

SERVICE MANUAL

MODEL: IM-806 RADIO/INTERCOM SYSTEM



CONTENTS

Title	Page
INTRODUCTION	3
INSTALLATION INSTRUCTIONS	3-17
RADIO-INTERCOM SYSTEM	3-7
Wiring Installation Guidelines	3-4
Limitations	3
Wiring Specifications	3
Overview of Wiring and Installation Procedure	4
Recommended Wiring Procedure	4
Representative Wiring Illustration	4
Mounting the Terminal Board	5
Wiring Connections	5-7
Connecting the Transformer	5
External Transformer Connections	6
Connecting the Antenna	6
Connecting the Ground Wire	6
Connecting Inside Remote Speakers and Remote Controls	6
Connecting Outside (Patio) Speakers and Remote Controls	7
Connecting Door Speakers	7

TELEPHONE COUPLER	7-10
Connecting Telephone Coupler to Terminal Board	7
Arranging for Telephone Company to Install RJ31X Connector	8-9
Location	8
Wiring Connections	8
Direct Wiring from Phone Lines	9
Private Phone Conversations	9
Arranging for Telephone Company to Install Miniature 6-Position Jack	9-10
Location	9
Wiring Connections	9-10
Canadian Operator's Information	10
PLUG-IN CHIME MODULE	10-11
Wiring	10
Installation	11
Chime Volume Adjustment	11
Optional External Chime	11
Optional Hook-ups to NuTone Security System, Record Changer and Tape Player	11

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Title	Page
CONNECTING THE MASTER STATION TO THE ROUGH-IN FRAME AND TERMINAL BOARD	12
SYSTEM OPERATING CONTROLS	12-14
Intercom Controls	12-13
Radio and Program Controls	13
"Hands Free" Operation	13
Operational Checkout	13-14
Initial Setup	13
Intercom Operation	14
RECOMMENDED TROUBLE-SHOOTING PROCEDURE	15
INSTALLER'S TROUBLE-SHOOTING GUIDE	15-17
VOLUME AND TIME-OUT ADJUSTMENTS	17
MOUNTING THE MASTER STATION	17
SYSTEM THEORY OF OPERATION	18-25
GENERAL	18
Electronic Switches	18
Manual Switches	18
OPERATION FROM REMOTE STATION	19
Remote Station Latch Circuit Operation	19
Microphone Amplifiers	19
Remote Microphone Amplifiers (from Nov.15,1983)	19
Remote Logic Operation	19
DOOR INTERCOM OPERATION	20
TELEPHONE ANSWERING OPERATION	20
MONITOR/NORMAL/Private SWITCH	21
CIRCUIT CONTROLS (Control and Audio Board)	21
TIMER CIRCUIT	21-22
TELEPHONE RING CIRCUIT	22
DISPLAY AND SELECT CIRCUITRY (Display Board)	22
MASTER INTERCOM BOARD	23
PRESCALER BOARD	23
POWER SUPPLY	23
OPTIONAL ELECTRONIC DOOR CHIME IAA-22	23
MICROPROCESSOR MASTER OSCILLATOR	24
NOTE-STRIKE AND NOTE-PLAYING CIRCUITS	24
OPTIONAL TELEPHONE COUPLER (IT-10 and IT-10C)	24
PRIVACY FEATURE	25
SCHEMATIC DIAGRAMS	26-32
IA-22 (Early Production)	26
INSIDE REMOTE SPEAKERS (Early Production)	27
INSIDE REMOTE SPEAKERS (Late Production)	28
OUTSIDE REMOTE SPEAKERS (Early Production)	29
OUTSIDE REMOTE SPEAKERS (Late Production)	30
IT-10 PHONE COUPLER	31
IT-10C CANADIAN PHONE COUPLER	32
P.C. BOARDS	33-46
INTERCONNECT DIAGRAM	47
I.C. AND TRANSISTOR VOLTAGE CHARTS	48-50
I.C. AND TRANSISTOR LEAD IDENTIFICATION	51-52
TUNER ALIGNMENT	52-54
EXPLODED VIEW DRAWING	55
REPLACEMENT PARTS	56-66

INTRODUCTION

This Service Manual covers the servicing of the NuTone IM-806 Series Radio Intercom system and is divided into the following sections:

Installation Instructions

Contains the instructions to connect the terminal board, transformer, antenna, ground, speakers and the optional telephone coupler and plug-in chime module. The operating instructions and trouble-shooting procedures are also included.

System Theory of Operation

Covers the theory of operation of the IM-806 Series System.

Alignment Procedure

Describes the alignment of the AM and FM tuner sections.

Printed Circuit Board Drawings

Shows the printed circuit boards with the foil path and component connections superimposed.

Transistor and I.C. Voltage Charts

Contains values for Non-logic Transistors and I.C.'s at rest.

Transistor and I.C. Lead Identification

Identifies leads of Non-standard Transistors and I.C.'s.

Replacement Parts

Lists the components by circuit symbol, NuTone Part number and description. Notice of component changes by module is included.

Schematics

Contains a folded insert of the schematics for all of the IM-806 Series System's printed circuit boards interconnected with ribbon cable. Schematics of the remote stations and the IT-10 telephone coupler are included.

INSTALLATION INSTRUCTIONS

Radio-Intercom System

This section contains information for installing the IM-806 Series terminal board and master station. All system wiring and rough-in frames should be installed before mounting and wiring the master station.

Refer to the installation instructions packaged with the IRA-15 Rough-In-Frame for detailed wiring information; for more detailed information on wiring and mounting, also refer to the installation instructions packaged with each separate component.

Wiring Installation Guidelines

Use the following guidelines when wiring the IM-806 Series Radio Intercom system. During the rough-in installation, the system can be wired by one of three methods:

1. **Loop Wired**—The wiring runs from the master station to the remote stations in a single line, with several remote stations wired in tandem.
2. **Direct Wired (Home Run)**—Each remote station is wired directly to the master station on a wire run of its own.
3. **Combination**—Some remote stations are wired directly to the master station; others are wired on loops which include other remote stations.

Limitations

Since each installation has specific requirements to meet, the wiring will vary. However, the following limitations should be adhered to in any installation.

- The total length of wire (IW-6) in a system must not exceed 4000 feet.
- No more than twenty (20) remotes should be used in a system.
- Outside remote controls, outside speakers, and patio speakers should be wired on a separate loop—not on a loop which includes inside speakers.
- No loop should exceed 500 feet.

- No more than ten (10) remote stations should be placed on the loop.
- Any direct wired speaker positioned more than 500 feet from the master station should be wired on a separate wire run.
- No direct wired single speaker run should exceed 1000 feet.

Wiring Specifications

NuTone IW-2	22 GA. Twisted Pair
NuTone IW-6	3-Twisted Pair (6 Wire, 22 GA.) Cable
NuTone S-143	18 GA.2-Conductor Insulated
No.14/2 with ground	120V,60Hz Power Cable, Class 1 U.L. Listed (Not Supplied by NuTone)
14 GA.	Ground Wire (Not Supplied by NuTone)

IMPORTANT: NuTone cannot be responsible for improper Radio-Intercom operation that results from interference generated by light dimmers, fluorescent lighting fixtures, and similar electrical products. Such interference must be corrected at the source. As an aid to help reduce this interference, all remote speaker wires and cables must be placed at least 12 inches from any AC power wiring.

INSTALLATION INSTRUCTIONS

Overview of Wiring and Installation Procedure

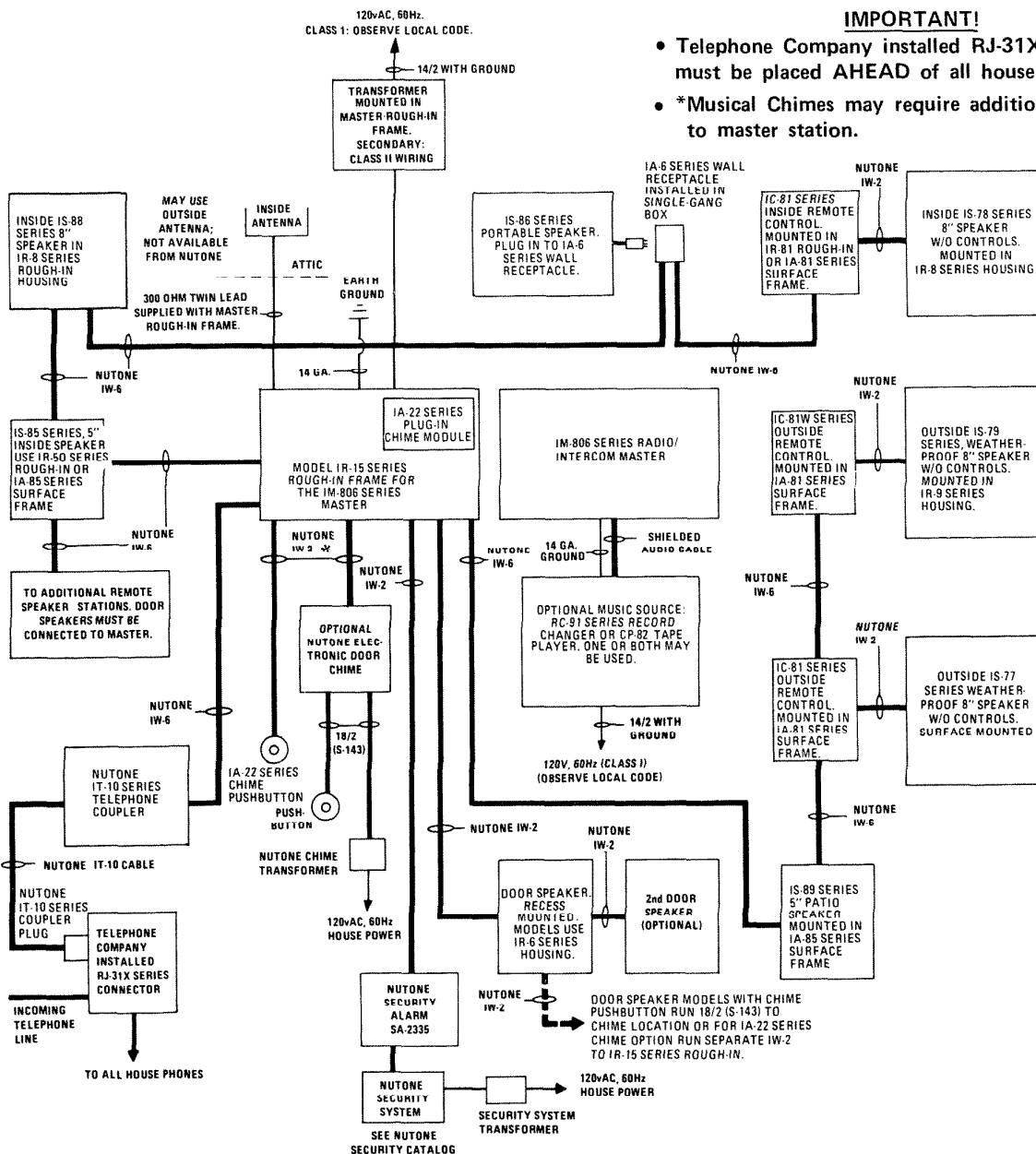
Nearly all system wiring is connected to the terminal board. The installation and wiring of the terminal board and the master station will follow these general steps:

- Mounting the terminal board to the previously installed IRA-15 Rough-In Housing.
- Connecting system wiring to the terminal board.
- Connecting master station control panel and radio to the terminal board.
- Checking and testing operation.
- Trouble-Shooting (if necessary).
- Final mounting of master station.

Recommended Wiring Procedure

1. Run wire from master station to remote location. Do not make connection at master station terminal board.
2. Connect wiring to remote station.
3. Connect wiring to master station terminal board. Making connections at the master terminal board the last step will help avoid damage to master station caused by faulty wiring.

Representative Wiring Illustration

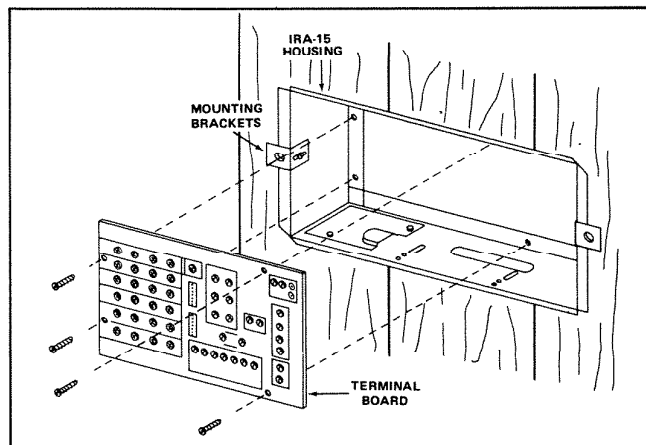


IMPORTANT!

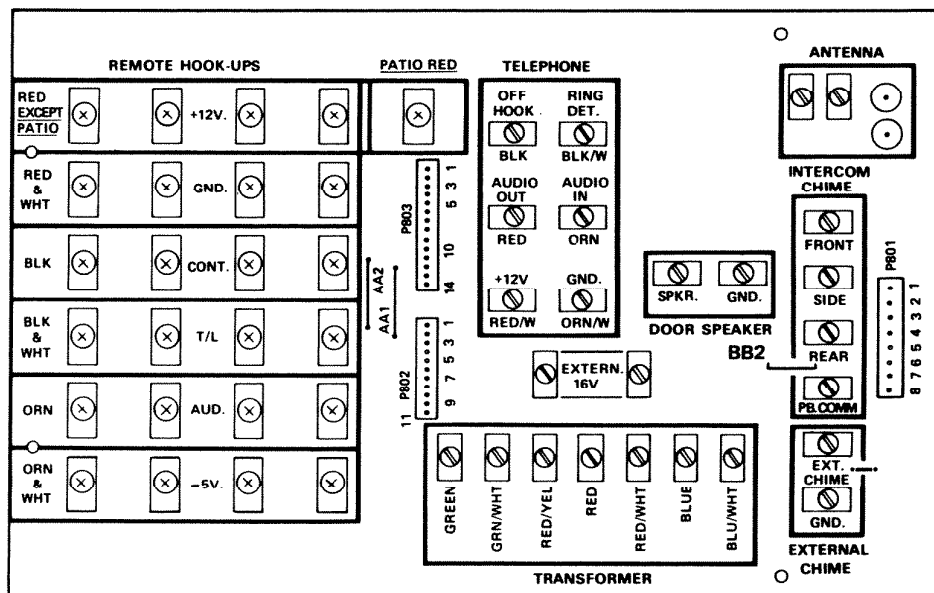
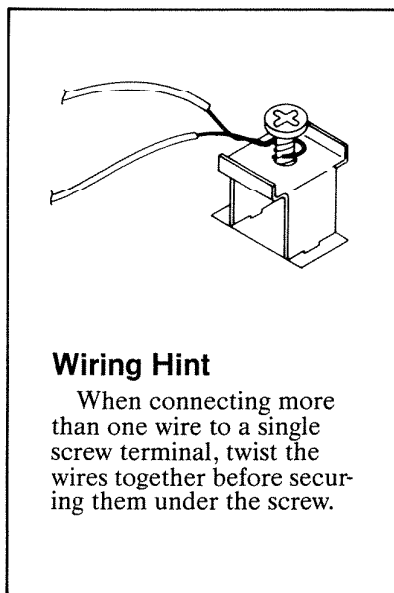
- Telephone Company installed RJ-31X connector must be placed AHEAD of all house phones.
- *Musical Chimes may require additional wiring to master station.

Mounting the Terminal Board

1. The terminal board mounts inside the IRA-15 Rough-In Housing.
2. Position terminal board against the inside flanges of the rough-in. Align mounting holes in terminal board with mounting holes in rough-in. See illustration.
3. Secure terminal board to rough-in with four (4) mounting screws.
4. Use two screws (provided) to install mounting brackets flush to wall.



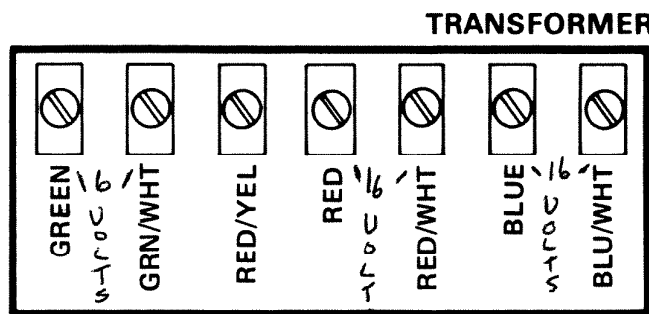
Wiring Connections (for the IM-806 Terminal Board)



Connecting the Transformer

Before connecting any wiring to the terminal board, turn off power to the transformer. Power may be supplied in order to test the master and remote stations if the wire connections to the last station on the run or loop are completed. Then, turn off power again when connecting wires to terminal board.

1. The transformer's primary leads should already be connected to 120vAC house supply wiring. See exception under "External Transformer Connections," page 6.
2. Connect the transformer's low voltage secondary wires to the terminal screws in the section marked **TRANSFORMER** of the terminal board. The transformer's low voltage wires are color-coded: connect red wires to terminal screws marked **RED**; blue wires to terminal screws marked **BLUE**, etc.



NOTE: ONE WIRE OF EACH PAIR (GREEN, RED, BLUE) BEARS A WHITE STRIPE. THIS DOES NOT AFFECT THE WIRING INSTRUCTIONS IN STEP 2.

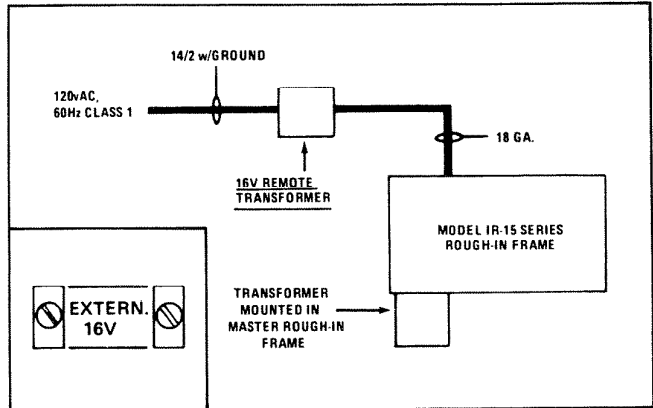
INSTALLATION INSTRUCTIONS

External Transformer Connections

If a remotely-mounted 16v transformer is used when adapting an existing intercom system to an IM-806 Series Radio-Intercom system, follow this procedure:

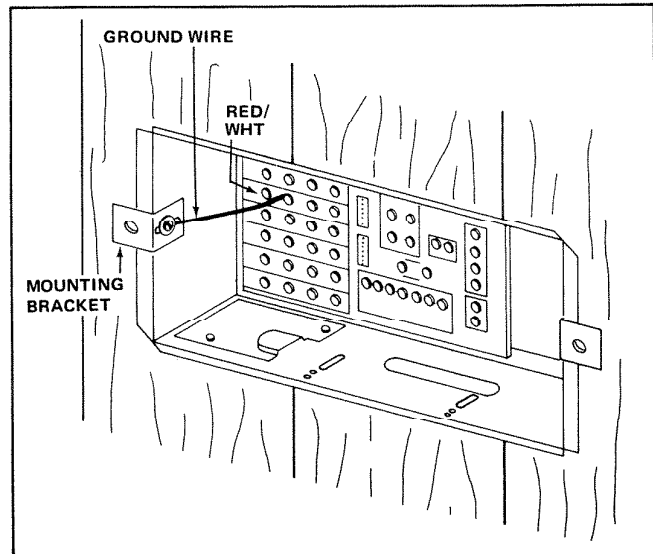
1. Use only a 301N transformer (16v).
2. Locate transformer no more than 50 feet from the master location.
3. Connect the house supply wiring (120vAC) to the 301N (16v) transformer.
4. Run 18 gauge (2-conductor) wire from remote transformer to the master station's terminal board.
5. Connect 18 gauge wires to the two (2) terminal screws in the **EXTERN.16V** section of the terminal board.
6. The use of a remotely-mounted transformer does not exclude the use of the transformer provided with the IRA-15. The secondary wires should be connected as explained in step number 2, "Connecting the Transformer," above; the primary leads **are not** connected to the house supply wiring.

NOTE: The adapting of an existing intercom to an IM-806 Series probably requires the use of the IKA-8 Adaptor Kit.



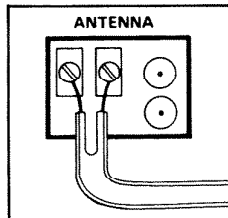
Connecting the Ground Wire

1. The IRA-15 Rough-In Frame should be grounded when the system is roughed-in and when the transformer is connected to the house supply wires. Grounding the Rough-In Frame will help reduce or eliminate most minor electrical noise problems.
2. Ground the terminal board by connecting the supplied ground wire between any of the RED/WHITE screw terminals and the mounting bracket screw on the left side of the rough-in frame.



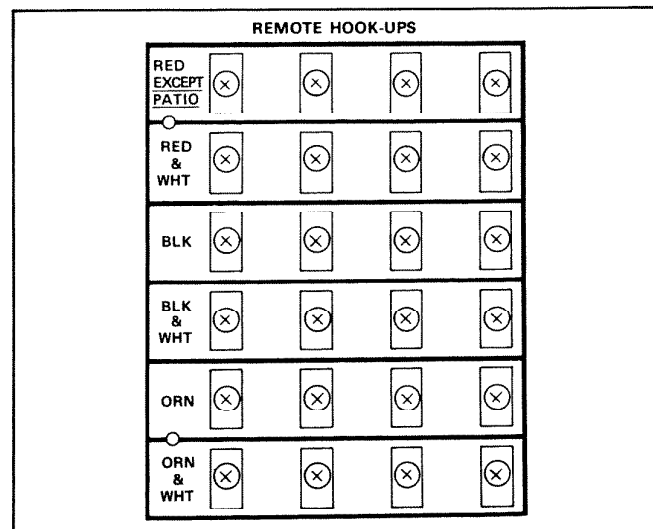
Connecting the Antenna

Connect the AM/FM antenna wires to the two screw terminals marked **ANTENNA** on the terminal board.



Connecting Inside Remote Speakers and Remote Controls

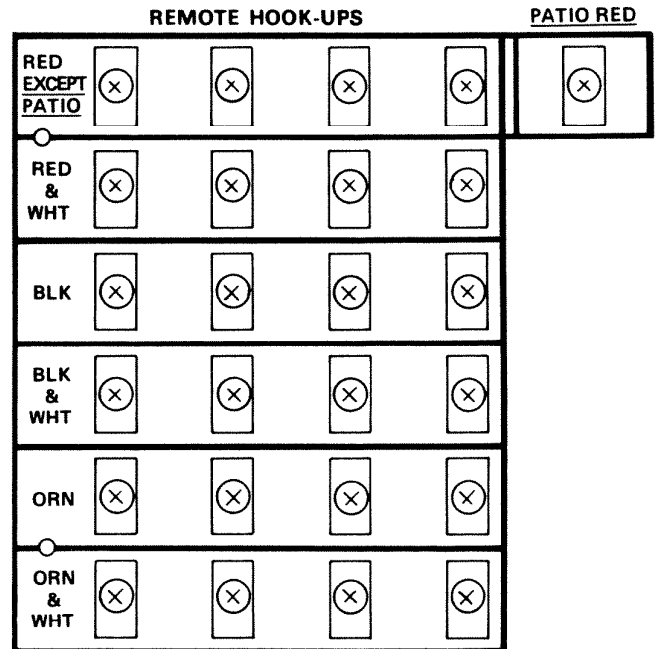
1. All inside speakers and inside remote controls are connected to the terminal screws in the REMOTE HOOK-UPS section of the terminal board.
2. Each remote wire run—loop or direct—uses NuTone IW-6/3-twisted pair cable. Run cable through one of the oblong wiring holes in IRA-15 Rough-In frame.
3. Connect the six (6) color-coded wires to the matching terminal screws on the terminal board. Connect the red wire to a terminal screw marked **RED**; red/white wire to a terminal screw marked **RED & WHT**; black wire to a terminal screw marked **BLK**, etc.



Connecting Outside (Patio) Speakers and Remote Controls

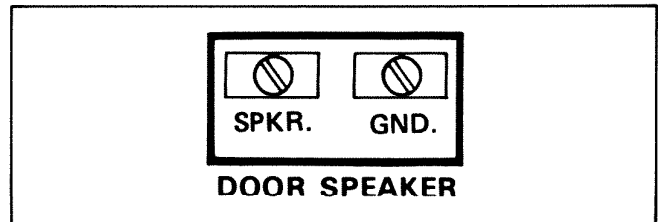
IMPORTANT: Outside (Patio) speakers and outside remote controls require a separate wiring run: they **should not** be wired on the same loop with inside units. The **PATIO RED** terminal is controlled by the PATIO ON-OFF pushbutton on the master station—a feature which allows independent control of outside speakers.

1. All outside (patio) speakers and outside remote controls are connected to the terminal screws in the **PATIO RED** and **REMOTE HOOK-UPS** sections of the terminal board.
2. Each wire run—loop or direct—uses NuTone IW-6/3-twisted pair cable. Run cable through one of the oblong wiring holes in rough-in frame.
3. Connect all the red wire(s) to the terminal screw marked **PATIO RED**.
4. Connect the remaining color-coded wires to the matching terminal screws on the terminal board. Connect the red/white wire to a terminal screw marked **RED/WHT**; black wire to terminal screw marked **BLK**, etc.



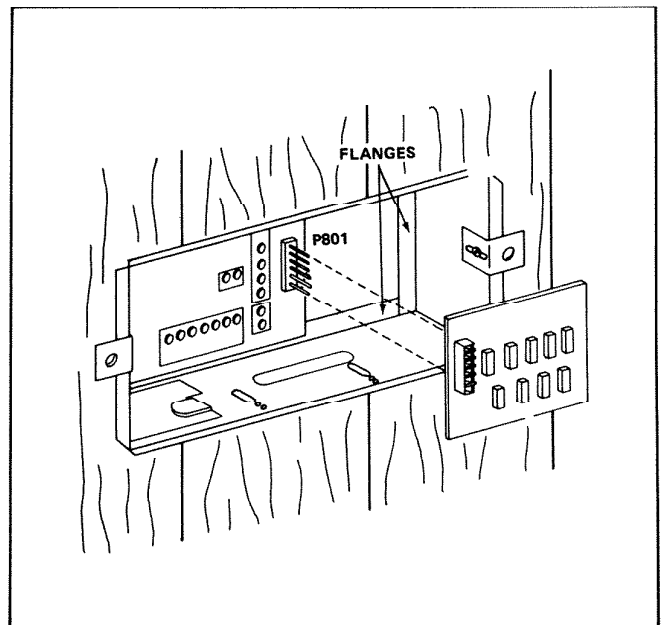
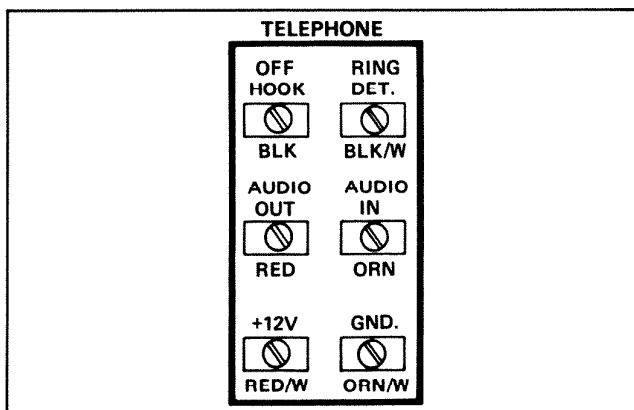
Connecting Door Speakers

1. Door speakers are connected with NuTone IW-2 wire to the terminal screws in the **DOOR SPEAKER** section of the terminal board.
2. Run IW-2 wires through one of the oblong wiring holes in the rough-in frame.
3. Connect one of the IW-2 wires to the terminal screw marked **SPKR**; connect the other wire to the terminal screw marked **GND**.



Telephone Coupler

1. The IT-10 Telephone Coupler is connected with IW-6 cable to the **TELEPHONE** section of the terminal board.
2. Connect the six (6) color-coded wires to the matching terminal screws on the terminal board. Connect the black wire to the terminal screw marked **BLK**; black/white wire to the terminal screw marked **BLK/WHT**, etc.



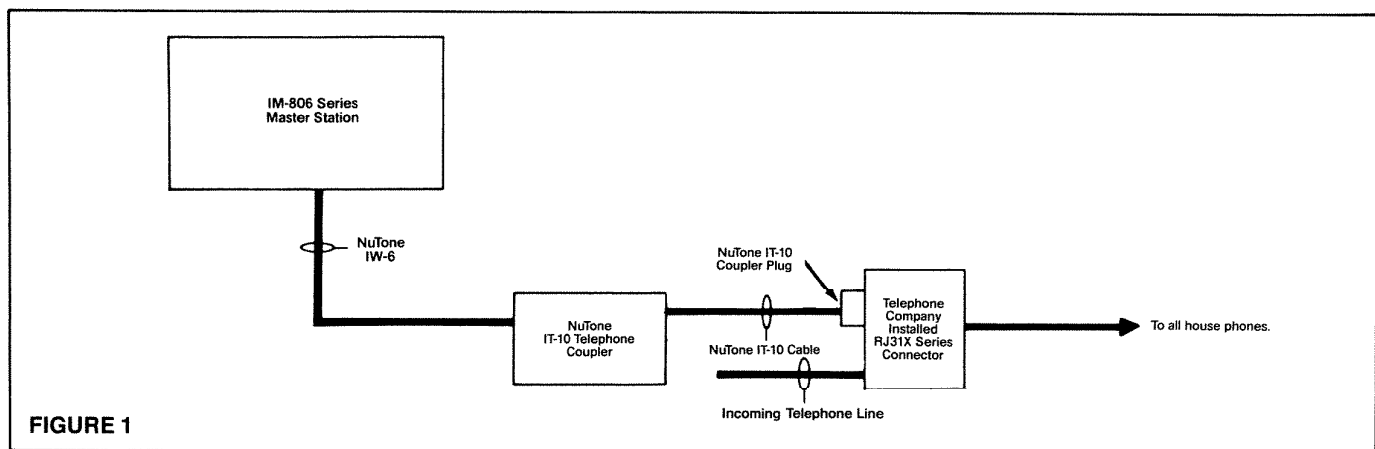
INSTALLATION INSTRUCTIONS

Arranging for Telephone Company to Install RJ31X Connector (IT-10)

1. Contact your local telephone company interconnect department or business office.
2. Request the following: one RJ31X Series Connector jack (used in U.S. only). See page 9 for Canadian information.
3. Specify connection to: NuTone IM-806 Series Radio-Intercom System, using NuTone Model IT-10 Telephone Coupler.
4. **Inform the telephone company of the IT-10 Telephone Coupler's:**
FCC Registration Number: AD998G-68232-MA-N
Ringer Equivalence Numbers: 0.0A,0.2B.

