R6	Same as R3			
R7	Same as R4			
R8	Same as R2			
R9	Resistor, Fixed Composition 8.2 K ohms, ±5%, 1/4w	AB	CB8225	2

AUDIO AMPLIFIER, AA-206

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
R10	Resistor, Fixed Composition 240 ohms, ±5%, 1/4w	AB	CB2415	2
R11	Same as R10			
R12	Same as R9			
R13	Resistor, Variable 1000 ohms, ±20%, 1/4w		3067P-1-102	1
R14	Resistor, Fixed Composition 1 K ohms, ±5%, 1/4w	AB	CB1025	1
T1	Transformer, Driver	Triad	TF5RX13ZZ SP-20	1
T2	Transformer, Output	UTC	SO-15P per TF5RX17ZZ	1

CARRIER OPERATED RELAY MODULE, COR-201

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C1	Capacitor, Fxd, Electrolytic (Tantalum) 10 uf, ±20%, 35 vdcw	81349	CS13AF100M	1
CR1	Semiconductor Device, Diode	Sylvania	1N462	1
K1	Relay, Armature DPDT, 24V 3.0 Amp @30 VDC, 1.0 Amp @ 115 VAC	P & B	SCG11D	1
Q1	Transistor	TI	2N697	2
Q2	Same as Q1			
Q3	Transistor	TI	2N335	4
Q4	Same as Q3			
Q5	Same as Q3			
Q6	Same as Q3			
R1	Resistor, Fxd, Composition 10 K ohms ±5% 1/4W	AB	CB1035	4
R2	Resistor, Fxd, Composition 100 K ohms ±5% 1/4W	AB	CB1045	2
R3	Same as R2			
R4	Same as R1			
R5	Resistor, Fxd, Composition 22 K ohms ±5% 1/4W	AB	CB2235	1
R6	Same as R1			
R7	Resistor, Fxd, Composistion 330 K ohms ±5% 1/4W	AB	CB3345	1
R8	Resistor, Variable 1 Megohm 1/2W	Bourns	3068P-1-105	1
R9	Resistor, Fxd, Composition 330 ohms, ±5% 1/2W	AB	EB3315	1
R10	Same as R1			

±12 VDC POWER SUPPLY PS-103

SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C1	Capacitor, Tantalum Electrolytic 100 uf. 20%	Sprague	150D107X0020S2	1
C2	Capacitor, Ceramic Disc 0/01 uf. 20%	Sprague	19C214	2
C3	Capacitor, Tantalum Electrolytic 150 uf. 20% 15 vdcw	81349	CS13AD151M	1
C4	Same as C2			
C5	Capacitor, Tantalum Electrolytic 1.0 uf. 20%	Sprague	150D105X0035A2	1
CR1	Diode, Zener	PSI	IN754A	1
Z1	Diode Bridge, Encapsulated	Motorola	MDA-920-3	1
F1	Fuse 3/4 Amp, Instrument	Little Fuse	361.750	1
Q1	Transistor, Silicon	TI	TI486	1
Q2	Transistor, Silicon	TI	2N708	1
R1	Resistor, Fixed Composition 1.3 K ohms ±5% 1/4 W	AB	CB1325	2
R2	Same as R1			
R3	Resistor, Fixed Compsotion 1.5 K ohms ±5% 1/4 W	AB	CB1525	1
R4	Resistor, Fixed Composition 1.8 K ohms ±5% 1/4 W	AB	CB1825	2
R5	Resistor, Variable 1000 ohms ±20% 1/2 W	Bourns	3067P-102	1
R6	Resistor, Fixed Composition 1.6 K ohms ±5% 1/4 W	AB	CB1625	1
R7	Same as R4			

+24 VDC POWER SUPPLY PS-104				
SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C1	**Capacitor,** Tantalum Electrolytic 47 uf, ±10%	MIL	CS13BF476K	2
C2	Capacitor, Ceramic Disc 0.01 uf, 20%	Sprague	19C214	1
C3	Same as C1			
CR1	Diode, Rectifier		1N717A	2
CR2	Same as CR1			
F1	Fuse, Instrument 3/4 Amp	Little Fuse	361.750	1
Q1	Transistor	TI	TI486	1
R1	Resistor, Fixed Composition 510 ohms, ±5%, 1/4 W	AB	CB5115	2
R2	Same as R1			
Z1	Diode Bridge, Encapsulated	Motorola	MDA-920-3	1

AUTOMATIC FREQUENCY CONTROL AMPLIFIER, AFC-203				
SYM OR ITEM	NOMENCLATURE OR DESCRIPTION	MFR	PART NO.	QTY REQ
C1	Capacitor, Fxd, Monolythic 2.2 uf ±20% 25 vdc	Sprague	5C15	2
C2	Same as C1			
Q1	Transistor	Fairchild	2N1131	1
R1	Resistor, Fxd, Composition 10 K ohms ±5% 1/4W	AB	CB1035	2
R2	Resistor, Fxd, Composition 33 K ohms ±5% 1/4W	AB	CB3335	1
R3	Same as R1			
R4	Resistor, Fxd, Composition 100 K ohms ±5% 1/4W	AB	CB1045	1
R5	Resistor, Fxd, Composition 10 ohms ±5% 1/4W	AB	CB1005	1
R6	Resistor, Fxd, Composition 5.1 K ohms ±5% 1/4W	AB	CB5125	1
R7	Resistor, Fxd, Composition 200 K ohms ±5% 1/4W	AB	CB2045	1
R8	Resistor, Fxd, Composition 22 K ohms ±5% 1/4W	AB	CB2235	1
R9	Resistor, Fxd, Composition 15 K ohms ±5% 1/4W	AB	CB1535	1
Z1	Operational Amplifier	Philbrick	PP65AU	1

2. Manufacturers List.

Abbreviation	Manufacturers
AB	Allen Bradley Company 136 W. Greenfield Avenue Milwaukee 4, Wisconsin
ACL	Astro Communication Laboratory 9125 Gaither Road Gaithersburg, Maryland
AM	Automatic Metal Products Corp. 315 Berry Street Brookly 11, New York
Arco (Elmenco)	Arco Electronics, Inc., Community Drive Great Neck, New York
Bourns	Bourns, Inc., Trimpot Division 1200 Columbia Avenue Riverside, Californis
Cannon	ITT Cannon Electric Company 3208 Humboldt Street Los Angeles, California
CTC	Cambridge Thermionic Corporation 445 Concord Avenue Cambridge, Massachusetts
Cut Hamm	Cutler-Hammer Inc. 41 North 12th Street Milwaukee, Wisconsin
Dialco	Dialight Company 60 Stewart Avenue Brooklyn 37, New York
Drake	Drake Manufacturing Co. 4626 N. Olcott Ave. Chicago 31, Illinois
Elco	Elco Corporation Maryland Road & Computer Avenue Willow Grove, Pennsylvania

Erie	Erie Technological Products, Inc., 644 W. 12th Street Erie, Pennsylvania
FXR/RF	FXR Div. of Amphenol-Borg Electronics Corp. Danbury, Connecticut
GI	General Instrument Company 65 Gouverneur Street Newark 4, New Jersey
Gremar	Gremar Manufacturing Corporation 7 North Avenue Wakefield, Massachusetts
Hopkins	Hopking Engineering Co. Sub Maxson Electronics Corp. 12900 Foothill Boulevard San Frando, California
Hubbell	Harvey Hubbell, Inc. State St. & Bostwick Ave. Bridgeport, Connecticut
Littelfuse	Littelfuse, Inc., 800 E. Northwest Hwy Des Plaines, Illinois
McCoy	Mc Coy Electronic Co., Div., Oak Mfg. Co., Mt. Holly Springs, Pennsylvania
Minn Hon	Minneapolis Honewell Microswitch Div. Freeport, Illinois
Motorola	Motorola Semiconductor Products, Inc. 5005 E. McDowell Road Phoenix, Arizonia
Nytronics	Nytronics, Inc., Essex Electronics Div., 550 Springfield Avenue Berkeley Heights, New Jersey

