

SERVICE MANUAL

NUTONE MODEL IM-203

3-WIRE

BUILT-IN DECENTRALIZED AM & FM RADIO/INTERCOM SYSTEM

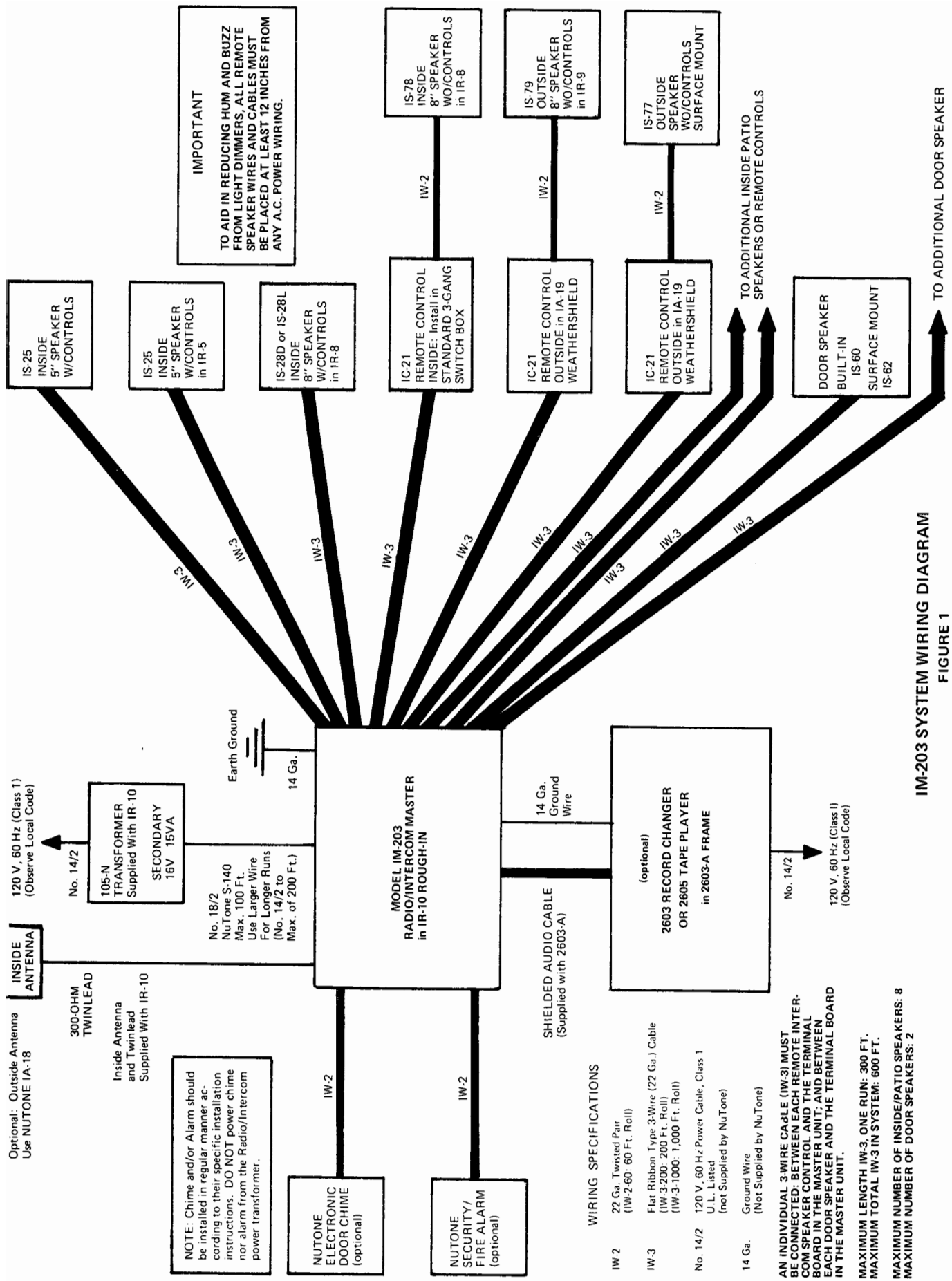


NuTone Housing Products

Scovill

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IM-203 SYSTEM WIRING DIAGRAM
FIGURE 1

WIRING SPECIFICATIONS

- IW-2 22 Ga. Twisted Pair (IW-2-60: 60 Ft. Roll)
- IW-3 Flat Ribbon Type 3-Wire (22 Ga.) Cable (IW-3-200: 200 Ft. Roll) (IW-3-1000: 1,000 Ft. Roll)
- No. 14/2 120 V, 60 Hz. Power Cable, Class I U.L. Listed (not Supplied by NuTone)
- 14 Ga. Ground Wire (Not Supplied by NuTone)

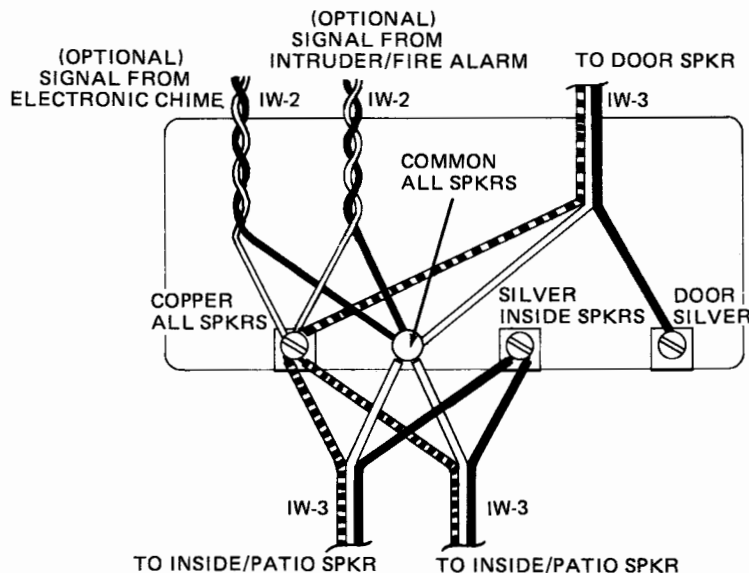
AN INDIVIDUAL 3-WIRE CABLE (IW-3) MUST BE CONNECTED BETWEEN EACH REMOTE INTERCOM SPEAKER CONTROL AND THE TERMINAL BOARD IN THE MASTER UNIT; AND BETWEEN EACH DOOR SPEAKER AND THE TERMINAL BOARD IN THE MASTER UNIT.

MAXIMUM LENGTH IW-3: ONE RUN: 300 FT. MAXIMUM TOTAL IW-3 IN SYSTEM: 600 FT.

MAXIMUM NUMBER OF INSIDE/PATIO SPEAKERS: 8

MAXIMUM NUMBER OF DOOR SPEAKERS: 2

INSTALLATION



NOTE: AN INDIVIDUAL IW-3 CABLE MUST BE RUN TO EACH INSIDE/PATIO SPKR (MAXIMUM OF 8). AN INDIVIDUAL IW-3 CABLE MUST BE RUN TO EACH DOOR SPKR (MAXIMUM OF 2).

THE CENTER (COMMON) WIRE FROM EVERY DOOR AND I/P SPKR MUST BE CONNECTED DIRECT TO THE "COMMON ALL SPKRS" BINDING POST.

THE SILVER (OUTPUT) WIRE FROM ALL I/P SPKRS MAY BE TWISTED TOGETHER AND SPLICED TO A SINGLE WIRE FOR CONNECTION AT THE "SILVER INSIDE SPKRS" TERMINAL.

THE COPPER (INPUT) WIRE FROM ALL I/P SPKRS AND DOOR SPKRS MAY BE TWISTED TOGETHER AND SPLICED TO A SINGLE WIRE FOR CONNECTION AT THE "COPPER ALL SPKRS" TERMINAL.

THE SILVER (OUTPUT) WIRE FROM THE DOOR SPKR(S) MUST BE CONNECTED TO THE "DOOR SILVER" TERMINAL.

IM-203D INTERCOM CONTROL TERMINAL BOARD CONNECTIONS

FIGURE 2

(1) The system must be installed, using the recommended wire and cable, as shown in SYSTEM BLOCK DIAGRAM, Figure 1.

(2) The Inside/Patio (I/P) Speakers; Door Speakers; and when used, the Chime and/or Alarm should be connected at the Master Unit Intercom Control Terminal Board as shown in Figure 2.

OPERATIONAL CHECKOUT

(1) The system must be capable of completing the entire checkout procedure. Failure to complete any step indicates a malfunction in part(s) of the system.

(2) Set the VOLUME CONTROL at every I/P Speaker for maximum loudness (full clockwise position).

(3) ON MASTER UNIT: (Figure 3)

(3.1) Set VOLUME/THIS SPEAKER CONTROL to maximum.

(3.2) Turn system ON with the ON/OFF-VOLUME/ALL SPEAKER CONTROL and set to approximate mid-range position.

(3.3) Set PROGRAM SELECTOR SWITCH to FM.

(3.4) With TUNING KNOB, tune receiver to a known FM station.

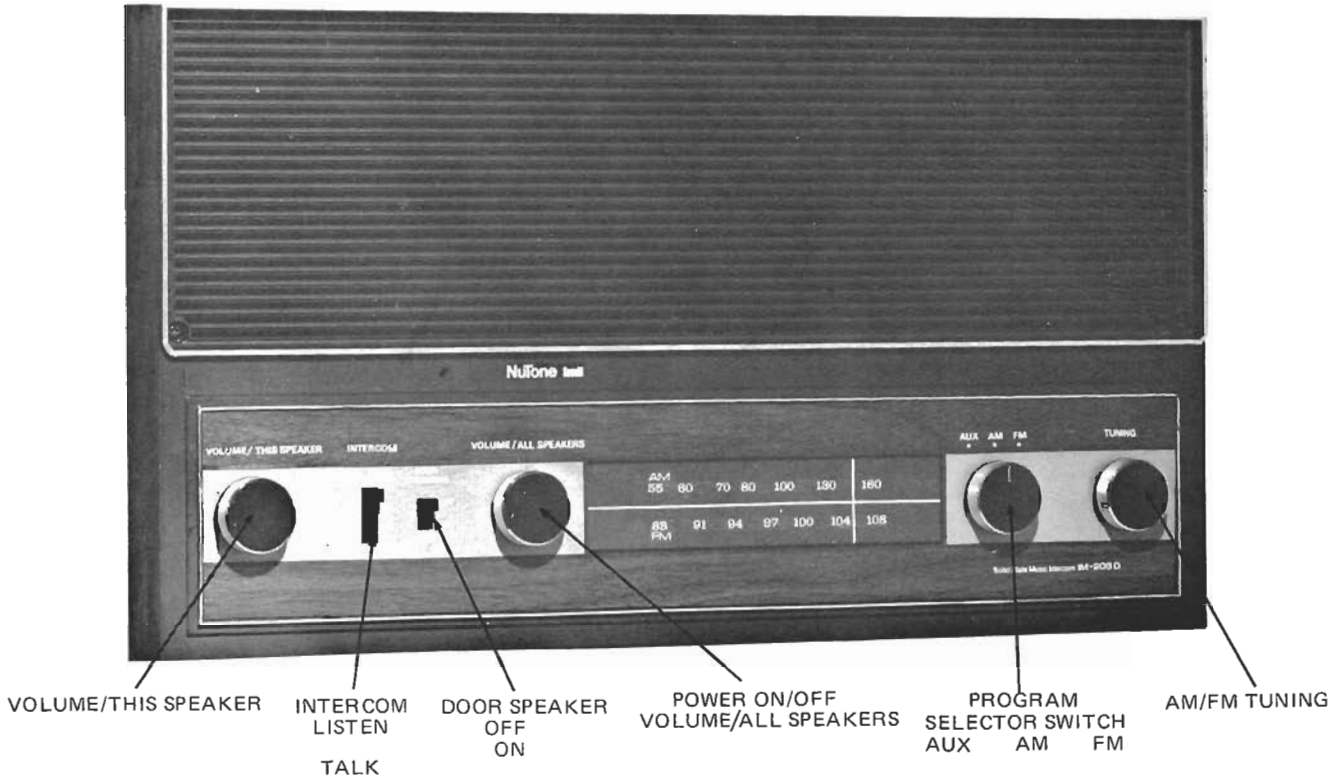
(4) SYSTEM VOLUME:

(4.1) Adjust the Master Unit's VOLUME/ALL SPEAKER CONTROL for sufficient audio level at the Master Unit and at every I/P Speaker. There must be sufficient volume at the site requiring the greatest sound level.

(4.2) Adjust the Master Unit's VOLUME/THIS SPEAKER CONTROL for the desired audio level in its area.

(4.3) Adjust the VOLUME CONTROL of each I/P Speaker for the desired audio level in its locale.

NOTE: If I/P Speakers' Volume Controls are set too low and Master Unit's VOLUME/ALL SPEAKERS CONTROL is set too high, distortion will result.



IM-203D MASTER UNIT CONTROLS

FIGURE 3

(4.4) The entertainment program; and the reception and transmission of intercom signals will be turned OFF:

At the Master Unit when VOLUME/THIS SPEAKER CONTROL is set to minimum, i.e. full counter clockwise position.

At the I/P Speaker when its VOLUME CONTROL is set to minimum, i.e. full counter clockwise position.

(5) On the Master Unit, tune to various FM stations to check reception across the band.

(6) Set PROGRAM SELECTOR SWITCH to AM and check by tuning for reception of AM stations across the band.