Location

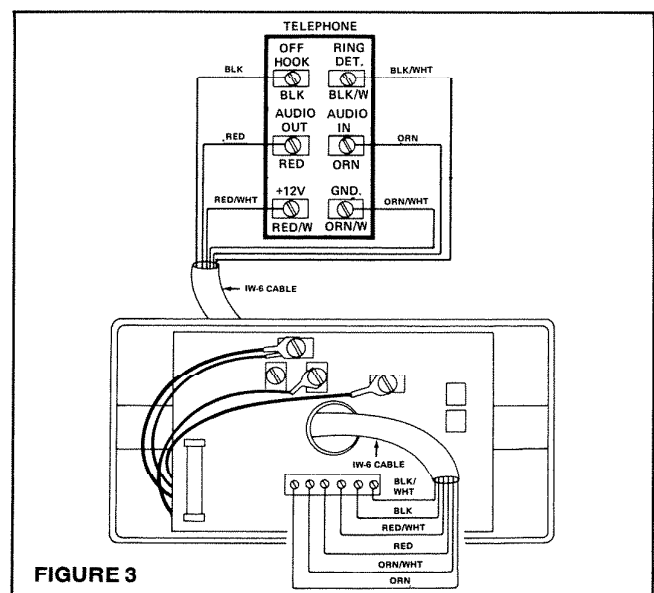
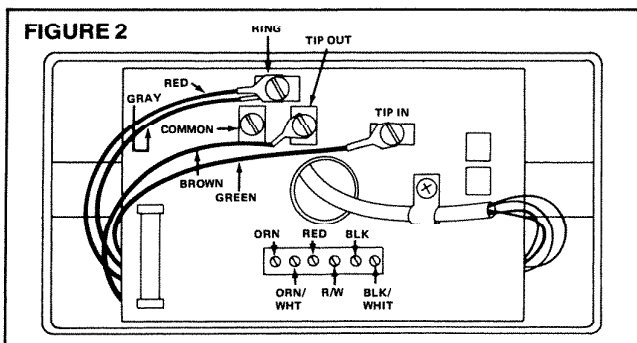
1. The IT-10 Telephone Coupler should not be located more than 5 feet from the telephone company installed RJ31X connector.
2. The telephone company installed RJ31X connector must be installed **AHEAD** of all house phones. See Figure 1.
3. When using the IM-806 Series Radio-Intercom system with a NuTone security system which includes a telephone dialer, the RJ31X jack for the security system's telephone dialer must be placed **AHEAD** of the RJ31X for the IT-10 Telephone Coupler.



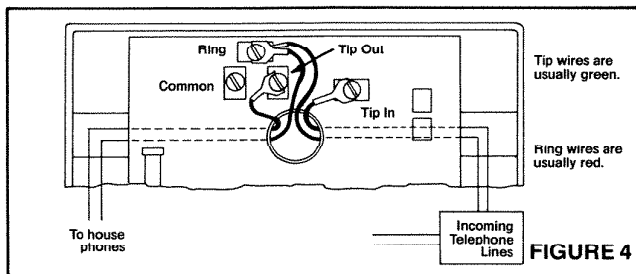
Wiring Connections

1. Remove cover from IT-10 Telephone Coupler.
2. The IT-10 cable/plug assembly, which connects to the RJ31X, is prepared as shown. See Figure 2.
3. The IT-10 Telephone Coupler is connected to the IM-806 Series terminal board with IW-6 cable (3-twisted pair/22GA.). Pull the IW-6 cable through the wiring hole in the center of the Telephone Coupler.
4. Connect the six (6) color-coded wires to the matching terminal screws on the IT-10 terminal block. Connect the orange wire to the screw terminal marked **ORN**; orange/white wire to the screw terminal marked **ORN/WHT**, etc. See Figure 3.
5. At the IM-806 Series terminal board, connect the six (6) color-coded wires to the matching terminal screws in the **TELEPHONE** section of the terminal board.

6. Replace the IT-10 Telephone Coupler cover.
7. Connect IT-10 cable plug to socket in RJ31X jack.



Direct Wiring from Phone Lines (where RJ31X Connector is not used)



Private Phone Conversations

When you answer the phone from an intercom station, all stations will hear both ends of the conversation. More often than not, you will enjoy the convenience of answering the phone from an intercom station but will wish to continue the conversation privately.

All you have to do to transfer the call from intercom to telephone is pick up the telephone receiver. When you lift the receiver from the cradle, the phone call will automatically be taken off the intercom system. The system will then time-out and return to playing program material.

You should **not press END CALL** before you pick up the telephone receiver: by doing so you will "hang up" on the phone caller.

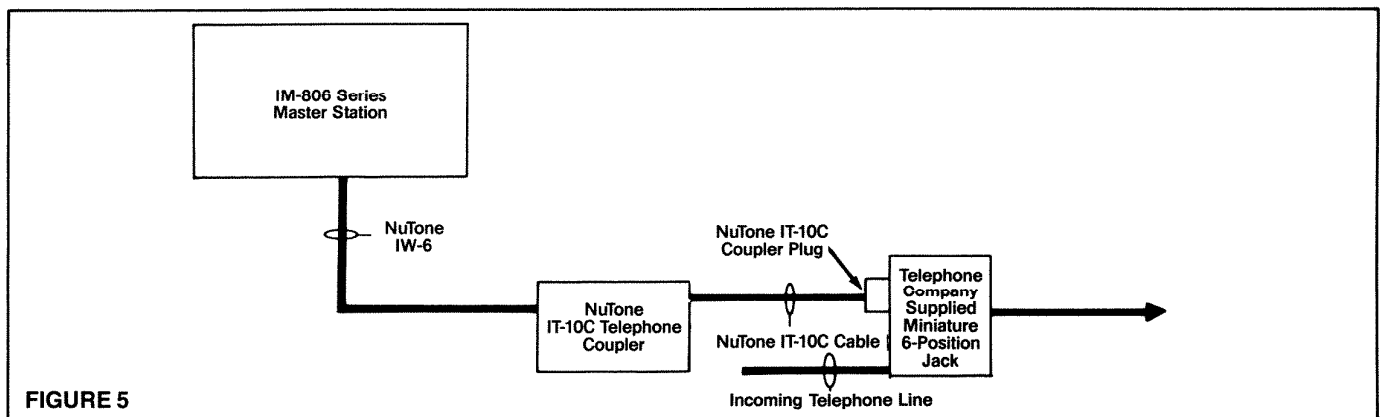
Arranging for Telephone Company to Install Miniature 6-Position Jack (IT-10C — for Use in Canada)

FOR USE IN CANADA. (Miniature 6-position jack required for Canadian installations only.)

1. Contact your local telephone company interconnect department or business office.
2. Request installation of a miniature 6-position jack which is compatible with a D.O.C. type G or H plug.
3. Specify connection to: NuTone Model IM-806 Series Radio-Intercom System, using NuTone Model IT-10C Telephone Coupler.
4. Inform the telephone company of the following Department of Communications Registration Numbers:
IT-10C Telephone Coupler: 179 263 A
Cord Set: G 179 209

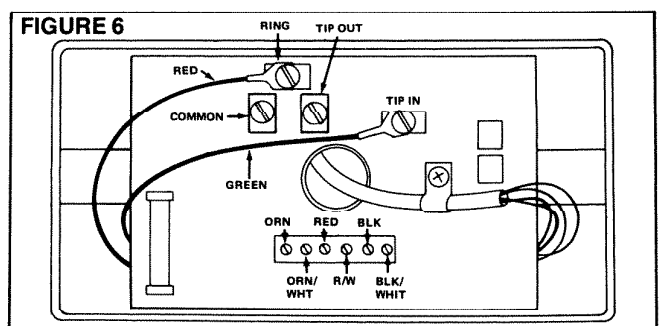
Location

1. The IT-10C Telephone Coupler should not be located more than 5 feet from the telephone company installed miniature 6-position jack.
2. When using the IM-806 Series Radio-Intercom System with a NuTone security system which includes a telephone dialer, connector jack for the security system's telephone dialer must be placed **AHEAD** of the miniature 6-position jack for the IT-10C Telephone Coupler. See Figure 5.



Wiring Connections

1. Remove cover from IT-10C Telephone Coupler.
2. The IT-10C cable/plug assembly, which connects to the miniature 6-position jack, is prewired as shown. See Figure 6.
3. The IT-10C Telephone Coupler is connected to the IM-806 Series terminal board with IW-6 cable (3-twisted pair/22GA.). Pull the IW-6 cable through the wiring hole in the center of the Telephone Coupler.
4. Connect the six (6) color-coded wires to the matching terminal screws on the IT-10C terminal block. Connect the orange wire to the screw terminal marked **ORN**;



INSTALLATION INSTRUCTIONS

orange/white wire to the screw terminal marked **ORN/WHT**, etc. See Figure 7.

- At the IM-806 Series terminal board, connect the six (6) color-coded wires to the matching terminal screws in the **TELEPHONE** section of the terminal board. Connect the black wire to the terminal screw marked **BLK**; connect the black/white wire to the terminal screw marked **BLK/W**, etc. See Figure 7.
- Replace the IT-10C Telephone Coupler cover.
- Connect IT-10C cable plug to the telephone company installed miniature 6-position jack.

Canadian Operator's Information

Use of the supplied D.O.C. type G or H plug eliminates the privacy feature described in "Private Phone Conversations."

When the D.O.C. type G or H plug is used, the telephone hand-set will **not** have priority over the Intercom. Lifting the telephone receiver will not take the call off the intercom system; the intercom will continue to send the conversation to all system speakers.

To make the conversation private, lift the telephone receiver and then return to the intercom and press **END CALL**.

NOTE: Although direct wiring the IT-10C Telephone Coupler to your incoming phone lines will allow the privacy feature to work, such direct wiring is against the Canadian Government Department of Communications Regulations.

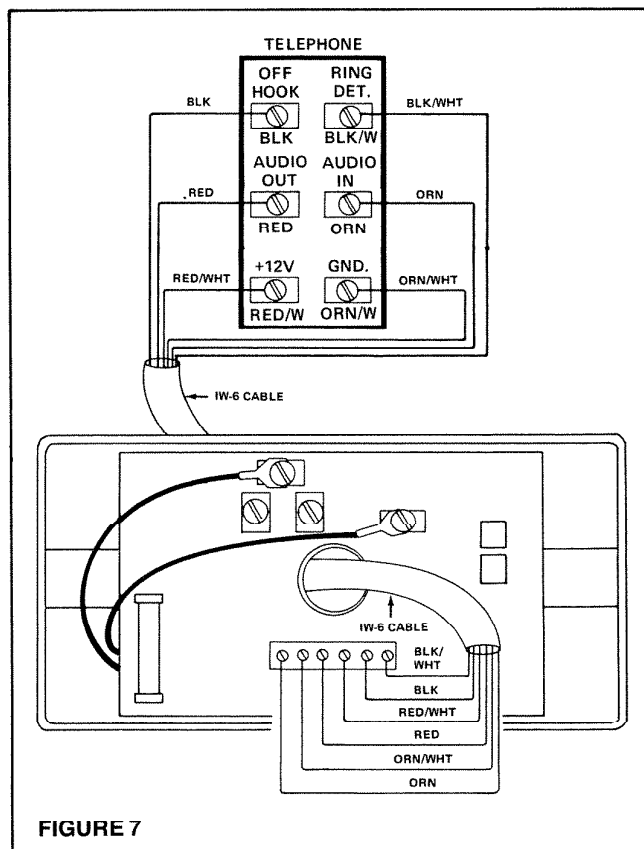


FIGURE 7

Plug-In Chime Module (IAA-22)

- Run IW-2 wire from pushbutton location(s) to the IRA-15 Rough-In location. Pull wire through oblong wiring hole.
- The pushbutton wires are connected to the screw terminals in the **INTERCOM CHIME** section of the IM-806 Series terminal board.
- Connect one wire from the front door pushbutton to terminal screw marked **FRONT**; connect the other wire to terminal screw marked **P.B.COMM** (common).
- Connect wires from side and rear door pushbuttons—if applicable—in the same manner. See Figure 8.
- IMPORTANT: Clip the jumper wire (BB2) on the terminal board. After the wire is clipped, make sure the two pieces do not contact each other.** See Figure 9.
- For optional hook-up to a separate NuTone security system, connect two wires from NuTone Model S-2335 Horn (which is separately wired to the security system) to the two terminal screws in the **EXTERNAL CHIME** section of the terminal board. **IMPORTANT: When connecting the Horn wiring, connect a 10k resistor in series with the EXTERNAL CHIME terminal.**

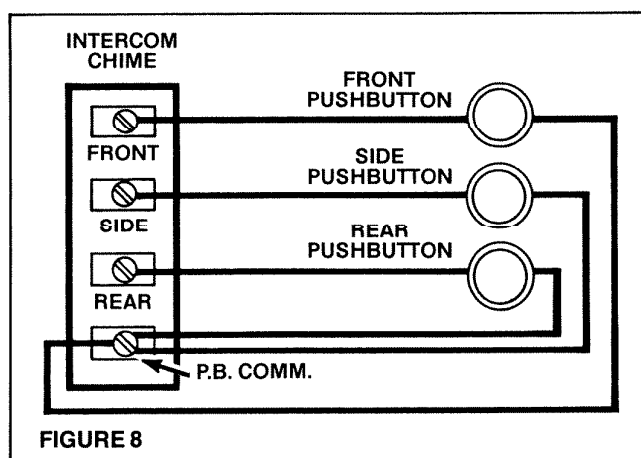
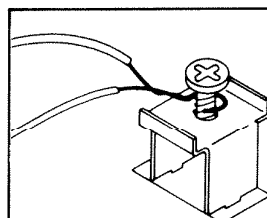
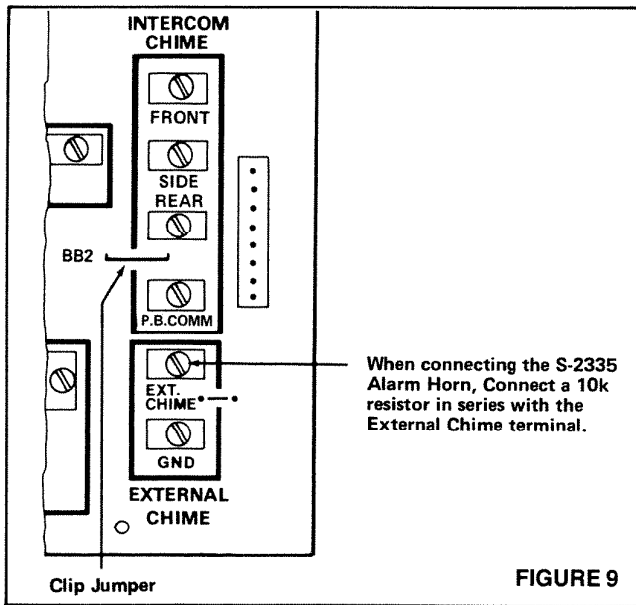


FIGURE 8



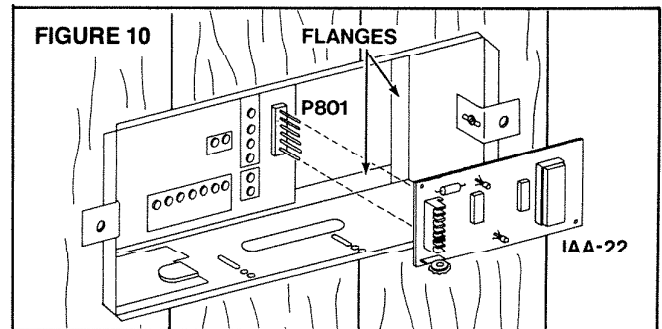
Wiring Hint

When connecting more than one wire to a single screw terminal, twist the wires together before securing them under the screw.



Installation

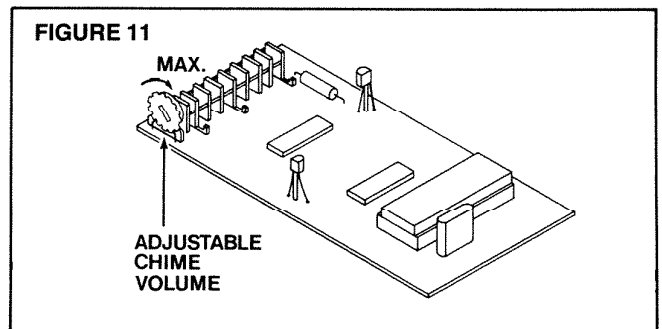
1. Remove paper from the two strips of double-faced tape on the back of the Chime Module.
2. Align Chime Module's connector with 8-pin connector (P-801) on terminal board. See Figure 10.
3. Carefully press Chime Module down until pins are fully inserted into connector and double-faced tape adheres to the rough-in housing's flanges.



Chime Volume Adjustment

The **PROGRAM VOLUME** controls—located on the master station and all Remote stations—also regulate the Chime Volume. When the Program Volume is increased or decreased, the Chime Volume is adjusted likewise.

If you want the Chime Volume to be louder than the Program Volume, you may adjust the Chime Volume level by using the thumbwheel pot on the IAA-22 Chime Module. **To increase the Chime Volume, turn the thumbwheel in the direction shown by the arrow.** See Figure 11. The Chime Volume pot is the only adjustable pot.



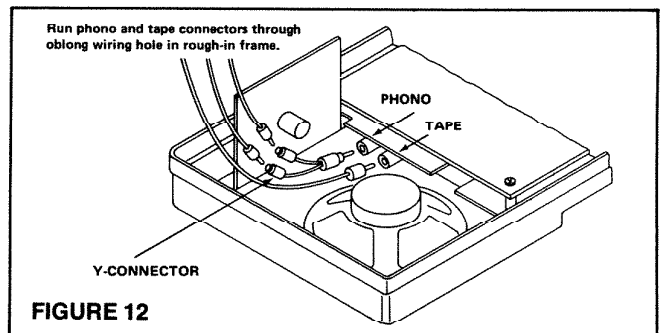
Optional External Chime

1. An external electronic chime may be connected to the terminal board.
2. Use IW-2 wire to connect the chime to the two (2) terminal screws in the **EXTERNAL CHIME** section of

the terminal board. **NOTE: Musical Chimes may require additional wiring to Master Station. See Installation Instructions for specific chime used.**

Optional Hook-Ups to NuTone Security System, Record Changer and Tape Player

1. For optional hook-up to a separate NuTone security system, connect two wires from NuTone Model SA-2335 Horn (which is wired to separate security system) to the two terminal screws in the **EXTERNAL CHIME** section of the terminal board.
2. **RECORD CHANGER & TAPE PLAYER:** For optional hook-up of NuTone Record Changer or Tape Player, connect supplied audio cable from changer to PHONO jack and audio cable from tape player to TAPE jack. Two audio cables are supplied with each accessory—**use only one cable for tape player; use two cables plus Y-connector (supplied with record changer) for record changer connection.** Record changer and tape player require separate 120 vAC, 60 Hz power supply.

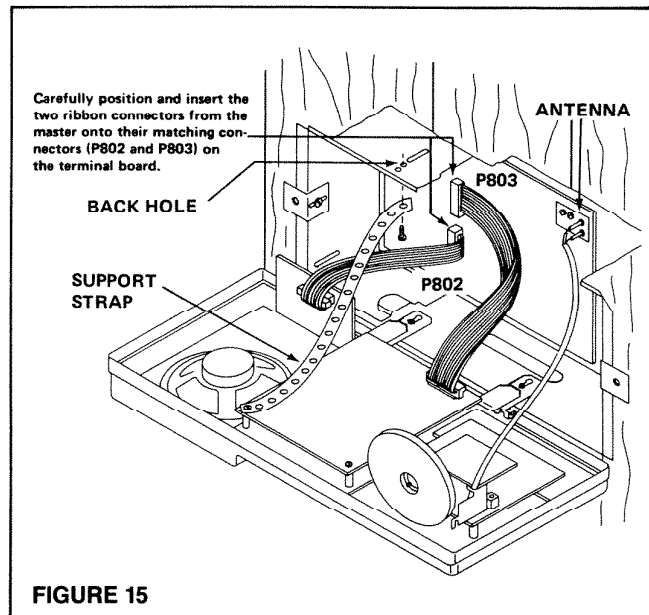
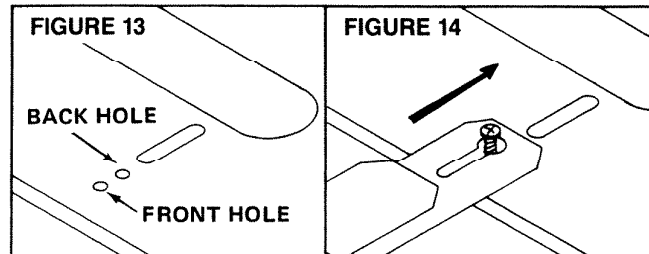


INSTALLATION INSTRUCTIONS

Connecting the Master Station to the Rough-in Frame and Terminal Board

IMPORTANT: If you are installing a new IM-806 Series into an existing IR-15 frame, use the enclosed template to drill the necessary hinge and support strap holes. Then follow mounting procedure detailed below.

1. Carefully place all excess wiring back through the oblong wiring holes in the rough-in frame and into the wall cavity. This will help prevent accidental damage to the master station or to the wiring.
2. **For rough-in frames which are recessed into the wall opening:** insert two #6 x $\frac{3}{8}$ screws (provided) into the front two holes in the rough-in frame. Do not completely tighten screws. See Figure 13.
For rough-in frames which are mounted flush with the wall: insert two #6 x $\frac{3}{8}$ screws (provided) into the back two holes in the rough-in frame. Do not completely tighten screws. See Figure 13.
3. Align the master with the rough-in frame.
4. Attach master to rough-in frame by placing keyhole slots in both mounting hinges over screw heads in rough-in frame.
5. Slide one hinge toward inside of rough-in as far as possible and tighten the screw securely. Position and secure the second hinge. See Figure 14.
6. Use provided #6 x $\frac{3}{8}$ screw to attach the support strap to the rough-in frame through the last hole in the strap and the back hole in top of rough-in frame. See Figure 15.
7. Attach antenna cable connectors from the master station to the pins in the ANTENNA section of the terminal board.
8. Make sure power is turned off before connecting ribbon connectors. Carefully position and insert the two ribbon connectors from the master onto their matching connectors (P802 and P803) on the terminal board. See Figure 15. The connectors are keyed so that they only fit one way—do not reverse connection by forcing connector onto pins.



System Operating Controls

The master station contains additional controls for the radio and program sources; however, all stations—master and remotes—contain similar intercom controls and program volume controls.

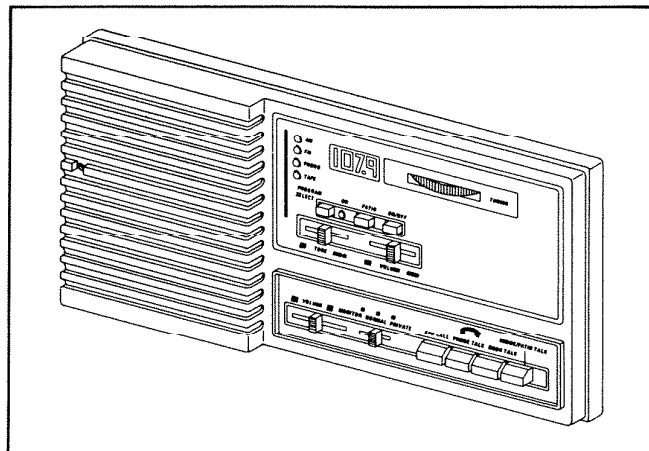
These controls are listed below and their functions are explained. Read through the list and become familiar with each control **before** proceeding to the "Operational Checkout!"

Intercom Controls

VOLUME—Use this slide control to adjust the intercom Volume. Slide the lever from left to right to increase volume.

MONITOR/NORMAL/PRIVATE Switch—Set switch for desired function:

MONITOR—All audio from "Monitored" station will be sent to all other stations. Audio from this station will



accompany program audio. "Monitored" station cannot receive program or intercom audio.

NORMAL—The station operates as both a microphone to send messages and as a speaker to receive them. Intercom, Radio, Phonograph and Tapes will be heard at all stations set on **NORMAL**. To answer the telephone from any station, switch must be set at **NORMAL**.

PRIVATE—No audio from "Private" station can be sent to other stations. Cannot make intercom calls from "Private" station. "Private" setting does not affect program audio.

END CALL—Press button to end an intercom call and return system to program source.

PHONE TALK—Press button to answer the telephone. Release button to hear reply.

DOOR TALK—Press the button to make a call to the door speaker. To hear a reply, release the button.

INSIDE/PATIO TALK—Press button to make a call to other speakers except the door speaker. Release button to hear reply.

Radio and Program Controls

Digital AM/FM Frequency Display—The display shows the AM and FM frequencies to which the radio is tuned.

TUNING Wheel—The wheel turns to tune the radio.

ON/OFF Pushbutton—Press the button to in position to turn on the program source (radio, phono, tape). Release the button to out position to turn off program source.

PATIO—This button controls the outside speakers and outside remote controls. Press the button to in position to turn on outside speakers and outside remote controls.

Patio ON Indicator Light—The LED will be lit when the outside speakers and outside remote controls are on.

PROGRAM SELECT—Press the pushbutton to select program source: AM radio, FM radio, PHONO, TAPE.

LED Program Indicator Lights—The light that is lit indicates what program source has been selected.

VOLUME—Use this slide control to adjust the Program Volume. Slide the lever from left to right to increase volume.

TONE—Use this slide control to adjust the Program Tone. Slide the lever right to increase treble, left to decrease treble.

"Hands Free" Operation

The IM-806 Series Radio-Intercom system is designed so that **only the person making the call must use the intercom controls**.

The person making the call presses a **TALK** button to speak to other stations and releases the button to listen to a reply.

The person who receives the call does not use any controls.

However, there are two exceptions to this feature:

1. If a call is made from station A and the person who responds from station B **unnecessarily** presses the **INSIDE/PATIO TALK** button, both persons will have to press their **INSIDE/PATIO TALK** buttons in order to continue the conversation. This situation can be avoided if the person who responds to a call always remembers to observe "**hands free**" operation.

2. **Secondary Calls.** If either the **PHONE TALK** or **DOOR TALK** buttons have been depressed to make a call, and then the **INSIDE/PATIO TALK** button is pressed to make a secondary call, the person who responds to the secondary call must push the **INSIDE/PATIO TALK** button at his station to reply to the secondary call. The secondary intercom conversation will be private from the phone lines.

An example: The door chime rings. A person at station A answers by pressing DOOR TALK. The same person then presses INSIDE/PATIO TALK to make a secondary call to station B. The person at station B must press INSIDE/PATIO TALK to reply.

Operational Checkout

Initial Setup

1. Turn on power to master station.
2. Press **END CALL** button. (Initially, the system will come on in the muted mode.)
3. Adjust all system **PROGRAM VOLUME** and **INTERCOM VOLUME** controls to one-third (1/3) of maximum.
4. Place all **MONITOR/NORMAL/PRIVATE** switches in **NORMAL** position.
5. Set **TONE** control on master station to mid-range.
6. Set **PATIO ON/OFF** button to out position.
7. Push **ON/OFF** button to in position. (**NOTE: The Intercom is always on.**)
8. Press **PROGRAM SELECT** button to select either AM or FM radio. Selection is shown by LED indicator lights.
9. Adjust **TUNING** wheel to select a local radio station which can be heard strongly and clearly.
10. Readjust all **PROGRAM VOLUME** controls to suit volume level requirements at each station.

INSTALLATION INSTRUCTIONS

Intercom Operation

Step	Station	Control	Operation	System Response
1.	Master	Press INSIDE/PATIO TALK.	Make a call to remote speakers.	Call from master heard at all remotes.
2.	Master	Release INSIDE/PATIO TALK.	Listen to reply.	Reply from remotes heard at master.
3.	At remotes	"Hands free"	Listen to and reply to call made from master station. No controls at remote used.	Audio from remotes heard at master station.
4.	Master	Press END CALL.	End intercom call.	All stations immediately return to original state—programming or OFF.
5.	Master	Press and release INSIDE/PATIO TALK.	Begin time-out cycle. NOTE: The "Time-out" period is reset each time any TALK button in the system is pressed. The "Time-out" is factory set for approximately three (3) minutes.	Program audio will return approximately three (3) minutes after the INSIDE/PATIO TALK button is released.
6.	Master	Press DOOR TALK.	Make a call to the door speaker(s).	Call from master heard at door speaker and at other remotes.
7.	Master	Release DOOR TALK.	Listen to reply from door.	Reply from door speaker heard at master station and all remotes.
8.	Master	Press END CALL.	End intercom talk with door speaker. NOTE: The "Time-out" period functions the same as when using INSIDE/PATIO TALK button.	All stations return to original state—program source or OFF.
9.	All remotes	Using the same procedure outlined above for the master station, check the intercom function at each remote. Make calls from remotes to master, from remotes to other remotes, and from remotes to door speakers. The station making the call uses controls; the station receiving calls is used "hands free." *See "Hands Free" Operation (page 13) .		
10.	Master or remotes.	Press PHONE TALK.	Respond to ring signal and answer phone.	All stations hear ring signal. Person calling on phone will hear answer. Answer will be heard at all stations.
11.	Master or remotes	Release PHONE TALK.	Listen to phone caller's reply.	Phone caller's reply heard at all stations.
12.	Master or remotes.	Press END CALL.	End phone conversation.	Hangs up phone. System returns to original state—program source or OFF.
13.	Master or remotes	To answer the phone from the Intercom System but continue the phone conversation privately, follow this procedure: Press PHONE TALK.	Respond to ring signal; answer phone.	Caller will hear answer. All stations will receive audio.
14.	Master or remotes.	Release PHONE TALK.	Listen to phone caller's reply.	Caller's reply heard at all stations.
15.	Telephone	-----	Pick up telephone receiver.	Phone conversation is taken off intercom system. System will time-out and return to original state—program source or OFF.

NOTE: Pressing END CALL BEFORE picking up phone receiver will result in "hanging-up" on phone caller.

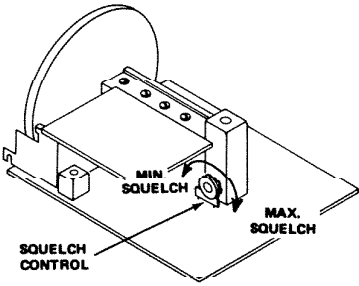
Recommended Trouble-Shooting Procedure*

1. One at a time, disconnect each wiring loop or run from the terminal board.
 2. With one loop or run disconnected, check operation. Repeat procedure until you find the loop or run which causes improper operation. See **Intercom Operation** chart on preceding page.
 3. When loop or run that causes improper operation is located, disconnect that loop at mid-point. Then, check operation again.
 4. If improper operation continues, disconnect the remainder of the loop and check operation.
 5. Continue this process until defective remote or faulty wiring is located.
 6. If an intercom call cannot be properly made under any circumstances, the problem is in the master station.
- *For detailed trouble-shooting, see Trouble-Shooting Guide, Radio-Intercom, IM-806 Series, Form No. FS-1255.**

Installer's Trouble-Shooting Guide

TROUBLE	POSSIBLE CAUSE	POSSIBLE REMEDY
1. No radio; no intercom. Radio display is off.	1. No electrical power.	1. Be sure there is 120 vAC, 60Hz power to transformer primary. Next, check AC to intercom master from transformer secondary (blue pair) for 16 volts. Check wiring from transformer to terminal board.
2. System goes on and off.	2. Overheating of transformer.	2. Check transformer secondary wiring. If transformer is defective, replace transformer.
3. No radio but intercom working (radio display on).	3. Installation problem.	3. Check terminal board for shorted terminals or miswired cables. Remove one 6-wire cable at a time to locate faulty line. When radio comes on, check speaker connections and run continuity check of speaker wiring.
4. No radio but intercom working (radio display on).	4a. Antenna problem.	4a. Check for shorted antenna connection. Remove master's antenna leads from antenna harness and hold each lead individually — if radio plays, antenna is not efficient; be sure it is installed properly. In weak signal areas, an outside antenna may be necessary.
	4b. Faulty master station.	4b. See Warranty.
5. Select switch will not work.	5. Faulty master station.	5. See Warranty.
6. Low or no volume from remote remote speaker which is set to MONITOR.	6a. Improper or broken wiring.	6a. Repair or replace wiring.
	6b. Defective remote station.	6b. Replace remote station.
7. Pressing Inside/Patio Talk button does not initiate a call from master.	7. Bad remote station.	7. Follow "Recommended Trouble-Shooting Procedure" until bad station is located. See Warranty.
8. Pressing Inside/Patio Talk button does initiate a call but no reply can be heard.	8. Bad remote station.	8. Same as 7 above.
9. System squeals when intercom is used.	9a. Remote speaker's I-COM VOLUME set too high.	9a. Reduce I-COM VOLUME at offending speaker.
	9b. Shorted wire on master or remote terminal board.	9b. Check for short between terminals or loose wires.
	9c. Speakers in adjacent rooms mounted on common wall or mounted back to back.	9c. If speakers are mounted directly back to back, one speaker will have to be relocated. If speakers are in a common wall, try placing fiberglass insulation behind each speaker or isolate the speaker from the wall by placing rubber washers or weather stripping between speaker and wall.
	9d. Improper wire used in installation.	9d. NuTone Model IW-6 3-twisted pair cable must be used.