Piezo	Piezo Crystal Company 265 E. Pomfret Street Carlisle, Pennsylvania
P & B	Potter & Brumfield Div. American Machine & Foundry Co., 1200 E. Broadway Princeton, Indiana
PSI/TRW	TRW Electronics/Pacific Semiconductor Semiconductor In., 14520 Aviation Blvd., Lawndale, California
QC	Quality Components, Inc., St. Marys, Pennsylvania
Sprague	Sprague Electric Company 125 Marshall Street North Adams, Massachusetts
Swcrft	Switchraft, Inc. 5537 N. Elston Avenue Chicago, Illinois
Sylvania	Sylvania Electric Products, Inc., 730 3rd Ave., New York, New York
TI	Texas Instrument, Inc., Dallas, Texas
UTC	United Transformer Company 150 Varick Street New York, New York

SECTION VII

ILLUSTRATIONS AND SCHEMATICS

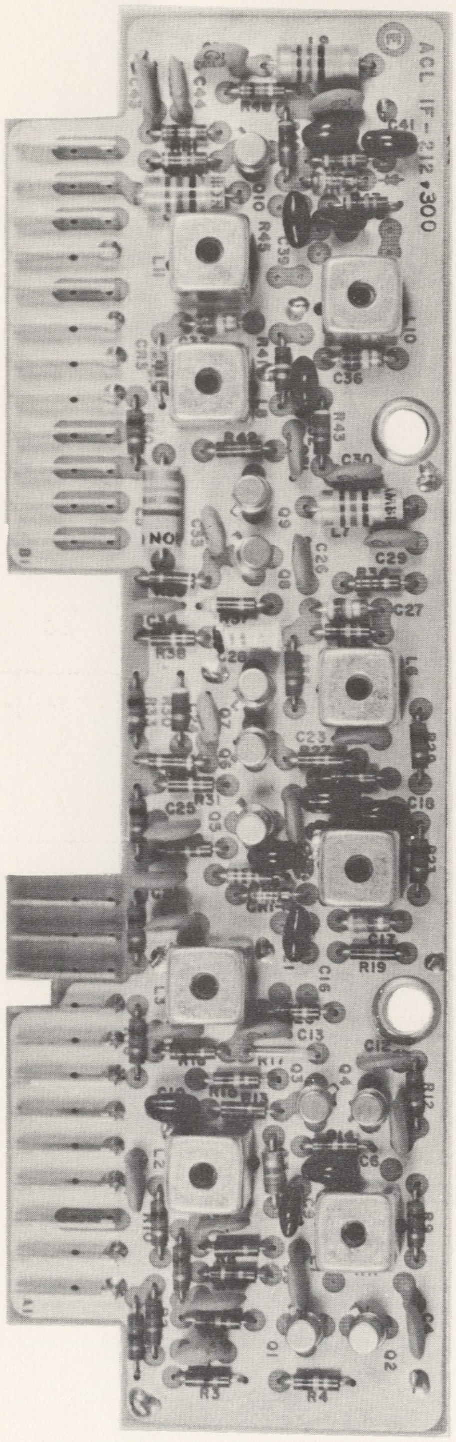
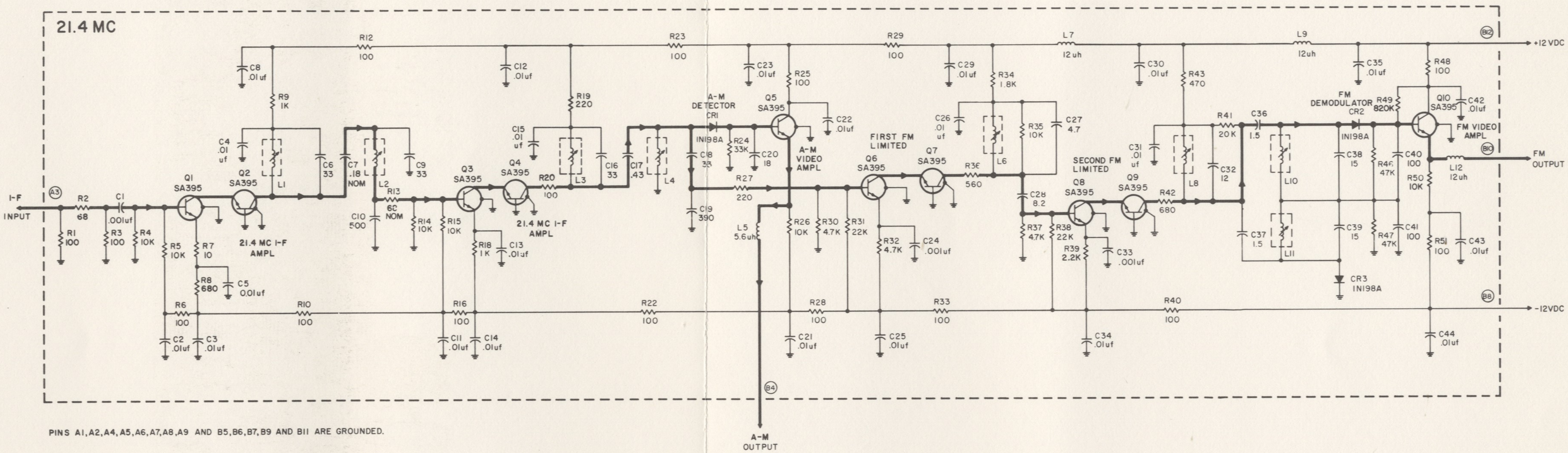


Figure 7-1A. Typical Wideband IF Amplifier, IF-212-300.

UNLESS OTHERWISE SPECIFIED:
ALL RESISTOR VALUES ARE IN OHMS, 1/4 W, 5%.
ALL CAPACITOR VALUES ARE IN pf.
NOM — NOMINAL INSTALLED VALUE, ACTUAL VALUE TBD BY TEST.



PINS A1, A2, A4, A5, A6, A7, A8, A9 AND B5, B6, B7, B9 AND B11 ARE GROUNDED.

300KC BANDWIDTH IF AMPLIFIER IF-212-300

Figure 7-1B. IF Amplifier, IF-212-300, Schematic.

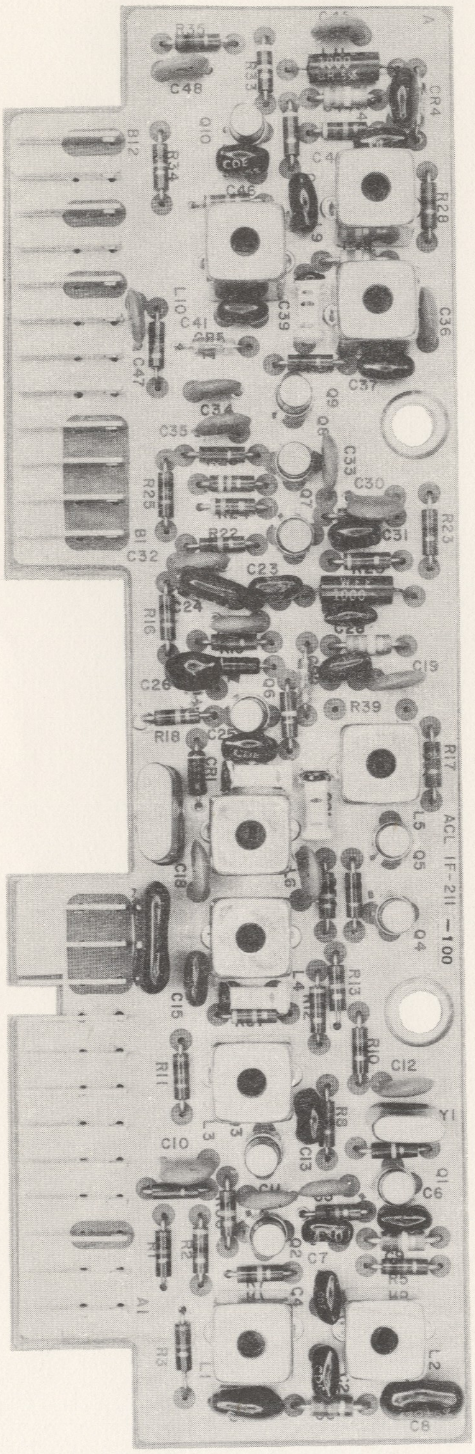


Figure 7-2A. Typical Medium Bandwidth
IF Amplifier, IF-211-100.