(7) If a Record Player or Tape Player is included in the system, throw the PROGRAM SELECTOR SWITCH to AUX and play a record or tape of known quality.

(8) MASTER UNIT INTERCOM OPERATION:

(8.1) Press the INTERCOM TALK/LISTEN SWITCH to TALK and speak into the Unit, the intercom signal will be transmitted to the I/P Speakers that are ON, and to the Door Speaker(s) if the DOOR SPEAKER ON/OFF SWITCH is in the ON position. (When Door Speaker is ON, it will receive the entertainment program.)

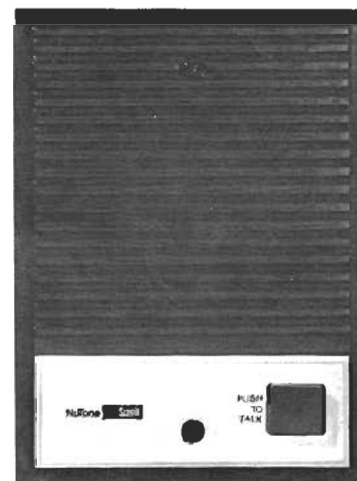
(8.2) If the DOOR SPEAKER ON/OFF SWITCH is in the OFF position, the Door Speaker will not receive the entertainment program nor the intercom signals from the Master Unit and I/P Speakers.

(8.2.1) When Door Speaker is OFF: If its TALK/LISTEN SWITCH is thrown to TALK, sounds in the vicinity of the Door Speaker(s) will be heard at the Master Unit and I/P Speakers.

(8.3) To receive "Hands Free" answer from the I/P Speakers and Door Speaker(s), throw the Master Unit INTERCOM TALK/LISTEN SWITCH to LISTEN. The person at the I/P and/or Door Speakers may answer without activating their TALK/LISTEN SWITCHES.

(8.4) HANDS FREE ANSWERING FROM THE I/P AND DOOR SPEAKERS IS POSSIBLE ONLY WHEN THE CALL IS ORIGINATED AT THE MASTER UNIT.

(8.5) MUTING: When the Master Unit is operating in the AM or FM mode, and its INTERCOM TALK/LISTEN SWITCH is activated, the entertainment program will be silenced. If the set is operating in AUX (phono or tape) mode, the program will not be silenced during intercom operation. The intercom signal must "Override" the tape or phono program.



IS-60 BUILT-IN DOOR SPEAKER

FIGURE 4

(8.5.1) When a call is received at an I/P Speaker and the entertainment program (AM or FM) is muted, the person at the receiving station will know that the call was originated at the Master and that it can be answered "Hands Free."

(9) I/P SPEAKERS INTERCOM OPERATION

(9.1) When an intercom call is originated at an I/P Speaker (or Door Speaker), the intercom signal must "Override" the entertainment program.

(9.2) Press the I/P Speaker TALK/LISTEN SWITCH to TALK and speak into the speaker, the intercom message should be heard at the Master Unit and Other I/P Speakers (and at the Door Speaker if ON).

(9.3) Other I/P Speakers; Master Unit or Door Speaker may answer the call by pressing its TALK/LISTEN SWITCH to TALK and speaking into the unit.

(10) LISTEN-IN OPERATION:

(10.1) Any I/P Speaker's TALK/LISTEN SWITCH can be locked in the TALK position. Sounds in the vicinity of this speaker will be heard. "Overriding" the entertainment program at the Master Unit and other I/P Speakers (and at Door Speaker(s) if ON).

(10.2) To increase intercom "Override," set the VOLUME CONTROL of the I/P Speaker(s) that is in "Listen-in" to maximum, i.e. full clockwise position.

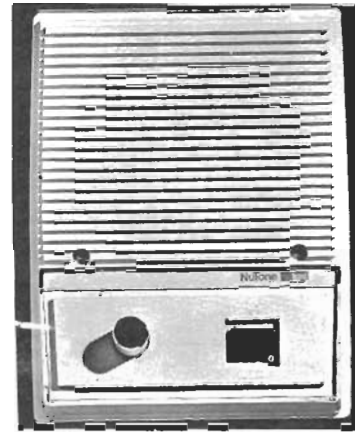
(11) INTERCOM OVERRIDE:

(11.1) To set the overall system intercom override, adjust the setting of the LEVEL SET CONTROL VR2 on the Master Unit's receiver/amplifier PC Board:

To increase relative strength of intercom signal, decrease the volume of the entertainment program.

To decrease relative strength of intercom signal, increase the volume of the entertainment program.

(11.2) After the Intercom Signal to Entertainment Program ratio has been set, the overall volume may be readjusted with the Master Unit's VOLUME/ALL SPEAKER CONTROL.



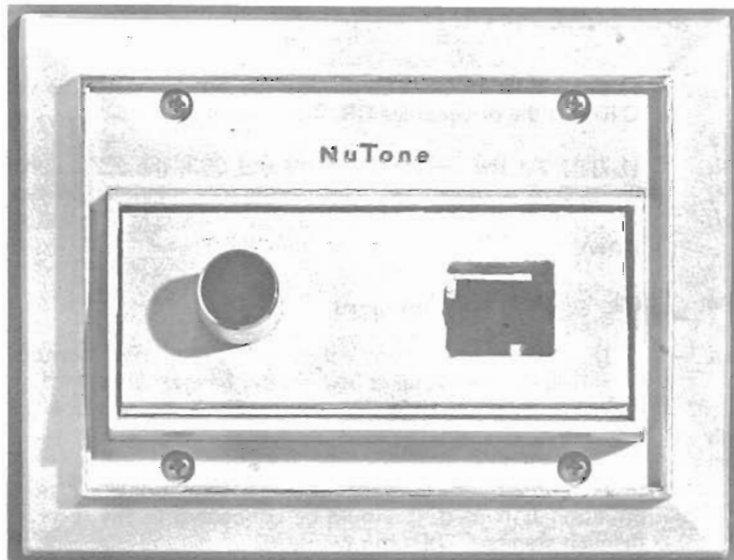
IS-25 INSIDE 5 IN. SPEAKER WITH CONTROLS

FIGURE 5



IS-28 INSIDE 8 IN. SPEAKER WITH CONTROLS

FIGURE 6



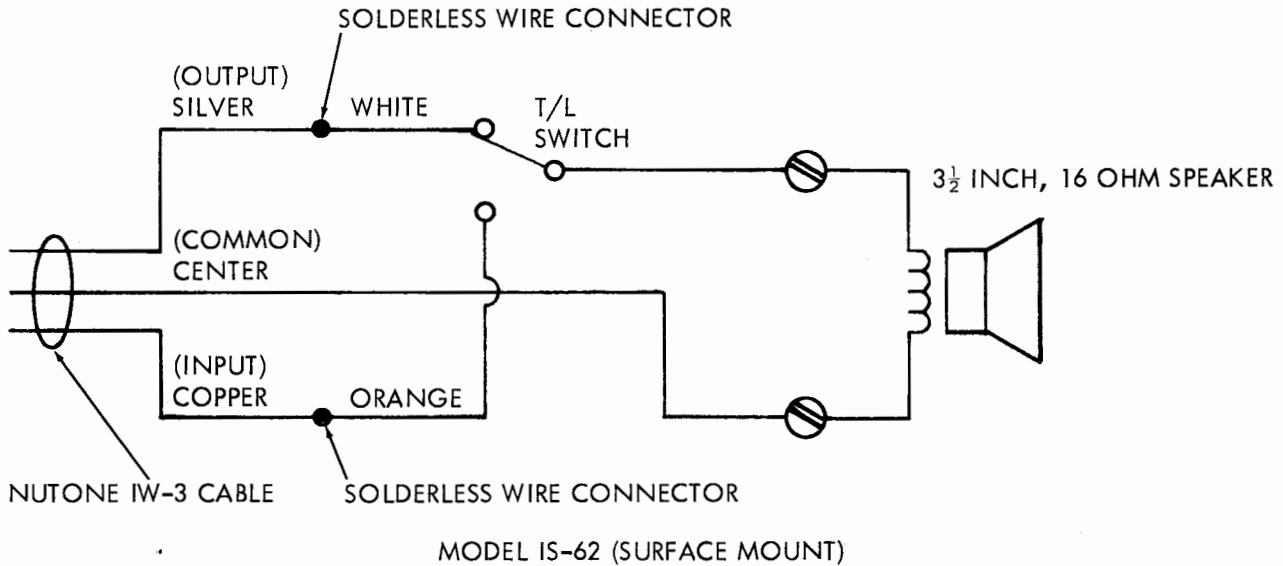
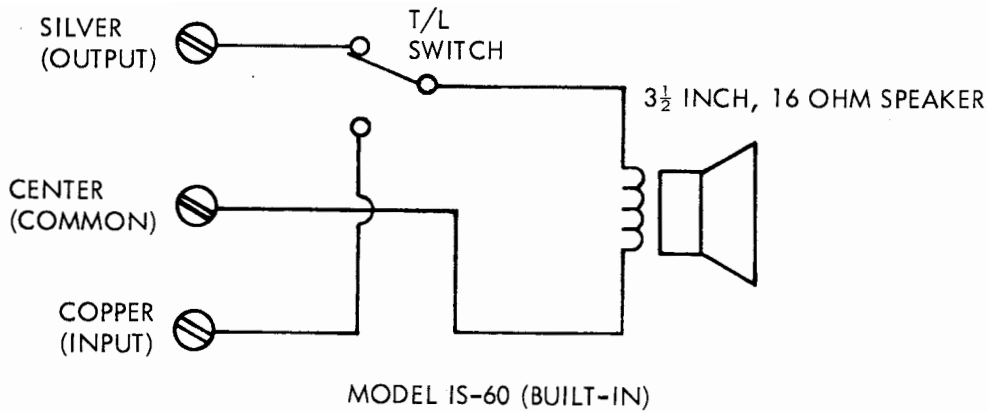
IC-21 REMOTE CONTROL

FIGURE 7



IS-77 OUTSIDE WEATHERPROOF SPEAKER

FIGURE 8



DOOR SPEAKERS CONTROLS
FIGURE 9

THEORY OF OPERATION (SEE SCHEMATIC DIAGRAM)

(1) POWER SUPPLY

(1.1) The Master Unit is powered by an externally mounted 16Vac, 15VA transformer — NuTone Model 105-N. The primary of the 105-N should be connected to 120V, 60 Hz. supply (Figure 1). This transformer is supplied with the IR-10 Rough-in Housing.

(1.2) The 16Vac from the 105-N is connected to the orange and black (both wires black in later production units) primary leads of power transformer T11 on the Master Unit chassis.

(1.3) The center-tapped secondary of T11 is fed through the ON/OFF SWITCH S4 (controlled by shaft of VR1) to the full-wave rectifier D8 and D9.

(1.4) The diode switching noise of D8 and D9 is bypassed by C73 and C72.

(1.5) The rectifier output (Vcc) is +15.4Vdc filtered by C63, R49 and C53.

(1.6) Full 15.4V Vcc powers the output stage Q9 and Q10 and the driver stage Q8.

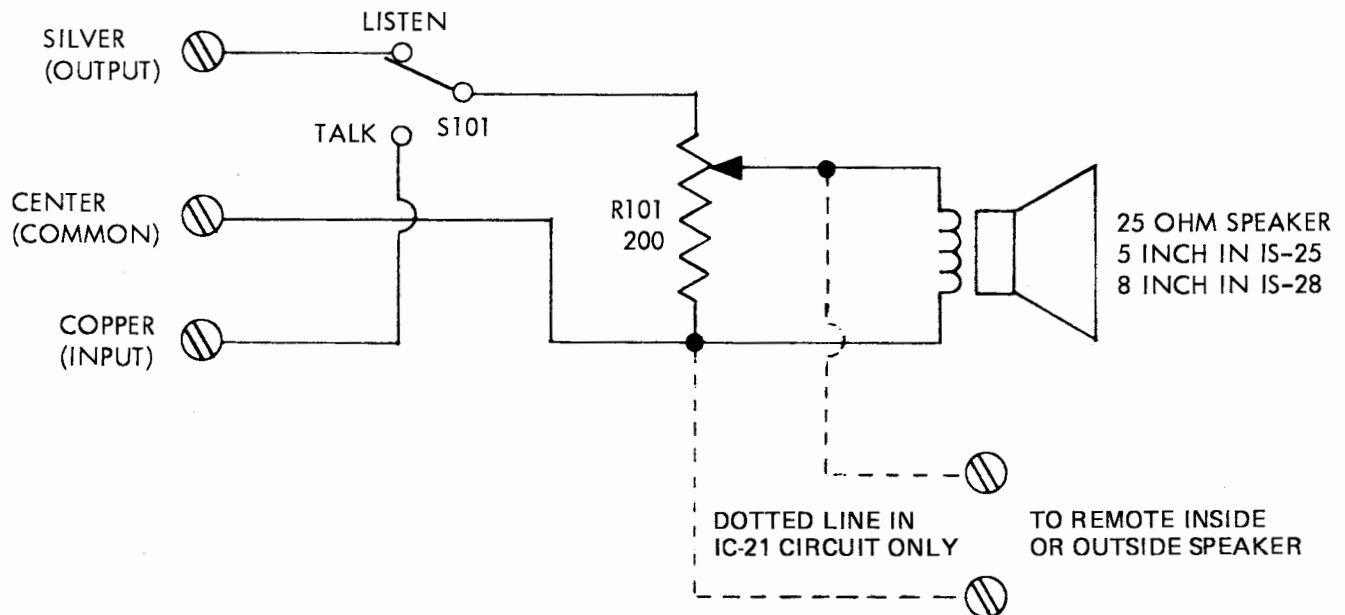
(1.7) At the junction of R49 and C53, the 7.2V Zener diode D15 is connected. This results in a regulated voltage to the first audio stage Q7 and to the AM/FM RF and IF stages.