INSTALLATION INSTRUCTIONS

TROUBLE	POSSIBLE CAUSE	POSSIBLE REMEDY
10. Hum in speakers.	10a. Intercom wiring run too close to household AC power wiring.	10a. Keep intercom wiring as far as practical from household AC power wiring. Do not run intercom wiring parallel to AC power wiring.
	10b. Shorted intercom power wiring or power wiring shorted to ground.	10b. Check power connections to master terminal board and connections to transformer.
	10c. Interference from household electrical fixtures.	10c. A dimmer switch may cause interference—NuTone Models DC-15 and DC-35 Dimmer Switches are designed to help minimize such interference. For fluorescent lighting interference, use filters (G.E.89G635 or equivalent, purchased locally).
11. Static	11a. Loose ground connection.	11a. Check ground connection to master and connection to earth ground source.
	11b. Interference from household electrical fixtures.	11b. A dimmer switch may cause interference—NuTone Models DC-15 and DC-35 Dimmer Switches are designed to help minimize such interference. For fluorescent lighting interference, use filters (G.E. 89G635 or equivalent, purchased locally).
	11c. Interference from household electrical appliances.	11c. Correct interference at the source: fish tank, heater, hand tool, coffee pot, fluorescent lights, etc.
12. Remote station not working	12. Wire installation.	12. Check terminal board for broken wire or loose connection. Check continuity of wire.
13. No door communication.	13a. Wire installation.	13a. Check continuity or wiring. Check connections at speaker and master.
	13b. Speaker.	13b. Check with a speaker known to be in working order.
14. Optional electronic chime does not work through intercom, or low volume.	14a. Wire installation.	14a. Be sure chime is wired to proper terminals on master terminal board and proper connections are made at the chime.
	14b. Improper operation.	14b. Be sure chime is electronic model. Be sure radio-intercom system is on. Check PROGRAM VOLUME control settings on all stations. Chime will be heard only through speakers set to NORMAL or PRIVATE .
	14c. Chime	14c. Increase volume control on chime. Check electronic pickups and continuity of chime input wiring.
15. Cannot receive radio station which is received by another radio in home.	15a. Faulty antenna connection.	15a. Antenna should be located in attic and connected to terminal strip in master's rough-in frame. Check antenna leads from master to be sure they are connected to terminal strip in rough-in frame.
	15b. FM Squelch control not properly adjusted.	15b. Adjust squelch control for sensitivity—clockwise to increase sensitivity, counter-clockwise to decrease.
		
16. Volume at door speaker too high or too low.	16. Improper level setting.	16. Adjust thumbwheel pot R156—see VOLUME AND TIMEOUT ADJUSTMENT (page 17).
17. Door speaker audio to system too high or too low.	17. Improper level setting.	17. Adjust thumbwheel pot R153—see VOLUME AND TIMEOUT ADJUSTMENT (page 17).
18. No dial tone when PHONE TALK is pressed and released. Loud squeal is heard.	18a. Input and output connections reversed in telephone coupler.	18a. Reverse TIP IN and OUT lines.
	18b. Defective coupler.	18b. Replace coupler.
19. No dial tone is heard when PHONE TALK is pressed and released.	19a. Improper level setting.	19a. Adjust thumbwheel pot R155. See VOLUME AND TIMEOUT ADJUSTMENT (page 17).
	19b. Bad coupler.	19b. Replace coupler when no dial tone is achieved through adjustment.

TROUBLE	POSSIBLE CAUSE	POSSIBLE REMEDY
20. Low audio coming from phone line.	20. Improper level setting.	20. Increase Intercom Volume Control on all stations or adjust thumbwheel pot R155—see VOLUME AND TIMEOUT ADJUSTMENTS (below).
21. Low audio going to phone line.	21. Improper level setting.	21. Adjust thumbwheel R151—see VOLUME AND TIMEOUT ADJUSTMENTS (below).
22. No ring signal is heard in system.	22a. PROGRAM VOLUME controls set too low.	22a. Adjust PROGRAM VOLUME controls—see “Initial Setup” (page 13).
	22b. Ring level adjustment too low.	22b. Adjust thumbwheel pot R154—see VOLUME AND TIMEOUT ADJUSTMENTS (below).
	22c. Defective coupler.	22c. Replace coupler.
23. Phone conversation is not taken off intercom system when handset is lifted.	23. Phone coupler is improperly wired to telephone line.	23. Connect phone coupler to phone line according to IT-10 Installation Instructions.
24. IS-86 Portable Speaker does not work properly.	24. IA-6 Wall Receptacle not wired correctly.	24. Check IA-6 wiring.

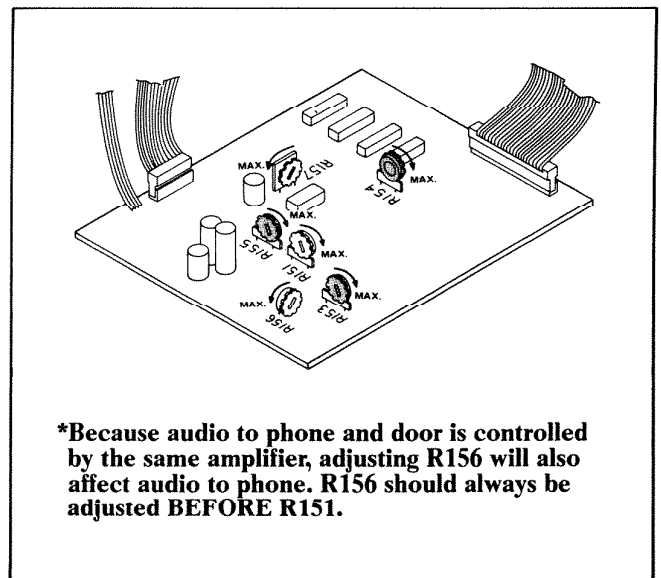
Volume and Time-out Adjustments

Six thumbwheel pots on the Audio/Control printed circuit board are factory set at normal levels. Although these pots may not require new settings, they are adjustable. Five pots control volume levels to and from the telephone and door speaker; the sixth pot controls the length of the “End Call” timeout.

See illustration for location of each thumbwheel pot. If necessary, adjust each pot as desired: arrows show the direction thumbwheel should be turned to **increase** volume or time.

The numbers and functions of each pot are listed below. **Make adjustments in the order given.**

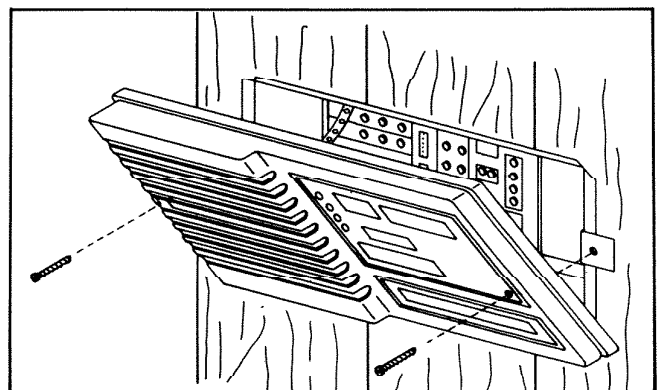
POT NUMBER	FUNCTION
*R156	Audio to door speaker (and phone).
*R151	Audio to phone lines.
R155	Audio from phone lines.
R154	System phone ring signal.
R153	Audio from door speaker.
R157	“End Call” timeout.



Mounting Master Station

1. Position master station over rough-in frame and align screw holes in master with mounting brackets on each side of the rough-in frame.
2. Secure master to rough-in mounting brackets with two (2) provided screws.

Please refer to IMA-806 Home Owner's Manual for Warranty Information. If Home Owner's Manual has been misplaced, write to: NuTone, Madison and Red Bank Roads, Cincinnati, Ohio 45227. Attn: Department of National Field Service.



SYSTEM THEORY OF OPERATION

General

Refer to MASTER INTERCONNECT SCHEMATIC, REMOTE STATIONS AND IT-10 TELEPHONE COUPLER SCHEMATICS.

The IM-806 Series Radio Intercom System is a six wire (IW-6 Cable) system. Wiring methods that may be used include loop wired, direct wired (home run), or a combination of loop and direct wired to the master station.

When the system is initially powered up, an END CALL button should be depressed. This insures that the system is in the proper initial state.

Two wires of the six wire cable are used for control. The station initiating the call puts control information on an outgoing control line. Stations other than the initiating station, except the door speaker and telephone coupler, respond based on information placed on the TALK/LISTEN input control line.

One audio line, Audio In/Out, is used for all audio. This is sometimes called a party line system. Audio (music programming or intercom) is placed on line by the initiating station and is sampled off line by other stations in the system.

Electronic Switches

Routing of audio to and from the audio line in each station is accomplished with devices called analog switches. These integrated circuit devices are electronic switches which may be turned on and off by a control signal. All remote stations as well as the master intercom board have electronic switches. These switches, as defined by their control lines, are as follows:

Control Point	Switch
C1	Microphone Output Switch
C2	Intercom Volume in Switch
C3	Program Volume in Switch

Manual Switches

A MONITOR/NORMAL/PRIVATE switch at each station functions in the following modes:

MONITOR mode— All audio from a station set to MONITOR will be sent to all other stations. The MONITOR mode mutes the station's speaker and permanently connects the station's microphone.

NORMAL mode— All normal intercom functions may take place. This is the most frequently used function.

PRIVATE mode— For complete privacy. No audio can be sent to other stations. No intercom calls can be made from a station in the PRIVATE MODE.

Note: In the following examples, the MONITOR/NORMAL/PRIVATE switch is in the NORMAL position.

When stations are in the initial condition (after a reset or a time out), program switch at C3 is turned on. Switches at C1 and C2 are turned off. Program material will be heard in the speaker and can be adjusted up or down by the program VOLUME control.

If an INSIDE/PATIO TALK button is depressed, a DC talk code level is sent to the master station over the control line. This input information is stored at the initiating station. Control circuits in the master station place -5 volts on the Talk/Listen line throughout the system. This causes all stations except the initiator to listen to the audio line through their remote or master speakers.

Audio from the microphone of the initiating remote station can now go on the audio line and be heard throughout the system.

When the INSIDE/PATIO TALK button is released, the change in the talk control voltage on the control line is sensed in the Master Control Logic and +6 volts appears on the Talk/Listen line throughout the system. All stations except the initiator place audio from their microphone circuits on line. The initiator may now hear audio from all other stations. The listening period by the initiating station may be adjusted to last up to three minutes. This process repeats itself and listening period is reinitiated each time the INSIDE/PATIO TALK button is depressed.

When a DOOR TALK button is depressed the system responds in a similar manner. All stations including the door speaker will hear the initiator. There will however be a difference upon DOOR TALK button release. All stations including the initiator will hear the response from the door speaker. The three minute timeout also applies to door answering.

When a PHONE TALK button is depressed, operation is similar to door answering. Depression of PHONE TALK button in response to a ring signal will allow all stations and caller to hear the party answering the phone with the exception of the door speaker. When the PHONE TALK button is released, all stations including the initiator will hear the calling party. The three minute timeout also applies to phone answering.

AM/FM radio, phono or tape program material will be muted for the timeout period. Anytime an END CALL button is depressed, the timeout cycle is terminated and program material is restored.

Note: For the purposes of the following discussion of intercom operation, a +5 or +6 will be considered a logic high and a -5 will be considered a logic low.

Operation from Remote Station

When an INSIDE/PATIO TALK button (SW2) is depressed, -5 volts is fed through D7 to Z7 (11) (Level Converter) (-5 to +5) and control logic in the remote station recognizes that a TALK button has been depressed. Two Z5 nor gates, pins 8 through 13, form a latch that stores key depression information. This information causes the station initiating the call to ignore the input control Talk/Listen command. A logic low appears at Z4 pins 9 and 12 preventing incoming control information from activating circuits at this station.

Remote Station Latch Circuit Operation

Depressing any TALK button causes the latch circuit to be set. A high at Z5 (4) will cause the latch to be reset. When +6 volts on the Talk/Listen line goes to zero (0) and the high from inverter Z7 (11, 10) goes low for more than 20 Ms, a high at Z5 (4) will cause a reset high at Z5 (9).

At the same time a specific voltage is developed on the system control line, (black wire of IW-6 cable); +7.3V with respect to ground. This happens as follows:

Switch SW2 connects 12K resistor R17 from -5 VDC through the control line back to the master station through a 4.7K resistor R116 on the control and audio board to +12 VDC. The resultant 7.3V feeds control circuitry to cause appropriate control signals to be generated.

With MONITOR/NORMAL/PRIVATE switch in the NORMAL position, a logic high is applied to Z5 (1) and causes control point C1 to go high and control points C2 and C3 to go low. Analog switches at C1 Z3 (10 and 11) are turned on and switches at C2 Z3 (3 and 4) and C3 Z3 (2 and 1) are turned off.

The overall effect of this switch combination is to place the initiator's microphone circuit on the Audio In/Out line and disconnect its speaker circuits. Speech may now be heard from this station.

Microphone Amplifiers

All stations in the system use an electret microphone. These microphones are active and require biasing. Bias resistors R1 and R2 supply current to microphone output pin. Audio from the microphone is applied through capacitor C1 to gate of transistor stage Q1. This stage has a gain of approximately five. Audio signal at drain of Q1 is applied through C3 to amplifier Z1 which has a gain of approximately five for an overall gain of 25. This is applied to resistor R10 through C8 and analog switch Z3 (6,8,9). R130 on the control and audio board in the master station then sums up audio from all stations.

Remote Microphone Amplifiers (from November 15, 1983)

All stations in the IMB806 system use an electret microphone. R1, R2, R4 and C2 form a supply line transient filter and biasing network for microphone M1. Audio from microphone M1 is applied through capacitor C1 and analog switch Z3 (10, 11, 12) to amplifier Z1 (2). Amplifier Z1 has a voltage gain of approximately 500. The output at amplifier Z1 (6) is applied through R32 (NORM) or R10 (MONITOR) to the audio line. R130 on the Master Station control and audio board then sums up audio from all stations.

Remote Logic Operation

When an intercom INSIDE/PATIO TALK button is depressed, control circuits in the master control and audio board place -5 volts on the Talk/Listen line (black-white wire of IW6 cable). At the noninitiating stations, the Z5 latch was not set and Z4 (9) is high. Minus 5 volts is applied through resistor network R24, R25, and R29 to level converter Z7 (9,8) and inverter Z7 (1,2) which applies -5V to Z4 (8) causing Z4 (10) to go low and Z6 (10) to go high. A plus 5 volts is applied to control point C2 Z3 (3 and 4) connecting intercom volume control R12 from audio line to audio amplifier Z2. Z6 (11) goes low causing Z4 (3) to go low and control point C3 Z3 (1 and 2) disconnects program volume control from audio line. Speech may now be heard at the noninitiating station.

When the INSIDE/PATIO TALK button is released, Z7 (11) goes to a logic high, Z7 (10) to a logic low and through the logic chain C1 goes to a logic low. A logic low at Z6 (9) and Z6 (8) cause C2 to go to a logic high and C3 to go to a logic low.

This turns off the microphone circuitry and connects audio from the audio line through Z3 (3 and 4), intercom volume control circuit to the audio power amplifier Z2 and speech may be heard at speakers.

The control line goes from +7.4 to +11.8VDC causing control circuits in the master to shift the voltage on Talk/Listen line from -5VDC to +6VDC. This is applied at noninitiating stations to resistor network R27, R28, R29 through level converter Z7 (3,4) and inverter Z7 (5,6) to place a logic high at Z4 (13) causing Z4 (11) and Z6 (5) to go high and Z6 (4) to go low. Z6 (3) and control point C1 go high. This connects series paths from microphones to audio line and allows noninitiating stations to place audio on line.

A high at Z6 (3) and Z6 (9) causes Z6 (10) and control point C2 to go low disconnecting the path from the audio line through buffer amplifier Q1 and R12 to power amplifier Z2.

The low at Z6 (10) through Z6 (12,13) causes Z6 (11) and Z4 (2) to go low causing Z4 (3) to go low and inhibits the path from the audio line through buffer amplifier Q1 and the program control R13 to the power amplifier Z2.

This process will repeat each time the button is depressed and/or released. The listen configuration will remain for 20 seconds to about three (3) minutes depending on the setting of control R157 (Time-out) on the control and audio board. If the time-out is terminated early by depressing an END CALL button, the following happens:

Depressing any END CALL button SW5 connects -5VDC through the switch and 470 ohm resistor R20 to the control line and the 4.7k resistor to +12VDC at the master station. This causes -3.5VDC to appear on the control line and the master station to terminate all control functions (voltages). When +6 volts on the Talk/Listen line is removed from resistor network R27, R28, R29 through level converter Z7 (3,4) and inverter Z7 (5,6), a low at Z5 (6) of the initiating station causes a slightly delayed reset level at Z5 (8) (latch circuit) and the system is restored to the initial mode of operation. The program material is unmuted.

Depressing END CALL restores the system to a rest condition and program material may again be heard throughout the system.

SYSTEM THEORY OF OPERATION

Door Intercom Operation

When the DOOR TALK button is depressed, -5 volts is fed through D6 to Z7 (11). Local key depression information is stored as it was with the INSIDE/PATIO TALK button.

At this time a specific system control voltage of $+3.8$ VDC with respect to ground is developed on the control line. Operation is as follows:

Switch SW3 (DOOR TALK) in a remote station connects a 4.7 k resistor R18 from -5 VDC through the control line back to the master control and audio board through a 4.7 k resistor R116 to $+12$ VDC. The resultant 3.8 VDC feeds the control circuitry and causes appropriate control signals to be generated. Logic operation at all remote stations is the same as when an INSIDE/PATIO TALK button is depressed.

On the control and audio board in the master station, the control circuits set door latch Z105 (12,11,10) with a logic high at Z105 (12) and through delay network and analog switch Z108 (1,2,13) energize relay K101. This connects door and phone amplifier Z112 to the door speaker. Analog switch Z108 (10,11,12) is turned on and allows audio to flow from the audio line through Z111 and Z112 and supplies audio to the door speaker.

When DOOR TALK button is released, control occurs differently than with an INSIDE/PATIO TALK button.

The control line goes from $+3.5$ to $+11.8$ VDC and control circuits in the master station hold a continuous -5 volts DC on the Talk/Listen line for the duration of the conversation.

The latch circuit in the initiating station is immediately reset. Minus 5 VDC on Talk/Listen line now causes all stations including the initiator to go to the listen mode.

W2 (control signal) goes low and through delay network causes Z108 (13) to go low. Analog switch Z108 (1,2,13) causes K101 to disconnect the door speaker from power amplifier Z112.

A high is applied to Z106 (5) and with the latched high from Z105 (10) through delay network and Z104 (8,9,10) energizes analog switch Z113 (1,2,13) and connects audio from door speaker through C121 to door and chime pre-amplifier Z114. A high is also applied to Z110 (6) and allows audio from wiper of R153 to flow through analog switch Z110 (6,8,9) and C116 to Z111 (summing amplifier).

Z111 amplifies and supplies audio to system audio line through R117 to summing resistor R130 and audio from the door speaker may now be heard throughout the system.

Each time the DOOR TALK button is depressed and released, this cycle repeats itself. A time-out or depressing button END CALL will terminate the cycle.

As with INSIDE/PATIO TALK button use, depressing END CALL restores the system to the initial condition.

Telephone Answering Operation

Depressing PHONE TALK button connects R19 from -5 VDC through SW4 to the control line through R116, 4.7 k resistor in the master control and audio board to $+12$ VDC. A resulting 0.17 VDC on the control line feeds control circuitry to cause appropriate control to be generated.

Logic operation at all stations is the same as when an INSIDE/PATIO TALK button is depressed.

On the control and audio board in the master station, the control circuits and a control signal called W3 sets phone latch Z105 (6,7,9) with a high at Z105 (6). Latched output Z105 (9) sends an "off hook" signal to the IT-10 phone coupler via X102-2 connector and 14 wire cable to the terminal board.

A high W3 is applied to analog switch Z108 (10,11,12) and Z109 (8). This causes Z109 (10) and Z113 (13) to go high. Analog switches Z108 (10,11,12) and Z113 (6,8,9) are now turned on. Audio may flow from system summing resistor R130 through Z111 (5,6,7), analog switch Z108 (10,11,12), C119, R120 through Z112 (8) to Z112 (4) through C126 to R106 through Z113 (6,8,9), R151, R113, and C120 to Z102 (4) and terminal board to the phone coupler. System audio may now be heard on the phone line.

When the PHONE TALK button is released, control circuits act similar to when the DOOR TALK button is released. The control line goes from 0.17 VDC to 11.8 VDC and a continuous -5 VDC is applied to the Talk/Listen line. The latch circuit in the initiating station is immediately reset. Minus 5 VDC on the Talk/Listen line causes all stations to go to the listen mode. W3 Z109 (8) and Z109 (10) in the master station go low turning off analog switch Z113 (6,8,9). A high is applied to Z106 (9) and Z106 (10) causing Z113 (5) to go high turning on analog switch Z113 (4,5,3).

This allows audio to flow from the phone coupler via the terminal board 14 wire cable X102-6 connector and R155 to the summing amplifier Z111 (1.2.3). R117 and system audio summing resistor R130.

Audio from the phone line may now be heard in the intercom system. Each time a PHONE TALK button is depressed and released this cycle repeats itself. A time-out or depressing of the END CALL button will terminate the cycle.

Monitor/Normal/Private Switch

Note: Intercom operation has been explained with the MONITOR/NORMAL/PRIVATE switch in the NORMAL position.

When the MONITOR/NORMAL/PRIVATE switch is placed in PRIVATE, the microphone audio path is interrupted at Z1 (6) (output). This prevents any monitoring of this station. If the switch is placed in MONITOR, a high is placed at Z5 (2) forcing a high at Z7 (12). This in turn forces a high at control point C1 turning on analog switch Z3 (6,8,9), Z3 (10,11,12) in IMB-806 and placing the microphone circuits on line continuously. The high at

Z7 (12) forces a low at Z6 (4) and Z4 (1) and causes control point C3 to go low turning off analog switch Z3 (1,2,13). The high at Z6 (3) is applied to Z6 (9) forcing a low at Z6 (10) and control point C2 turning off analog switch Z3 (3,4,5). The overall result of this switch position is that the microphone circuits are placed on audio line continuously and all receiving circuits are blocked.

Note: In the previous discussion, the remote station circuitry was traced. That circuitry is duplicated in the master station on a portion of the switch, master intercom, and control and audio boards.

Control Circuits (Control and Audio Board)

When a control function button is depressed in the system, a program resistor (R17,R18, R19, R20, in a remote station) (R901, R902, R903, R904 on master station switch-board) is connected from -5VDC to the control line to resistor R116 (4.7k) in the master station. A series of control voltages are generated as follows for each function:

Control Function Button	Resistor	Control Voltage
INSIDE/PATIO TALK	R901* or R17(12k)	+7.4VDC \pm 1.7V
DOOR TALK	R902* or R18(4.7k)	+3.5VDC \pm 1.7V
PHONE TALK	R903* or R19(1.8k)	+0.17VDC \pm 1.7V
END CALL	R904* or R20(470 ohm)	-3.5VDC \pm 1.7V

(*On master station switch board)

Voltages are fed through level converter Z101 to Z102 (5). Z102 is an analog to digital converter. Once calibrated, Z102 operates as follows:

When the voltage at Z102 (5) is zero (0), all outputs Z102 (11,12,13,14,15,16,17,18) are at +12 VDC through pullup resistors R123,R124, R125, R126.

If two (2) volts are applied to Z102 (5), Z102 (17 and 18) go from +12VDC to zero (0) volts. These pins will

stay low as long as Z102 (5) is between 2VDC and 4VDC.

A window (opening) is thus created for the control voltage. This means any voltage between 2VDC and 4VDC applied to Z102 (5) will cause Z102 (17 and 18) to go low. The low, through a level converter and integrating network, generates a function at Z103 (2) called window one W1 and corresponds to depressing an INSIDE/PATIO TALK button.

Each control function button has its own voltage window. The nominally applied control voltage is centered in its window. For the above case, the control voltage applied to level converter Z101 is 7.4VDC. Through the level converter Z101, this voltage is converted to +3VDC and applied to Z102 (5) causing Z102 (17 and 18) to go low. The following is a table of normal control voltages from the function desired to the window it appears in:

Control Function Button	Normal Control Line Voltage X102 (14)	Converter Input Z102(5)	Window	Orig. Resistor
INSIDE/PATIO TALK	+7.4VDC	3.0VDC	W1	R17 or R901*
DOOR TALK	+3.5VDC	5.0VDC	W2	R18 or R902*
PHONE TALK	+0.17VDC	7.0VDC	W3	R19 or R903*
END CALL	-3.5VDC	9.0VDC	W4	R20 or R904*

(*On master station switch board)

Timer Circuit

When W1, W2 or W3 cause a high to appear at Z104 (3), inverter Schmitt Trigger Z107 (1,2) through diode D108 discharges capacitor C124. Z107 (3) goes low and through double inverters Schmitt Trigger Z107 (3,4,5,6) applies a low to Z104 (13). Z104 (11) is now low allowing latch Z105 (2,3,4) to be set. When the talk function (W1,W2,W3) is removed, resistor R157 (time-out period adjust) begins charging C124 towards +5VDC. Each time a talk function is generated, C124 is discharged and the cycle restarts. If no TALK button is depressed for the time-out period, C124 will charge to approximately zero (0) volts where Schmitt Trigger Z107 (3,4) threshold occurs. A high will appear at Z104 (13 and 11) and a TIME-OUT or END CALL (TEC) signal will reset latch Z105 (2,3,4), Z105 (10,11,12), Z105 (6,7,9), and set latch Z105 (1,14,15).

If a W4 (END CALL) is generated by pushing an END CALL button, a high occurs at Z104 (12). The resulting high at Z104 (11) generates a TEC signal and resets the

system just as the timer did.

When talk functions W1, W2 or W3 are generated, "or" gates whose outputs are Z104 (3,4,11) set latch Z105 (2,3,4). Through inverter Z103 (13,12) a mute signal goes to the master intercom board and turns off program material. This mute remains in effect until a time-out or end call occurs. Another latch Z105 (1,14,15) in the initial condition places a high on Z109 (2) and supplies a high from Z109 (3) to Z106 (2,13). Z106 gates 1,2,3,11,12 and 13 control analog gates supplying voltages to the Talk/Listen line. If an Inside/Patio talk W1 was generated, the high at Z104 (3) is applied to Z106 (1). Since Z106 (2) was previously enabled, a high appears at Z108 (6) connecting the Talk/Listen line through analog gate Z108 (6,8,9) to -5VDC. The high at Z106 (3) is also applied to Z103 (11) inverter and Z103 (10) applies a low to Z106 (12). Z106 (11) applies a low to Z108 (5) and turns off analog switch Z108 (3,4,5).

SYSTEM THEORY OF OPERATION

A talk voltage of -5VDC has thereby been placed on the Talk/Listen line. If the W1 function is now removed by releasing the button, Z104 (3) goes low and Z106 (1) goes low. The low at Z106 (3) turns off analog switch Z108 (6,8,9). The low at Z106 (3) through the inverter Z103 (11,10) supplies a high to Z106 (12). The resulting high at Z106 (11) and Z108 (5) turns on analog switch Z108 (3,4,5) and connects a listen voltage of $+5\text{VDC}$ to the Talk/Listen line.

If a door W2 or phone W3 talk function is generated, W2 + W3 causes Z105 (1,14,15) latch to be reset by placing a high at Z105 (15). This causes Z105 (1) to go low. Z109 (2) goes low causing Z106 (2,13,3,11) to go low. Analog switches Z108 (3,4,5) and Z108 (6,8,9) are both

turned off and apply no voltages to the Talk/Listen line. The low at Z105 (1) is applied to analog switch Z110 (3,4,5) pin 5. This switch is used as an inverter whose output is Z110 (3). The resulting high is applied to analog switch Z110 (10,11,12) pin 12. This turns on the switch and applies -5 volts continuously to the Talk/Listen line.

If a time-out or end call (TEC) signal has occurred, the low at Z105 pin 2 places a low at Z109 (1). The resulting low at Z109 (3) and Z106 (2 and 13) produces lows at Z106 (3 and 11) and turns off analog switches Z108 (3,4,5) and Z108 (6,8,9). The high at Z105 (1) through Z110 (3,4,5) analog switch and inverter turns off analog switch Z110 (19,11,12). All voltages are removed from the Talk/Listen line and the system is back in its initial condition.

Telephone Ring Circuit

When a ring signal is detected in the IT-10 telephone coupler $+12\text{VDC}$ is applied to X102 (3) and through level converter D111 and R137 applies a high to Z109 (5). Free running square wave oscillator Z107 (8,9), R159 and C118 alternate highs and lows to Z109 (6) at approximately a 20 KHz rate. A second oscillator Z107 (10,11), R135 and C101 has a frequency of about 2 KHz and is gated on and off by the signal coming from Z109 (4) and analog switch Z113 (10,11,12). This occurs at the rate

of the lower frequency oscillator and generates a broken tone ring signal applied to R154. From wiper of R154, signal is applied to Z111 (2,3,8) summing amplifier through R117 to system audio summing resistor R130. A ring signal will now be heard in the system.

Audio amplifier Z115 receives an input signal from the master intercom board and supplies high level audio to the speaker.

Display and Select Circuitry (Display Board)

The first function of this board is to select the program mode of AM, FM, Phono or Tape. Z502 is a five bit ring counter with ten Johnson decoded outputs. Only five outputs, Q0, Q1, Q2, Q3 and Q4 are used.

In the initial powered up mode the system will be in Q0 which corresponds to AM radio mode. A high ($+12$) at Z502 (3) through Z503 (7) causes Z503 (6) to go low, zero (0) volts through D505 to Z501 (14) and places the system in the AM mode. The low level at Z503 (6) through D501 and R506 turns on transistor switch Q501 and supplies $+12\text{VDC}$ to the AM portion of tuner and prescaler. The same $+12\text{VDC}$ through D502 and R505 turns on the display driver. A current source in the display driver supplies a current sink to I501 and the AM display LED is illuminated.

If a positive transition is applied from a switch on the master intercom board through Z502 (7) and R504 to Z501 (14), the counter steps from Q0 to Q1 and a high appears at Z502 (2). Through inverter Z503 (9,10) a low through D504 and R509 turns on transistor switch Q502 and supplies $+12\text{VDC}$ to the FM portion of the tuner and prescaler. Plus 12 volts applied through D503 and R505 turn on display driver.

The low at inverter Z503 (9,10) output also sinks current from I502 and causes the FM LED to illuminate.

When Q1 went high, Q0 went low through inverter Z503 (7,6), the high at Z503 (6) through level converting diode D501 and resistor R506 turns off Q501; which turns off the AM portion of the tuner. The high at Z503 (6) through level converting diode D505 applies 8VDC to Z501 (14) and places it in the FM mode.

If another positive transition is applied to Z502 (14), the ring counter will step from Q1 to Q2 and Z502 (4) will go high. All previously activated radio circuits will be turned off. The display drive will be turned off. The high at

Z502 (4) through inverter Z503 (5,4) will sink current from I503 (phono) and the phono LED will illuminate.

If another positive transition is applied to Z502 (14), the ring counter will step from Q2 to Q3 and a high will appear at Z502 (7). Inverted output at Z503 (2) will sink current from I504 (Tape) and the tape LED will illuminate. The current sink to I503 will be removed.

Another positive transition applied to Z502 (14) will cause the counter to step to Q4 which immediately applies a reset to Z502 (15) and resets the counter to Q0 and the complete cycle repeats.

During power up of the system, $+12$ volts from the power supply is applied to C504. This voltage is applied through D506 to Z502 (15) (reset) for about two (2) seconds until C504 changes through R502 and R512.