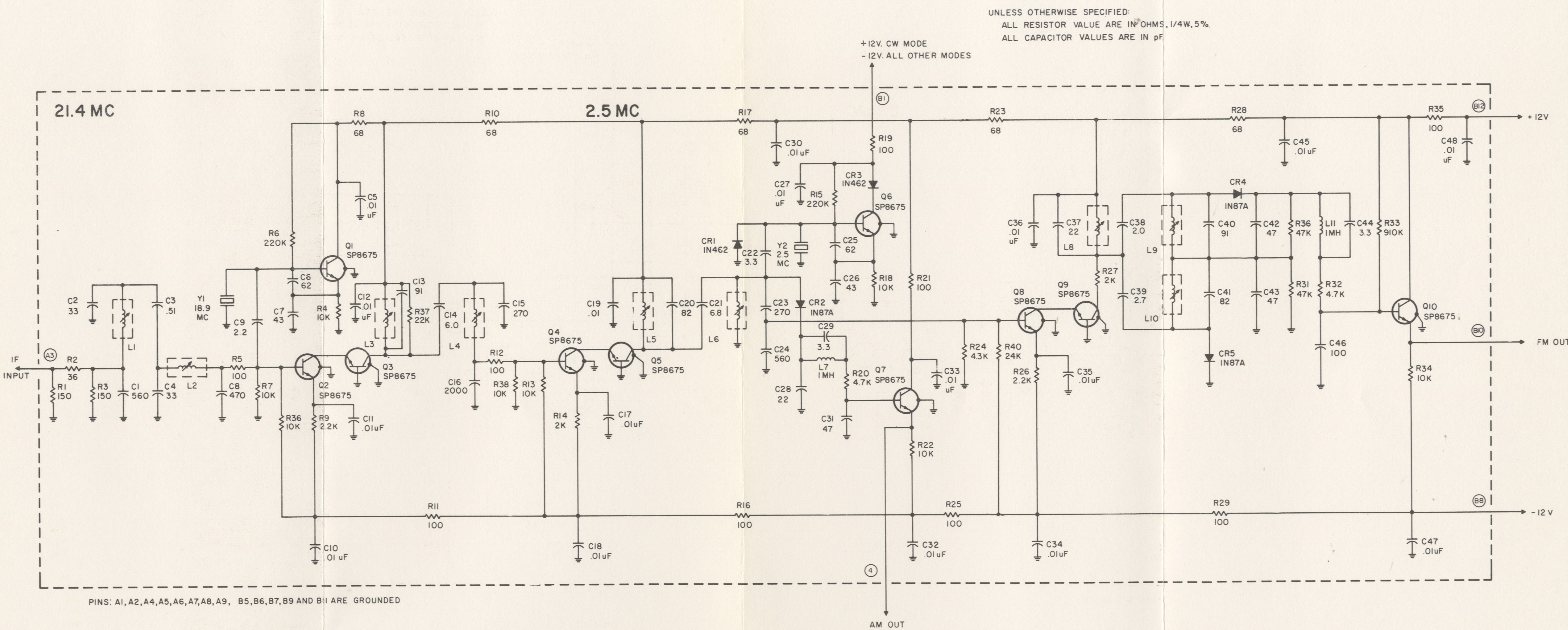


Figure 7-2B. IF Amplifier, IF-211-100, Schematic.

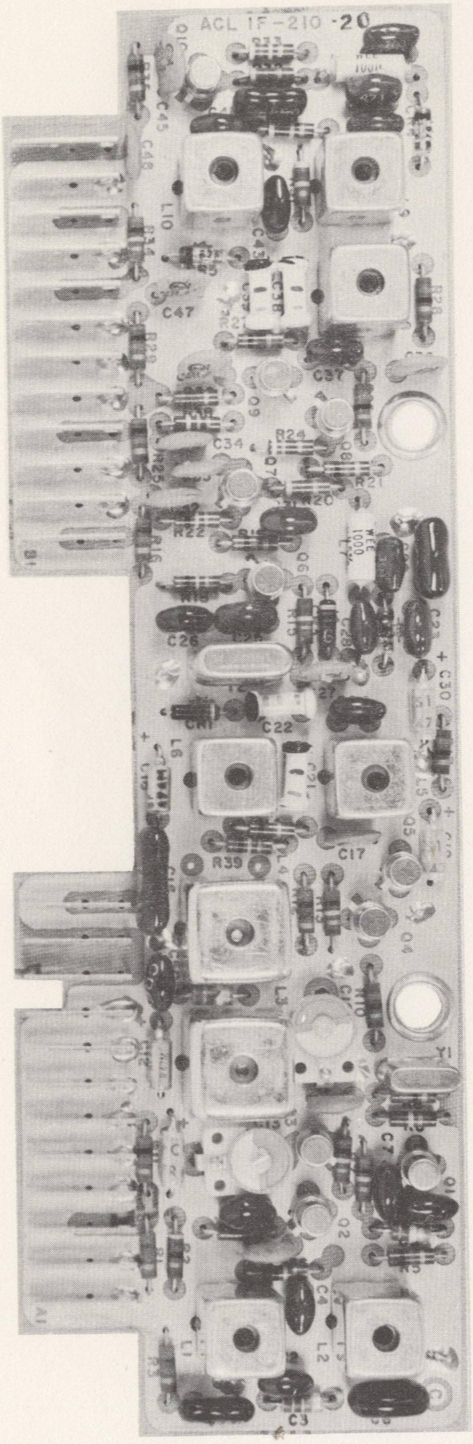


Figure 7-3A. Typical Narrow Bandwidth IF Amplifier, IF-210-20.

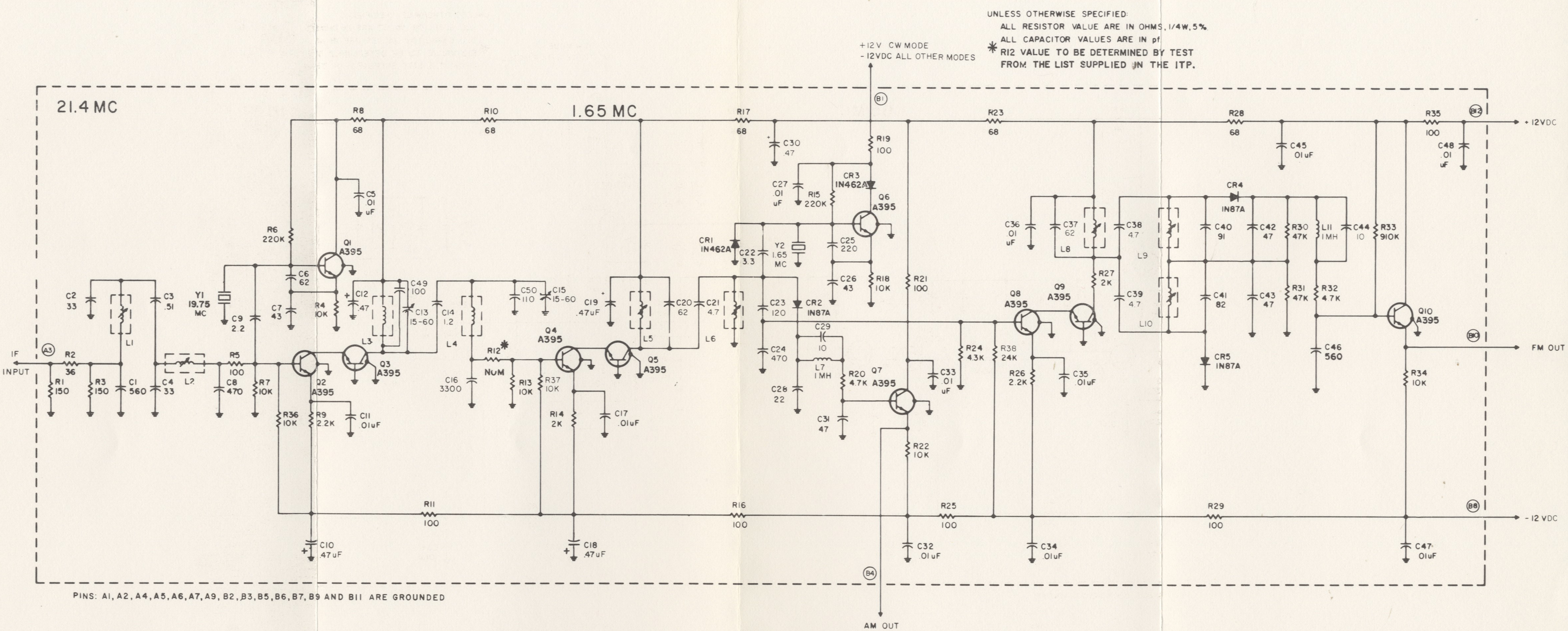


Figure 7-3B. IF Amplifier, IF-210-20, Schematic.