(2) ANTENNA

(2.1) An inside antenna is supplied with the IR-10 Rough-in Housing. The signal is fed to the receiver through flat, 300-ohm twinlead. The 300-ohm twinlead also serves as the AM antenna.

(2.2) When an outdoor antenna (directional or non-directional) is used, it should be connected to the receiver through standard 300-ohm twinlead.

(2.3) The antenna is connected to the AM and FM receivers through balance coil L12.



IS-25/IS-28 INSIDE SPEAKER & IC-21 REMOTE INSIDE/OUTSIDE SPEAKER CONTROL

FIGURE 10

(2.4) Low-voltage static charges are drained off the antenna by the reverse-connected diodes D13 and D14.

(2.5) Hi-voltage static charges are drained off the antenna by the neon lamp NE1. This lamp fires at approximately 90 volts.

(2.6) The circuits will protect the antenna against nearby lightning strikes, but will probably not protect the set against direct hits.

(3) FM TUNER

(3.1) The FM band signals are fed through L1 to the base of the tuned collector RF amplifier. The collector tank is tuned to the desired FM signal carrier frequency and the output is fed between emitter and base of the FM oscillator/convertor Q2.

(3.2) The oscillator tank circuit, L6/L7/C307 and associated components, is tuned to 10.7 MHz. above the RF carrier frequency. The output of this tank is fed through C68 to the emitter of the FM convertor Q2. It is beat with the RF carrier and the 10.7 MHz. is loaded by the primary circuit of IF transformer T1.

(3.3) Diode D1 is FM overload protector. If the voltage developed in the T1 primary tank circuit is too high, D1 will conduct with a resulting drop in the Q2 collector voltage.

(3.4) Q1 and Q2 are connected to the +7.2 voltage supply through the FM terminals of SELECTOR SWITCH S1-A only when the switch is in FM position.

(3.5) The 10.7 MHz. IF is fed through secondary of T1 to the base of the first IF amplifier Q3 where, it is amplified and fed to the remainder of the IF strip: T2; Q4; T3; Q5; T4; and ratio detector transformer T5.

(3.6) The standard ratio detector incorporates the matched diodes D4 and D5.

(3.7) The detector's audio output is connected to the de-emphasis network R34/C42 and from the high-side of C42 to the FM terminals of S1-C.

(3.8) The AFC voltage is generated across C44 and is fed through R13 to the reverse-biased AFC diode D12. Changes in the IF frequency results in a change in the voltage developed across C44 and this change adds to or subtracts from the reverse bias applied to D12.

(3.9) Changing the reverse bias on D12 results in a change of the effective capacitance of the oscillator tank circuit, thus compensating for any oscillator drift.

(3.10) Further stability is built-in through the use of the regulated 7.2Vdc supply and the common bias supply.

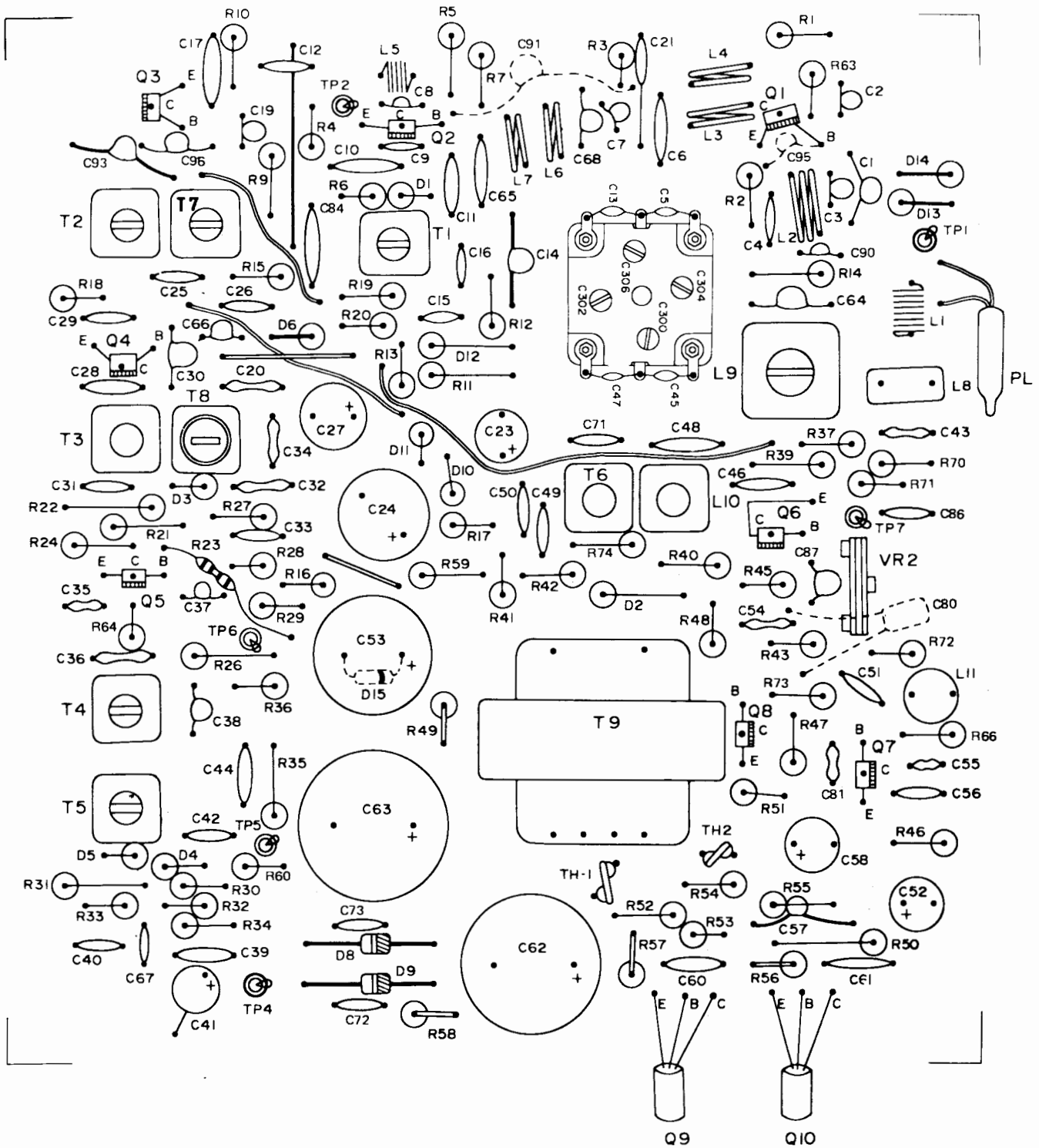
(3.11) Bias to the first IF amplifier is fed through the FM terminal of S1-B; R76; the secondary of T6; secondary of T1 and through R9 to Q3's base.

(4) AM TUNER

(4.1) The AM signal is fed from the AM antenna (300-ohm twinlead) to the balance coil L12; and then through L8 and C64 to the primary of L9 (coil of the tuned RF circuit). This tuned signal is fed through the secondary of L9 to the base of the AM oscillator/convertor Q6.

(4.2) The oscillator tank: L10; C303; C302; etc. is tuned to 455 KHz. above the AM carrier. The oscillator output is fed through C48 and the secondary of L9 to the base of Q6 where it is beat against the RF carrier signal and the 455 KHz. difference frequency is loaded by the tuned tank of the IF transformer T6 primary. Vcc is fed to Q6 through S1-A in AM position only.

(4.3) D2 provides protection against AM overload. When Q6 is over-driven, its collector goes toward emitter potential-forward biasing D2. When D2 conducts it swamps the tuned primary of the first AM IF transformer.



TUNER/AMPLIFIER PC BOARD COMPONENT LAYOUT (TOP VIEW)

FIGURE 11

(4.4) The AM IF is coupled to the base of Q3 and then through T7; Q4; and T8 to the detector.

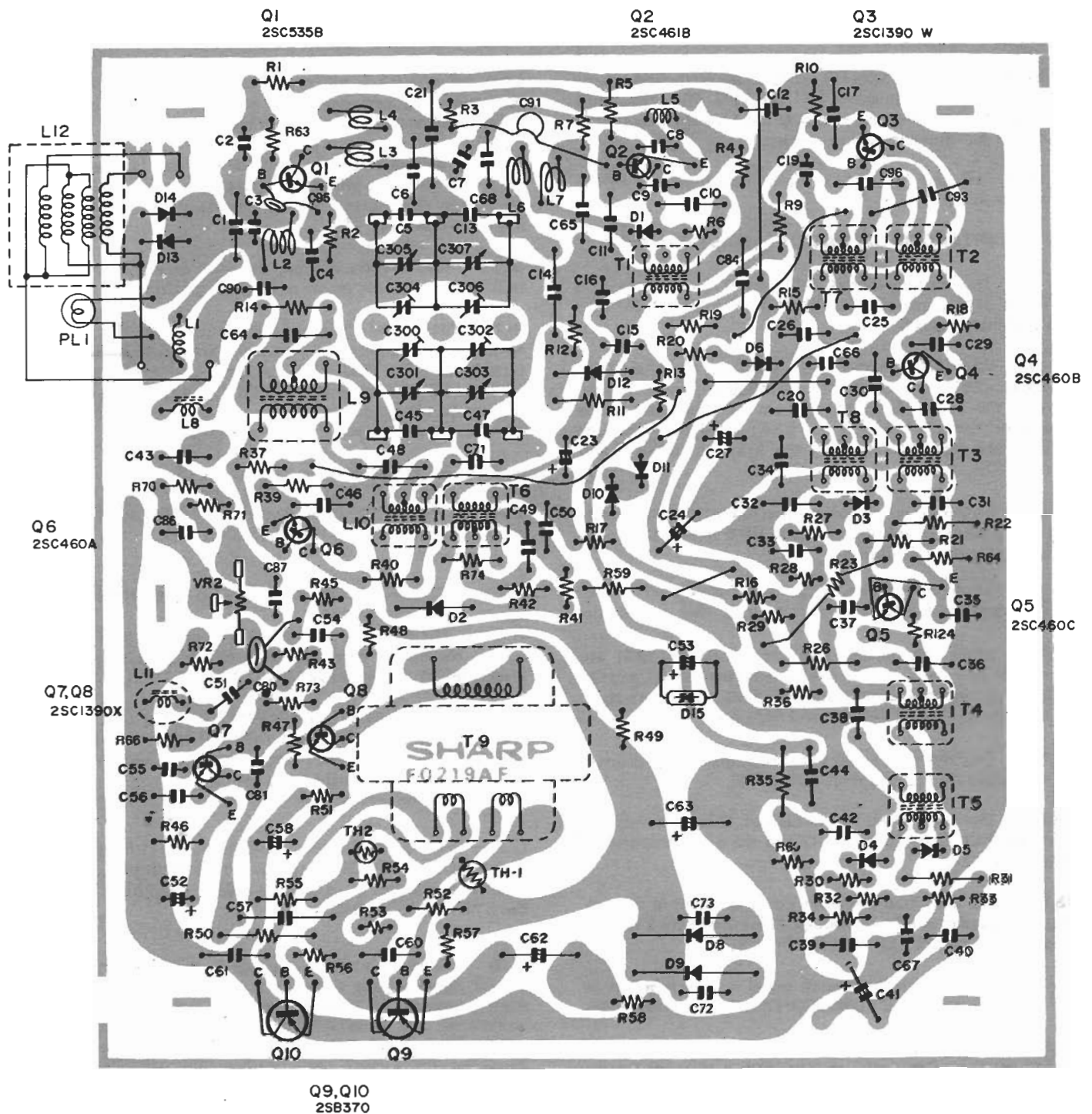
(4.5) Diode detection is provided by D3. The audio signal is generated across C32 and fed through R27 and R36 to the AM terminal of S1-C.

(4.6) Bias to Q3 is fed from R29 (AGC is developed at junction of C33/R29/R28) through R16; R17; secondary of T6 through secondary of T1 and R9. C23 serves as AGC

rectified voltage filter. The AGC voltage is superimposed on the bias and adds to or subtracts from the bias resulting in control of the first IF amplifier gain.

(5) AUDIO AMPLIFIER:

(5.1) The 3-position PROGRAM SELECTOR SWITCH S1 controls the entertainment program that is fed to the audio amplifier, i.e. AUX (phono or tape); AM; or FM.



TUNER/AMPLIFIER PC BOARD FOIL PATTERN (BOTTOM VIEW)
(Components as viewed through the board)

FIGURE 12

(5.2) The audio signal is fed through common terminal of S1-C; C43; and the treble boost network R70/R71/C86 to the wiper terminal of LEVEL SET CONTROL VR2.

(5.3) The low side of VR2 is connected to common ground through R72, keeping the wiper contact of VR2 at 22K above ground when the LEVEL SET CONTROL is set to minimum.

(5.4) The entertainment program is coupled from high-side of VR2 to VOLUME/ALL SPEAKER CONTROL VR1. The signal on the wiper contact of VR1 is coupled through R45; C54; and R73 to the base of the first audio voltage

amplifier Q7. C55 rolls off hi-frequencies at the base. Degenerative feedback capacitor C81 reduces hi-frequency gain of this stage.

(5.5) The collector output of Q7 is direct coupled to the base of driver stage Q8. Q8's collector output is transformer T9 coupled to the Class AB complimentary power output stage Q9 and Q10.