If AM mode has been selected (a high at Q0), a low at Z501 (14) will place Z501 in the AM mode. The AM local oscillator frequency appears at X504 (1) and Z501 (15). The counter in Z501 will count the frequency and subtract the AM I.F. frequency (455k Hz) from it and display the resultant in KHz on the four (4) digit display. Z501 outputs to the 7-segment display are current sinks supplied to a common anode display. The frequency displayed is now the frequency of the incoming signal.

If FM mode has been selected, a current sink at Z501 (26) causes the third decimal point to light. The FM local oscillator frequency divided by 100 appears at Z504 (3) and Z501 (13). The counter counts the frequency and subtracts 107 from it. The result with the decimal point on the third digit is the input frequency of the FM tuner displayed in MHz.

The 60 Hz clock applied to connector Z502 (2) through R501 to Z501 (3) is used as a time base for the counter.

Integrated Circuit Z501 requires an 8VDC power source. Voltage regulator Z504 converts $+12\text{VDC}$ to $+8\text{VDC}$.

Master Intercom Board

All intercom functions on this board are identical to the remote stations. The only differences are that the control switches and power amplifier are located on another board.

The select circuitry on this board works as follows:

As AM, FM, Phono, Tape modes are selected in turn, analog switches are selected connecting audio sources through the trebel control to the summing amplifier on the control and audio module. Mute pin X202 (8) must be high for this to occur.

If AM program mode was selected, +12VDC is applied to connector P201 (5). Through level converting zener D201 supplies a high to Z205 (1) and with a high on the mute line X202 (8) supplies a high turn on voltage from Z205 (3) to analog switch Z206 (1,2,13). Audio is connected from X203 (3) through resistor divider and analog switch Z106 (1,2,13), C211 and trebel control circuit to X202 (4) and to P101 (4) on control and audio board. Summing amplifier Z111 (1,2,3) then feeds audio into system. Similar actions occur with FM, Phono and Tape.

Prescaler Board

The purpose of this board is to buffer and divide local oscillator sampling. In the FM mode +12VDC is fed to the prescaler board through P601 (4). D601, R601, Q601 comprise a regulator that sets up a supply voltage of 4.6V to Z602 pins 1 and 8 and Z601 (4). L603 is a link coupling of the FM local oscillator to wide band amplifier Z601 which boosts the signal to a level usable by prescaler Z602. Z602 divides this frequency by 100 and supplies an output at nominally 1.1MHz at Z602 (2). This output is a four (4)

volt peak to peak square wave. It is applied to low pass filter C608, L602, C609. Filtered output at P601 (3) is sent on to X504 pin 3 on the display board to be counted. In AM mode +12VDC is applied to P601 (2). Through coupling capacitor C611 the AM local oscillator is connected to buffer amplifier Q602. Through C612, the sampled AM local oscillator is sent via P601 (1) to the display board pin X504 (1) to be counted.

Power Supply

The transformer supplies 16 VAC through the Blue and Blue/White wires to diode bridge D401, D402, D403, D404. Capacitor C406 is charged to 16 to 21 volts, depending on loading. This voltage is applied to Z403 (1). Z403 is a three (3) terminal voltage regulator adjusted to exactly +12VDC at output pin 2 by R408.

Full wave center tap diode configurations are connected as follows:

D406 and D407 are connected to the transformer 16 VCT through the Red, Red/White wires to charge C401 to +8 to +10VDC which is applied to Z401 (1), another

three (3) terminal voltage regulator. The output of this regulator is nominally +6VDC.

Full wave center tap diode configuration D407 and D408 is connected to 16 VCT (Red, Red/White) to charge C402 to -8 to -10VDC. This is applied to Z402 (2), three (3) terminal voltage regulator. Z402 regulator output is adjusted to exactly -5VDC by R407.

Diodes D409 and D410 are connected to the transformer through the Green, Green/White wires to form a full wave raw DC power supply about 3V RMS to drive display LED common anodes.

Optional Electronic Door Chime IAA-22

The chime provides for operating up to three door entrances. Depressing the front door pushbutton plays eight notes, the rear door pushbutton plays two notes and the side door pushbutton plays one note. The chime volume potentiometer R711 is the only adjustment that can be made.

Front, Side and Rear Door Pushbutton Circuits

The front, side and rear door pushbutton circuits consist of Z703, Z702, Q703 and associated resistors and capacitors.

Front Door Pushbutton Circuit

When the front door pushbutton is depressed, the input to Z703A is returned to ground through Q703. This causes the output of Z703A to go from +5V to approximately 0V. The +5V to 0V transition on the output of Z703A causes the "one shot" consisting of Z702, C704 and R707

to produce a positive going pulse approximately one ms wide on pin 10 of Z702C. This pulse is applied to pin 25 of Z701, (the microprocessor). As soon as Z701 recognizes the negative going edge of the pulse produced by the "one shot", it takes pin 10 of Z702C to approximately +5V which turns transistor Q703 off. This stops the current through R713. When the chimes are finished playing, Z701 returns pin 10 of Z702C to ground and is ready for another cycle.

Side and Rear Door Pushbutton Circuits

Z701 recognizes that the side or rear door chime pushbutton has been depressed when a level of 0V is produced on pins 26 or 27. The same set of events take place as described in paragraph, Front Door Pushbutton Circuit, except that only two notes will be played for the rear door and one note will be played for the side door.

SYSTEM THEORY OF OPERATION

Microprocessor Master Oscillator

Z701's Master Oscillator is controlled by the 4.00 MHZ crystal. C703 is used to offset an internal capacitance on pin 5 of Z701. If C703 is not properly connected in the circuit, the chime module will appear to be completely

dead. The wave form of the 4.00 MHZ oscillator may be seen with an oscilloscope on pin 4 of Z701. The oscilloscope must, however, have an impedance greater than or equal to 10Meg-ohms and a capacitance less than 13 pf.

Note-Strike and Note-Playing Circuits

The note strike circuit consists of R702, R703, D702, D701, C702, C701 and Q702. This circuit gives each note that is played a strike and decay sound. Before each note starts to play, pin 9 of Z701 which is normally high is pulled low by Z701. This reverses the charge on C701 through D701. C702 is used to slow the initial charging of C701 through D701 to lengthen the attack time of each note. When pin 9 of Z701 is brought back high, C701 begins to discharge through R703 and D702 since D701 is now reverse biased. This discharge provides an exponentially decaying current at the emitter of Q702.

The note-playing circuit consists of R708, R701, Q701 and C706. It uses the decaying current produced by the note-strike circuit to produce an exponentially decaying square wave voltage at the collector of Q701.

Tone Shaping Circuit

The tone shaping circuit consists of R719, R709, C707 and C708. These components make up a two-pole low pass filter which helps remove much of the high order harmonies of the square wave. This results in the notes having a smooth sound.

Power Supply

The +5V is derived from the system +12V supply through the use of a simple zener shunt regulator which consists of D703 and R712. This provides the regulated +5V to Z701 and other 5V logic.

Optional Telephone Coupler (IT-10 and IT-10C)

Note: the IT-10 or IT-10C is connected to the master station terminal board with IW-6 cable and must also be connected to the house telephone line as shown in Installation Instructions.

This coupler depends entirely on optical isolator integrated circuits for isolation between customer equipment and the telephone lines.

When a PHONE TALK button is depressed, the "off hook" signal from the master to the coupler goes from -5VDC to +6VDC. Through D4 and R8 base current is supplied to Q1. Current drawn at the collector of Q1 pulls in relay K1. This connects the coupler to the telephone line.

Q2, R1, R2, R3, R9 and C2 form a variable impedance network to be applied through bridge D12, D13, D14 and D15 between tip and ring of the telephone line. The network works as follows:

At DC, the impedance across the phone line is about 200 ohms. As audio frequencies are applied to the line, the impedance rises at 100 Hz and above to between 600 and 800 ohms. The 200 ohms at DC supplies an "off-hook" condition for the telephone exchange.

When a ring signal of about 100 VRMS is placed on the phone line, the signal is full wave detected through C5,

R16, R13, D8, D9, D10 and D11. This applies a pulsating DC current between pins 1 and 2 of Z4. Current flowing in the LED causes the transistor in Z4 to conduct. Plus 12 volts pulsating DC appears at Z4 (4). This is filtered by C3 and R15 to supply a steady DC voltage to the ring detection circuits in the master. Ring signals may now be heard throughout the system.

Audio from the master may now be applied to the Audio In line. Input protective network D2, D3, R21 and R4 limits the maximum audio that may be put in. Through C1, audio is applied to the anode (pin 1) of the LED in Z1. This audio modulates the current through the diode and by means of the optical coupler, the collector current of Z1 transistor. This, in turn, modulates the base current of Q2 of the variable impedance generator. This modulation appears as audio on the telephone line.

Audio on the telephone line between tip and ring through bridge D12, D13, D14 and D15 is applied through R22 to Z2 diode (1,2) and modulates the current through it. This, in turn, modulates the collector current of Z2 transistor and audio appears on the Audio Out line. This audio is fed back to the master through IW-6 cable.



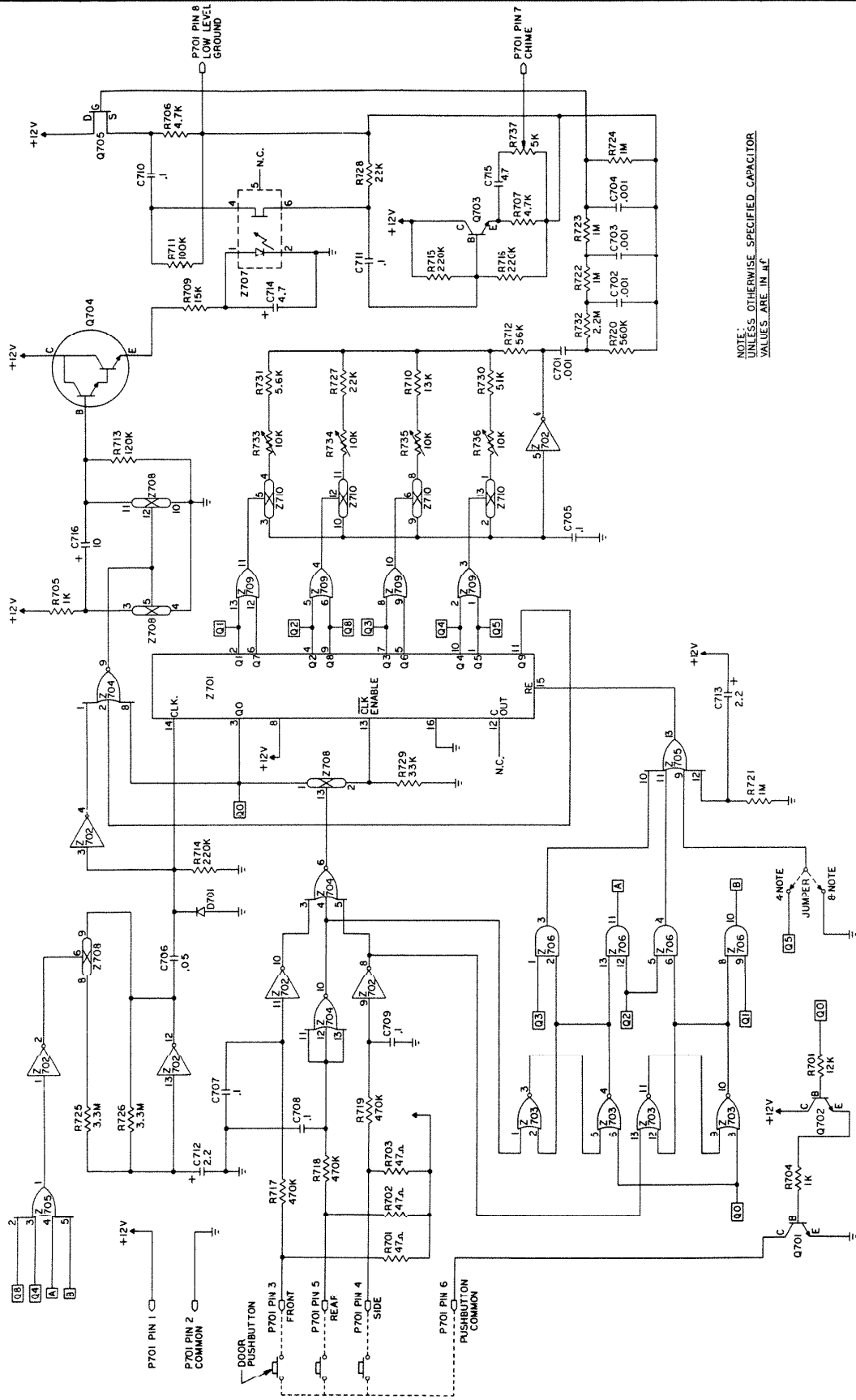
Privacy Feature

When a standard telephone appears as a load between tip out and ring, current is drawn through R5. The resultant voltage appears across Z3 diodes (1,2) and by means of the optical coupler, turns on the transistor in Z3. Transistor

Q1 is then turned off and releases relay R1 which takes the coupler off line. No interaction can now occur between the intercom system and the phone line.

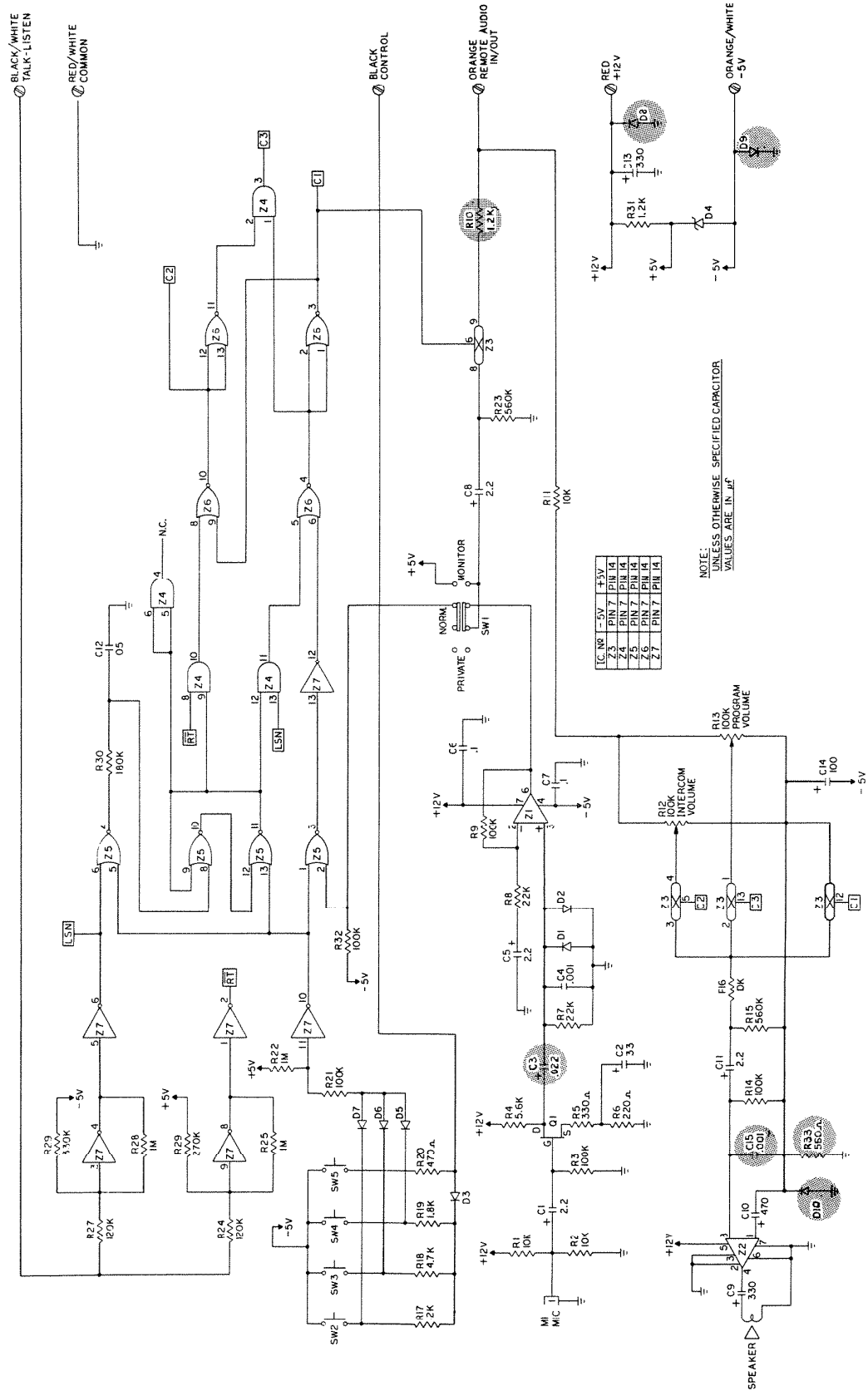
SCHEMATIC DIAGRAMS

IA-22 CHIME MODULE



NOTE: UNLESS OTHERWISE SPECIFIED CAPACITOR VALUES ARE IN μ F

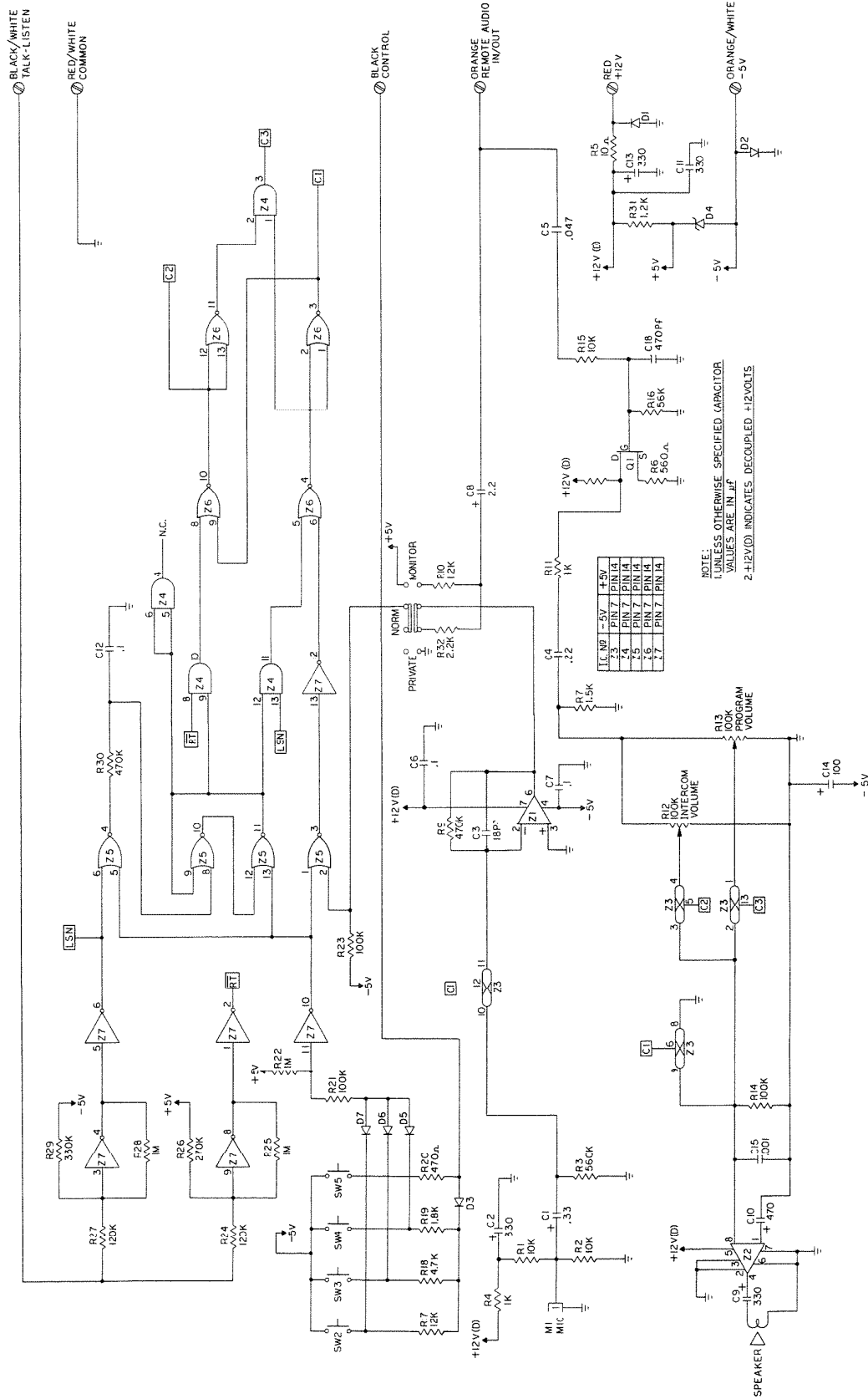
INSIDE REMOTE SPEAKERS (EARLY PRODUCTION)



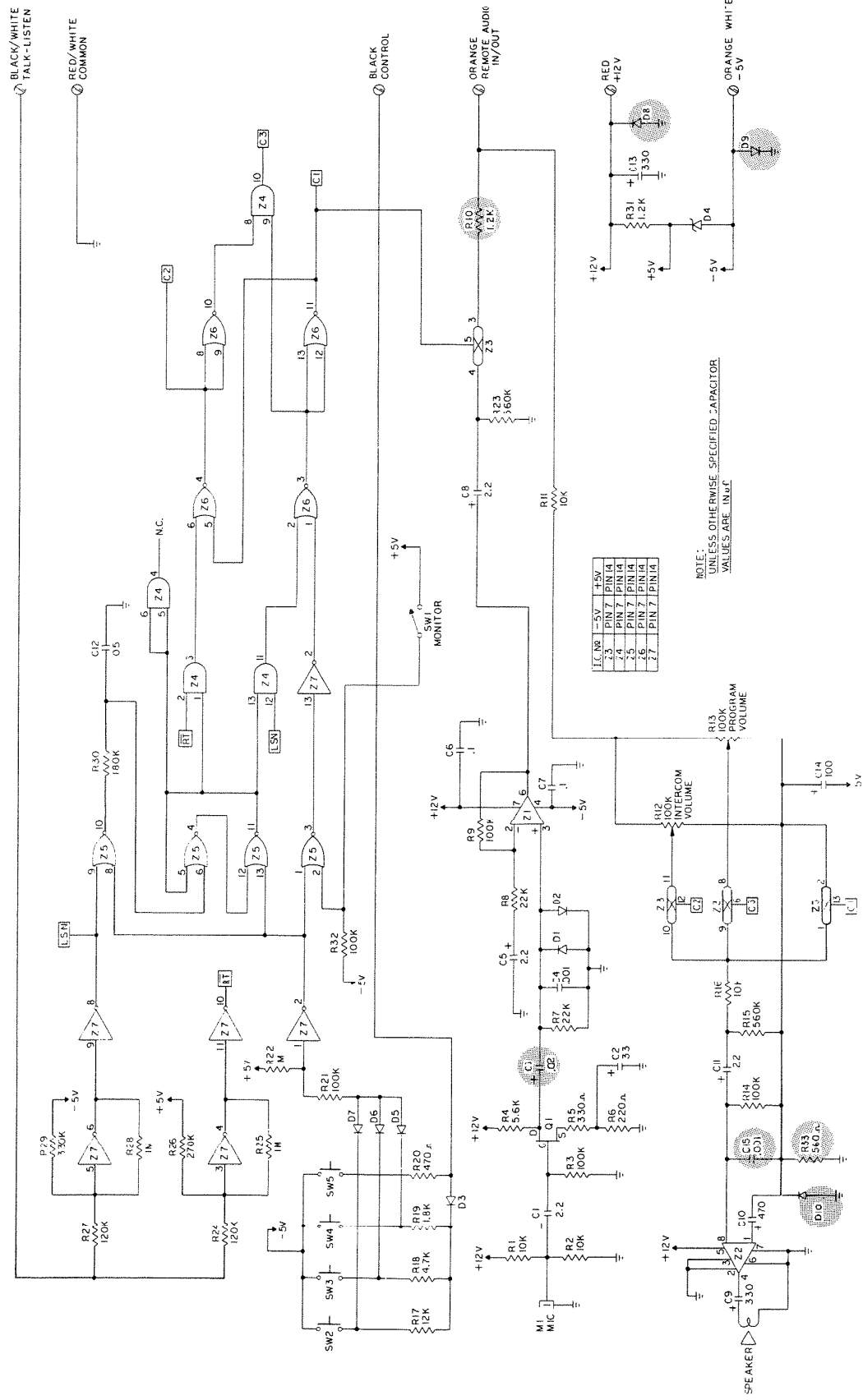
See "CHANGES" in Replacement Parts.

SCHEMATIC DIAGRAMS

INSIDE REMOTE SPEAKERS (LATE PRODUCTION)



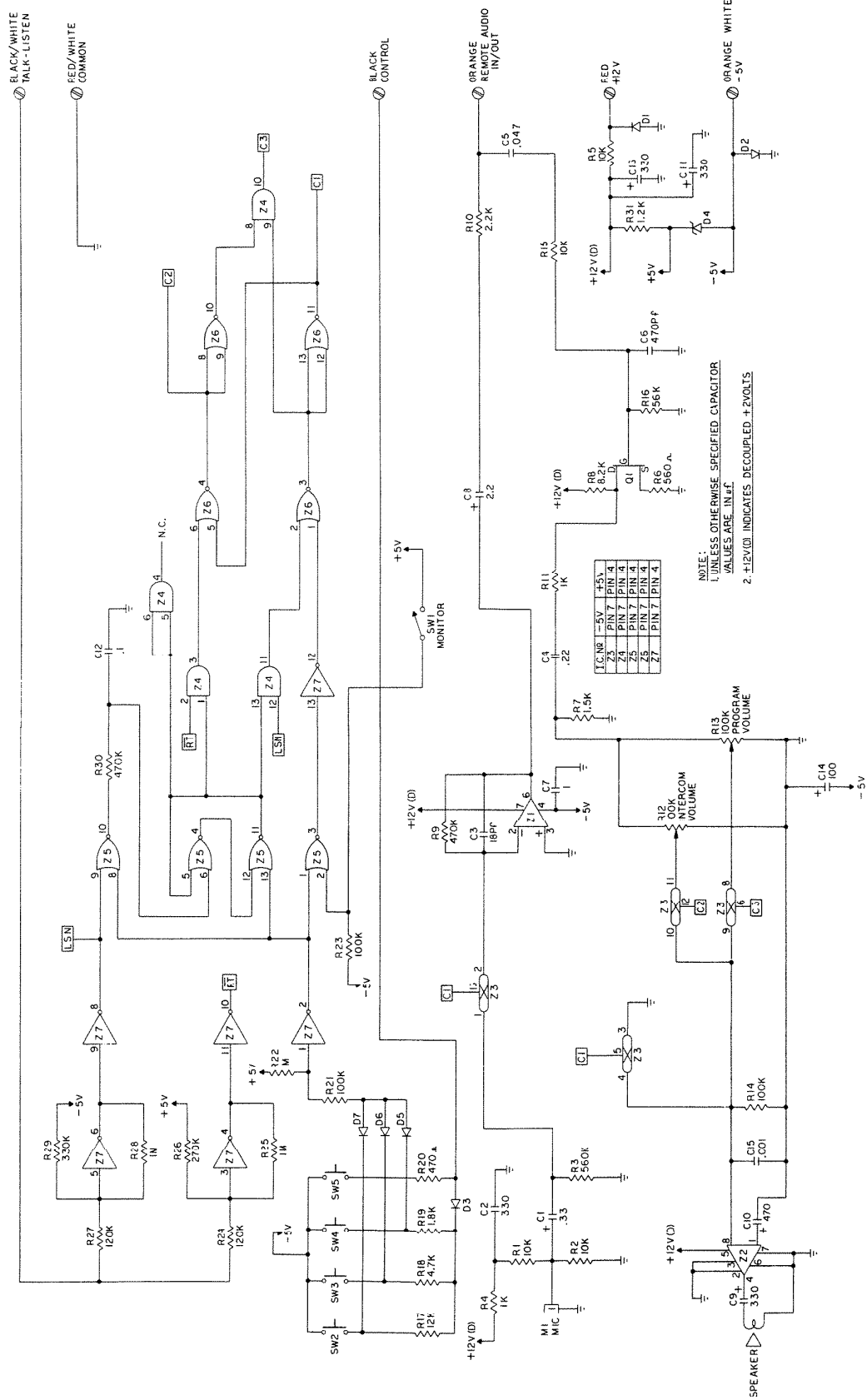
OUTSIDE REMOTE SPEAKERS (EARLY PRODUCTION)



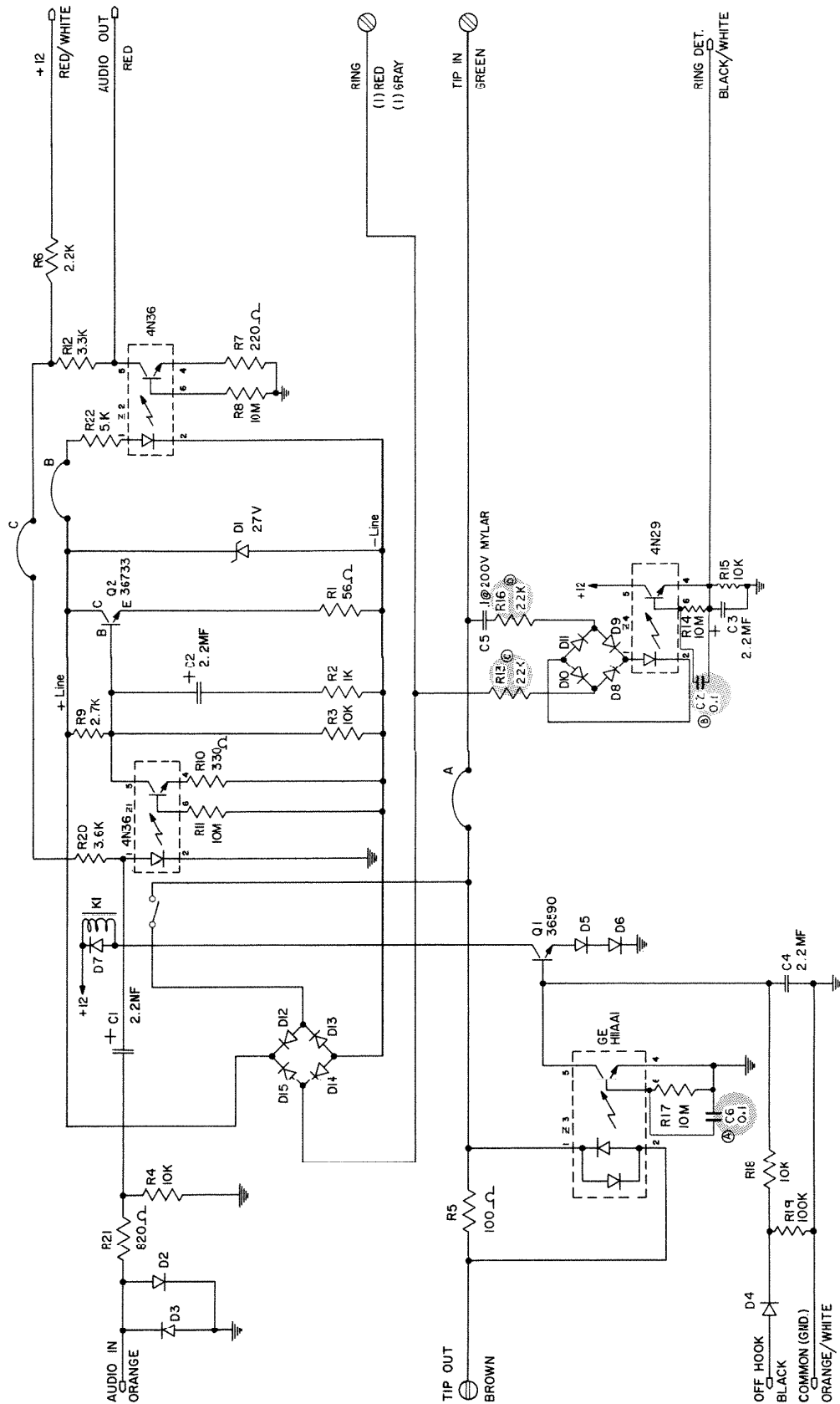
See "CHANGES" in Replacement Parts.