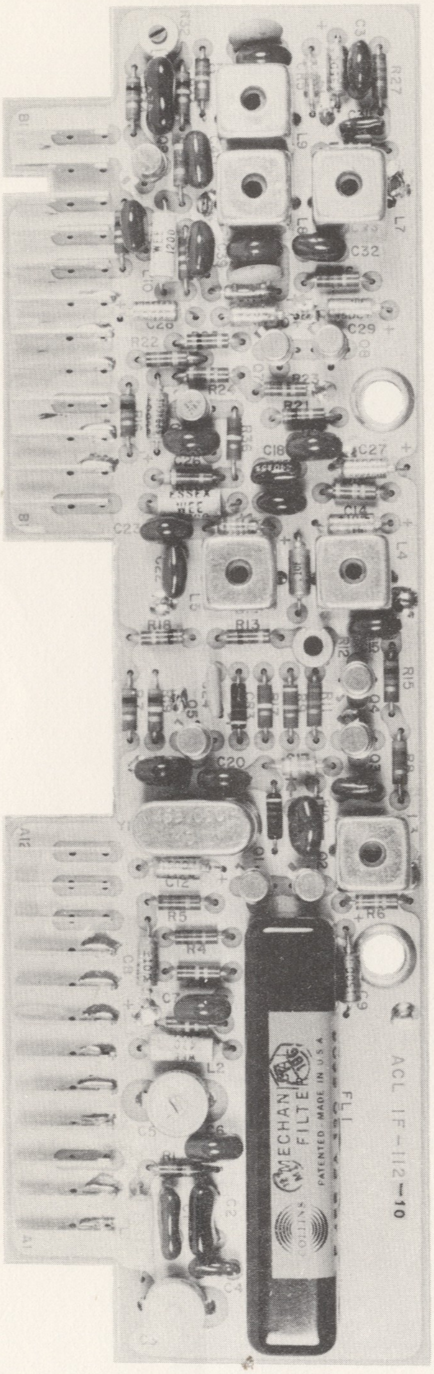
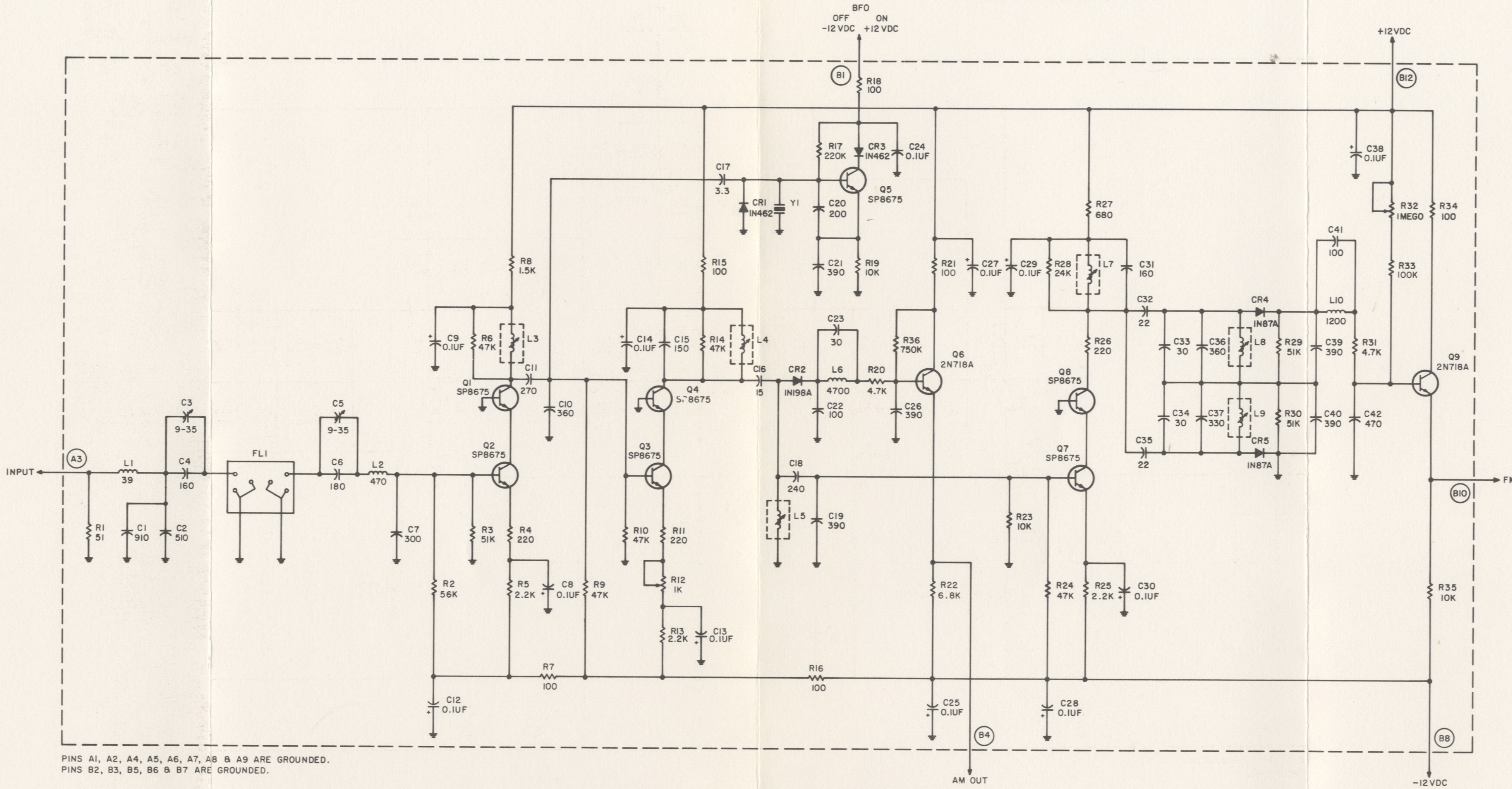


Figure 7-4A. Typical Narrow Bandwidth IF Amplifier, IF-112-10.

UNLESS OTHERWISE SPECIFIED:
ALL RESISTOR VALUES ARE IN OHMS, 1/4 W, 5%.
ALL CAPACITOR VALUES ARE IN UUF.



PINS A1, A2, A4, A5, A6, A7, A8 & A9 ARE GROUNDED.
PINS B2, B3, B5, B6 & B7 ARE GROUNDED.

Figure 7-4B. IF Amplifier, IF-112-10, Schematic.