(5.6) The amplified audio output is coupled through C62 to pin 2 of J1. Full audio signal is developed across R58. The ground side of R58 is connected to pin 1 of J1. The audio output is then coupled through pins 2 and 1 of P1 to the Intercom Control Terminal Board.

(5.7) Audio(AC)feedback is coupled from output through R50/C57 to the base of Q8.

(5.8) The output stages Q9 and Q10 are protected against overload by the thermistors TH1 and TH2. Their resistance changes as they heat up, reducing the forward bias on Q9 and Q10 and thus the output current.

(5.9) C60 and C61 reduce the hi-frequency gain of the output transistors.

(6) INTERCOM OPERATION – MASTER UNIT

(6.1) The muting diodes D10 and D11 are connected through J1/P1 terminal 7 to the TALK/LISTEN SWITCH S3 terminals 1 and 8.

(6.2) When S3 is in the TALK position, one side of the speaker voice coil is connected to Input Common. The hi-side of the audio (AC) path is from the other side of the voice coil through VR4; S3-7 to S3-8; to S3-1 and through C82 to the tapped primary of the Intercom Input Transformer T12.

(6.3) At the same time the muting line's DC path is from S3-1 to S3-8/S3-7 and then through VR4 and speaker voice coil to common foil ground.

NOTE: The circuit common foil ground is connected through lower section of T12 to chassis ground. (See Schematic)

(6.4) When the muting transistors D10 and D11 are grounded as in (6.3) above, the forward bias on Q3 and Q4 will be so reduced as to turn off these transistors thus, effectively turning off the AM and FM signal.

(6.5) The intercom audio signal is coupled from primary to secondary of T12 and then across R66.

(6.6) The voltage at the hi-side of R66 is connected through R43; C80; C54; and R73 to the audio amplifier at the base of Q7.

(6.6.1) The amplified intercom signal is fed from the output of the audio amplifier through J1/P1-2 and S3-3 to S3-4 and then to the SILVER (OUTPUT) LINE.

(6.7) The amplified intercom signal will be heard at all I/P Speakers whose VOLUME CONTROLS are turned ON.

(6.8) If DOOR SWITCH S2 is open, the signal will not be fed to the Door Speaker(s); if the switch is closed the audio signal from the amplifier will be heard at the Door Speakers.

NOTE: When the TALK/LISTEN SWITCH is released, the charge on C82 prevents the immediate return of the audio signal. It will require 1 to 2 seconds for full recovery.

(6.9) The Intercom Input Transformer T12 must be connected exactly as shown in the schematic. Its phasing is important to long wire operation of intercom. Do not reverse the color-coded wires at J1/P1. The primary tap is off-center to equalize the difference in stray noise pickup of the speaker cables.

(6.10) C51 and L11 form a series resonant circuit. This is a rather low-Q, broad-bandpass circuit shorting hi-frequency (in the order of 42 KHz.) signals that may be present at the hi-side of R66.

(6.11) The intercom signal volume is controlled by the VOLUME/ALL SPEAKERS CONTROL VR1. The 1.8K resistor R45 prevents complete attenuation of the intercom signal when VR1 is set to minimum. This added intercom load resistance provides "head start" for the intercom signal over the entertainment program.

(6.12) VR2 controls the level of the entertainment program and does not effect the intercom signal. It is used to adjust the relative level of the entertainment program for intercom override.

(6.13) R61 slightly reduces the level of the audio signal to SP1 when S3 is in its normal (center position).

(6.14) When the S3 is in LISTEN position, SP1 is connected across the output of the audio amplifier. At the same time the SILVER (OUTPUT) terminal is connected through S3-2 and S3-1 and then through C82 to the primary of T12, making all I/P Speakers (and Door Speaker(s) if S2 is ON) operate as transmitters of intercom signals.

(6.14.1) At the same time, the DC path for the muting diodes is through S3-1 to S3-2, then through the I/P Speakers' voice coils back through CENTER (COMMON) terminal and J1/P1-1 to circuit common foil.

(7) INTERCOM OPERATION – IP SPEAKERS

(7.1) The speakers are normally connected so that they receive the output of the audio amplifier and each speaker's level is set by its individual VOLUME CONTROL R101.

(7.2) When TALK/LISTEN SWITCH S101 is activated, the speaker is connected across COPPER (INPUT) and CENTER (INPUT COMMON). The transmitting level from the speaker is also controlled by R101, and if it is set at minimum, no signal will be sent to the Input Transformer T12.

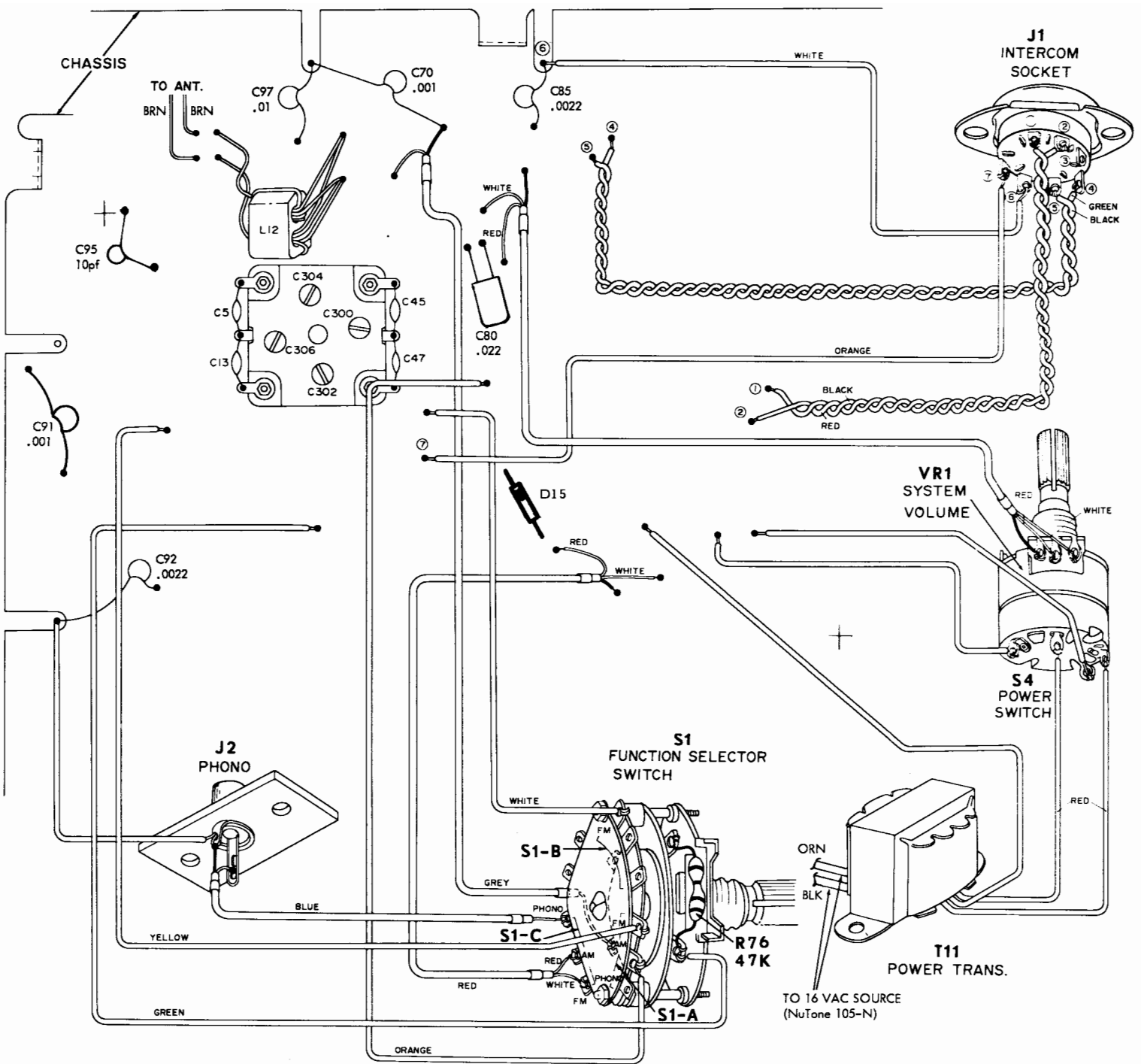
(7.2.1) For best intercom operation, the I/P Speakers' Volume Control R101 should be set to maximum, i.e. full clockwise position or as loud as system conditions permit. See SYSTEM VOLUME, page 3.

(7.3) When an intercom message is originated at one of the I/P Speakers, the signal must "Override" the entertainment program. To increase Intercom Override, lower the volume of the entertainment program by adjusting the LEVEL SET CONTROL VR2 on the Master Unit Receiver/Amplifier PC Board. Then readjust the VOLUME/ALL SPEAKERS CONTROL for desired audio level.

(8) INTERCOM OPERATION – DOOR SPEAKER

(8.1) When the DOOR SWITCH S2 on the Master Unit is in OFF, the Door Speaker cannot receive entertainment program nor intercom signals. If the T/L SWITCH on the Door Speaker is thrown to TALK, sounds in the vicinity will be heard at the Master and I/P Speakers overriding the entertainment program.

(8.2) When the DOOR SWITCH S2 on the Master Unit is in ON, the Door Speaker will operate the same as the I/P Speakers, except, there is no volume control on the Door Speaker and it operates at full volume.

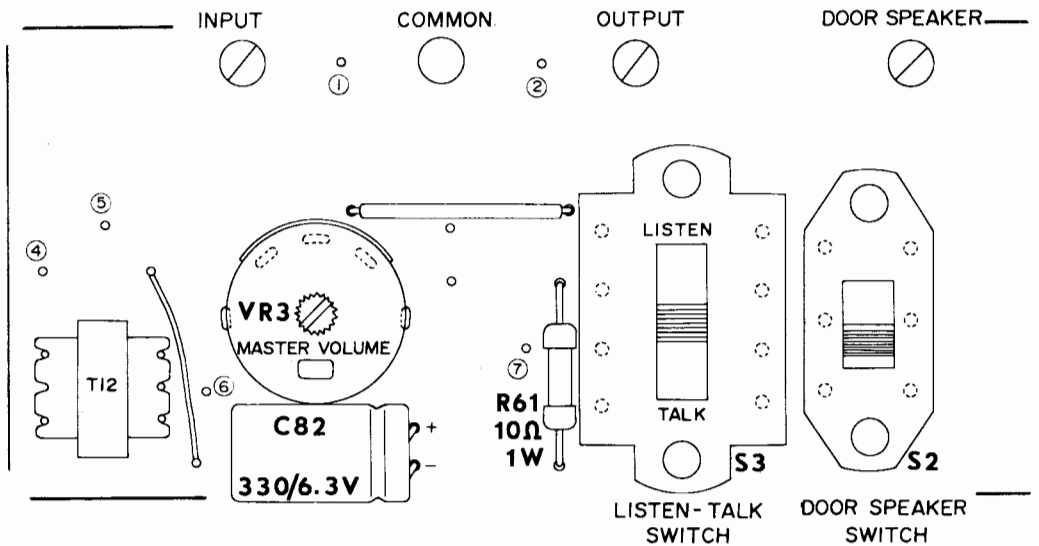
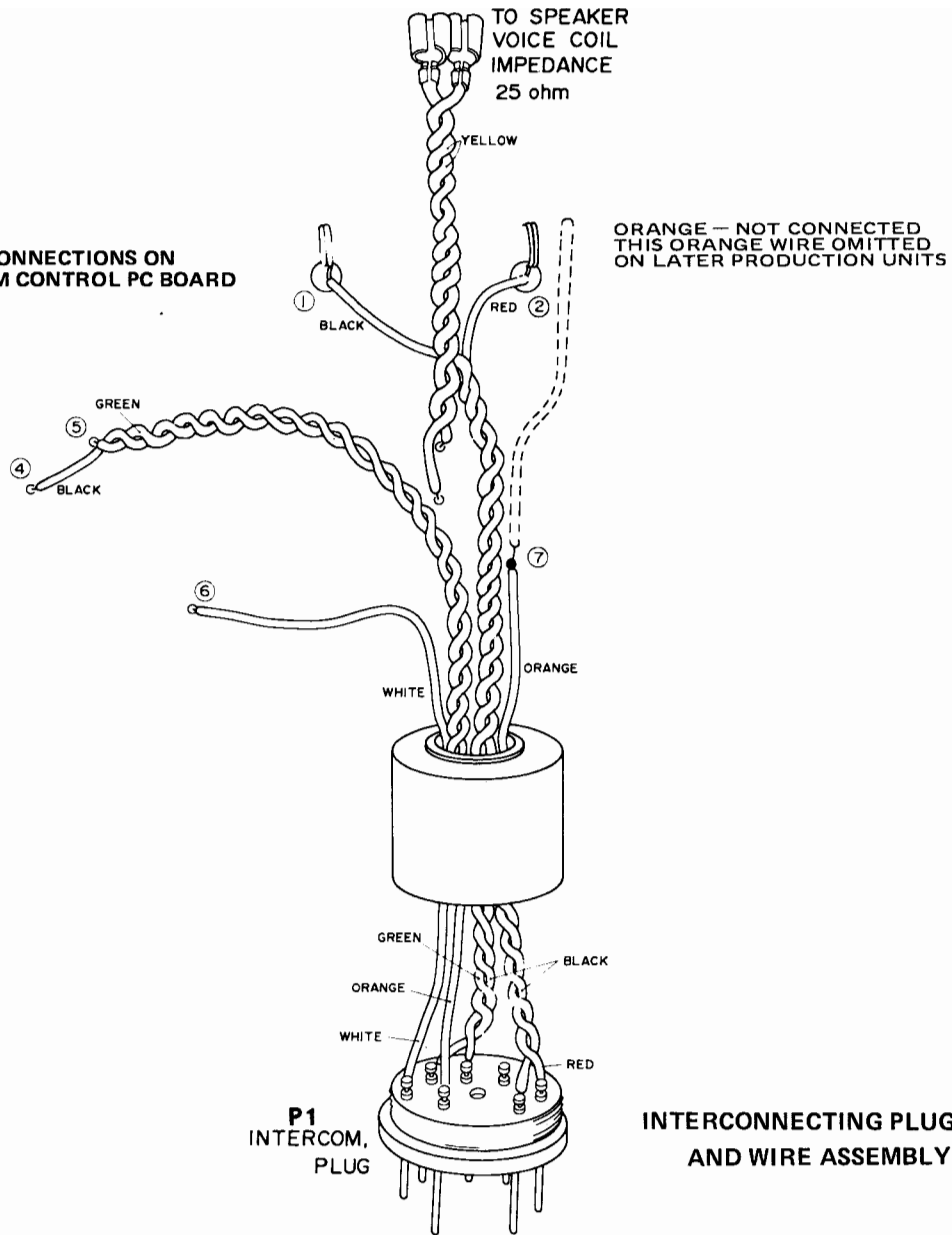