SCHEMATIC DIAGRAMS

OUTSIDE REMOTE SPEAKERS (LATE PRODUCTION)



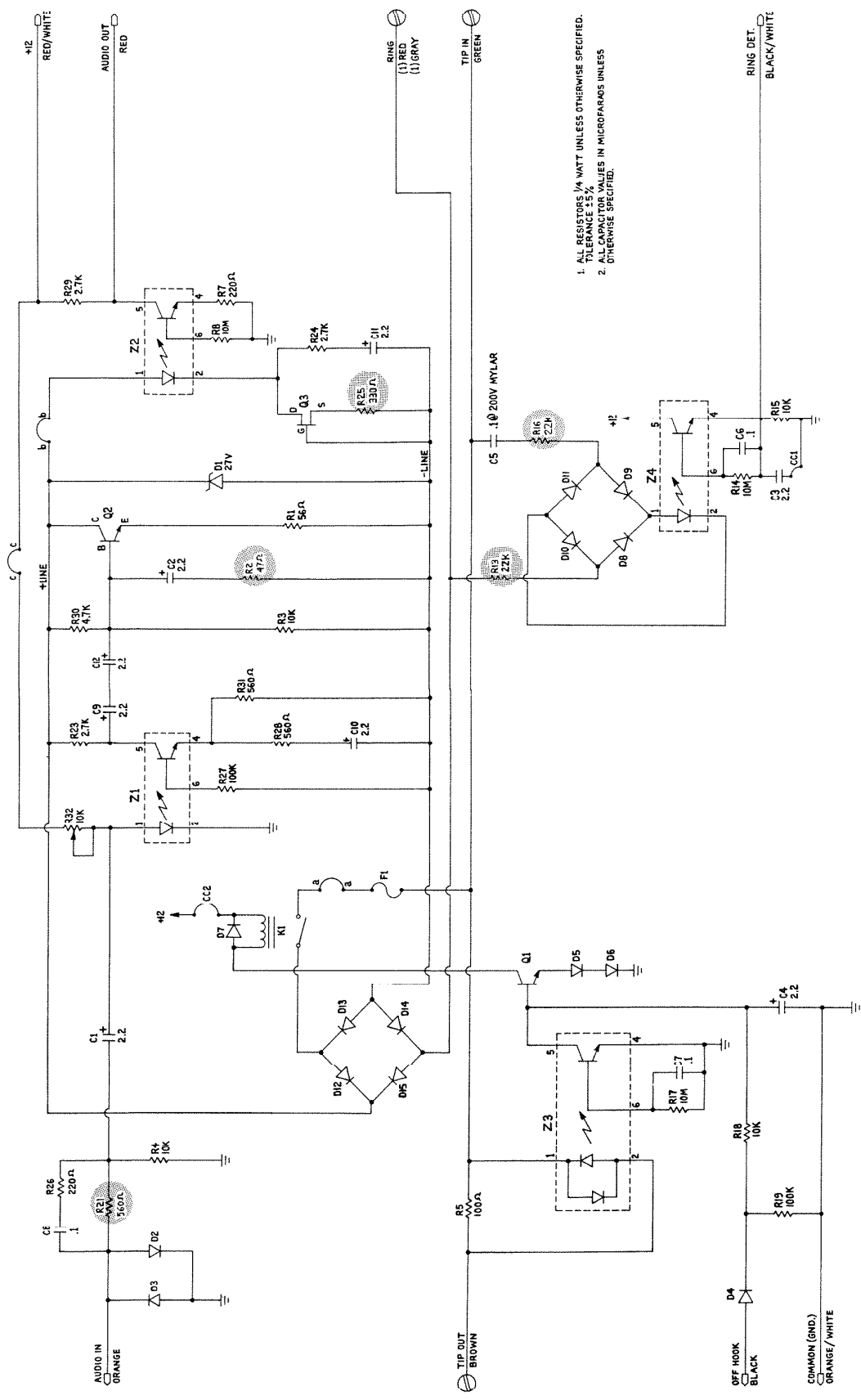
IT-10 TELEPHONE COUPLER



See "CHANGES" in Replacement Parts.

SCHEMATIC DIAGRAMS

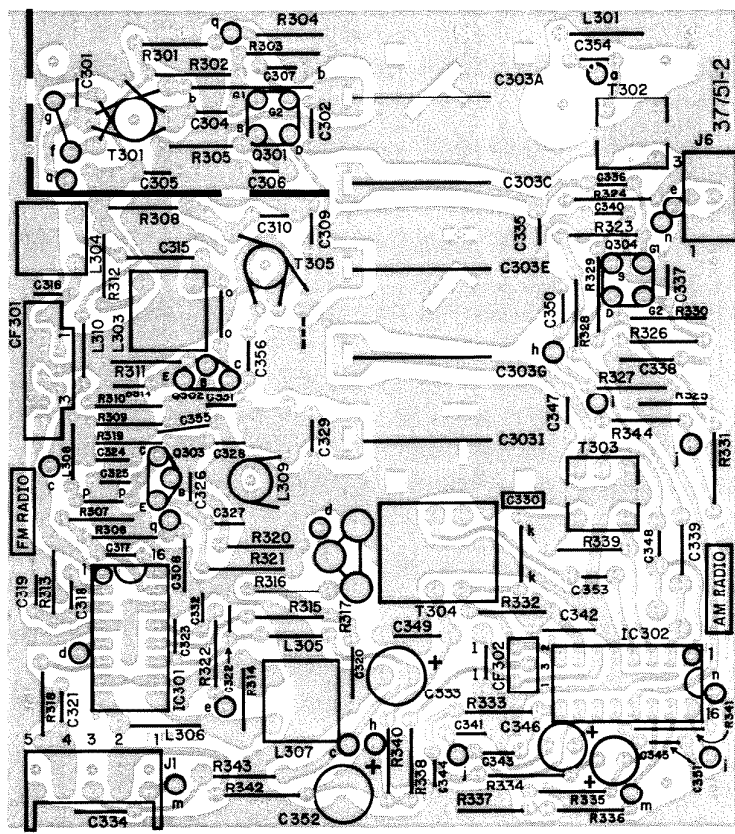
IT-10C CANADIAN TELEPHONE COUPLER



See "CHANGES" in Replacement Parts.

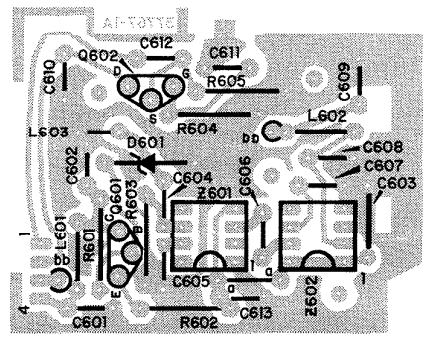
P.C. BOARDS

Tuner Board



COMPONENT AND SOLDER SIDE
FOIL PATTERN
(37751)

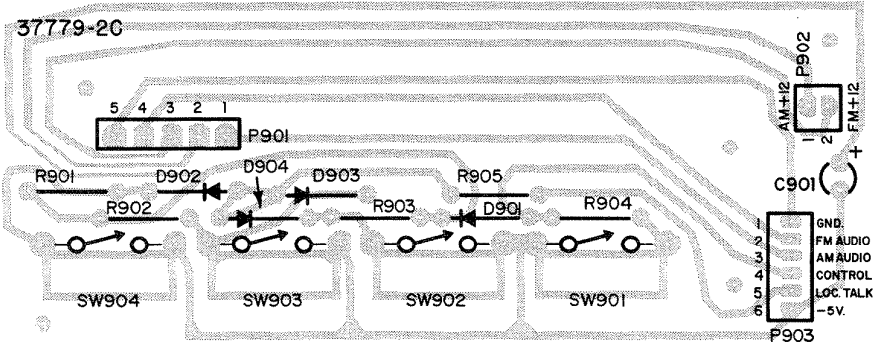
Prescaler Board



COMPONENT AND SOLDER SIDE
FOIL PATTERN
(37767)

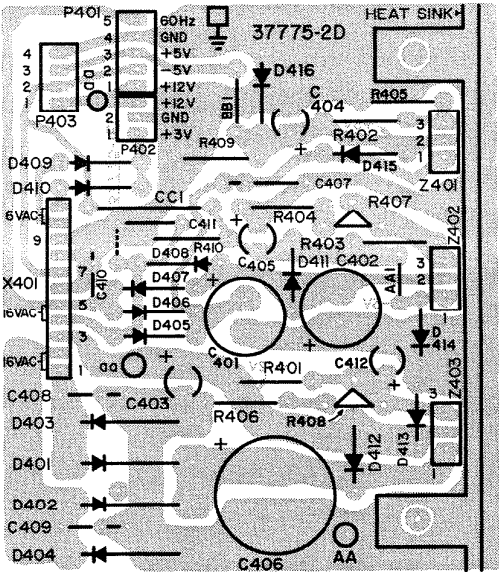
P.C. BOARDS

Switch Board



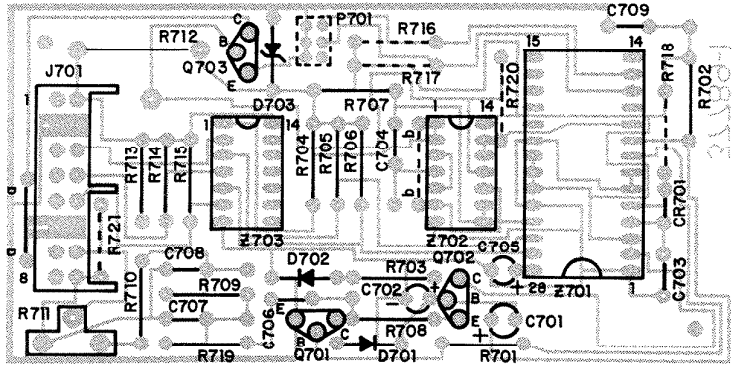
**COMPONENT AND
SOLDER SIDE
FOIL PATTERN
(37779)**

Power Supply Board



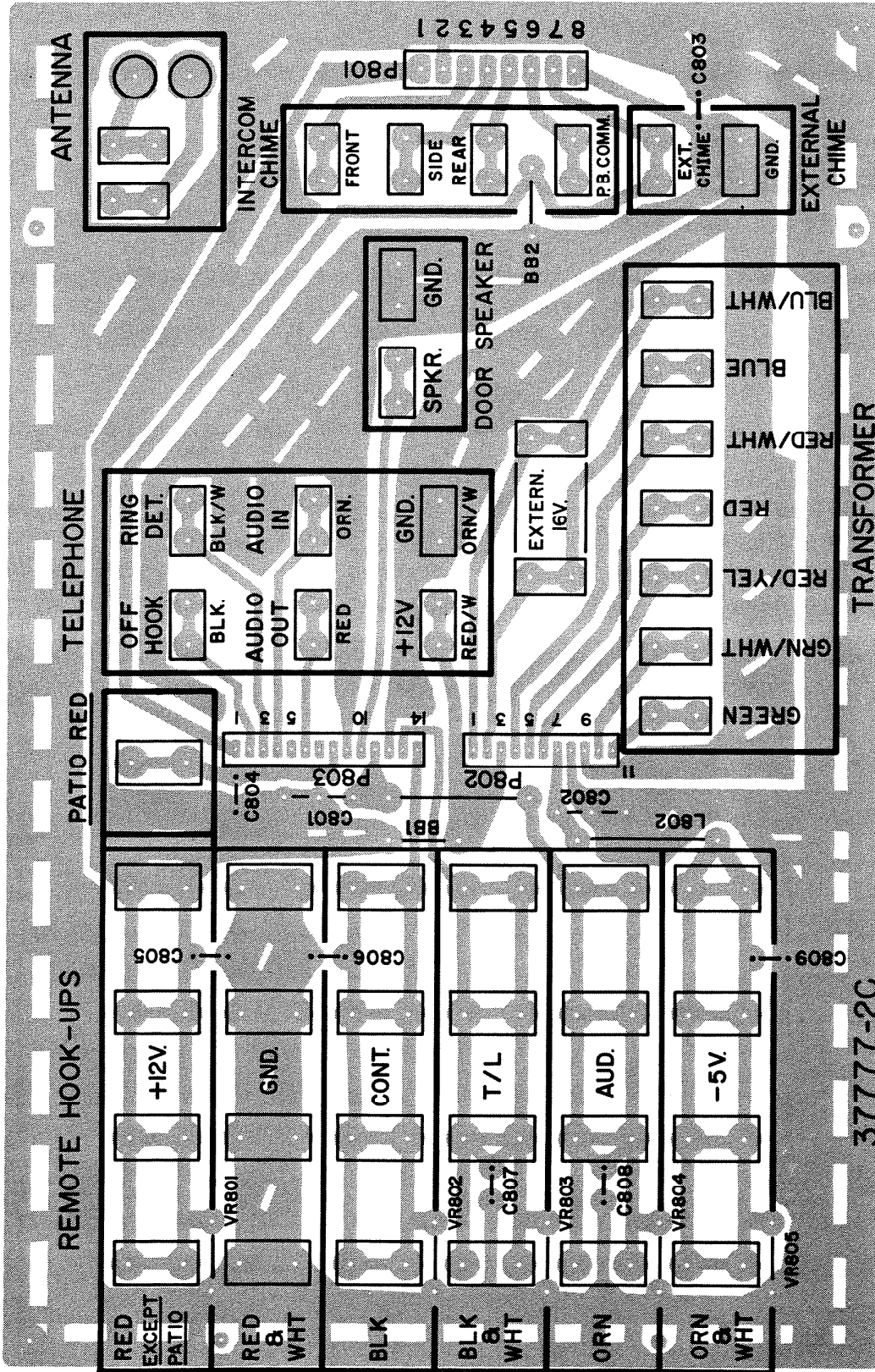
**COMPONENT AND
SOLDER SIDE
FOIL PATTERN
(37775)**

New Chime Board IAA-22



**COMPONENT AND
SOLDER SIDE
FOIL PATTERN
(37789)**

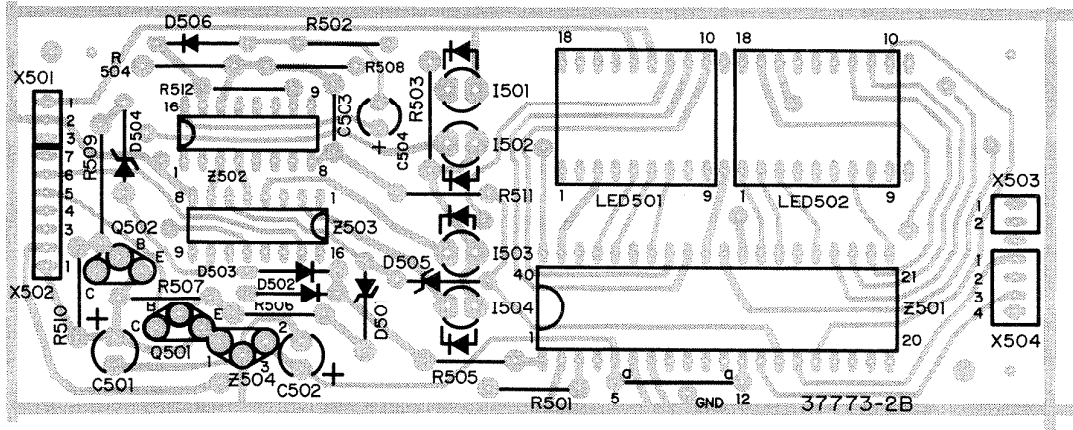
Terminal Board



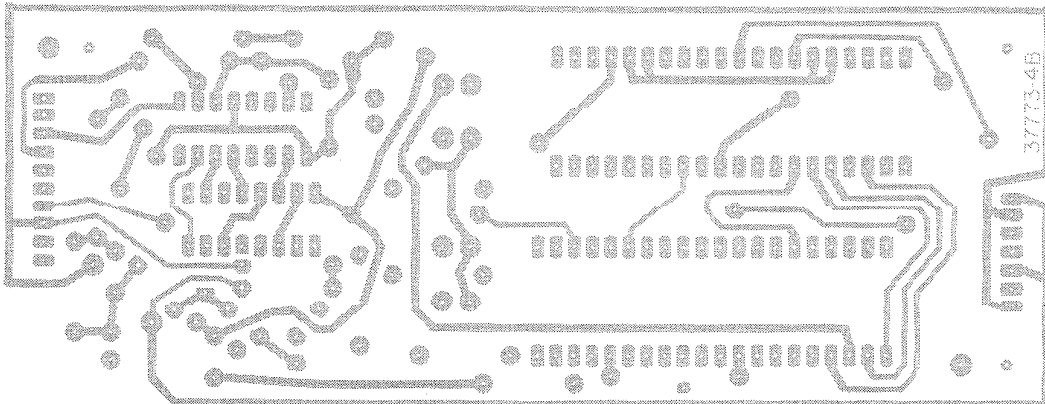
COMPONENT AND
SOLDER SIDE
FOIL PATTERN
(37777)

P.C. BOARDS

Display Board

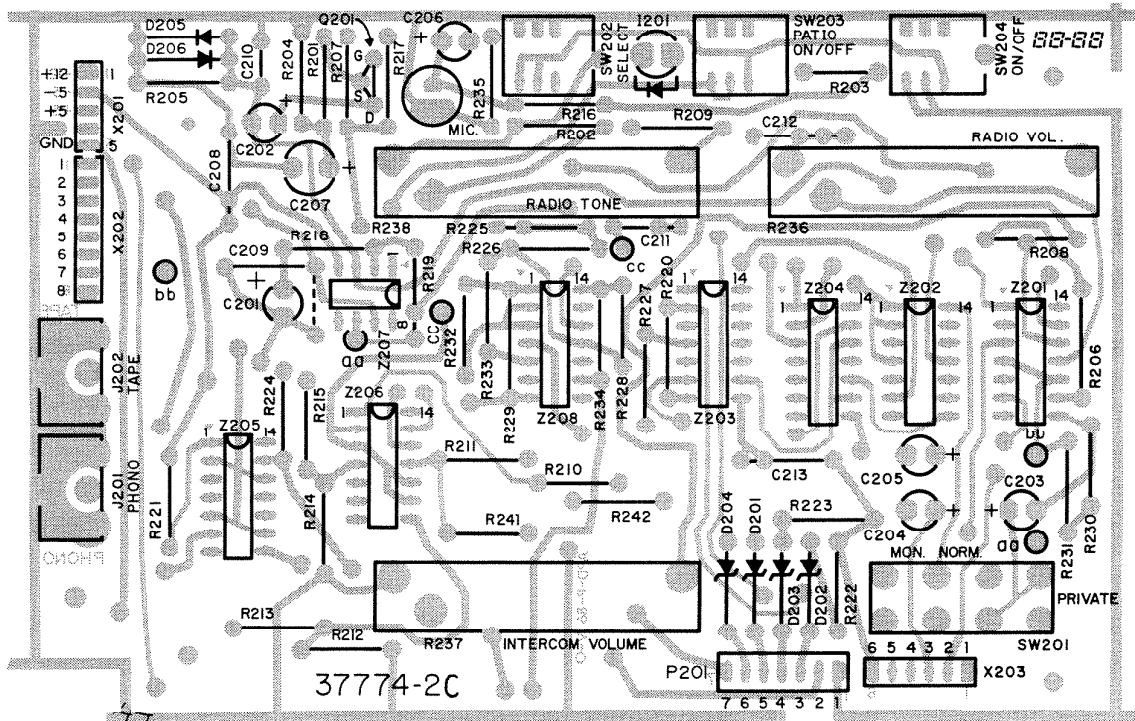


**COMPONENT AND SOLDER SIDE
FOIL PATTERN
(37773)**

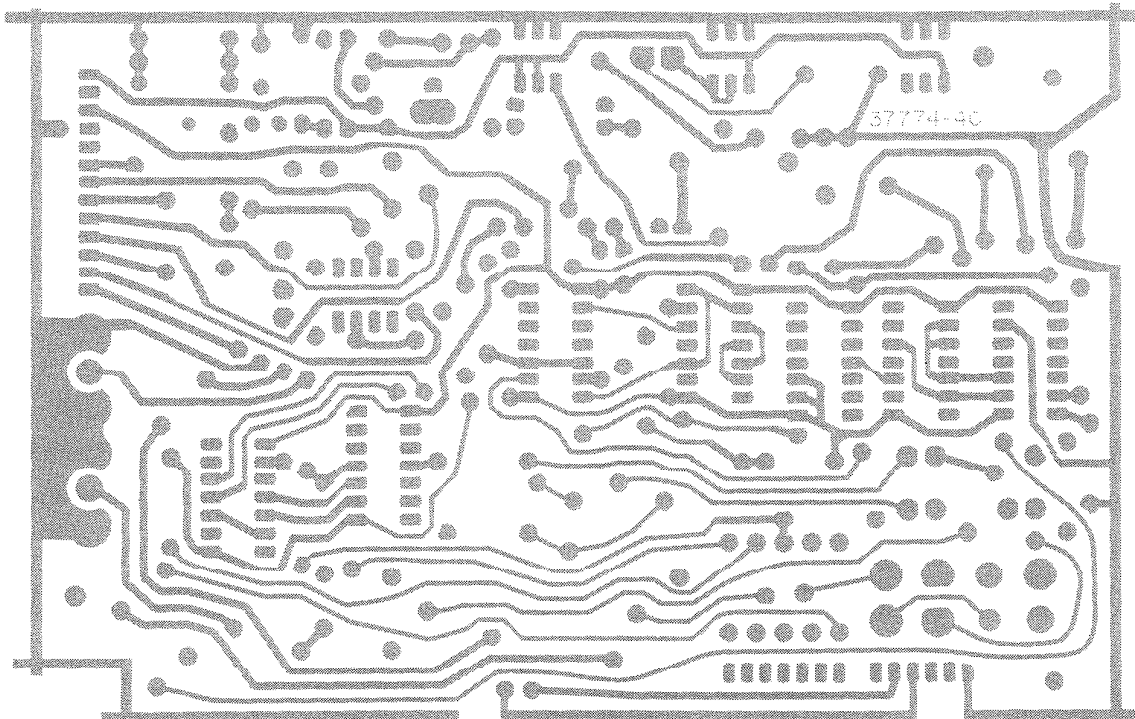


**FOIL PATTERN
ON COMPONENT SIDE
(37773)**

Master Intercom Board



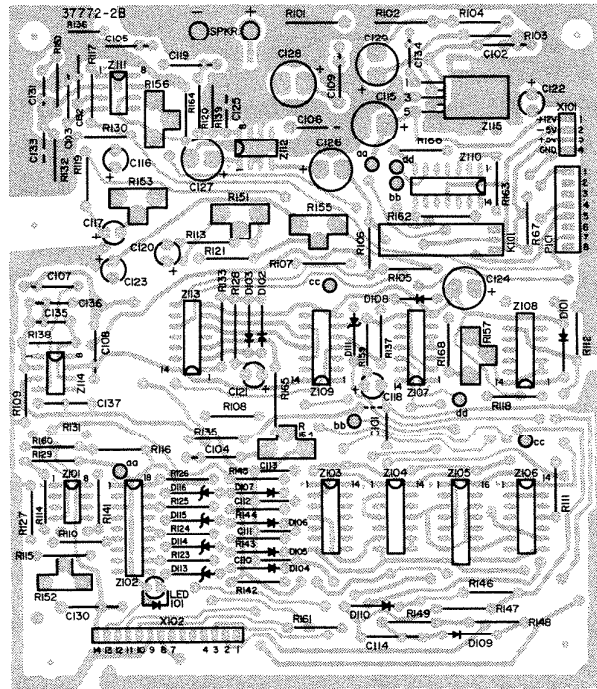
**COMPONENT AND SOLDER SIDE
FOIL PATTERN
(37774)**



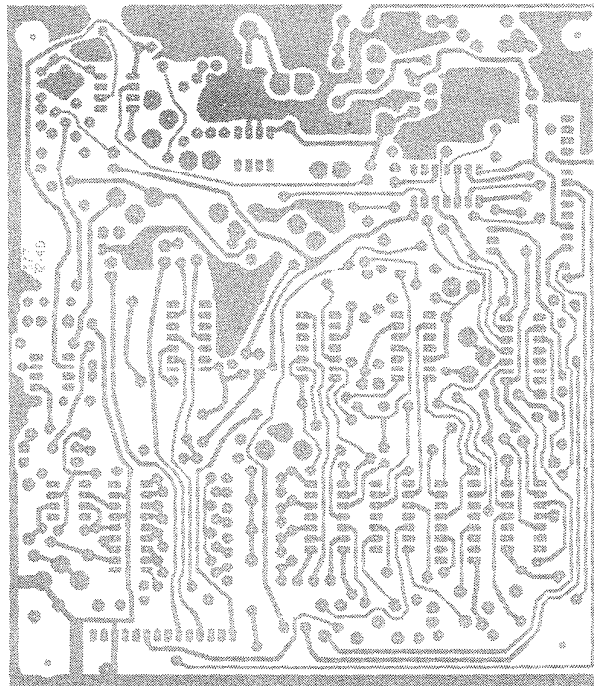
**FOIL PATTERN
ON COMPONENT SIDE
(37774)**

P.C. BOARDS

Control and Audio Board

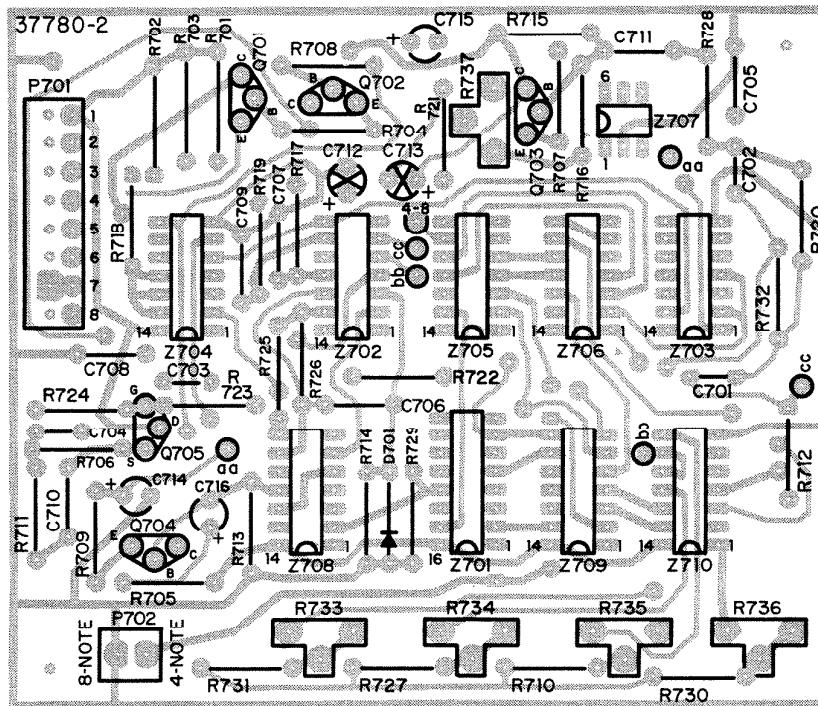


**COMPONENT AND SOLDER SIDE
FOIL PATTERN
(37772)**

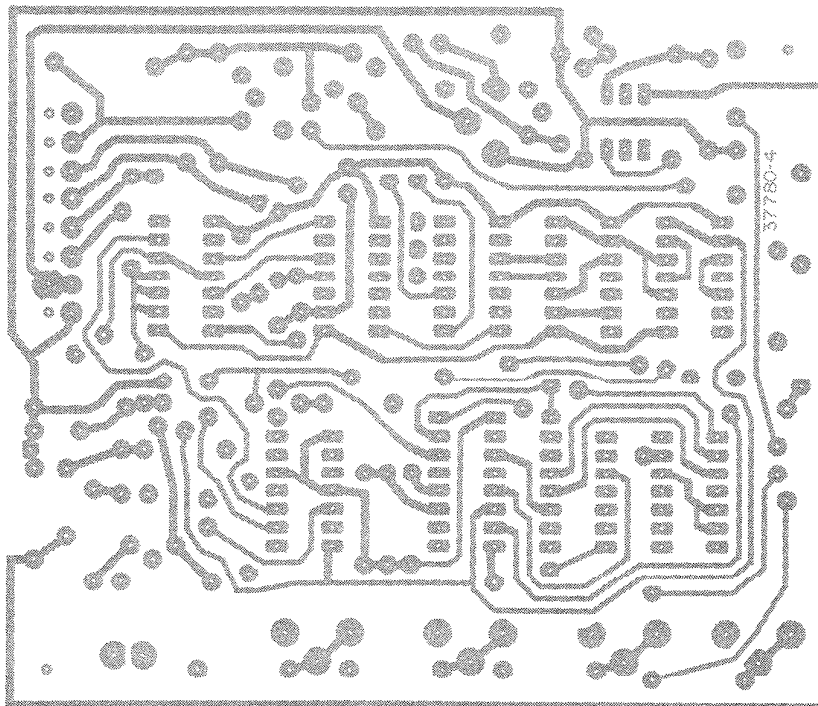


**FOIL PATTERN
ON COMPONENT SIDE
(37772)**

Old Chime Board IA-22



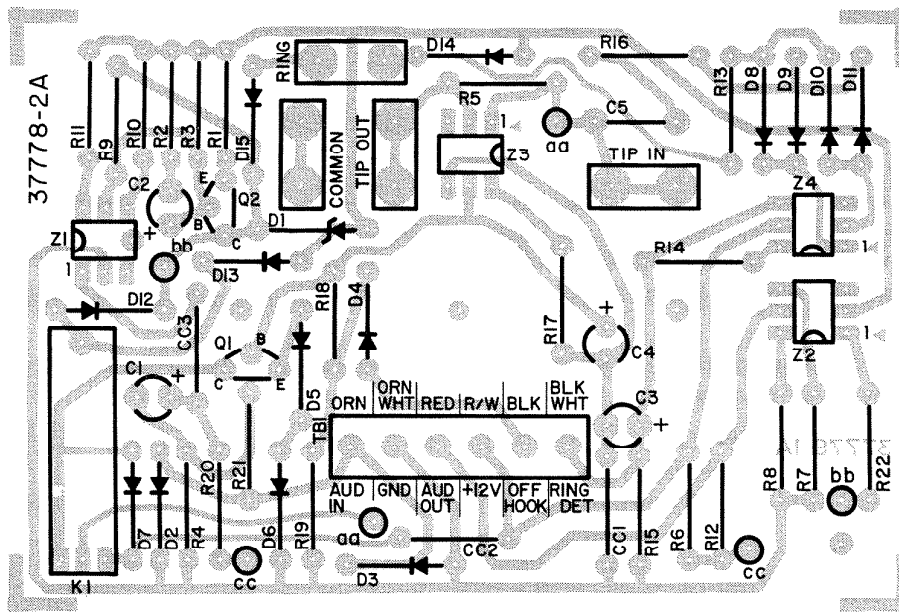
**COMPONENT AND SOLDER SIDE
FOIL PATTERN
(37780)**