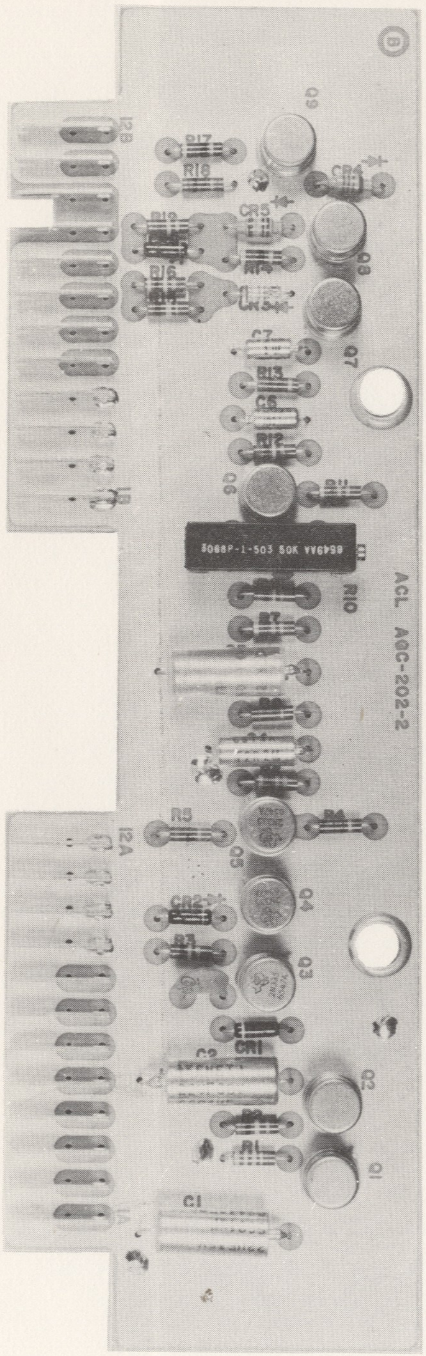


Figure 7-5A. AGC Amplifier, AGC-202-2.

UNLESS OTHERWISE SPECIFIED:
ALL RESISTOR VALUE ARE IN OHMS, 5%, 1/4 W.

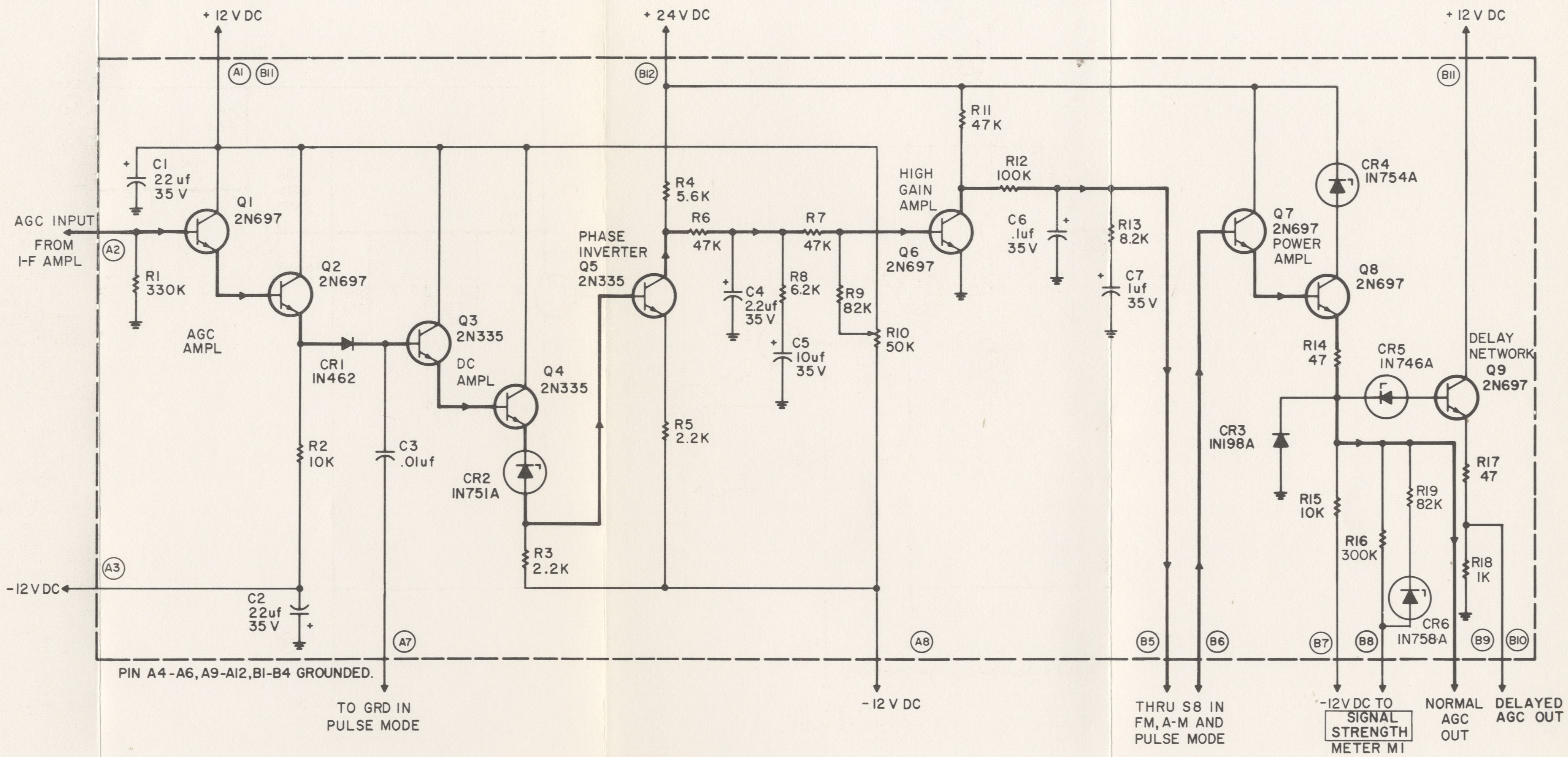


Figure 7-5B. AGC Amplifier, AGC-202-2 Schematic.

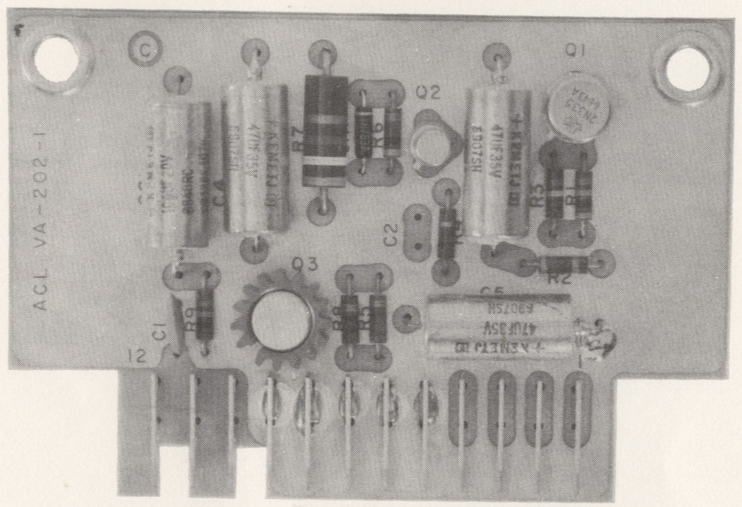


Figure 7-6A. Video Amplifier, VA-202-1.

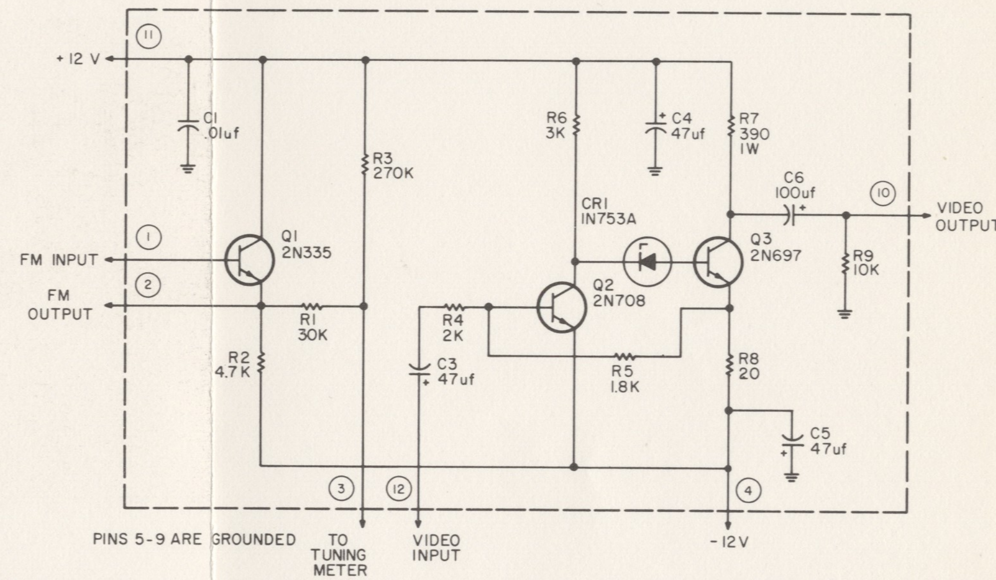


Figure 7-6B. Video Amplifier, VA-202-1, Schematic.