IM-203 CHASSIS WIRING DIAGRAM (SHOWING CAPACITORS ON BOTTOM OF PC BOARD)

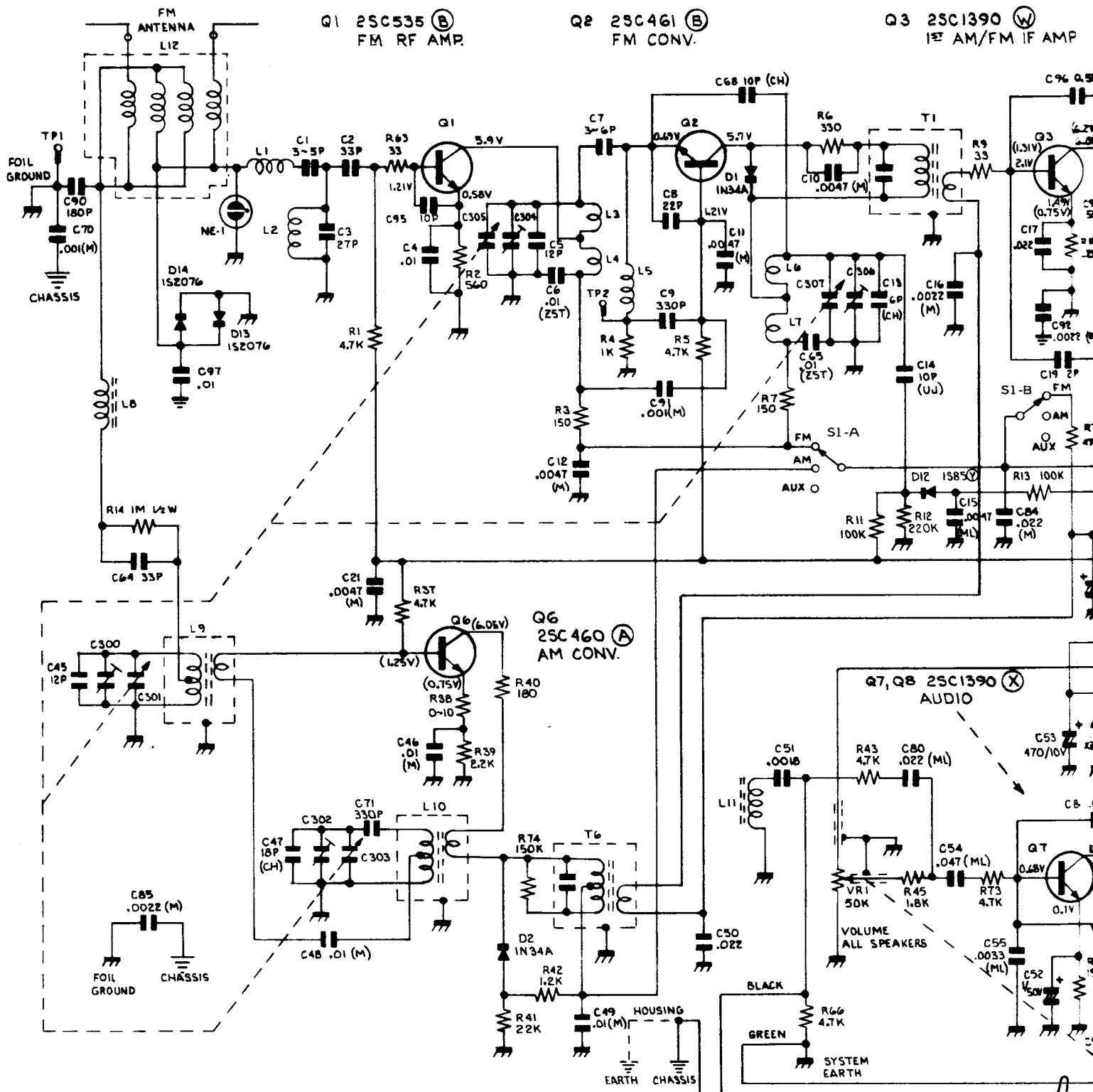
IM-203 MASTER UNIT INTER-STAGE W

FIGURE 14

WIRING CONNECTIONS ON INTERCOM CONTROL PC BOARD



FRONT VIEW (COMPONENT SIDE) INTERCOM CONTROL PC BOARD



IF: AM = 455 KHz., FM = 10.7 MHz.

PROGRAM SELECTOR SWITCH S1 IN FM

RESISTORS: VALUE IN OHMS; 1/4 WATT; ± 10% UNLESS NOTED

CAPACITORS: VALUE IN MICROFARADS EXCEPT AS NOTED.
ELECTROLYTICS: POLARITY AS SHOWN, VALUE IN MICROFARADS/AT RATED VOLTAGE

ON TUNER SECTION: VOLTAGES IN PARENTHESIS ARE AM MEASUREMENTS.

VOLTAGES MEASURED IN RESPECT TO FOIL COMMON: ZERO SIGNAL

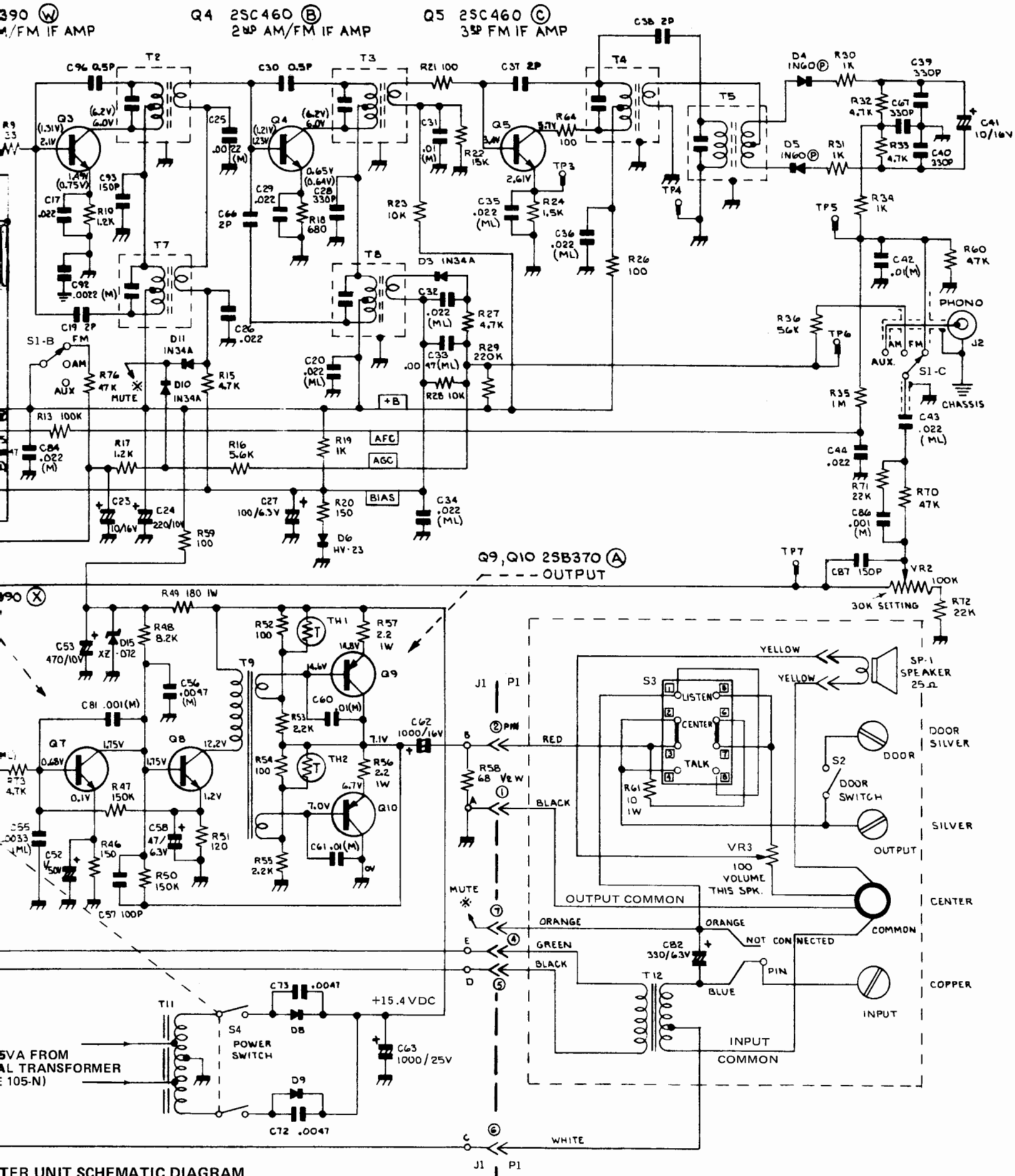
VR2 NOMINAL SETTING: 30 KOHM BETWEEN WIPER AND TP7 FOR NORMAL INTERCOM/RADIO OVERRIDE

T12 MUST BE CONNECTED EXACTLY AS SHOWN

16VAC, 15VA FROM EXTERNAL TRANSFORMER (NUTONE 105-N)