**FOIL PATTERN
ON COMPONENT SIDE
(37780)**

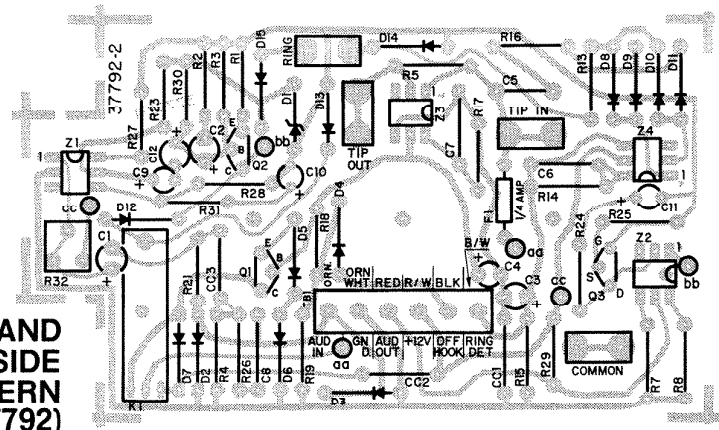
P.C. BOARDS

IT-10 Telephone Coupler



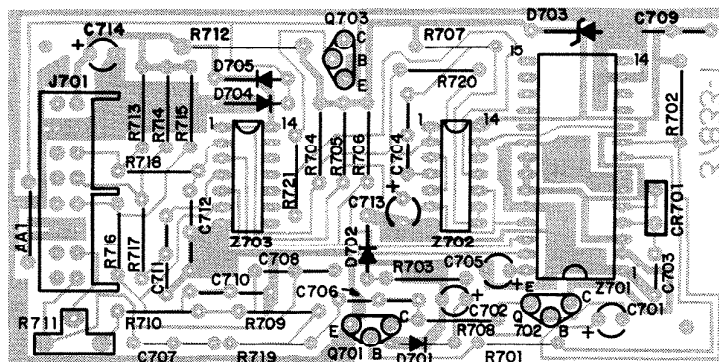
COMPONENT AND
SOLDER SIDE
FOIL PATTERN
(37778)

IT-10C Canadian Telephone Coupler

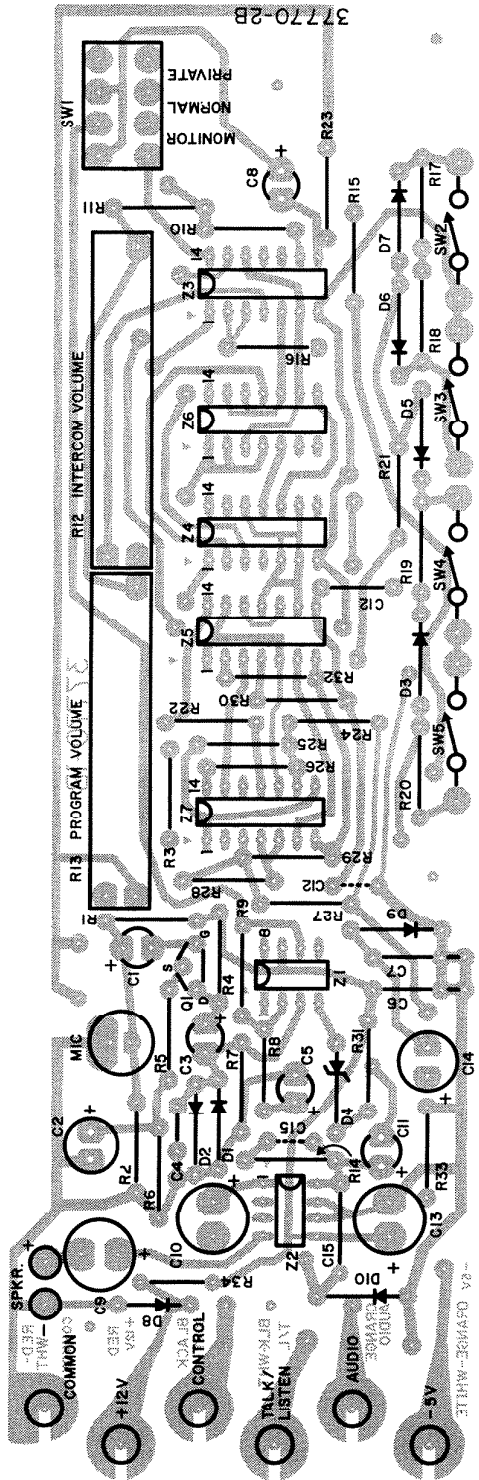


COMPONENT AND
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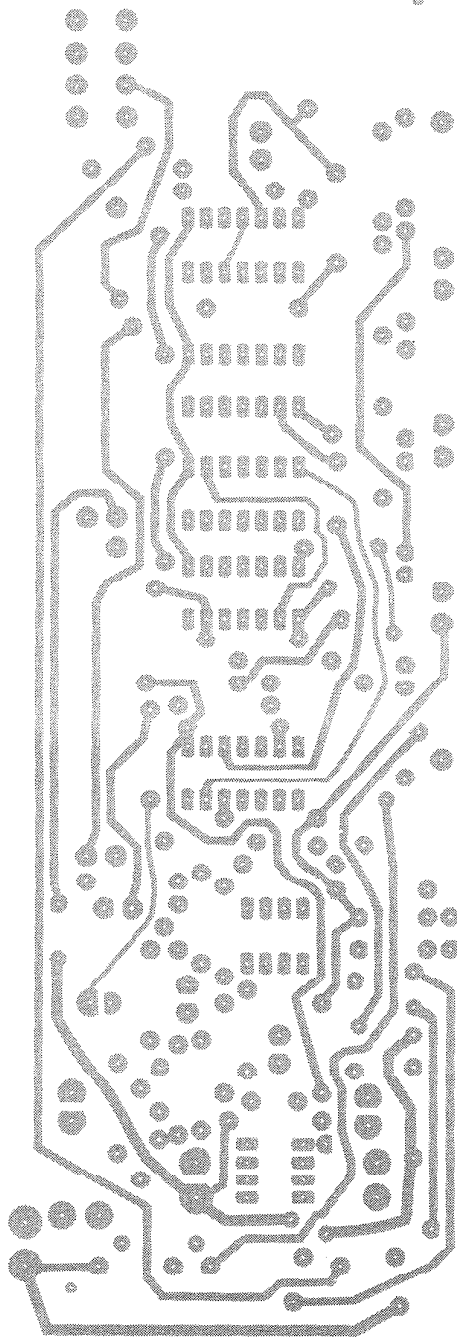
New Chime Board IAA-22 (after October, 1984)



COMPONENT AND
SOLDER SIDE
FOIL PATTERN
(37833)



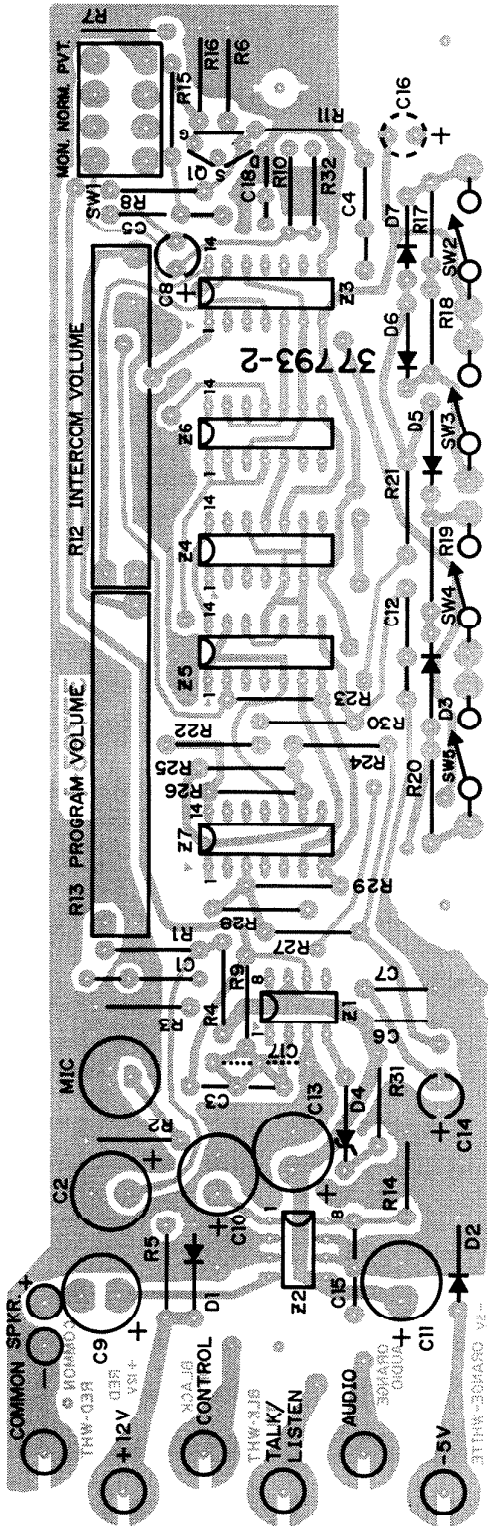
COMPONENT AND SOLDER SIDE
FOIL PATTERN
(37770)



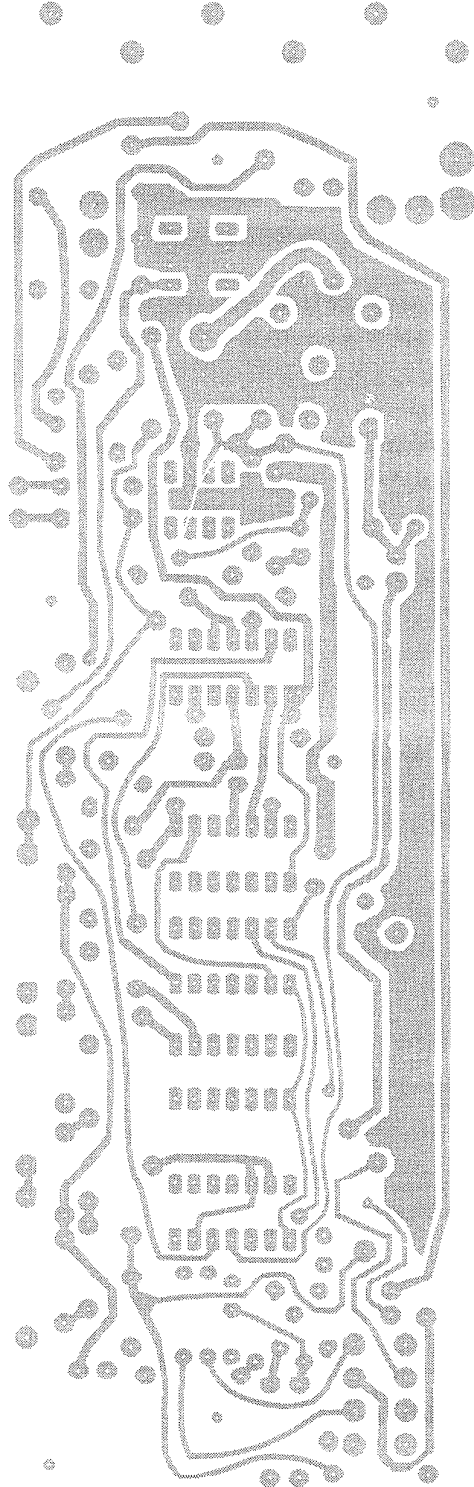
FOIL PATTERN
ON COMPONENT SIDE
(37770)

P.C. BOARDS

ISB-88

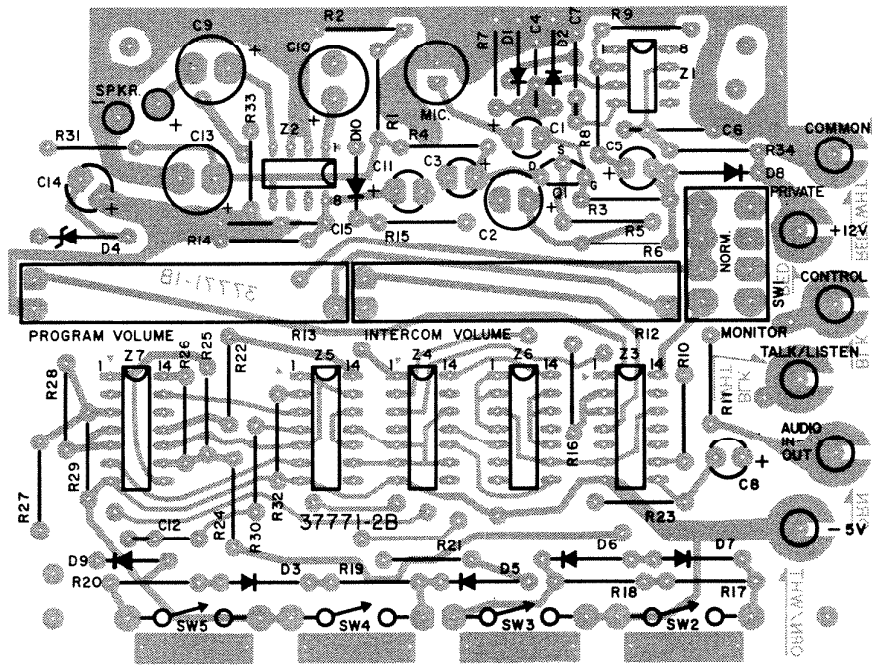


**COMPONENT AND SOLDER SIDE
FOIL PATTERN
(37793)**

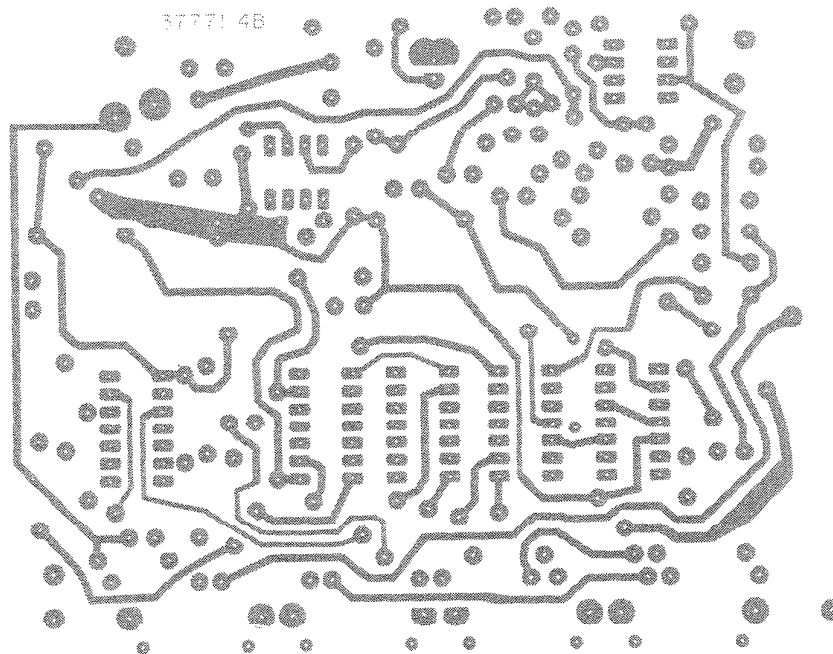


**FOIL PATTERN
ON COMPONENT SIDE
(37793)**

IS/ISA-86, IC/ICA-81, IS/ISA-85



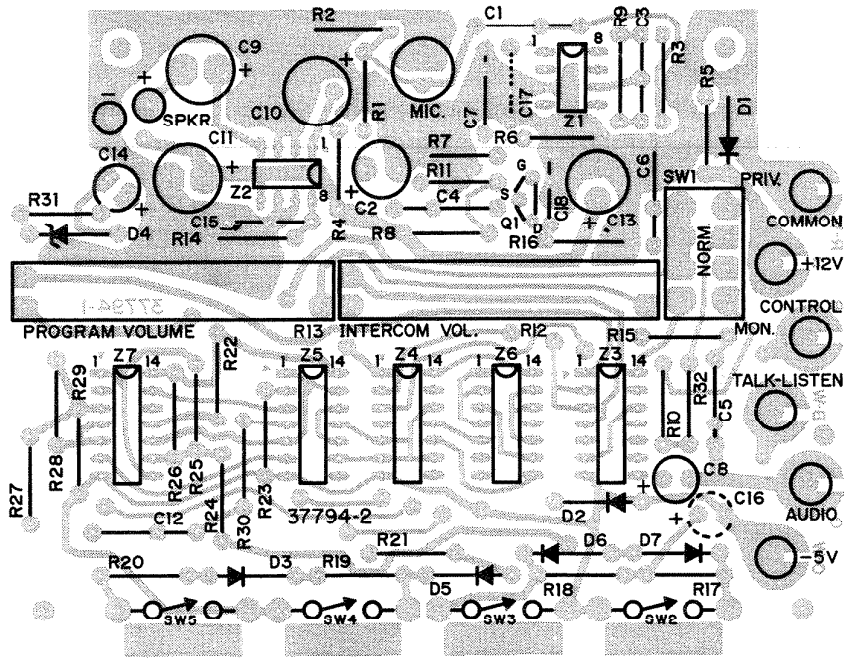
**COMPONENT AND SOLDER SIDE
FOIL PATTERN
(37771)**



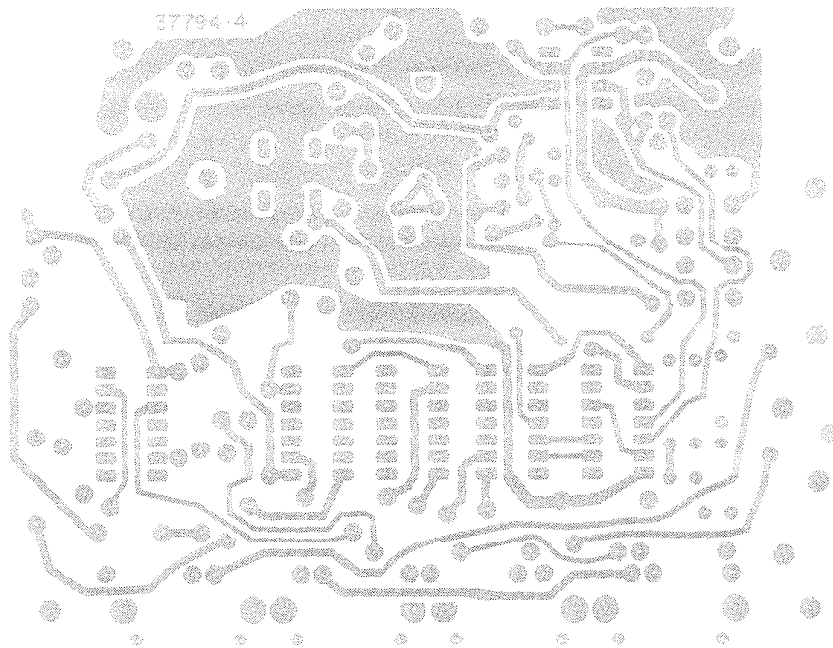
**FOIL PATTERN
ON COMPONENT SIDE
(37771)**

P.C. BOARDS

ISB-86, ICB-81, ISB-85

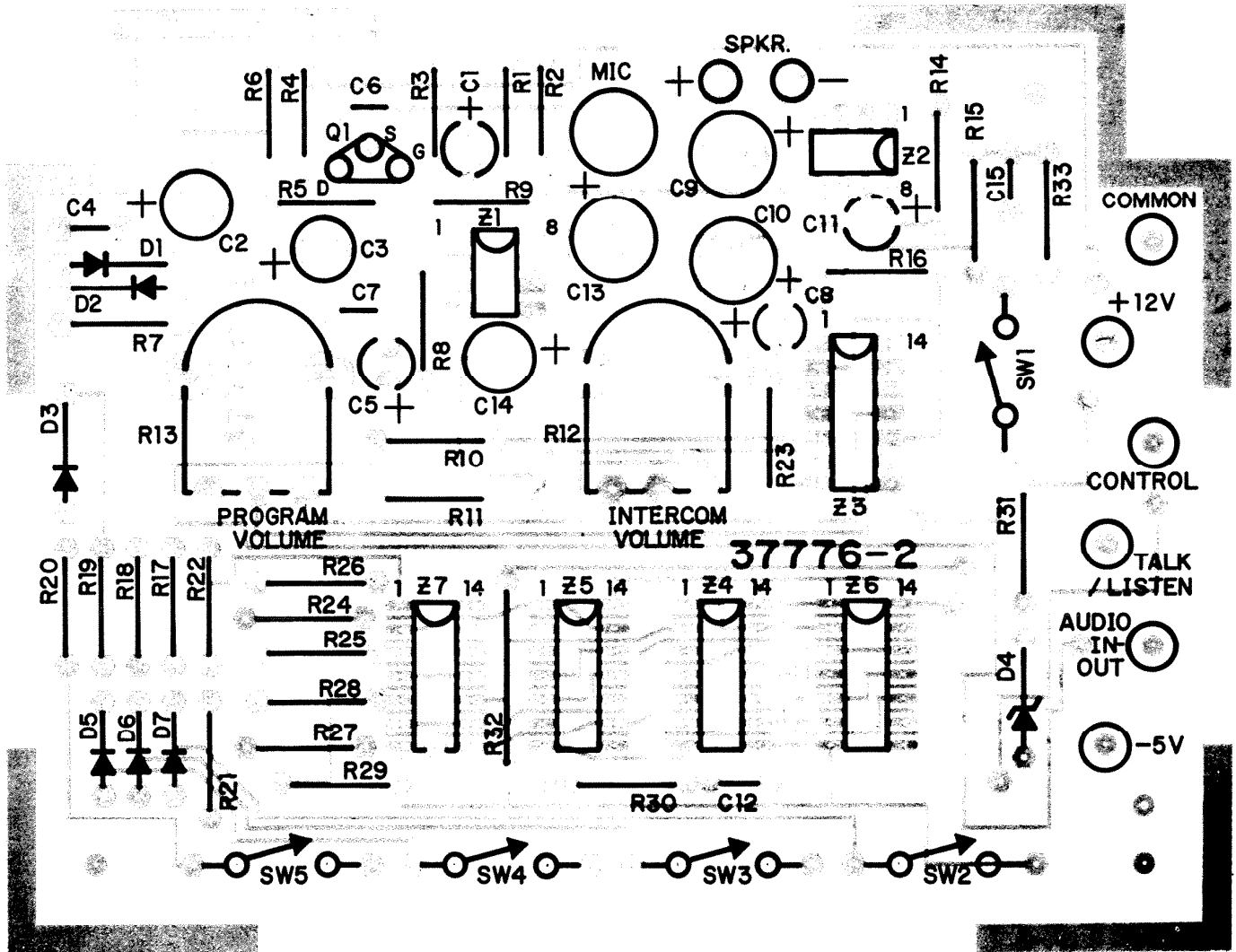


COMPONENT AND SOLDER SIDE
FOIL PATTERN
(37794)



FOIL PATTERN
ON COMPONENT SIDE
(37794)

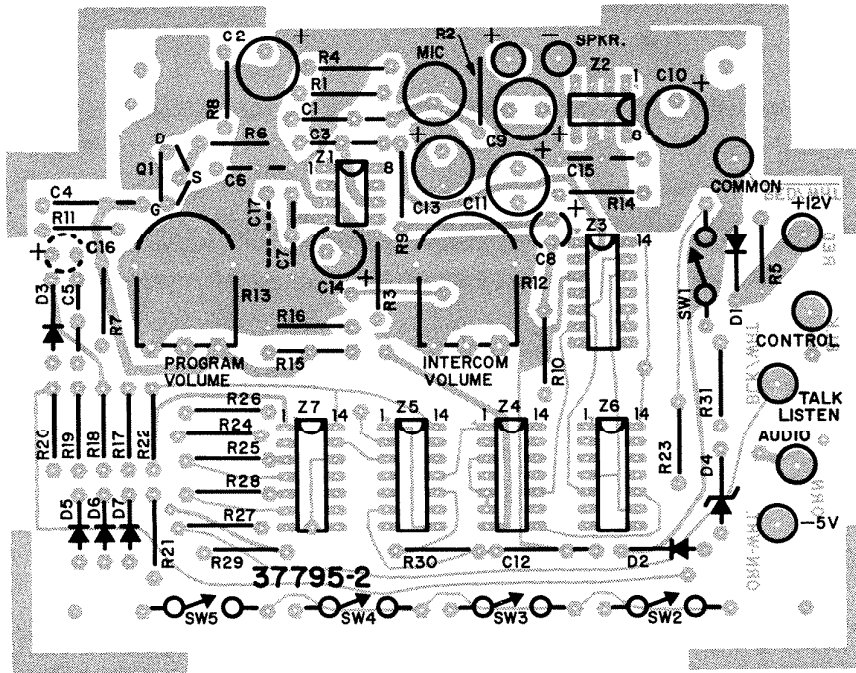
IS89, IC81W



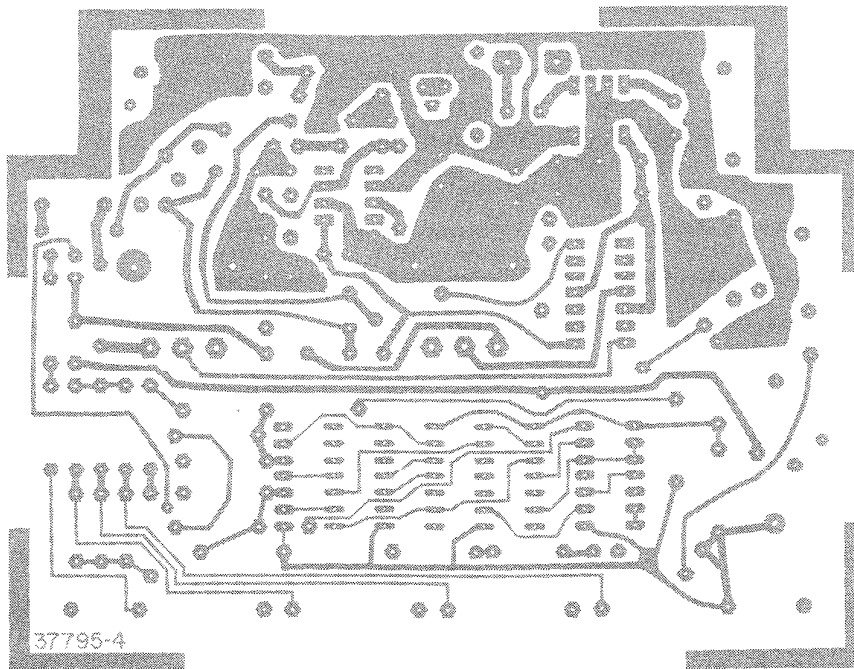
COMPONENT AND SOLDER SIDE
FOIL PATTERN
(37776)

P.C. BOARDS

ISA-89, ICA-81W



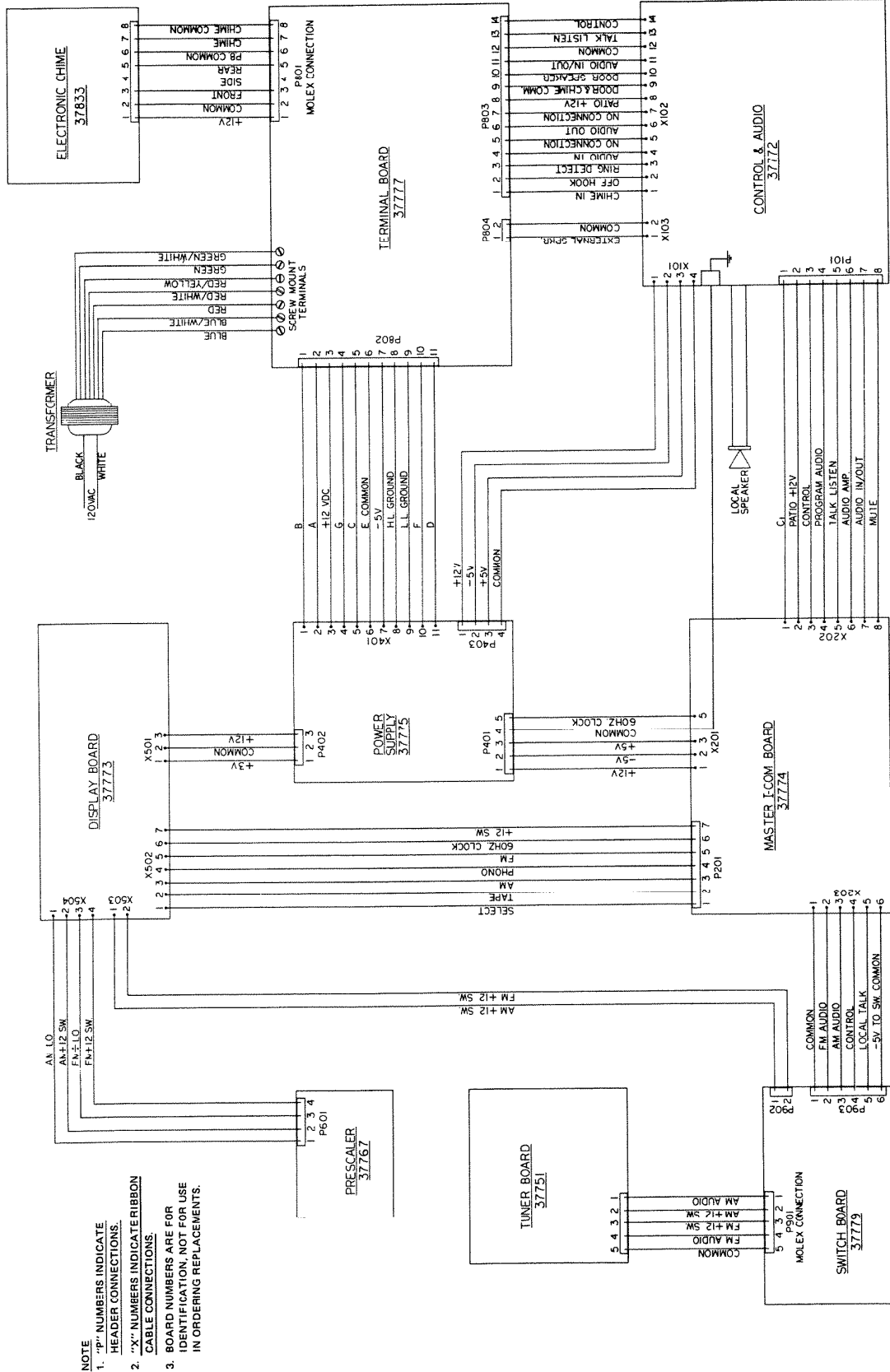
**COMPONENT AND SOLDER SIDE
FOIL PATTERN
(37795)**



**FOIL PATTERN
ON COMPONENT SIDE
(37795)**

INTERCONNECT DIAGRAM

IMA-806 MASTER UNIT



- NOTE**
1. "P" NUMBERS INDICATE HEADER CONNECTIONS.
 2. "X" NUMBERS INDICATE RIBBON CABLE CONNECTIONS.
 3. BOARD NUMBERS ARE FOR IDENTIFICATION, NOT FOR USE IN ORDERING REPLACEMENTS.

TRANSISTOR VOLTAGE CHART (All readings are DC volts.)

TR (FET)	E (S)	C (D)	B (G)	G2	OPERATING POSITION
Q201	.35	8.3	0		
Q301	1.84	8.9	1.5	4.6	
Q302	.42	10.35	1.1		
Q303	5	10.5	5.7		
Q304	4.3	9.5	3.75	8.0	AM
Q501	11.88	.036	11.83		
Q502	11.88	11.76	11.12		
Q601	5.5	11.69	6.13		
Q602	1.52	11.8	0		AM

All readings at normal FM operation — unless otherwise noted.

NOTES:

1. All voltage readings are referred to **EARTH** ground lug on Terminal Board. See page 5.
2. A High (H) is 4.5 to 6.0 volts (VDC).
3. A Low (L) is -4.0 to -5.0 volts (VDC).

I.C. VOLTAGE CHARTS (All readings are DC volts.)