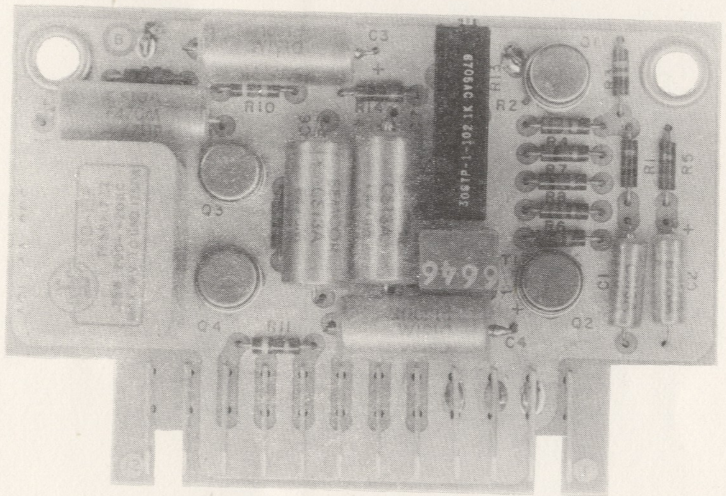


Figure 7-7A. Audio Amplifier, AA-206.

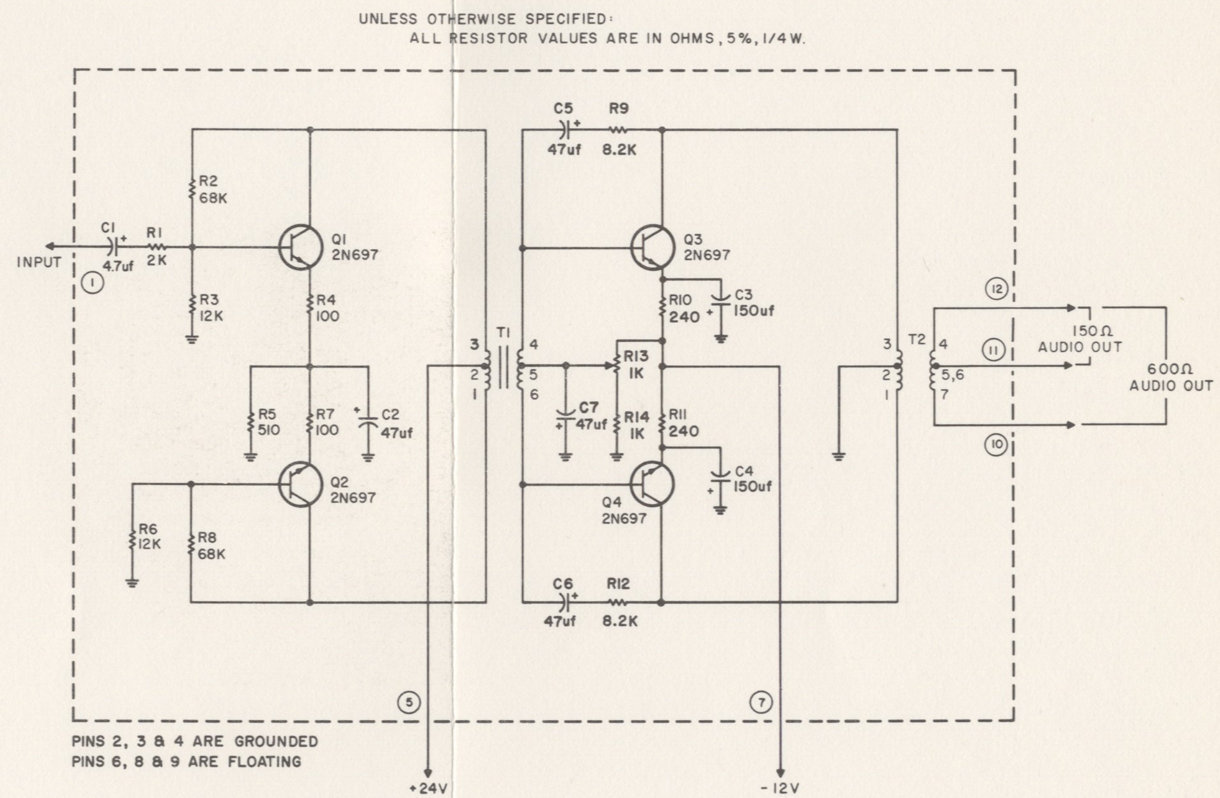


Figure 7-7B. Audio Amplifier, AA-206, Schematic.

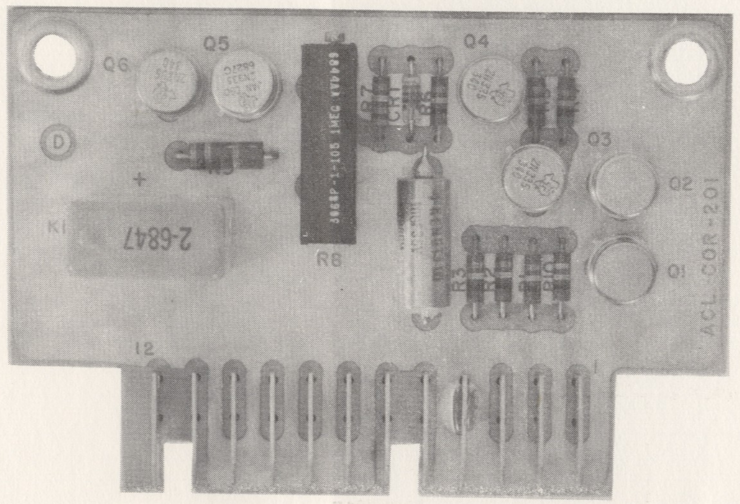


Figure 7-8A. Carrier Operated Relay Amplifier, COR-201.