IM-203 MASTER UNIT SCHEMATIC

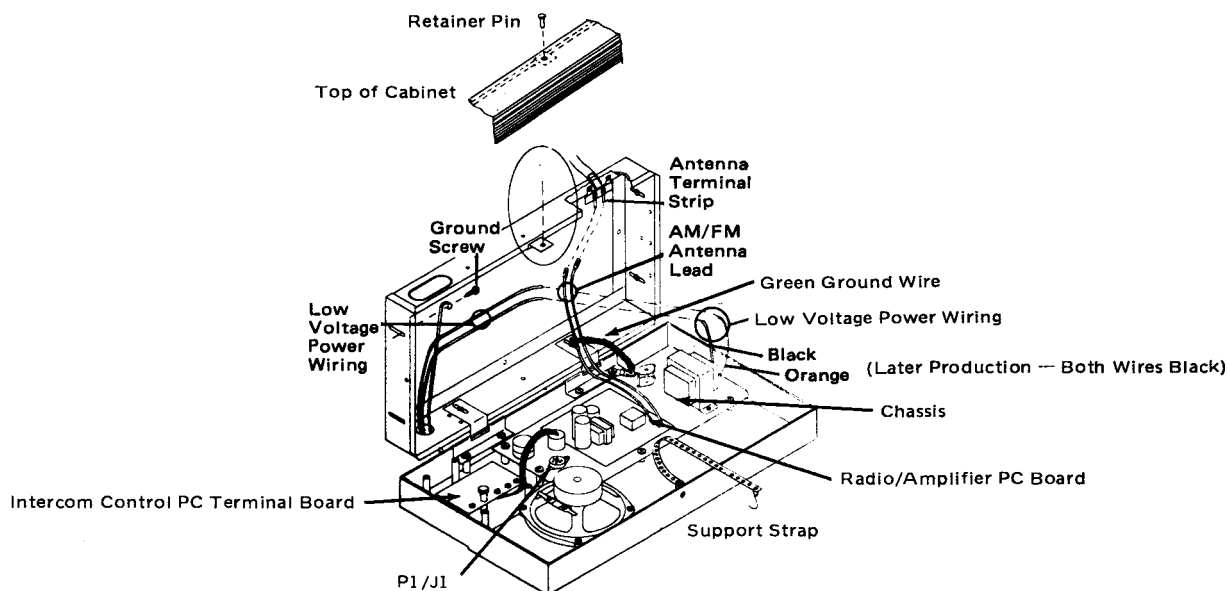
FIGURE 1



INTER UNIT SCHEMATIC DIAGRAM

FIGURE 13

REMOVING MASTER UNIT FROM ROUGH-IN FRAME



IM-203-D MASTER UNIT IN IR-10 ROUGH-IN FRAME

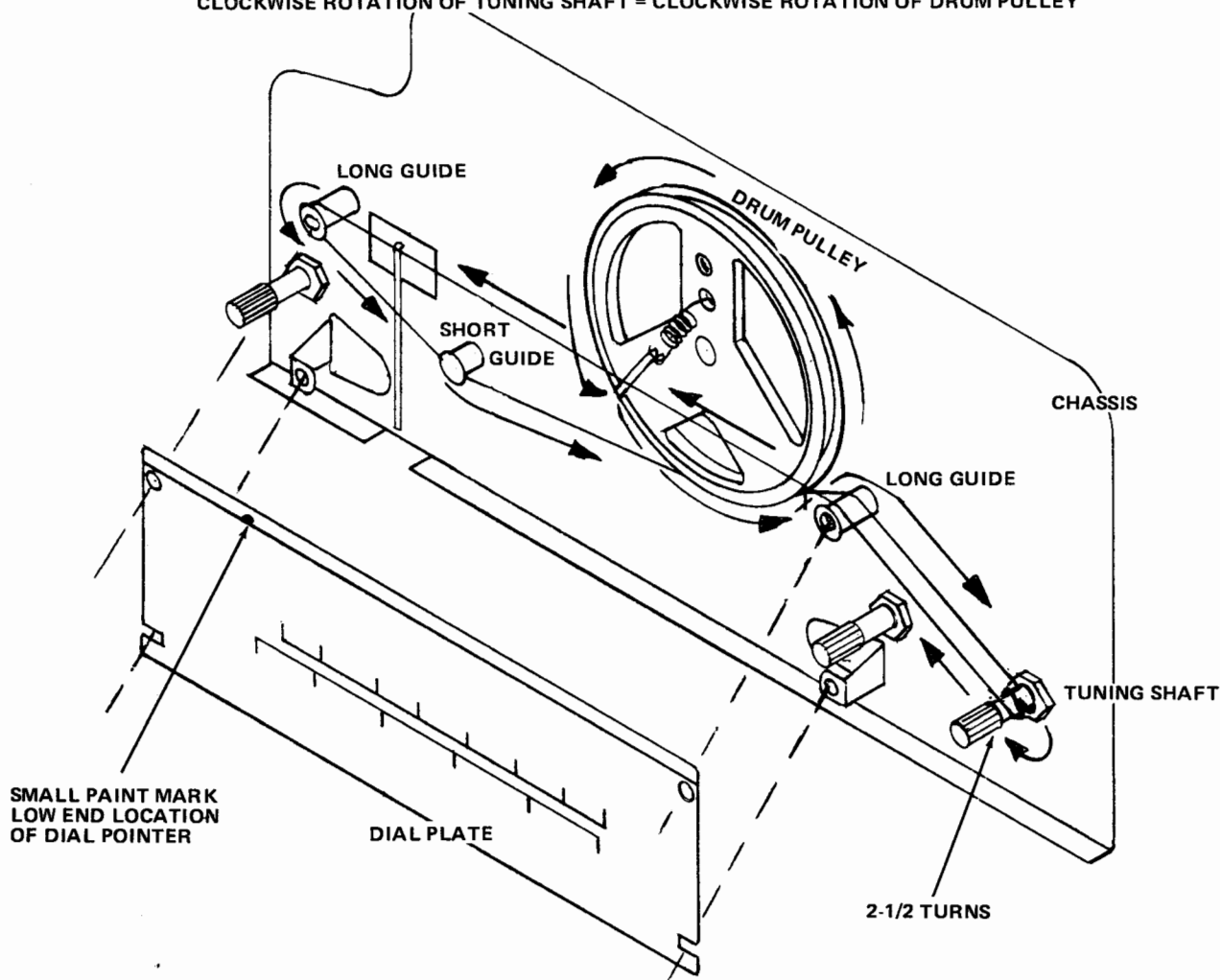
FIGURE 15

- (1) Remove retaining pin from top of cabinet and open the Master Unit to horizontal position. Connect the support strap to top of Rough-in Frame to hold Master Unit in position. (Figure 15)
- (2) Disconnect the low-voltage power wiring from the power transformer's Orange and Black leads. (Later production units — both transformer leads are Black.)
- (3) Make certain that the low-voltage power wires will not be shorted while the Master Unit is out of the Rough-in Frame.
- (4) Disconnect the chassis grounding wire from the Rough-in Frame.
- (5) Disconnect the two brown antenna lead wires from the antenna terminal strip.
- (6) Disconnect: The I/P Speakers' and Door Speaker(s) flat three-wire cable, and when used, the Chime and/or Alarm signal wires from the Intercom Control PC Terminal Board. Label the Door Speaker(s') cables. (See Figure 2, page 3)
- (7) **ORIGINAL PRODUCTION UNITS:** Remove screws securing the hinges to the Rough-in Frame.
 - (7.1) While supporting Master Unit, unhook the support strap from the Rough-in Housing and remove Unit.
- (8) **LATER PRODUCTION UNITS:** Unhook the support strap from the Rough-in Frame.
 - (8.1) Lift Master Unit and moveable leaf hinge assemblies away from the fixed leaf and pin assemblies that are fastened to the Rough-in Frame.

DISASSEMBLY AND REPLACEMENT OF MASTER UNIT COMPONENTS

- (1) **SPEAKER:** Remove twisted yellow pair lead wires from the speaker slide-on connectors.
 - (1.1) Remove four phillips head mounting screws and lift speaker out of cabinet.
 - (1.2) Reverse process to install new speaker.
- (2) **INTERCOM CONTROL PC TERMINAL BOARD:** Remove VOLUME/THIS SPEAKER CONTROL VR3 knob (front of cabinet).
 - (2.1) Disconnect: Two yellow leads from slip-on speaker terminals; and unplug P1 from J1.
 - (2.2) Remove four No. 6 slotted head mounting screws. One screw is located under the COPPER ALL SPKRS terminal label.
 - (2.3) The individual components on this board may be repaired or replaced. Use "Solder sucker" type iron when removing components. Do not overheat the board nor components.
 - (2.4) A complete new board and wire assembly or the old repaired board may be installed by reversing the steps above.
- (3) **CHASSIS ASSEMBLY:** Remove the TUNING; PROGRAM SELECTOR; and ON/OFF-VOLUME/ALL SPEAKERS knobs (front of cabinet).
 - (3.1) Remove P1 from J1.
 - (3.2) Remove the five phillips head mounting screws, and lift chassis assembly out of cabinet.

CLOCKWISE ROTATION OF TUNING SHAFT = CLOCKWISE ROTATION OF DRUM PULLEY



IM-203-D MASTER UNIT DIAL CORD INSTALLATION

FIGURE 16

(3.3) The complete chassis assembly must be removed when:

(3.3.1) Restrung dial cord. (See Figure 16)

(3.3.2) Repairing or replacing any component on the TUNER/AMPLIFIER PC BOARD. (to gain access to solder connections on bottom of board.)

(3.3.3) Replacing Power Transformer T11.

(3.3.4) Replacing ON/OFF SWITCH S4 – VOLUME/ALL SPEAKERS CONTROL VR1.

(3.3.5) Replacing J1.

(3.3.6) Replacing PROGRAM SELECTOR SWITCH S1.

(3.3.7) Replacing Output Transistors Q9 and Q10.

(3.4) The chassis assembly may be replaced by reversing steps (3) through (3.2) above.

(4) **TUNER/AMPLIFIER PC BOARD: (See Figures 11, 12 and 14)**

(4.1) Remove Chassis Assembly as directed in steps (3)–(3.2) above.

(4.2) Set AM/FM tuning pointer to low end of tuning dial, i.e. completely close Gang Tuning Capacitor C300. Dial pointer should be aligned with indicator mark on dial frame.

(4.3) Remove 4 screws holding dial plate and slip plate from beneath pointer and remove. **DO NOT DAMAGE POINTER.** (Figure 16)

NOTE: Some of the components on the PC Board and the output transistors may now be replaced. Use care when removing or replacing components. When removing components use "Solder sucker" type iron. **DO NOT OVERHEAT THE BOARD NOR COMPONENTS.** Follow Figures 11, 12, and 14.

If component requiring service is behind drum pulley or if the complete PC Board is to be replaced, complete steps (4.4) through (4.10).

(4.4) Remove dial cord spring from drum pulley; and remove and safely store dial cord and spring.

(4.5) Remove phillips head retaining screw that holds drum pulley to tuning capacitor drive shaft. Save pulley and screw.

(4.6) Any individual component on the PC Board may now be serviced. **USE CARE.**

(4.7) To remove the complete PC Board, disconnect the wires from bottom of Board. (See Figure 14)

(4.8) Disconnect the ground side of all components that are connected to the chassis ground tabs.

(4.9) Remove the screw and clamp holding the Output Transistors to the chassis.

(4.10) Straighten the four mounting tabs (one in each corner of PC Board) and lift PC Board away from chassis.

(4.11) New PC Board may be installed by reversing steps (4.7) through (4.10) above.

(4.12) Drum pulley and dial cord should be reassembled by reversing steps (4.4) and (4.5) above.

(4.12.1) Replace dial plate. Make certain that C300 is closed and align dial pointer with paint mark on dial.

(4.13) Reassemble chassis by reversing steps (3) through (3.2) above.

(5) The PHONO/TAPE JACK J2 can be replaced without removing the chassis assembly.

(5.1) Remove screws holding old jack in place, disconnect wires, connect wires to new jack and secure in place.

SERVICING THE SYSTEM

(1) A standard 20,000 ohm/volt multi-meter will suffice for most voltage and resistance measurements in this system. It is suggested that when a VTVM (or other high-impedance input meter) is available, it be used.

(1.1) A VTVM with a DC scale of 0 to 1.5 volts will be especially useful when measuring base and emitter voltages.

(2) The voltages included with the schematic diagram are for reference. Actual voltages may vary $\pm 10\%$ to 20% . THE RELATIONSHIP BETWEEN THE VOLTAGES ON THE DIFFERENT ELEMENTS SHOULD REMAIN FAIRLY CONSTANT TO ACHIEVE DESIGN PERFORMANCE.

(3) To prevent leakage paths when measuring resistance of some components, it may be necessary to disconnect one side of the component under measurement.

(4) OBSERVE POLARITY WHEN MAKING RESISTANCE MEASUREMENTS IN TRANSISTOR CIRCUITS. IMPROPER POLARITY MAY RESULT IN FALSE READINGS AND IN SOME CASES REVERSE POLARITY MAY EXCEED THE REVERSE BREAKDOWN RATINGS OF THE DEVICE.

(5) Make certain that power is OFF when making resistance measurements and when replacing components.

(6) Treat all printed circuit boards with care. Do not burn nor mutilate when making or breaking solder connections. Be careful of the foil paths.

(7) The audio amplifier is direct coupled between stages Q7 and Q8. Voltage measurements of these stages will generally be more accurate than resistance measurements.

NOTE: HUM AND/OR SQUEAL MAY RESULT IF CIRCUIT COMMON FOIL IS INADVERTENTLY CONNECTED TO CHASSIS GROUND. COMMON FOIL IS CONNECTED TO CHASSIS GROUND THROUGH TAP OF T12 SECONDARY: WHITE LEAD; AND J1/P1-6 TO CHASSIS GROUND AT ONE POINT. IT MUST NOT BE CONNECTED TO CHASSIS GROUND AT ANY OTHER POINT (SEE SCHEMATIC DIAGRAM).

WHEN USING SIGNAL GENERATORS, MEASURING INSTRUMENTS, ETC., CONNECT LOW SIDE (GROUND OR COMMON) TO CIRCUIT COMMON FOIL - TP1 OR TP4.

COMPLETE ALIGNMENT INSTRUCTIONS: PAGES 18 AND 19
TROUBLE SHOOTING CHART: PAGE 20

ALIGNMENT

This receiver should be aligned ONLY WHEN ABSOLUTELY NECESSARY and ONLY BY QUALIFIED PERSONNEL.

Use non-inductive low-capacity alignment tools when adjusting tuner components.

When both AM and FM sections are to be aligned, align AM section first. (See Page 19)

F. M. ALIGNMENT

(1) MASTER UNIT SETTING:

- (1.1) PROGRAM SELECTOR SWITCH S1 in FM position.
- (1.2) VOLUME/THIS SPEAKER VR4 set to maximum (full clockwise position).
- (1.3) VOLUME/ALL SPEAKERS set to desired listening level.