Control and Audio

PIN	Z101	Z102	Z103	Z104	Z105	Z106	Z107	Z108	Z109	Z110	Z111	Z112	Z113	Z114	Z115
1	-5.3	1.3	4.6	-5.3	6.3	-5.3	-5.3	-5.3	-5.3	0	.17	1.12	0	-5.3	.45
2	4.4	0	-5.3	-5.3	-5.3	-5.3	6.3	6.3	6.3	0	0	0	0	0	.45
3	4.4	11.9	4.6	-5.3	6.3	-5.3	1.5	6.3	-5.3	-4.16	0	0	0	0	0
4	-5.3	0	-5.3	-5.3	-5.3	-5.3	-5.3	0	-5.3	-4.2	-5.3	6.5	0	-5.3	5.6
5	-5.3	.318	4.6	-5.3	6.3	6.3	-5.3	-5.3	-5.3	6.3	0	11.9	-5.3	-5.3	11.9
6	.318	10.2	-5.3	-5.3	-5.3	-5.3	6.3	-5.3	0	6.3	0	0	-5.3	0	
7	11.9	10.2	-5.3	-5.3	6.3	-5.3	-5.3	-5.3	-5.3	-5.3	.14	0	-5.3	6.3	
8	0	8.95	-5.3	-5.3	-5.3	-5.3	.05	-5.3	-5.3	0	6.3	0	0	0	
9		10.3	4.3	-5.3	-5.3	6.3	.05	0	6.3	0			0		
10		10.7	6.3	-5.3	-5.3	-5.3	-5.3	.142	-5.3	0			-5.3		
11		10.95	-5.3	6.3	6.3	-5.3	0	0	-5.3	-5.3			0		
12		10.9	6.3	-5.3	-5.3	6.3	6.3	-5.3	6.3	-4.16			-5.3		
13		10.9	-5.3	6.3	0	-5.3	-5.3	-5.3	-5.3	-5.3			-5.3		
14		10.9	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3			6.3		
15		10.9			-5.3										
16		10.9			6.3										
17		10.9													
18		10.9													

NOTES:

1. All voltage readings are referred to **EARTH** ground lug on Terminal Board. See page 5.
2. A High (H) is 4.5 to 6.0 volts (VDC).
3. A Low (L) is -4.0 to -5.0 volts (VDC).

Master Intercom

PIN	Z201	Z202	Z203	Z204	Z205	Z206	Z207	Z208
1	0	6.3	-5.3	6.3	-5.3	0	-5.3	-83
2	0	6.3	-5.3	6.3	6.3	0	0	5.5
3	0	-5.3	6.3	6.3	-5.3	0	0	5.5
4	0	6.3	6.3	-5.3	6.3	0	-5.3	-5.3
5	-5.3	-5.3	-5.3	-5.3	6.3	-5.3	-5.3	-4.1
6	-5.3	-5.3	-5.3	-5.3	5.5	-5.3	0	6.3
7	-5.3	-5.3	-5.3	-5.3	-5.3	-5.3	11.9	-5.3
8	0	6.3	6.3	6.3	-5.3	0	0	-5.3
9	0	-5.3	6.3	6.3	6.3	0		6.07
10	0	-5.3	-5.3	6.3	-5.3	0		-4.1
11	0	6.3	6.3	-5.3	-5.3	0		1.44
12	6.3	-5.3	-5.3	6.3	6.3	6.3		-5.3
13	6.3	-5.3	-5.3	-5.3	-5.3	-5.3		6.3
14	6.3	6.3	6.3	6.3	6.3	6.3		6.3

Tuner

PIN	IC301	IC302	Z601
1	2.14	.79	0
2	2.14	1.4	1.66
3	2.14	10.08	1.95
4	0	.65	4.86
5	0	0	3.56
6	5.6	9.3	1.7
7	5.6	1.4	.98
8	5.6	1.4	.98
9	5.58	.85	
10	5.58	5.0	
11	0	.7	
12	4.7	1.5	
13	2.7	8.1	
14	0	.84	
15	4.6	5.0	
16	0	10.2	

Power Supply

PIN	Z401	Z402	Z403
1	11.53	-5.29	23.0
2	6.34	-11.56	11.92
3	5.1	-4.03	10.65

Prescaler

PIN	Z602
1	4.87
2	1.74
3	0
4	0
5	2.90
6	2.83
7	2.85
8	4.87

Display

PIN	Z501	Z502	Z503	Z504
1	7.4	0	11.88	11.88
2	0	11.9	11.88	8.2
3	3.85	0	0	0
4	0	0	11.88	
5	8.2	0	0	

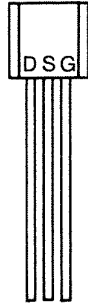
I.C. VOLTAGE CHARTS (All readings are DC volts.)

Display (cont.)

PIN	Z501	Z502	Z503	Z504
6	0	0	11.23	
7	0	0	0	
8	1.5	0	0	
9	0	0	11.9	
10	1.6	0	.52	
11	1.6	0	11.8	
12	8.2	11.9	0	
13	1.8	0	0	
14	8.0	0	11.88	
15	1.5	0	0	
16	.8	11.9	0	
17	.8			
18	2.0			
19	.8			
20	1.8			
21	.8			
22	.8			
23	.8			
24	.8			
25	.8			
26	.8			
27	1.4			
28	1.4			
29	1.4			
30	1.4			
31	1.4			
32	.8			
33	.8			
34	.8			
35	.8			
36	.8			
37	2.5			
38	.8			
39	2.2			
40	2.2			

I.C. AND TRANSISTOR LEAD IDENTIFICATION

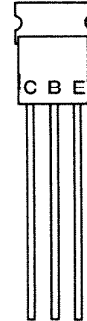
Q201, Q602, Q1 (Remotes)



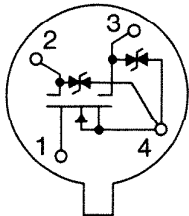
Q302, Q303, Q501, Q502



Q601



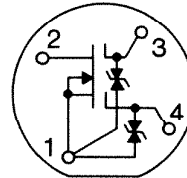
Q301, Q304 Metal Can



Bottom View

1. Drain
2. Gate No. 2
3. Gate No. 1
4. Source, Substrate and Case

Q301, Q304 Plastic Case



Bottom View

1. Source and Substrate
2. Drain
3. Gate No. 2
4. Gate No. 1

Z501 RF Display

G4	21	20	E4
F4	22	19	D4
A4	23	18	AM Out
B3	24	17	C4
C3	25	16	B4
Out FM	26	15	AM In
D3	27	14	AM/Test/FM/Select
E3	28	13	FM In
G3	29	12	U.S.A./Europe
F3	30	11	FM IF Frequency
A3	31	10	AM IF Frequency
A2	32	9	Crystal Oscillator Out
B2	33	8	Crystal Oscillator In
G2	34	7	50/60 Hz or Crystal Select
C2	35	6	Vss
D2	36	5	Vdd
E2	37	4	Standby Vdd
F2	38	3	50/60 Hz Input—60Hz Out
B1	39	2	Display Select
C1	40	1	Brightness

Z102 Display Driver

Output No. 1	1	18	Output No. 2
V-	2	17	Output No. 3
V+	3	16	Output No. 4
Divider Low End	4	15	Output No. 5
Signal Input	5	14	Output No. 6
Divider High End	6	13	Output No. 7
Reference Output	7	12	Output No. 8
Reference Adjust	8	11	Output No. 9
Mode Select	9	10	Output No. 10

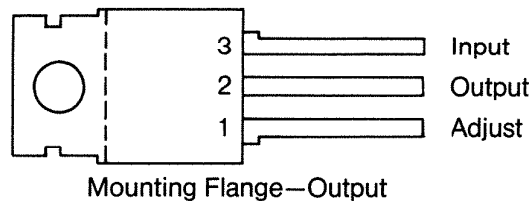
Z504 Voltage Regulator



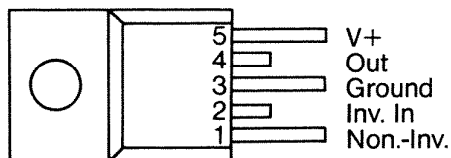
1. Input
2. Common
3. Output

I.C. AND TRANSISTOR LEAD IDENTIFICATION

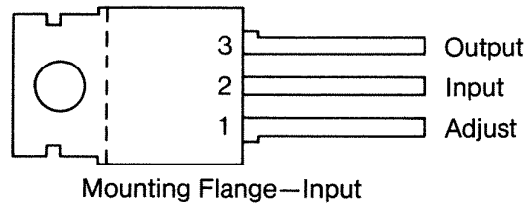
Z401, Z402 Adjustable Voltage Regulators



Z115 Audio Amplifier



Z403 Adjustable Voltage Regulator

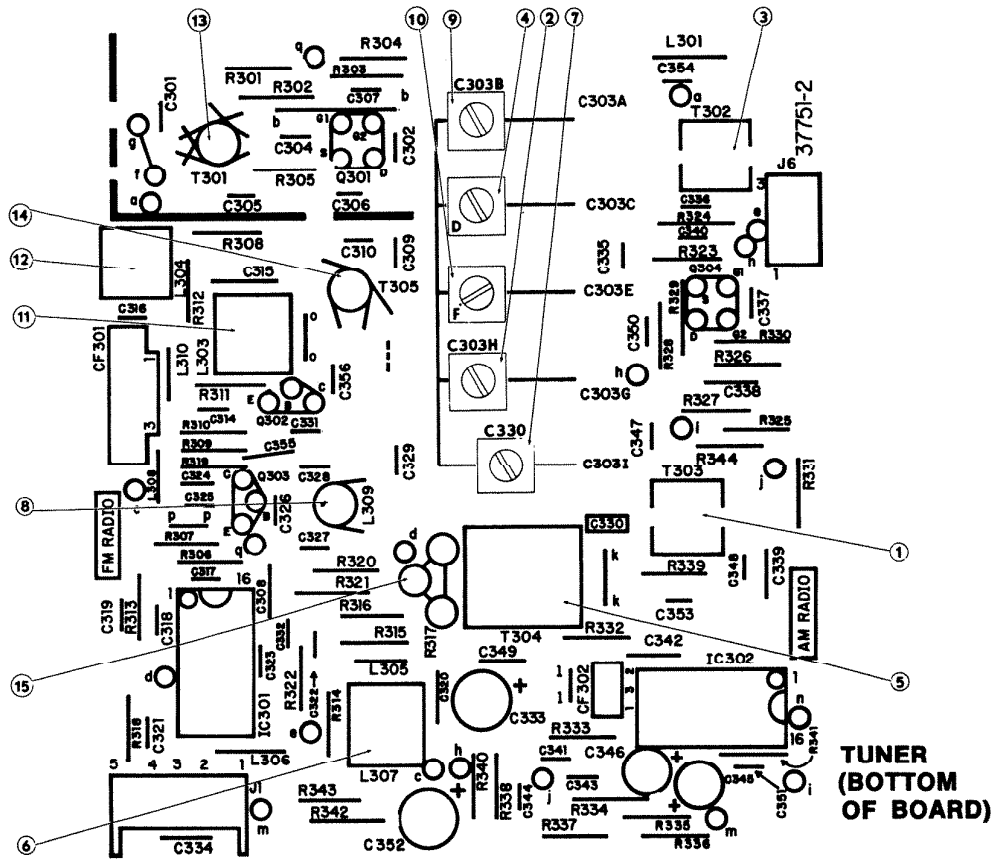


TUNER ALIGNMENT

Alignment Procedure

1. The master station is shipped from the factory with the AM/FM tuner completely aligned and the FM SQUELCH CONTROL R317 set at MAXIMUM, i.e., at full squelch.
2. Alignment should be checked, and if necessary, realignment attempted by qualified personnel ONLY WHEN ABSOLUTELY NECESSARY.
3. The surge impedance (Z_0) of different antennae and their associated transmission lines may vary.
 - 3.1. The antenna transformer T301 must be relatively broad-band to allow for the variations of Z_0 , and when the FM tuner is aligned with the 50 ohm dummy antenna according to the instructions in the alignment chart, it may not exactly match the system antenna to the FM RF input.
4. If the FM signal appears weak when checking the squelch circuit as described below, it may be possible to increase the input to the RF amplifier Q301. (Refer to paragraphs 5.5 through 10.)
5. In The Field Adjustment of the Squelch Control R317:
 - 5.1. On the master station's front panel, set the Master Program VOLUME slide control R236 for normal operation.
 - 5.2. Set SQUELCH CONTROL R317 located on tuner board to MINIMUM, i.e., no squelch.
 - 5.3. Tune the receiver to the weakest FM station that the homeowner would normally be expected to receive.
 - 5.4. If the weak station's reception is acceptable, advance the SQUELCH CONTROL R317 until it interferes with reception of the station, then, back the control until reception is again acceptable.
 - 5.5. When in normal operation the FM tuner is properly aligned and the received signal is too weak to permit full squelch operation, if possible, the RF signal input to the receiver should be increased.
 - 5.5.1. This may be accomplished by changing the position of the inside antenna that is supplied with the receiver; installation of an outside antenna, and if required, a directional antenna with an antenna rotor. In some cases, increasing the height of the existing antenna will increase the input sufficiently.
 - 5.6. Remember, with a properly aligned FM tuner, unsatisfactory operation of the squelch circuit is generally due to insufficient FM signal input.
6. Tune the Receiver to an FM station.
7. Using a high-impedance-input voltmeter, measure the voltage at IC301-13.
8. Pin 13 of the IC supplies a voltage which may be used to drive a tuning meter. Although a tuning meter is not used in this circuit, the voltage at pin 13 will increase with an increase of signal input to the RF amplifier Q301.
9. While measuring the voltage at pin 13, adjust the tuning slug of T301 for maximum reading on the meter.
10. Only very slight adjustment should be required. If tuning seems to be too far off, realign "In shop" according to the alignment chart.

AM Alignment



Master Unit Settings:

1. SELECTOR SWITCH in AM position.
2. VOLUME ALL SPEAKERS CONTROL set to desired level.

Instruments Required:

1. CATHODE RAY OSCILLOSCOPE:
 - 1.1 High-side of vertical input connected through a 15K, 1/2-watt resistor to tuner's AM audio output at J1/P1-1.
 - 1.2 Low-side (ground) of vertical input connected to receiver's circuit ground at J1/P1-5.

1.3 VTVM (or other high-impedance input meter) may be used, but an oscilloscope is recommended so that linearity as well as amplitude of the recovered audio signal may be observed.

2. AM SIGNAL GENERATOR:

- 2.1 Modulate RF output with 400 Hz. @ 30%.
- 2.2 Connect high-side of generator output through a 200 pf (ceramic or mica) capacitor to shield (braid) of the coax antenna lead-in.
- 2.3 Connect low-side (ground) of generator output to tuner module ground at RF shield.

To prevent activation of AGC, keep RF Signal Generator output at minimum level throughout alignment procedure.

STEP	SIGNAL GENERATOR SETTING	RECEIVER SETTING	ADJUST	TUNE FOR
1.	537 KHz. Use minimum signal level required. Do not drive tuner to AGC.	AM Tuning Dial to 537 KHz. (Ganged tuning capacitor C303 fully closed.)	① T303, oscillator low-frequency padder; and mixer to oscillator feedback coupling.	Maximum linear sine wave trace on scope; or maximum voltage on meter.
2.	1620 KHz. (Check level)	AM Tuning Dial to 1620 KHz. (Ganged tuning capacitor C303 fully open).	② C303H oscillator high frequency trimmer.	do
3.	Reducing signal generator as required: Repeat steps 1 and 2 until no further improvement can be made and oscillator tunes at both ends of AM band.			
4.	600 KHz. (Check level)	AM Tuning Dial to 600 KHz.	③ T302 AM Antenna to RF Amplifier input Transformer.	do
5.	1500 KHz. (Check level)	AM Tuning Dial to 1500 KHz.	④ C303D AM antenna to RF Amplifier input trimmer.	do
6.	Reducing signal generator as required. Repeat steps 3 and 4 until no further improvement can be made and RF tuning tracks across the band.			
7.	1500 KHz. (Check level)	AM Tuning Dial to 1500 KHz.	⑤ T304 AM IF (455 KHz.) Transformer: primary and secondary (top and bottom slug).	do

TUNER ALIGNMENT

FM Alignment

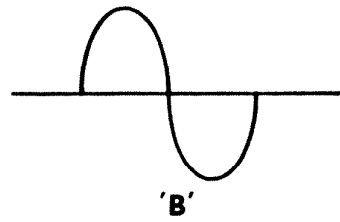
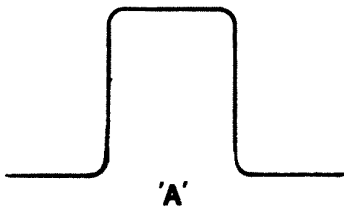
Master Unit Settings:

1. SELECTOR SWITCH in FM position.
2. VOLUME ALL SPEAKERS CONTROL set to desired level.
3. SQUELCH CONTROL R317 (on tuner module) set to minimum.

Instruments Required:

1. CATHODE RAY OSCILLOSCOPE:
 - 1.1 High-side of vertical input connected through a 15K, 1/2-watt resistor to tuner's FM audio output at J1/P1-4.

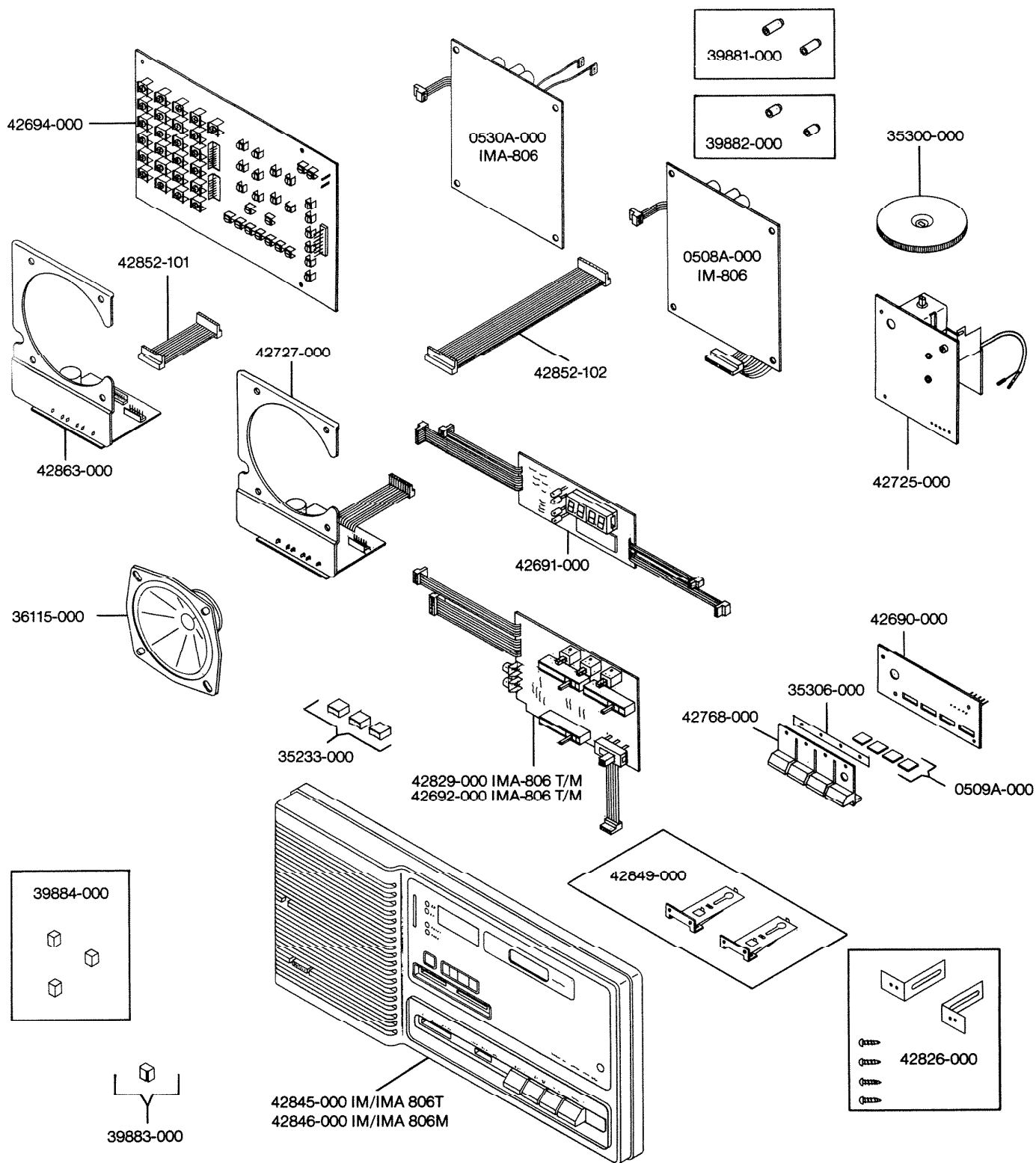
- 1.2 Low-side (ground) of vertical input connected to receiver's circuit ground at J1/P1-5.
- 1.3 Use 60Hz. horizontal sweep. If scope does not have own 60Hz. horizontal sweep, use exterior source.
2. FM SIGNAL GENERATOR:
 - 2.1 Modulate RF output with 60Hz. at 400 KHz. sweep width.
 - 2.2 Connect a 50-ohm resistor across RF output of signal generator.
 - 2.3 Connect high-side of generator's output to center conductor of coax antenna lead-in.
 - 2.4 Connect low-side (ground) of signal generator's output to shield (braid) of coax lead-in.



To prevent limiting, Signal Generator Output level should be as low as possible consistent with good trace on Scope.

STEP	SIGNAL GENERATOR SETTING	TUNER SETTING	ADJUST	TUNE FOR
1.	106 MHz. @ 2 to 5 micro-volts. (If generator does not have a calibrated output, use lowest level consistent with good trace on scope.)	Tune receiver time receiver to pick up signal generator.	⑥ L307 quadrature coil. Detune coil to get wave-form "A" above. If wave is negative, (reverse direction of slug detuning)	Maximum trace on scope as shown in "A" above. Sacrifice gain for linearity and flat-top. If necessary, reduce signal generator output to prevent limiting.
2.	108.5 MHz. (Check level)	FM tuning dial to 108.5 MHz. (Ganged tuning capacitor C303 full open.)	⑦ C330 oscillator trimmer.	do
3.	87.5 MHz. (Check level)	FM tuning dial to 87.5 MHz. (Ganged tuning capacitor C303 full close.)	⑧ L309 oscillator coil. Use extreme care, adjust in small increments.	do
4.	Repeat steps 2 and 3. Oscillator should be "Rocked-in" at both ends of dial.			
5.	106 MHz. (Check level)	FM tuning dial to 106 MHz.	⑨ C303B RF input trimmer. ⑩ C303F RF amplifier output trimmer. ⑪ L303 FM Mixer tank to 10.7 MHz. IF. ⑫ L304 FM mixer 10.7 MHz. IF coupler.	do
6.	90 MHz. (Check level)	FM tuning dial to 90 MHz.	⑬ T301 antenna input transformer. Two peaks may be noted when adjusting this slug. USE THE PEAK WITH THE SLUG POSITIONED NEAR THE BOTTOM OF THE COIL. ⑭ T305 RF amplifier drain tank and mixer coupler.	do
7.	Repeat steps 5 and 6 until no further improvement in scope trace is noted at either setting. As the set is aligned, it may be necessary to reduce signal generator output in order to prevent FM tuner limiting.			
8.	90 MHz. (Check level, do not drive tuner to limiting.)	FM tuning dial to 90 MHz.	⑥ L307 quadrature coil.	Maximum symmetrical "S" curve. See "B" above. Curve should be linear and equal distance above and below the scope's horizontal reference line.
9.	90 MHz.	FM tuning dial to 90 MHz.	Increase signal generator output until tuner goes into limiting. Should occur before signal generator output reaches 10 micro-volts.	Maximum symmetrical "S" curve that does not increase in amplitude after tuner limiting is reached.
10.	Check limiting action across band: With output set at 10 micro-volts tune signal generator to various frequencies across the FM broadcast band (88-108 MHz.). Adjust FM tuning dial to receive these frequencies. Linear "S" curve should remain constant in amplitude at every frequency.			
11.	Disconnect signal generator and, if used, external sweep to scope. Scope should use regular horizontal sweep. Tune receiver between stations and note noise at J1/P1-4 as seen on scope. Turn FM SQUELCH CONTROL R317 ⑮ clockwise to full squelch. Noise should disappear from scope and horizontal trace should be a straight line.			

EXPLODED VIEW DRAWING



REPLACEMENT PARTS

RESISTORS: Value in Ohms $\pm 5\%$, 1/4-watt, Carbon Film, unless otherwise noted.
 K = Kilo = 10^3 M = Mega = 10^6

CAPACITORS: Value in micro farads (10^{-6}), 500 Vdc, Ceramic Disc, unless otherwise noted.
 p = pico = 10^{-12}

Schematic Symbol	NuTone Part No.	Description
TUNER AND PRESCALER BOARDS		
	42725-000	Complete Assembly
AM/FM TUNER BOARD		
	42726-000	Complete Assembly
	37751-000	PC Board
Capacitors		
C301	35100-174	130 pf
C302	35101-142	15 pf
C303A-J	35092-000	Ganged, AM and FM Tuning
C304	35100-120	.001
C305	35100-139	.01 $\pm 20\%$, 50V
C306	35100-120	.001
C307	35100-139	.01 $\pm 20\%$, 50V
C308	35076-101	.22 +80%, -20%, 12V
C309	35101-142	15 pf
C310	35100-138	.005 $\pm 20\%$, 100V
C311, C312, C313	Not Used	
C314	35100-139	.01 $\pm 20\%$, 50V
C315	35101-147	1.2 pf, 0.25%/pf
C316	35100-125	220 pf
C317	35100-120	.001
C318, C319	35100-139	.01 $\pm 20\%$, 50V
C320	35076-101	.22 +80%, -20%, 12V
C321	35100-156	.0022
C322	35100-139	.01 $\pm 20\%$, 50V
C323	35101-139	470 pf
C324	35100-139	.01 $\pm 20\%$, 50V
C325	35100-138	.005 $\pm 20\%$, 100V
C326	35101-140	10 pf
C327	35101-141	5.6 pf
C328	35101-135	7.5 pf
C329	35101-148	22 pf, 100V
C330	35090-000	1-8 pf, 100VAC, Oscillator Trimmer ALPS #C1Y 114B11
C331	35101-126	1.2 pf, $\pm 0.25\%/pf$
C332	Not Used	
C333	35091-109	47 +100%, -10%, 25WVDC Electrolytic
C334	35100-141	.05 +80%, -20%, 50V
C335	35101-140	10 pf
C336, C337	35100-139	.01 $\pm 20\%$, 50V
C338	35076-106	.1 $\pm 20\%$, 25V
C339	35100-141	.05 +80%, -20%, 12V
C340, C341	35076-104	.082 +80%, -20%, 12V
C342	35100-141	.05 +80%, -20%, 50V
C343	35076-108	.02 $\pm 20\%$, 16V
C344	35100-139	.01 $\pm 20\%$, 50V
C345	35091-102	10 +100%, -10%, 16WVDC, Electrolytic
C346	35091-109	47 +100%, -10%, 25WVDC, Electrolytic
C347	35101-141	5.6 pf
C348	35100-139	.01 $\pm 20\%$, 50V

Schematic Symbol	NuTone Part No.	Description
C349	35100-141	.05 +80%, -10%, 50V
C350	35076-104	.082 +80%, -20%, 12V
C351	Not Used	
C352	35091-109	47 +100%, -10%, 25WVDC, Electrolytic
C353	35100-139	.01 $\pm 20\%$, 50V
C354	35100-174	150 pf
C355	35100-193	.03 +80%, -20%, 50V
C356	35101-139	470 pf
Integrated Circuits		
IC301	36623-000	Monolithic IC, FM IF Amplifier, Detector, Audio Preamp, etc. RCA CA3089E
IC302	36622-000	Monolithic IC, AM Oscillator/Mixer, IF Amplifier, Detector, AF Preamp, etc. RCA CA3088E
Connectors		
J1	39339-101	5-pin receptacle
Coils		
L301	30106-000	220 microH $\pm 10\%$ @ 50 mA
L302	35232-000	Ferrite Bead, FM RF amplifier drain- lead parasitic suppressor
L303	30590-000	10.7 MHz. tank circuit for FM Mixer collector load
L304	30591-000	10.7 MHz. adjustable coupling between FM Mixer collector and CF301
L305	30062-000	RF Choke (decoupler)
L306	30105-000	22 microH $\pm 10\%$ @ 100 mA
L307	30092-000	10.7 MHz. adjustable quadrature coil
L308	30062-000	RF Choke (decoupler)
L309	30088-000	Coil, FM Oscillator
	30073-000	Form, for oscillator coil L309
	31915-000	Core, powdered iron (Tuning Slug) for oscillator coil
L310	30062-000	RF Choke (decoupler)
L311	35232-000	Ferrite Bead, AM RF amplifier drain- lead parasitic suppressor
Transistors		
Q301	36624-000	DGFET, FM RF Amplifier General Instruments Corp. MEM615A, MEM614 Motorola MFE-130 Texas Inst. 3N203
Q302	36578 000	Silicon, NPN, Epitaxial Planar, FM Mixer Texas Inst. SKA-4231 Motorola SPS 4484 National Semi SM-43-049
Q303	36581-000	Silicon, NPN Planar FM Oscillator Texas Inst. SKA-4230 National Semiconductor SM-43-050
Q304	36624-000	DGFET, AM RF Amplifier (for suppliers, see Q301 above)

Schematic Symbol	NuTone Part No.	Description
Ceramic Filters		
CF301	36109-000	FM 10.7 MHz. IF; Ceramic Murata Corp. SFE10.7MS23
CF302	36087-000	AM 455KHz. IF; Ceramic Murata Corp. SFB4550
Resistors		
R301	33082-474	470K
R302	33082-684	680K
R303	33082-124	120K
R304	33082-334	330K
R305	33082-391	390
R306, R307	33082-103	10K
R308	33082-331	330
R309	33082-333	33K
R310	33082-392	3.9K
R311	33082-102	1K
R312	33082-221	220
R313	33082-331	330
R314	33082-392	3.9K
R315	33082-471	470
R316	33082-623	62K
R317	34043-000	0-500K \pm 30%, 0.1 watt, linear taper SQUELCH CONTROL CTS Corp. Type X-201
R318	33082-272	2.7K
R319	33082-822	8.2K
R320, R321	33082-103	10K
R322	Not Used	
R323	33082-564	560K
R324, R325	33082-334	330K
R326	33082-103	10K
R327	33082-393	39K
R328	33082-121	120
R329	33082-820	82
R330	33082-391	390
R331	33082-271	270
R332	33082-332	3.3K
R333	33082-222	2.2K
R334	33082-153	15K
R335	33082-562	5.6K
R336	33082-682	6.8K
R337	33082-152	1.5K
R338	33082-332	3.3K
R339	33082-182	1.8K
R340	33082-331	330
R341	Not Used	
R342	33082-101	100
R343	33082-470	47
R344	33082-621	620
Transformers		
T301	30087-000 30108-000 30107-000 31915-000 30073-000	RF, Antenna/RF-Amplifier input Primary Winding Secondary Winding Tap Section Secondary Winding Core, powered iron (Tuning Slug) Coil Form
T302	30597-000	AM, 537-1620 KHz. operating range Antenna/RF-Amplifier input Toko America RHR-42185R G.I. Ex. #27402

Schematic Symbol	NuTone Part No.	Description
T303	30598-000	AM, 992-2075 KHz. operating range Oscillator Tuning/Coupling Toko America RWR-42209N Gen. Inst. Tex #3227
	30599-000	Alternate EL-Filters, Inc. EO #405
T304	30579-000	AM IF, 455 KHz. TRW #50137 Gen. Inst. Corp. #22562
T305		RF, RF Amplifier output/FM Detector input
	30087-000	Primary Winding
	30109-000	Secondary Winding
	31915-000	Core, powered iron (Tuning Slug)
	30073-000	Coil Form
Miscellaneous		
	42491-000	Cable, Coaxial Assembly Complete, Antenna Lead-in
	35303-003	Shield, RF
PRESCALER BOARD		
	42688-000	Complete Assembly
	37767-000	PC Board — Prescaler
Diodes		
D601	36594-000	Zener, 1/2W, 6V Type 1N5234A
Capacitors		
C601, C602	35100-177	820 pF
C603	35129-104	.1
C604	35100-177	820 pF
C605	35100-184	1000 pF
C606	35100-162	27 pF
C607	35100-184	1000 pF
C608, C609	35100-124	270 pF
C610	35100-184	1000 pF
C611	35101-127	2.2 pF
C612	35101-140	10 pF
C613	35100-124	270 pF
Resistors		
R601	33082-122	1.2K
R602	33082-068	6.8
R603	33082-103	10K
R604	33082-105	1M
R605	33082-122	1.2K
Transistors		
Q601	36733-000	NPN Silicon, Natl. Semi. TN 2219A
Q602	36748-000	N-Channel Silicon, Natl. Semi. 4416, Motorola MPF 4416

REPLACEMENT PARTS

Schematic Symbol	NuTone Part No.	Description
Integrated Circuits		
7601 Z602	36742-000 36739-000	Wide Band SL 560C Prescaler DS 8629
Coils		
L601, L602 L603	30062-000 39887-000	Trap Coil 10.7 MHz. Coupling Link
SWITCH BOARD		
	42690-000 37779-000	Complete Assembly PC Board Switch
Diodes		
D901-D904	36549-000	Rectifier
Resistors		
R901 R902 R903 R904 R905	33082-123 33082-472 33082-182 33082-471 33082-104	12K 4.7K 1.8K 470 100K
Switches		
SW901- SW904	36737-000	Reed Switch
General		
P901 P902 P903	39338-101 39896-101 39896-104	Connector Post Assembly Polarized Straight Post Header Polarized Straight Post Header
CHANGES — SWITCH BOARD		
	April, 1982	Added two Spacers, 39745-000, to shim Switch Board away from Magnetic Push Button Assembly.
	May, 1983	On PC Board, 37779-000, holes for push buttons enlarged to prevent buttons sticking.
SW901- SW904	Sept., 1983	Reed Switches, 36772-000, replaced Reed Switches, 36737-000. Also removed Spacers, 39745-000.
DISPLAY BOARD		
	42691-000 37773-000	Complete Assembly PC Board — Display
Diodes		
D501 D502, D503 D504	36594-000 36549-000 36594-000	Zener, 6V, ½W, Type 1N5234A Rectifier, Type 1N4002 Zener, 6V, ½W, Type 1N5234A

Schematic Symbol	NuTone Part No.	Description
D505 D506 LED501, LED502 I501-I504	36743-000 36617-000 36750-000 36636-000	Zener 3.9V, Type 1N5228B Silicon Switching IN914, IN4148 Light Emitting, Numerical Display — 2 Digit Light Emitting, Yellow, XC556Y
Capacitors		
C501, C502 C503 C504	35091-111 35076-106 35091-128	Electrolytic, 2.2 .1 Electrolytic, 100
Resistors		
R501 R502 R503 R504 R505, R506 R507 R508 R509 R510 R511	33082-105 33082-104 33082-102 33082-513 33082-222 33082-104 33082-564 33082-102 33082-104 33082-222	1M 100K 1K 51K 2.2K 100K 560K 1K 100K 2.2K
Integrated Circuits		
Z501 Z502 Z503 Z504	36749-000 36659-000 36735-000 36747-000 39744-000	RF Display, MM 5431 Counter, MC 14017 Hex Inverting Buffer, MC 14049 Voltage Regulator MA78L08CP I.C. Socket — 40 Pin for Z501
Transistors		
Q501, Q502	36606-000	Silicon, PNP, Motorola MPS-K71 (Yellow), NPC Elec. NPC-079
General		
X501 X502 X503 X504	42729-101 42729-106 42729-102 42729-103	Ribbon Wire Assembly — 3 CKT Ribbon Wire Assembly — 7 CKT Ribbon Wire Assembly — 2 CKT Ribbon Wire Assembly — 4 CKT
CHANGES — DISPLAY BOARD		
Q502	April, 1982	Changed from 36606-000 to 36615-000 Silicon, PNP, Motorola MPS-A56, Fairchild Semi. TEH-0224
POWER SUPPLY BOARD		
	42727-000 37775-000 42729-108	Complete Assembly, PC Board, Heat Sink and 11 CKT Ribbon Wire Assy. PC Board Only 11 CKT Ribbon Wire Assy.