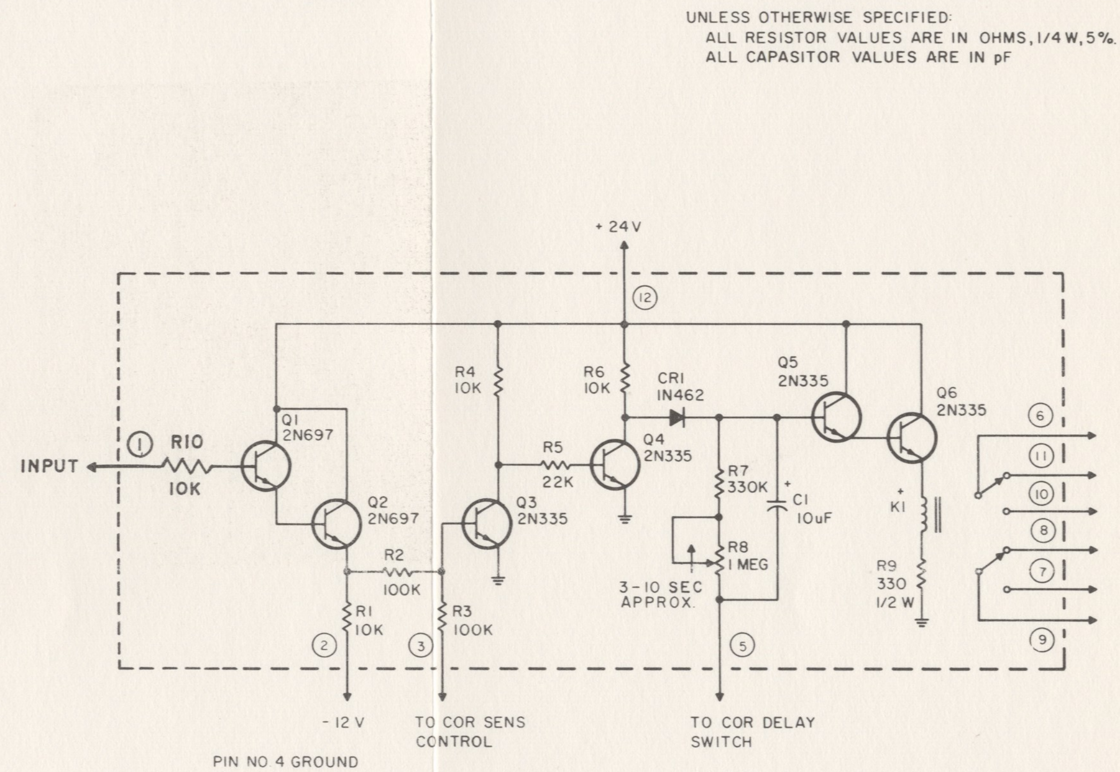


Figure 7-8B. Carrier Operated Relay Amplifier, COR-201, Schematic.

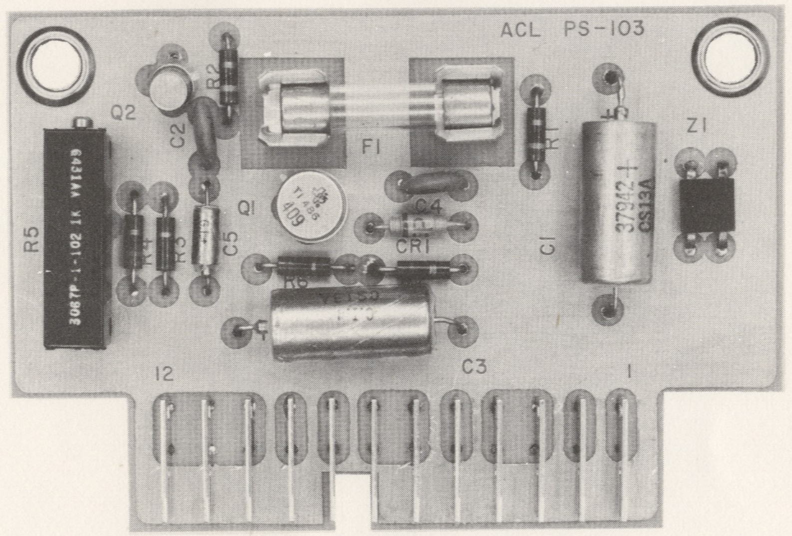


Figure 7-9A. ±12 VDC Power Supply, PS-103.

UNLESS OTHERWISE SPECIFIED:
ALL RESISTOR VALUES ARE IN OHMS, 1/4 W, 5%

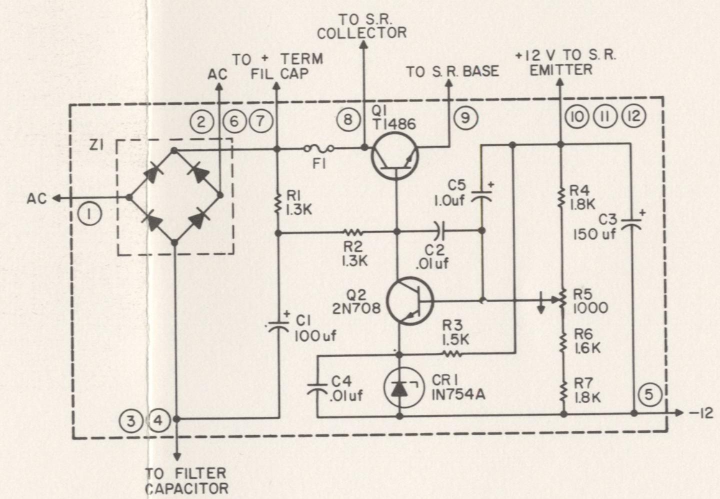


Figure 7-9B. ±12 VDC Power Supply, PS-103, Schematic

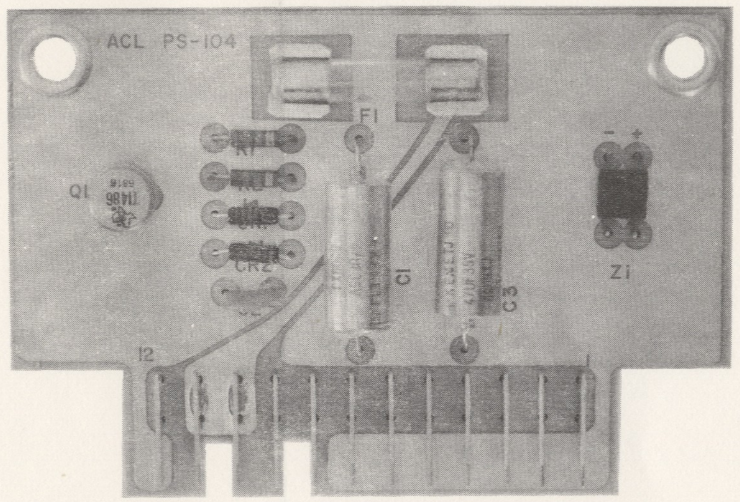
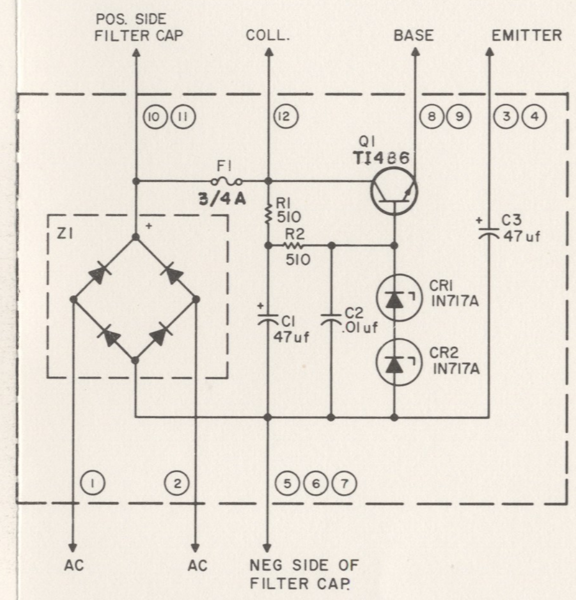


Figure 7-10A. +24 VDC Power Supply, PS-104.



+24V DC POWER SUPPLY PS-104

Figure 7-10B. +24 VDC Power Supply, PS-104, Schematic.

NOTE:

* VALUE TO BE DETERMINED BY TEST; NOMINAL VALUE SHOWN.