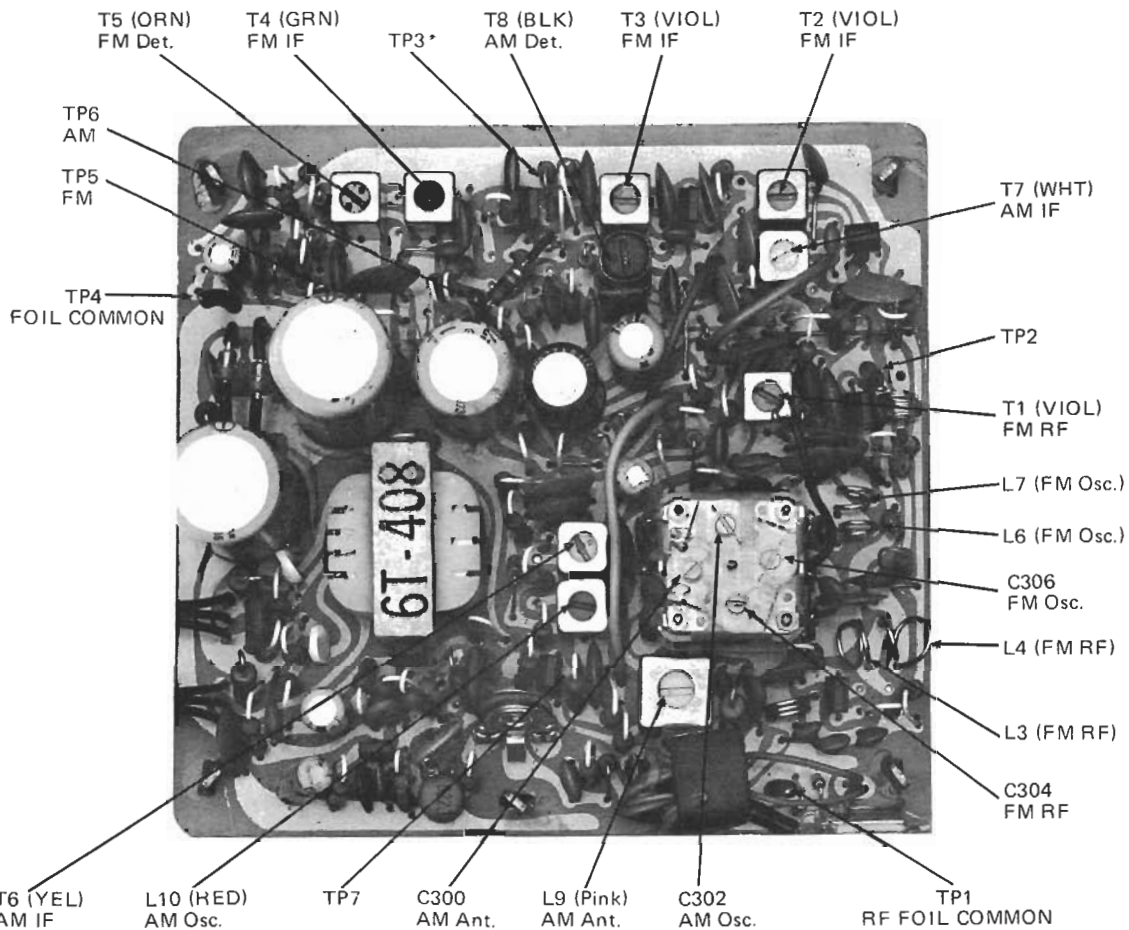
(2) INSTRUMENTS REQUIRED:

- (2.1) F. M. SIGNAL GENERATOR: High-side as directed; Ground side to RF circuit foil common TP1.
- (2.2) VOLT METER (High-impedance input AC and DC (such as VTVM) with zero centering); or OSCILLOSCOPE: Connect high-side as directed; ground side to circuit foil common TP4.

STEP	SIGNAL GENERATOR SETTING	RECEIVER SETTING	ADJUST	TUNE FOR
1.	10.7 MHZ., AM modulated 30% @ 400 Hz. Connect hi-side through 5 pf capacitor to TP2 and low side to circuit foil common. Use lowest output consistent with good output meter reading.	Lowest point on FM dial: Tuning capacitor C300 fully closed-maximum capacity. Detune T4	T1 (Viol) T2 (Viol) T3 (Viol)	Connect VTVM between TP3 and foil common. Use closest full scale reading. Tune for maximum AC voltage. (Maximum on scope) (See Note A)
2.	10.7 MHz. unmodulated. Connected same as step 1.	do	T5 (Orn)	Connect VTVM between TP5 and foil common. Use lowest scale zero centered. Tune for zero DC. (Zero trace on scope.) (See Note A)
3.	10.7 MHz., FM modulated 30% @ 400 Hz. Connected same as step 1.	do	T4 (Grn)	Tune for maximum on meter. If scope is used with sweep generator, tune for balanced peak, linear waveform. (See Note A)
4.	87 MHz., FM modulated 30% at 400 Hz. May be loosely coupled to antenna lead in with ground side to TP1, or through dummy antenna of 300 ohms Use lowest output consistent with good meter reading.	Lowest point on FM dial: Tuning capacitor C300 fully closed, i.e. maximum capacity.	L6/L7 (See Note B)	Maximum AC reading on VTVM (Maximum symmetrical trace on scope)
5.	109 MHz., FM modulated 30% at 400 hz. Connected same as step 4.	Highest point on FM dial: Tuning capacitor C300 fully open, i.e. minimum capacity.	C306	do
6.	88 MHz., FM modulated 30% at 400 Hz. Connected same as step 4.	88 MHz.	L3/L4 (See Note B)	do
7.	108 MHz., FM modulated 30% at 400 Hz. Connected same as step 4.	108 MHz.	C304	do
8.	Repeat steps 4, 5, 6 and 7 (rock in) until no further improvement is noted.			

NOTE: (A) If available, 10.7 MHz. sweep generator may be used for steps 1, 2, and 3.

(B) Use extreme care when adjusting RF and Oscillator coils. L6, L7, L3, and L4 are tuned by compressing or expanding the turns. ADJUST ONLY IF ABSOLUTELY NECESSARY.



*NOTE: TP3 = JUNCTION OF Q5 EMITTER AND HIGH-SIDE OF R24

IM-203 LOCATION OF AM & FM ALIGNMENT COMPONENTS
FIGURE 17

A. M. ALIGNMENT

- (1) Set PROGRAM SELECTOR SWITCH S1 in AM position. (Volume set as in (1.2) and (1.3) under F. M. ALIGNMENT)
- (2) Loosely couple A. M. SIGNAL GENERATOR to antenna; connect ground side to RF circuit foil common TP1.
- (3) Connect VTVM (or SCOPE): High-side to TP6, ground side to circuit foil common TP4.

STEP	SIGNAL GENERATOR SETTING	RECEIVER SETTING	ADJUST	TUNE FOR
1.	455 KHz., AM modulated 30% at 400 Hz. Lowest usable output; do not drive the receiver into AGC.	Highest point on AM dial: Tuning Capacitor C300 fully open, i.e. minimum capacity.	T6 (Yel) T7 (Wht) T8 (Blk)	Maximum AC reading on VTVM (Maximum linear trace on scope) (See Note A)
2.	510 KHz. AM modulated 30% at 400 Hz. Set same as step 1.	Lowest point on AM dial: Tuning Capacitor C300 fully closed, i.e. maximum capacity.	L10 (Red)	do
3.	1650 KHz., AM modulated 30% at 400 Hz. Set same as step 1.	Highest point on AM dial: Tuning Capacitor C300 fully open, i.e. minimum capacity.	C302	do
4.	600 KHz., AM modulated 30% at 400 Hz. Set same as step 1.	Tune to Signal	L9 (Pink)	do
5.	1400 KHz., AM modulated 30% at 400 Hz. Set same as step 1.	Tune to Signal	C300	do
6.	Repeat steps 2, 3, 4 and 5 (rock in) until no further improvement is noted.			

NOTE: (A) Use of 455 KHz. sweep generator with scope will give more exact result for step 1.

TROUBLESHOOTING

- (1) **SYSTEM DEAD**
Check: AC power supply; OFF/ON Switch S4; Program Selector Switch S1; DC Supply at high-side of C63; Speaker.
- (2) **NO RADIO-INTERCOM OPERATION NORMAL**
In early production sets, check that the ORANGE muting wire on the Intercom Control PC Terminal Board is not grounded; J1/P1-4; C82.
Check Selector Switch S1.
Check for audio continuity between Phono/Tape Jack J1 and speaker with S1 in AUX position. If audio signal comes through, the problem is probably in the AM/FM tuner. Check 7.2 voltage supply. Check setting of Intercom Override Control VR2.
Check Intercom Talk/Listen Switch S3. Must not be stuck in Talk or Listen position, if stuck will mute radio signals.
Check Antenna Connections. Antenna must be installed.
- (3) **NO FM RADIO – OTHER OPERATIONS NORMAL**
Check Q1 and Q2 operating voltages. Check Selector Switch S1-A, S1-B and S1-C. Check FM IFs.
- (4) **NO AM RADIO – OTHER OPERATIONS NORMAL**
Check Q6 operating voltages. Check Selector Switch S1-A and S1-C. Check AM IFs.
- (5) **NO INTERCOM – OTHER OPERATIONS NORMAL**
Check Intercom Input Transformer T12, P1/J1 and wiring between T12 and Radio/Amplifier PC Board.
- (6) **HIGH PITCH SQUEAL**
Check for shorts between SILVER and COPPER wires in the I/P Speaker Cables. Check at Speakers and at Terminal Board.
If squeal is present only when Door Speaker is ON, check door speaker wiring, Door Speaker Switch and wiring at the Intercom Control PC Terminal Board.
- (7) **AN I/P SPEAKER RECEIVES MUSIC AND INTERCOM – CAN'T SEND INTERCOM MESSAGES**
Check COPPER wire and connections between this speaker and Intercom Control PC Board. Check the Speaker controls – Volume Control and Talk/Listen Switch. Check S3
- (8) **LOW LEVEL FEEDBACK BETWEEN SPEAKERS DURING INTERCOM OPERATION**
Speakers must not be installed back to back on a common wall. Reduce volume of different speakers to determine acoustic feedback to specific speakers.
- (9) **NO AM AND/OR FM**
All voltages check normal. Transistors and switching are normal. Switching appears normal. AM and FM antenna normal. Set probably requires alignment of the AM and FM sections. (See Alignment Instructions, pages 18 and 19)

REPLACEMENT PARTS LIST

MODEL IM-203

3-WIRE BUILT-IN DECENTRALIZED RADIO/INTERCOM SYSTEM

CAPACITORS: Value in farads $\pm 20\%$; 50V Ceramic — unless otherwise noted.

RESISTORS: Value in ohms $\pm 10\%$; ¼ watt: Carbon Composition — unless otherwise noted.

K (Kilo) = 1,000 M (Mega) = 1,000,000 m (micro) = 10^{-6} p (pico) = 10^{-12}

Schematic Symbol	NuTone Part No.	Description
IM-203D MASTER UNIT		
	13023-900	Complete Assembly
	38546-000	FM/AM Chassis
	5062A-000	AM/FM Printed Circuit Assembly
	69811-000	Intercom Control Terminal Board PC Complete Assembly with Plug and Wire
CAPACITORS		
C1, C7	60258-103	3 pf, $\pm .25$ pf
C2, C64	60258-116	33 pf, $\pm 5\%$
C3	60258-117	27 pf, $\pm 5\%$
C4, C97	60258-119	.01 mf, +80% -20%
C5, C45	60258-120	12 pf, $\pm 5\%$, 30V
C6, C65	60258-139	.01 mf, +80% -20%, 30V
C8	60258-121	22 pf, $\pm 5\%$
C9, C28, C39 C40, C67, C71	60258-133	330 pf, $\pm 5\%$
C10, C11, C12, C21, C33, C56	60258-118	.0047 mf
C13	60258-131	6 pf, $\pm .5$ pf
C14	60258-134	10 pf, $\pm 5\%$
C15	60262-102	.0047 mf, Mylar
C16, C25, C51, C85, C92	60258-122	.0022 mf
C17, C26, C29 C44, C50	60261-101	.022 mf, +80% -20%
C18	Not Used	
C19, C37, C66, C38	60258-123	2 pf, $\pm .5$ pf
C20, C32, C34, C35, C36, C43, C80	60262-104	.022 mf, Mylar
C22	Not Used	
C23, C41	60263-114	10 mf, +50% -10%, 16V, Electrolytic
C24	60263-111	220 mf, +50% -10%, 10V, Electrolytic
C27	60263-109	100 mf, +50% -10%, 6.3V, Electrolytic
C30, C96	60258-124	.5 pf, $\pm .25$ pf
C31, C42, C46, C48, C49, C60, C61	60258-125	.01 mf
C47	60258-138	18 pf, $\pm 5\%$
C52	60263-116	1 mf, +50% -10%, Electrolytic
C53	60263-112	.47 mf, +50% -10%, 10V Electrolytic
C54	60262-103	.047 mf, Mylar
C55	60262-105	.0033 mf, Mylar
C57	60258-137	100 pf, $\pm 5\%$

Schematic Symbol	NuTone Part No.	Description
C58	60263-110	47 mf, +50% -10%, 6.3V, Electrolytic
C59	Not Used	
C62	60263-113	1,000 mf, +50% -10%, 16V, Electrolytic
C63	60263-115	1,000 mf, +50% -10%, 25V, Electrolytic
C68	60258-132	10 pf, $\pm 5\%$
C69	Not Used	
C70, C86, C91	60258-128	.001 mf
C72, C73	60258-126	.0047 mf, +80% -20%
C74-C79	Not Used	
C81	60262-102	.001 mf, Mylar
C82	60263-108	330 mf, +50% -10%, 6.3V, Electrolytic (On Intercom PC Board)
C83	Not Used	
C84	60258-127	.022 mf
C87, C93	60258-135	150 pf, $\pm 5\%$
C88, C89	Not Used	
C90	60258-136	180 pf, $\pm 5\%$
C94	Not Used	
C95	60258-130	10 pf, $\pm .5$ pf
C300-C307	5039A-000	FM/AM Variable Tuning Capacitor
C300		AM Antenna Trimmer
C301		AM Antenna Tuning Section
C302		AM Oscillator Trimmer
C303		AM Oscillator Tuning Section
C304		FM RF Trimmer
C305		FM RF Tuning Section
C306		FM Oscillator Trimmer
C307		FM Oscillator Tuning Section
COILS		
L1	5022A-000	FM Antenna Coupling
L2	5023A-000	FM Antenna Loading
L3, L4	5024A-000	FM RF Amplifier Collector Tank
L5	5068A-000	FM Converter Emitter RF Choke
L6, L7	5025A-000	FM Oscillator Tuned Tank
L8	5026A-000	AM Antenna Coupling
L9	60230-000	AM Antenna Tuned RF
L10	5027A-000	AM Oscillator Tuned Tank
L11	60235-000	Series Trap, Intercom Input
L12	5028A-000	FM Antenna
DIODES		
D1	60280-000	FM Overload, 1N34A