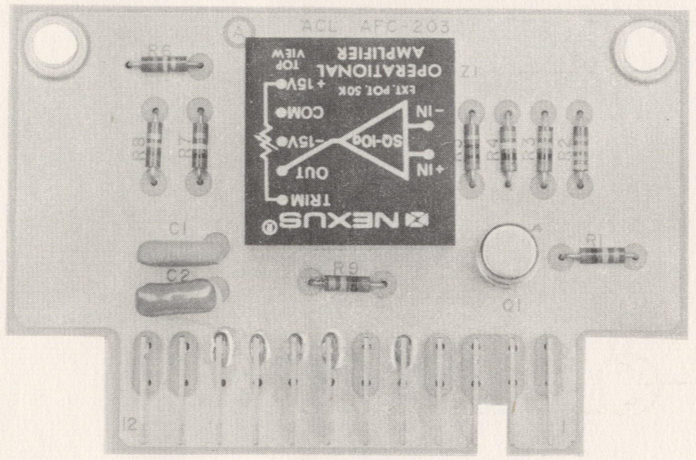
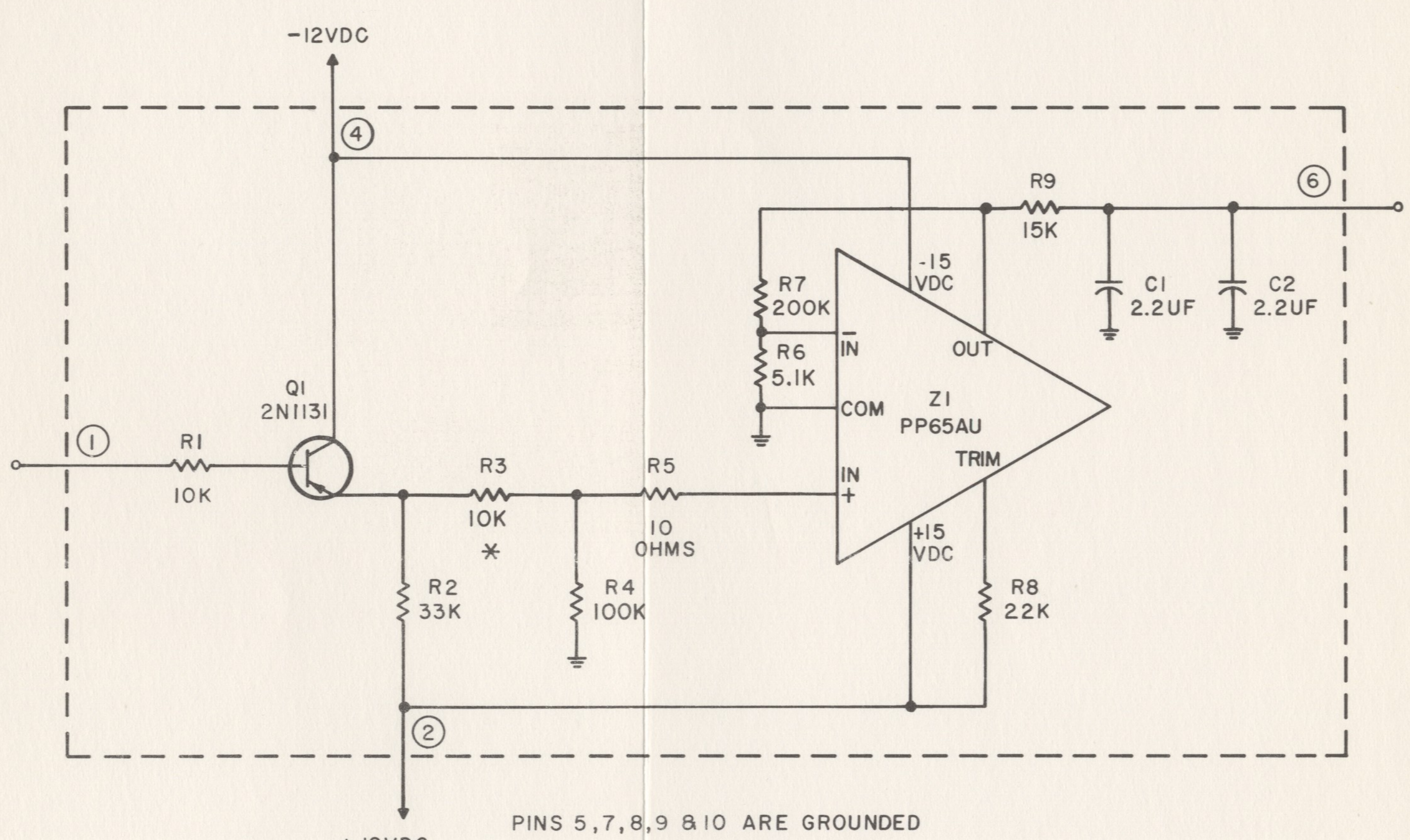


Figure 7-11A. AFC Amplifier, AFC-203.



PINS 5,7,8,9 & 10 ARE GROUNDED

PINS 3,11 & 12 NOT USED

Figure 7-11B. AFC Amplifier, AFC-203, Schematic.

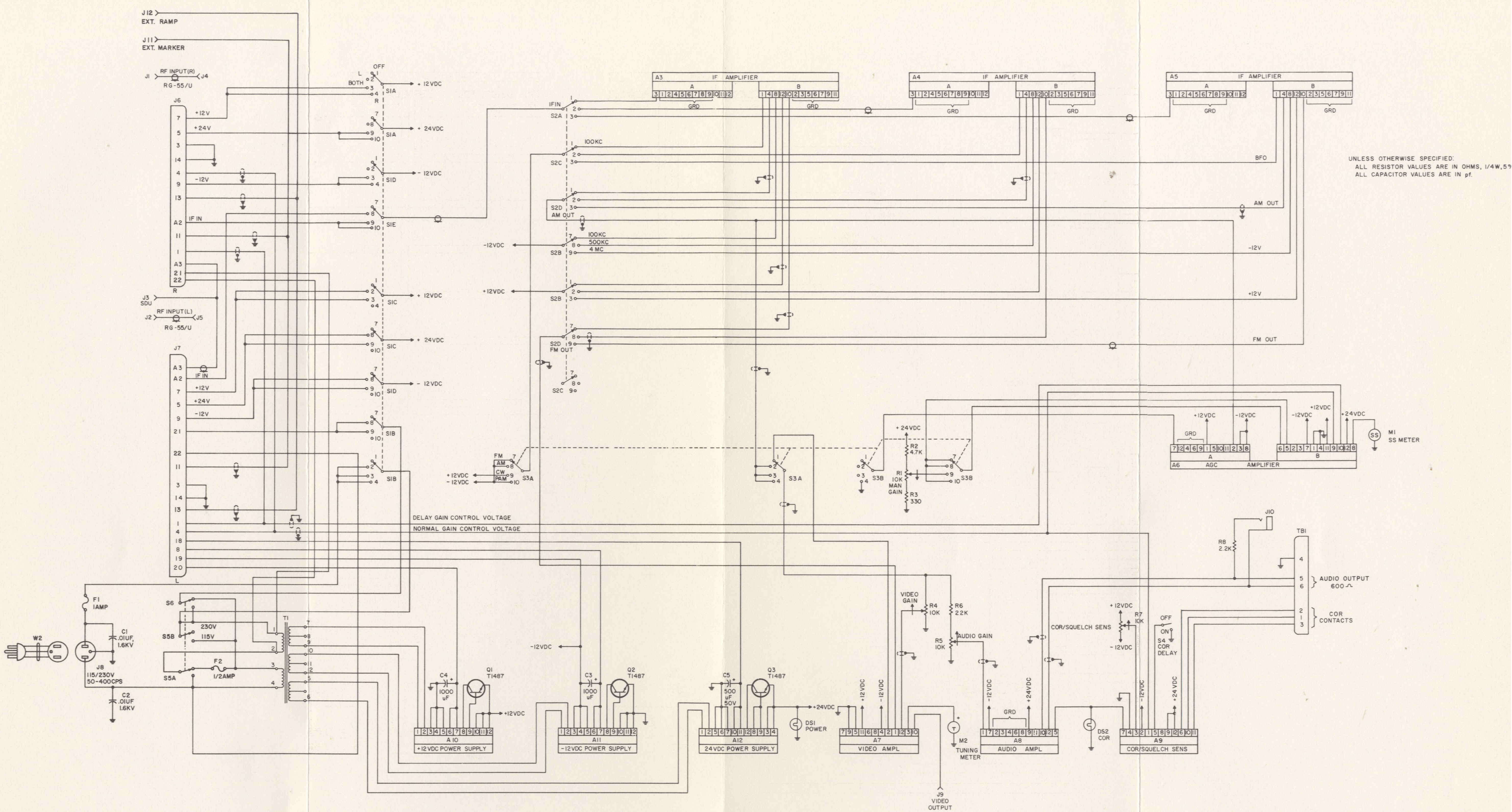


Figure 7-12. SR-209 Interconnection Diagram

Courtesy of http://BlackRadios.terryo.org