Schematic Symbol	NuTone Part No.	Description
D2	60280-000	AM Overload, 1N34A
D3	60280-000	AM Detector, 1N34A
D4, D5	60279-000	FM Detector (Use Matched Pair) 1N60
D6	5017A-000	Bias Stabilizer, HV-23
D7	Not Used	
D8, D9	5018A-000	Power Rectifier
D10, D11	60280-000	Muting, 1N34A
D12	5019A-000	FM AFC, 1S85
D13, D14	5020A-000	Protector, Antenna Static Charge, 1S2076
D15	5021A-000	Zener Voltage Regulator, 7.2V, XZ-072
RESISTORS		
R1, R5, R15, R27, R32, R33, R37, R43, R66, R73	60256-472	4.7K
R2	60256-561	560
R3, R7, R20, R46	60256-151	150
R4, R19, R30, R31, R34	60256-102	1K
R6	60256-331	330
R8	Not Used	
R9, R63	60256-330	33
R10, R17, R42	60256-122	1.2K
R11, R13	60256-104	100K
R12, R29	60256-224	220K
R14	5040A-105	1M, ½ Watt
R16	60256-562	5.6K
R18	60256-681	680
R21, R26, R52, R54, R59, R64	60256-101	100
R22	60256-153	15K
R23	60257-103	10K
R24	60257-152	1.5K
R25	Not Used	
R28	60256-103	10K
R35	60256-105	1M
R36	60256-563	56K
R38	Not Used	
R39, R53, R55	60256-222	2.2K
R40	60256-181	180
R41, R71, R72	60256-223	22K
R44	Not Used	
R45	60256-182	1.8K
R47, R50, R74	60256-154	150K
R48	60256-822	8.2K
R49	5041A-181	180, 1 Watt, Oxide Film
R51	60256-121	120
R56, R57	5041A-222	2.2, 1 Watt, Oxide Film
R58	5042A-680	68, ½ Watt
R60, R70, R76	60256-473	47K (R76 on Selector Switch S1-B)

Schematic Symbol	NuTone Part No.	Description
R61	5067A-103	10, 1 Watt, Oxide Film (On Intercom PC Board)
R62	Not Used	
R65	Not Used	
R67-R69	Not Used	
R75	Not Used	
THERMISTORS		
TH1, TH2	5037A-000	Output Transistor's Temperature Compensator (Use Matched Pair)
VARIABLE RESISTORS		
VR1	60247-000	50K, Volume All Speakers (Ganged with S4 ON/OFF Switch)
VR2	5043A-000	100K, Level Set (On AM/FM PC Board)
VR3	34059-000	100, Volume Master Unit Speaker (On Intercom PC Board)
SWITCHES		
S1	5049A-000	Program Selector
S2	34615-000	Door Speaker ON/OFF (On Intercom PC Board)
S3	34617-000	T/L Master Unit Speaker (On Intercom PC Board) 3-Position; Center Normal; Momentary-Spring Return
S4	60247-000	Power ON/OFF (Ganged with VR1)
TRANSFORMERS		
T1	5029A-000	1st. FM IF, 10.7 MHz.
T2	5029A-000	2nd. FM IF, 10.7 MHz.
T3	5029A-000	3rd. FM IF, 10.7 MHz.
T4	5030A-000	4th. FM IF, 10.7 MHz.
T5	5031A-000	FM Detector
T6	5032A-000	1st. AM IF, 455 KHz.
T7	5033A-000	2nd. AM IF, 455 KHz.
T8	5034A-000	3rd. AM IF, 455 KHz.
T9	60243-000	Audio, Output Driver
T10	Not Used	
T11	5035A-000	Power (Auto Transformer), 16-18Vac Primary Input from exterior mounted NuTone 105-N; Secondary Center Tapped
T12	5036A-000	Intercom Input (ON Intercom PC Board)
	41493-000	NuTone 105-N, Primary 120Vac, Secondary 16Vac @ 15VA (Supplied with IR-10 Rough-in): Assembly Complete with Label.
TRANSISTORS		
Q1	5010A-000	FM RF Amplifier, Sharp 2SC535(B)

Schematic Symbol	NuTone Part No.	Description
Q2	5011A-000	FM Oscillator/Converter, Sharp 2SC461(B)
Q3	5012A-000	1 st. AM/FM IF Amplifier, Sharp 2SC1390(W)
Q4	5013A-000	2nd. AM/FM IF Amplifier, Sharp 2SC460(B)
Q5	5014A-000	3rd. FM IF Amplifier, Sharp 2SC460(C)
Q6	5015A-000	AM Oscillator/Converter, Sharp 2SC460(A)
Q7	5016A-000	1st. Audio Amplifier, Sharp 2SC1390(X)
Q8	5016A-000	Audio Driver, Sharp 2SC1390(X)
Q9, Q10	60278-000	Audio Power Output; Matched Pair, Sharp 2SB370(A)
	5050A-000	Retainer, Output Transistors (Holds Output Transistors to Chassis)
MISCELLANEOUS		
NE1	5052A-000	Neon Lamp, Antenna Hi-voltage Static Protector
	5060A-000	Intercom PC Board
P1	5064A-000	Plug, 7-Pin, Intercom PC Board to Chassis
J1	5063A-000	Receptacle, 7-Pin, (Intercom)
J2	5065A-000	Phono Jack
	5058A-000	Dial Cord
	5044A-000	Long Guide, Dial Cord
	5045A-000	Short Guide, Dial Cord
	5047A-000	Shaft, Tuning
	5051A-000	Drum, Plastic, Dial Cord Pulley
	5055A-000	Dial, FM/AM Scale
	5057A-000	Pointer, AM/FM Tuning
	5059A-000	Spring, Dial Cord
	5054A-000	Terminal, Intercom PC Board Door, Output, Input
	5053A-000	Terminal, Intercom PC Board Common (Ground)
	41491-000	Front Panel Assembly
	38547-000	Front Panel
	38553-000	Panel Inlay
	38557-000	Control Panel Inlay
	31986-000	Hanger Strap, Master Unit Support
	31987-000	"S" Hook, Hanger Strap
	39345-000	Knob, Master Unit Speaker Volume Control (Control on Intercom PC Board)
	39357-000	Knob, Long Shaft, Tuning, Selector, All Speaker Volume Control
SP1	36090-000	Speaker, 5-inch, 25 ohm Voice Coil
	39395-015	Screw, #8 x 15/32, Truss Phillips, Speaker Mounting
	38634-036	Hinge, Moveable Leaf
	39395-015	Screw, #8-18 x 15/32, Truss Phillips, Hinge, Chassis and Hanger Strap Mounting

Schematic Symbol	NuTone Part No.	Description
	38614-000	Bracket, Retainer
	41605-000	Hinge Bracket and Pin Assembly
	38632-036	Hinge Bracket (Fixed Leaf)
	39326-000	Pin, Fixed Leaf Hinge Bracket
	22391-001	Screw, #8 x 3/8, Slotted, Fixed Leaf and Retainer Bracket Mounting
	39410-007	Pin, Master Unit Retaining
	45399-000	Label, FM Antenna
	46878-000	Homeowners Operating Manual
	46519-000	Service Manual
IR-10 ROUGH-IN HOUSING		
	08525-900	Complete Assembly
	40674-005	Frame Assembly
	39096-000	Antenna Terminal Strip
	46620-000	Caution Label
	41493-000	Power Transformer (105-N): 120Vac; 60 Hz. Primary; 16Vac 15VA Secondary; Assembly complete with Label
	40072-000	FM Antenna Assembly
	29911-000	Transformer, 230Vac Primary For Export Only (X302-N)
IC-21 REMOTE CONTROL		
IS-25 INSIDE 5 INCH SPEAKER		
IS-28D/L INSIDE 8 INCH SPEAKER		
	13650-900	IC-21 Remote Control Complete
	13680-900	IS-25 Speaker Panel Assembly Complete
	13685-900	IS-28D Walnut Speaker Panel Assembly Complete
	13687-900	IS-28L Golden Elm Speaker Panel Assembly Complete
	38558-000	Control Insert (IC-21)
	38526-000	Remote Speaker Panel (IS-25)
	38530-000	Remote Speaker Panel (IS-28D)
	38531-000	Remote Speaker Panel (IS-28L)
	36090-000	Speaker, 5 in., 25 Ohm Voice Coil (IS-25)
	36089-000	Speaker, 8 in., 25 Ohm Voice Coil (IS-28D/L)
	39395-015	Screw, #8-18 x 15/32 Speaker Mounting (IS-25 and IS/28D/L)
	39342-000	Pushbutton (T/L Switch)
S101		Talk/Listen Switch
	39439-051	Contact Wire (T/L Switch)
	31405-051	Contact (T/L Switch, 2 used)
R101		Potentiometer, 200 ohm, Volume Control
	31400-003	Link (IC-21)

Schematic Symbol	NuTone Part No.	Description
	39344-000	Knob, Volume Control (IC-21 and IS-25)
	39346-000	Knob, Volume Control (IS-28D)
	39380-000	Knob, Volume Control (IS-28L)
	38571-000	Bezel (IC-21)
IS-60 BUILT-IN DOOR SPEAKER		
IS-62 SURFACE MOUNT DOOR SPEAKER		
	13745-900	IS-60 Speaker Assembly Complete
	13749-900	IS-62 Speaker Assembly Complete
	38356-202	IS-62 Box
	41504-000	Front Panel Assembly (IS-60)
	38576-000	Front Panel (IS-60)
	38338-000	Grille (IS-62)
	36076-000	Speaker, 3½ In., 16-Ohm Voice Coil
	32268-000	Mounting Plate (IS-62)
	34546-000	Talk/Listen Switch Assembly Complete (IS-62)
	39370-000	Pushbutton, Talk/Listen (IS-60)
	39431-051	Contact Wire, T/L Switch (IS-60)
	39432-051	Contact, T/L Switch (IS-60)
IS-77 OUTSIDE WEATHERPROOF SPEAKER		
	13780-900	Complete Assembly
	38423-000	Outdoor Speaker Housing

Schematic Symbol	NuTone Part No.	Description
	36074-000	Speaker, Polyurethane, Weatherproof, 16-ohm, 20-watt Peak, Ceramic Magnet
	41385-000	Hanger Bracket Assembly Complete
	38424-014	Connecting Strap
	39267-000	Bushing
	39297-000	Spacer
	38447-014	Mounting Bracket
	41365-000	Hanger Bracket Assembly
	38427-014	Hanger Bracket
	38425-000	Grille
	38599-000	Nameplate
	31128-000	Solderless Wire Connector
IS-78 INSIDE METAL FRAME SPEAKER		
	13782-900	Panel Assembly
	32180-008	Panel
	32181-032	Panel Back
	36089-000	Speaker, 8-inch, 25-ohm Voice Coil
	46665-000	Model Label
IS-79 OUTSIDE METAL FRAME SPEAKER		
	13784-900	Panel Assy
	32180-008	Panel
	32181-000	Panel Back
	36074-000	Speaker, Polyurethane, Weatherproof, 16-ohm, 20-watt Peak, Ceramic Magnet
	46668-000	Model Label

NUTONE WARRANTY

NuTone products are warranted to be free from defects in material and workmanship for (12) months from original date of installation unless otherwise stated. Light bulbs, dial lights, record changer needles and batteries (with exception of those specifically designated as rechargeable) are not warranted or guaranteed, in any manner for any length of time.

During this warranty period, NuTone will repair or replace at NuTone's sole option, free of charge, any defective parts returned prepaid to our closest Authorized Service Center. Provide the model number of the product, original date of installation, and nature of difficulty being experienced.

For the name of your nearest NuTone Authorized Service Center, residents of the contiguous United States call, toll free, 800-543-8687; in Ohio call, 800-582-2030.

Residents of Alaska, Hawaii and all other locations outside the contiguous U.S., except Canada, write: Field Engineering Department, NuTone Division of Scovill Mfg., Madison and Red Bank Roads, Cincinnati, Ohio 45227.

Canadian residents contact: NuTone Electrical, Limited, 2 St. Lawrence Avenue, Toronto, Ontario M8Z - 5T8; 416-251-6580.

Our warranty does not cover damage or failure caused by abuse, misuse, abnormal usage, faulty installation, improper maintenance or any repairs other than those provided by an Authorized NuTone Service Center.

There will be charges rendered for product repairs made after our warranty period has expired (12 months after original date of installation).

Specific parts of certain models have an extended warranty period. These are specially noted in the current NuTone Catalog. NuTone is responsible for parts only during the remaining portions of the warranty period after the first 12 months. Labor is extra — to be charged to the customer. Your Authorized Service Center can tell you what portions of your particular model may have an extended warranty.

THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, FOR MERCHANTABILITY OR FITNESS, AND THERE ARE NO OBLIGATIONS OR LIABILITIES ON THE PART OF NUTONE OR SCOVILL MANUFACTURING COMPANY FOR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE PRODUCT OR OTHER INDIRECT DAMAGES WITH RESPECT TO LOSS OF USE, REVENUES OR PROFIT. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. THE WARRANTIES SET FORTH HEREIN MAY NOT BE EXTENDED OR ALTERED EXCEPT BY WRITTEN AMENDMENT.

NuTone Housing Products

Scovill

Madison & Red Bank Rds., Cincinnati, Ohio 45227 — Phone 1-513-527-5415