Schematic Symbol	NuTone Part No.	Description
Diodes		
D401-D404	36608-000	Silicon, Motorola MR 502
D405-D414	36549-000	Rectifier, Type 1N4002
Capacitors		
C401, C402	35091-125	Electrolytic, 1000 PF, 16V
C403-C405	35091-106	Electrolytic, 2.2, 25V
C406	35091-126	Electrolytic, 2200
C407	35129-104	.1
C408	35129-107	.01
C409	35076-107	.01
C410, C411	35129-107	.01
Resistors		
R401-R403	33082-122	1.2K
R404	33082-222	2.2K
R405	33082-332	3.3K
R406	33082-682	6.8K
R407	34091-000	Potentiometer, Trim
R408	34050-000	Potentiometer, Trim
Integrated Circuits		
Z401, Z403	36724-000	Regulator, National Semi. LM317T
Z402	36745-000	Regulator, National Semi. LM337T
General		
X401	42729-108	Ribbon Wire Assembly — 11 CKT
P401/P402	39896-105	Polarized Straight Post Header — 8 CKT
P403	39896-102	Polarized Straight Post Header — 4 CKT

CHANGES — POWER SUPPLY BOARD

R402	May, 1982	Changed from 33082-122, 1.2 K ohm Resistor to 33082-821, 820 ohm Resistor.
R409	May, 1982	Add 33082-391, 390 ohm Resistor — from +5V to Ground.
R410	May, 1982	Add 33082-391, 390 ohm Resistor — from -5V to Ground.
D415, D416	Dec., 1982	Add 36549-000, Rectifier Diodes, to Protect Z401 from field miswiring.
C412	Dec., 1982	Add 35091-102, 10 mF Electrolytic Capacitor from Pin 3 of Z403 to ground to improve hum rejection.
X401	Jan., 1983 (IMA-806)	Add 39896-106, 11 CKT Straight Post Header. Connects to 42852-101, Ribbon Wire Assembly which replaces 42729-108 Ribbon Wire Assembly.
	Jan., 1983	Power Supply Complete Assembly, 42863-000, without cable replaces Assembly 42727-000.

INTERCOM BOARD

42692-000	Complete Assembly
37774-000	PC Board — Intercom

Schematic Symbol	NuTone Part No.	Description
Diodes		
D201-D204	36594-000	Zener, 1/2W, 6V, Type 1N5234A
D205, D206	36549-000	Rectifier, Motorola 1N4002
I201	36636-000	L.E.D., Yellow, XC556Y
Resistors		
R201	33082-331	330
R202, R203	33082-102	1K
R204	33082-221	220
R205, R218	33082-223	22K
R206	33082-512	5.1K
R207	33082-562	5.6K
R208-R217	33082-103	10K
R219, R224	33082-104	100K
R225, R226	33082-124	120K
R227	33082-184	180K
R228	33082-274	270K
R229	33082-334	330K
R230, R231	33082-564	560K
R232-R234	33082-105	1M
R235	33082-104	100K
R236	34688-000	Slide Control, Radio Volume
R237	34688-000	Slide Control, Intercom Volume
R238	34688-000	Slide Control, Radio Tone
R241, R242	33082-103	10K
Capacitors		
C201, C202	35091-111	Electrolytic, 2.2
C203, C204	35091-111	Electrolytic, 2.2
C205, C206	35091-111	Electrolytic, 2.2
C207	35091-104	Electrolytic, 33
C208, C209	35129-104	.1
C210	35100-145	.001
C211	35129-117	.022
C212	35129-105	.22
C213	35129-102	.047
Integrated Circuits		
Z201, Z206	36658-000	Quad, RCA CD4066AE or CD4066BE
Z202, Z203	36644-000	Quad, CD4001
Z204, Z205	36630-000	Quad, MC14081, CD4081
Z207	36700-000	OP AMP, MC1741CP, UA741TC
Z208	36740-000	Hex. Inv., MC14069BCP
Switches		
SW201	34687-000	Slide (DPTT)
SW202	34677-000	Momentary
SW203, SW204	34676-000	Interlocking
Transistors		
C201	36738-000	N-Channel Silicon, Siliconex J230, Motorola J230

REPLACEMENT PARTS

Schematic Symbol	NuTone Part No.	Description
General		
M201	36121-000	Electret Microphone
J201, J202	39797-000	Phono Connector
P201	39897-102	Right Angle Post Header Assembly 7 CKT
X201	42729-104	Ribbon Wire Assembly — 5 CKT
X202	42729-107	Ribbon Wire Assembly — 8 CKT
X203	42729-105	Ribbon Wire Assembly — 6 CKT

CHANGES — INTERCOM BOARD

R206	Dec., 1982	5.1K Resistor, 33082-512 changed to 1.2K, 33082-122.
X201	Jan., 1983	Ribbon Cable cut at Pin 4 and Wire Assembly, 32557-W06, inserted in Hole #4 of PCB. Wire Assembly connects Intercom to Control and Audio Board.
	Jan., 1983	Complete Intercom PC Board Assy., 42829-000, Replaces PC Board Assy., 42692-000.
R202	July, 1983	Removed 1K Resistor, 33082-102.
C212	Oct., 1983	.22 Capacitor 35129-105, changed to .02, 35129-117, to improve highs response in Tone Control.
P201	Nov., 1983	Added Keyed 7 CKT Right Angle Post Header, 39927-101, to replace two piece Header Assembly 39897-102.

CONTROL AND AUDIO BOARD

	0508A-000	Complete Assembly
	37772-000	PC Board — Control and Audio
Diodes		
D101-D110	36549-000	Rectifier, Type 1N4002
D111-D116	36594-000	Zener, 6V, ½W, Type 1N5234A
D117, D118	36743-000	Zener, Type 1N5228B
Resistors		
R101	33082-010	1
R102	33082-022	2.2
R103	33082-470	47
R104	33082-221	220
R105	33082-621	620
R106	33082-680	680
R107-R111	33082-122	1.2K
R112	33082-152	1.5K
R113	33082-221	220
R114, R115	33082-222	2.2K
R116	33082-472	4.7K
R117	33082-512	5.1K
R118	33082-822	8.2K
R119	33082-333	33K
R120	33082-104	100K
R121	33082-223	22K
R122-R127	33082-103	10K
R128	33082-123	12K
R129	33082-153	15K
R130	33082-122	1.2K

Schematic Symbol	NuTone Part No.	Description
R131	33082-223	22K
R132	33082-273	27K
R133	33082-563	56K
R134	33082-563	56K
R135	33082-154	150K
R136-R138	33082-104	100K
R139	33082-103	10K
R140	33082-104	100K
R141-R145	33082-104	100K
R146-R149	33082-224	220K
R150	33082-474	470K
R151	34093-000	Potentiometer — Trim 1K
R152	34092-000	Potentiometer — Trim 10K
R153-R155	34041-000	Potentiometer — Trim 50K
R156	34094-000	Potentiometer — Trim 20K
R157	34023-000	Potentiometer — Trim 2.2M
R158	33082-564	560K
R159	33082-104	100K
R160	33082-154	150K
R161	33082-470	47
R162-R163	33082-103	10K
R164	33082-512	5.1K
R165	33082-225	2.2M
R168	33082-224	220K
Transistors		
Q101	36613-000	Transistor — NPN Silicon, Motorola MPS-A20, Texas Inst. TIS-98
	39886-000	Transistor Clip
Capacitors		
C101	35129-107	.01
C102	35129-108	.033
C103-C109	35129-104	.1
C110-C113	35076-106	.1
C114	35129-106	.47
C115	35091-125	1000
C116-C118	35091-106	2.2
C119	35129-105	.22
C120-C123	35091-106	2.2
C124	35091-108	100
C125	35129-103	.001
C126	35091-123	330
C127	35091-124	470
C128	35091-125	1000
C129	35091-124	470
C130	35055-101	.47 Mylar
C131	35129-109	100 PF
C135	35129-112	.0022
Integrated Circuits		
Z101, Z114	36700-000	OP AMP, MC1741CP, UA 741 TC
Z102	36736-000	Display Driver, National Semiconductor LM 3914
Z103	36740-000	Hex Inverter, MC 14069 BCP
Z104	36701-000	Quad, MC 14071 BCP
Z105	36734-000	Quad, MC 14043 BCP
Z106, Z109	36630-000	Quad, SCL 4081-AE
Z107	36677-000	Trigger, MC 14584 BCP
Z108, Z110	36658-000	Quad Bilateral, RCA 4066 BE

Schematic Symbol	NuTone Part No.	Description
Z111	36669-000	Dual OP-AMP, MC 1458 CPI
Z112	36741-000	Audio Amplifier, Sprague ULN 2283 B
Z113	36658-000	Quad Bilateral RCA 4066 BE
Z115	36682-000	Audio Amplifier, 8 Watt, SGS ATEZ 1DA 2002 AH
K101	39337-000	Reed Relay
Connections		
X101	42729-103	Ribbon Wire Assembly — 4 CKT
X102	42729-109	Ribbon Wire Assembly — 14 CKT
P101	39896-105	Polarized Straight Post Header — 8 CKT

CHANGES — CONTROL AND AUDIO BOARD

Q101	Aug., 1982	Remove Transistor 36613-000.
C132	Sept., 1982	Add 470 pF Capacitor 35100-134 across R136.
C133, C134	Sept., 1982	Add 270 pF Capacitors, 35100-124 across R132 and from Z115 Pin 1 to ground.
C136, C137	Sept., 1982	Add 470 pF Capacitors, 35100-134 across R109 and from Z114 Pin 3 to ground.
R166, R167	Oct., 1982	Cut foil to Pins 7 and 14 of Z110. Added 68 ohm Resistors, 33082-680, in series with the foil cuts.
C123	Nov., 1982	PCB incorrectly marked. Capacitor 35091-106, must have NEG. side installed in hole marked “+”.
	Dec., 1982	Add .22 Capacitor, 35076-101 (no symbol), from ground end of R102 to power ground. To prevent audio oscillation.
C138	Dec., 1982	Add 100 pF Capacitor, 35100-188, across R141 to reduce noise in control line.
D117	Dec., 1982	Add Zener Diode, 36549-000, from pin 9 of Z108 to -5 Volt line.
D118	Dec., 1982	Add Zener Diode, 36549-000, from pin 4 of Z108 to +5 Volt line.
R169	Jan., 1983	Cut PCB line from Z110 Pin 4 to -5 Volt line and add 1K Resistor, 33082-102, in series with the cut to protect Z110 from field miswiring.
R170	Jan., 1983	Cut PCB line from X102 Pin 13 to R112. Add 220 Resistor, 33101-221, in series with the cut to protect Z110 from miswiring.
	Jan., 1983	Remove .22 Capacitor 35076-101 (no symbol), added on December, 1982.
	Jan., 1983	Add 1 pin Connector (made from 5 post assembly, 39338-110) to ground foil by C122. Connects by wire assembly, 32557-W06, to Intercom Board.
	Jan., 1983	Cut ground foil next to P101, Pin 1 and 2.
	Jan., 1983	Add jumper wire from ground end of R102 to power ground.
	Jan., 1983	Add jumper wire from low level ground of R109 to high level ground.

Schematic Symbol	NuTone Part No.	Description
CHANGES — CONTROL AND AUDIO BOARD (Continued)		
X102	Jan., 1983	Add Polarized Straight Post Header, 14 CKT, 39896-107. Connects to ribbon wire assembly, 42852-102, which replaces assembly 42729-109.
	June, 1983	Remove Transistor Clip, 39886-000, from Z115.
	Jan., 1983 (IMA806)	Control and Audio complete assembly 0530A-000, replaces complete assembly, 0508A-000.

TERMINAL BOARD

42694-000	PC Board Assembly
37777-000	PC Board
VR801-VR805	36718-000 Varistor — Metal Oxide
	35238-000 Screw Terminal
P801	39338-103 Connector Post Assembly
	41724-000 Terminal Assembly
	39723-000 Pin Bead Terminal
P802	39896 106 Polarized Straight Post Header — 11 CKT
P803	39896-107 Polarized Straight Post Header — 14 CKT
P804	39896-101 Polarized Straight Post Header — 2 CKT

CHANGES — TERMINAL BOARD

C801, C802	June, 1982	Add 1000 pF Capacitors, 35129-103, for improved RFI protection.
L801, L802	June, 1982	Add 100 MicroH, RF Choke Coils, 30110-000, for improved RFI protection.
P804	June, 1982	Remove 2 CKT Straight Post Header, 39896-101.
	Jan., 1983	Antenna terminals staked into Terminal PC Board. Stronger than solder only.
BB2	June, 1983	Add jumper wire at BB2 to replace wire jumper between EXT. CHIME and CHIME GROUND.

GENERAL PARTS

42845-000	Front Panel — IM-806, IMA-806 T (Includes Push Button Assy. and Retainer)
42846-000	Front Panel — IM-806, IMA-806 M (Includes Push Button Assy. and Retainer)
39247-000	Cable Clamp
35300-000	Tuning Knob
39465-015	Screw, #6 x 1/4 Sld. Hex “17” for Mounting Tuning Knob
31396-000	Washer, 3/8" OD for Mounting Tuning Knob
48943-000	Insulator — Prescaler Board
35305-000	Heat Sink
35325-000	Insulator — Heat Sink
39886-000	Transistor Clip

REPLACEMENT PARTS

Schematic Symbol	NuTone Part No.	Description
	36115-000	Speaker, 5", 8 ohm
	48945-000	Insulator, Power Supply Module
	39881-000	Spacer — Long, for Control and Audio Board
	39882-000	Spacer — Short, for Control and Audio Board
	39884-000	Knob — Slide Position
	39883-000	Knob — 3 Position Switch
	35233-000	Push Button for SW203, SW204 or SW205
	42768-000	Push Button Assy. for End Call, Phone Talk, Door Talk and Inside/Patio Talk (Includes Push Button and Magnets)
	0509A-000	Magnet — Set of 4 for 42768-000
	35306-000	Retainer for Push Button Assembly
	42826-000	Plastic Bag Assembly (Mounting Brackets and Screws)
	35304-000	Mounting Bracket
	52786-039	Screw #6 x 3/8 Ph. Pan Hd. "A"
	42849-000	Hinge (Added January, 1983)
	52789-015	Screw #6 x 3/8 Ph./Sltd. Pan 25 (Hinge to Front Panel)
	52808-007	Screw #6 x 1/4 Ph. Pan Hd. "A" (Front Panel to Mounting Brackets)
	49215-000	Operator's Manual
	49216-000	Instruction Sheet
	FS-1255	Trouble - Shooting Guide

REMOTE SPEAKERS AND CONTROLS		
Inside Remotes — IS/ISA-85, IS/ISA-86, IC/ICA-81, IS/ISA-88		
Outside Remotes — IS-89, IC-81W (Early Production Units)		
	0518A-000	Speaker Panel Assembly IS/ISA-85
	0519A-000	Speaker Panel Assembly IS/ISA-86
	0511A-000	Panel Assembly IC/ICA-81
	0531A-000	Speaker Panel Assembly IS/ISA-88 Dark
	0532A-000	Speaker Panel Assembly IS/ISA-88 White
	0512A-000	Speaker Panel Assembly IS-89
	0516A-000	Panel Assembly IC-81W
	36119-000	Speaker, 5" IS/ISA-85, IS/ISA-86
	36089-000	Speaker, 8" IS/ISA-88
	36122-000	Speaker, 3" x 5", Weatherproof IS-89
	37776-000	PC Board Only
	42878-000	Compete Replacement PC Board Assembly (B Series Board) IS/ISA-85, IS/ISA-86, IC/ICA-81
	42885-000	Complete Replacement PC Board Assembly (B Series Board) IS/ISA-88
	42893-000	Compete Replacement PC Board Assembly (B Series Board) IS-89, IC-81W
	35326-000	Screw Retainer — PC Board (All Models)
	42767-000	Pushbutton Assembly IS/ISA-86
	42766-000	Pushbutton Assembly (All Other Models)
	35306-000	Pushbutton Retainer (All Models)
	0509A-000	Magnet — Set of Four (All Models)
	0517A-000	Rocker Switch Assembly IS-89, IC-81W
	35338-000	Retainer — Rocker Switch IS-89, IC-81W

Schematic Symbol	NuTone Part No.	Description
Diodes (All Models)		
D1-D3	36549-000	Rectifier, IN4002 or MR2065
D4	36746-000	Zener, IN5240B
D5-D7	36549-000	Rectifier, IN4002 or MR2065
D8, D9	36549-000	Rectifier, IN4002 or MR2065 (IS/ISA-85, ICA-81, ISA-88)
Resistors (All Models)		
R1, R2	33082-103	10K
R3, R9	33082-104	100K
R4	33082-562	5.6K
R5	33082-331	330
R6	33082-221	220
R7, R8	33082-223	22K
R10	33082-512	5.1K
R11, R16	33082-103	10K
R12, R13	34685-000	Slide Control — Volume (Inside Remotes)
R12, R13	34095-000	Potentiometer (Outside Remotes)
R14, R21	33082-104	100K
R15, R23	33082-564	560K
R17	33082-123	12K
R18	33082-472	4.7K
R19	33082-182	1.8K
R20	33082-471	470
R22, R25	33082-105	1M
R24, R27	33082-124	120K
R26	33082-274	270K
R28	33082-105	1M
R29	33082-334	330K
R30	33082-184	180K
R31	33082-122	1.2K
R32	33082-104	100K
R33	33082-561	560 (IS-85, IS-86, IC-81, IS-88, IS-89, IC-81W)
R33	32741-000	Jumper Wire .450 (ISA-85, ISA-86, ICA-81, ISA-88)
R34	33082-100	10 (ISA-85, ISA-86, ICA-81, ISA-88)
Capacitors (All Models)		
C1, C3	35091-106	Electrolytic, 2.2
C2	35091-104	Electrolytic, 33
C4, C15	35129-103	.001 (Inside Remotes)
C4, C15	35100-145	1000 pF (Outside Remotes)
C5, C8	35091-106	Electrolytic, 2.2
C6, C7	35129-104	.1, Axial Lead (IS/ISA-85, IC/ICA-81, IS/ISA-88)
C6, C7	35076-106	.1, Ceramic Disc (IS/ISA-86, IS-89, IC-81W)
C9, C13	35091-123	Electrolytic, 330, 16V
C10	35091-124	Electrolytic, 470, 6.3V
C11	35091-106	Electrolytic, 2.2
C12	35129-102	.047, Axial Lead (IS/ISA-85, IC/ICA-81, IS-88)
C12	35076-105	.05, Ceramic Disc (IS/ISA-86, ISA-88, IS-89, IC-81W)
C14	35091-127	Electrolytic, 100, 10V
Transistor (All Models)		
Q1	36738-000	N Channel Silicon, Siliconix J230, Motorola J230

Schematic Symbol	NuTone Part No.	Description
Integrated Circuits (All Models)		
Z1	36700-000	Op Amp, MC1741CP, Fairchild UA741TC
Z2	36741-000	Audio Amp, Sprague ULN2283B
Z3	36658-000	Quad Bilateral Sw., RCA CD4066AE, MC14066
Z4	36630-000	Quad AND, MC14081, SCL4081AE
Z5, Z6	36629-000	Quad, NOR, CD4001AE, MC14001
Z7	36740-000	Hex Inverter, MC14069BCP
Switches		
SW1	34686-000	Slide Switch, DP3T (Inside Remotes)
SW1	36772-000	Reed Switch (Outside Remotes)
SW2-SW5	36772-000	Reed Switch (All Models)
Miscellaneous		
MIC	36121-000	Electret Microphone (All Remotes)
	32558-W45	Wire Assembly — Blue (All Inside Remotes)
	35328-000	Knob — Slide Potentiometer (IS/ISA-85, IC/ICA-81, IS/ISA-88W)
	35329-000	Knob — Slide Potentiometer (IS/ISA-86, IS/ISA-88D)
	35330-000	Knob — 3 Position Switch (IS/ISA-85, IC/ICA-81, IS/ISA-88W)
	35331-000	Knob — 3 Position Switch (IS/ISA-86, IS/ISA-88D)
	35333-000	Knob — Volume Control (IS-89, IC-81W)
	42618-000	Envelope Assembly — Mounting Screws (IS/ISA-85, IC/ICA-81)
	0513A-000	Base Assembly w/Foot Bumpers (IS/ISA-86)
	1535A-000	Foot Bumper — Set of 4 (IS/ISA-86)
	41622-000	Envelope Assembly — Mounting Screws (IS/ISA-88D)
	42437-000	Envelope Assembly — Mounting Screws (IS/ISA-88W)
	42711-000	Envelope Assembly — Mounting Screws (IS-89)
	0514A-000	Envelope Assembly — Mounting Screws (IC-81W)

MID-SERIES CHANGES — REMOTE SPEAKER AND CONTROLS (Early Production)

D8, D9, D10	May, 1982	Add Diodes, 36549-000. All are in the circuit back-biased.
R33, D10	Aug., 1982	R33 shorted out and Diode, D10, across R33 removed.
	Aug., 1982	Spacers, 39745-000, added to improve clearance of reed switches on PCB.
C15	Dec., 1982	Added a .001 MF Capacitor, 35100-120, from Pin 6 to Pin 8 of Z2.
R10	Dec., 1982	Changed R10 from 5.1K to 1.2K Resistor, 33082-122. Some units provided with a 1.5K Resistor tacked across the 5.1K Resistor.
C3	June, 1983	2.2 Capacitor changed to .022 Capacitor, 35129-117.
		Changed PC Board from 37776-000 to 37784-000 to incorporate changes to date.

Schematic Symbol	NuTone Part No.	Description
REMOTE SPEAKERS AND CONTROLS		
Inside Remotes — ISB-85, ISB-86, ICB-81, ISB-88D/W		
Outside Remotes — ISA-89, ICA-81W		
(Late Production Units)		
	0518A-000	Speaker Panel Assembly ISB-85
	0519A-000	Speaker Panel Assembly ISB-86
	0511A-000	Panel Assembly ICB-81
	0531A-000	Speaker Panel Assembly ISB-88 Dark
	0532A-000	Speaker Panel Assembly ISB-88 White
	0512A-000	Speaker Panel Assembly ISA-89
	0516A-000	Panel Assembly ICA-81W
	36119-000	Speaker, 5" ISB-85, ISB-86
	36089-000	Speaker, 8" ISB-88
	36122-000	Speaker, 3"x5", Weatherproof ISA-89
	42878-000	PC Board Assembly (With PC Board 37794-000) ISB-85, ISB-86, ICB-81
	42885-000	PC Board Assembly (With PC Board 37793-000) ISB-88
	42893-000	PC Board Assembly (With PC Board 37795-000) ISA-89, ICA-81W
	35326-000	Screw Retainer — PC Board (All Models)
	42767-000	Pushbutton Assembly ISB-86
	42766-000	Pushbutton Assembly (All Other Models)
	35306-000	Pushbutton Retainer (All Models)
	0509A-000	Magnet — Set of Four (All Models)
	0517A-000	Rocker Switch Assembly ISA-89, ICA-81W
	35338-000	Retainer — Rocker Switch ISA-89, ICA-81W
Diodes (All Models)		
D1-D3	36549-000	Rectifier, IN4002 or MR2065
D4	36746-000	Zener, IN5240B
D5-D7	36549-000	Rectifier, IN4002 or MR2065
Resistors (All Models)		
R1, R2	33082-103	10K
R3	33082-564	560K
R4, R11	33082-102	1K
R5	33082-100	10
R6	33082-561	560
R7	33082-152	1.5K
R8	33082-822	8.2K
R9, R30	33082-474	470K
R10, R31	33082-122	1.2K (Inside Remotes)
R10	33082-222	2.2K (Outside Remotes)
R12, R13	34685-000	Slide Control — Volume (Inside Remotes)
R12, R13	34095-000	Potentiometer (Outside Remotes)
R14	33082-104	100K
R15	33082-103	10K
R16	33082-563	56K
R17	33082-123	12K
R18	33082-472	4.7K
R19	33082-182	1.8K
R20	33082-471	470
R21, R23	33082-104	1.5K
R22, R25	33082-105	1M
R24, R27	33082-124	120K
R26	33082-274	270K

REPLACEMENT PARTS

Schematic Symbol	NuTone Part No.	Description
R28	33082-105	1M
R29	33082-334	330K
R32	33082-222	2.2K (Inside Remotes)
Capacitors (All Models)		
C1	35129-121	.33
C2	35091-123	Electrolytic, 330, 16V (Inside Remotes)
C2	35091-104	Electrolytic, 33 (Outside Remotes)
C3	35129-122	18 pF
C4	35129-105	.22
C5	35129-102	.047
C6	35129-104	.1 (Inside Remotes)
C6	35129-111	470 pF (Outside Remotes)
C7	35129-104	.1
C8	35091-106	Electrolytic, 2.2
C9, C13	35091-123	Electrolytic, 330, 16V
C10	35091-124	Electrolytic, 470, 6.3V
C11	35091-123	Electrolytic, 330, 16V (Inside Remotes)
C11	35091-106	Electrolytic, 2.2 (Outside Remotes)
C12	35129-104	.1
C14	35091-127	Electrolytic, 100, 10V
C15	35129-103	.001
C18	35129-111	470 pF (Inside Remotes)
Transistor (All Models)		
Q1	36738-000	N Channel Silicon, Siliconix J230, Motorola J230
Integrated Circuits (All Models)		
Z1	36773-000	Op Amp, National Semi. LF411CN (Inside Remotes)
Z1	36700-000	Op Amp, MC1741CP (Outside Remotes)
Z2	36741-000	Audio Amp, Sprague ULN2283B
Z3	36658-000	Quad Bilateral Sw., RCA CD4066AE, MC14066
Z4	36630-000	Quad AND, MC14081, SCL4081AE
Z5, Z6	36629-000	Quad NOR, CD4001AE, MC14001
Z7	36740-000	Hex Inverter, MC14069BCP
Switches		
SW1	34686-000	Slide Switch, DP3T (Inside Remotes)
SW1	36772-000	Reed Switch (Outside Remotes)
SW2-SW5	36772-000	Reed Switch (All Models)
Miscellaneous		
MIC	36121-000	Electret Microphone (All Remotes)
	32558-W45	Wire Assembly — Blue (All Inside Remotes)
	35328-000	Knob — Slide Potentiometer (ISB-85, ICB-81, ISB-88W)
	35329-000	Knob — Slide Potentiometer (ISB-86, ISB-88D)
	35330-000	Knob — 3 Position Switch (ISB-85, ICB-81, ISB-88W)
	35331-000	Knob — 3 Position Switch (ISB-86, ISB-88D)

Schematic Symbol	NuTone Part No.	Description
	35333-000	Knob — Volume Control (ISA-89, ICA-81W)
	42618-000	Envelope Assembly — Mounting Screws (ISB-85, ICB-81)
	0513A-000	Base Assembly w/Foot Bumpers (ISB-86)
	1535A-000	Foot Bumper — Set of 4 (ISB-86)
	41622-000	Envelope Assembly — Mounting Screws (ISB-88D)
	42437-000	Envelope Assembly — Mounting Screws (ISB-88W)
	42711-000	Envelope Assembly — Mounting Screws (ISA-89)
	0514A-000	Envelope Assembly — Mounting Screws (ICA-81W)
IA-22 ELECTRONIC CHIME BOARD (Early Production Units)		
	42689-000	Complete Assembly
	37780-000	PC Board
Diodes		
D701	36549-000	Rectifier, IN4002
Resistor		
R701-R703	33103-470	47, 1/8W
R704, R705	33082-102	1K
R706, R707	33082-472	4.7K
R708	33082-123	12K
R709	33082-153	15K
R710	33082-133	13K
R711	33082-104	100K
R712	33082-563	56K
R713	33082-124	120K
R714-R716	33082-224	220K
R717-R719	33082-474	470K
R720	33082-564	560K
R721 R724	33082-105	1M
R725, R726	33082-335	3.3M
R727, R728	33082-223	22K
R729	33082-333	33K
R730	33082-513	51K
R731	33082-562	5.6K
R732	33082-225	2.2M
R733-R736	34092-000	Potentiometer, Trim 10K
R737	34050-000	Potentiometer, Trim 5K
Capacitors		
C701-C704	35100-184	.001
C705	35055-113	Mylar, .1
C706	35100-141	.05
C707-C711	35076-106	.1
C712, C713	35091-111	Electrolytic, 2.2
C714, C715	35091-119	Electrolytic, 4.7
C716	35091-102	Electrolytic, 10

Schematic Symbol	NuTone Part No.	Description
Integrated Circuits		
Z701	36659-000	Decade Counter, MC14017BCP
Z702	36677-000	Trigger, MC14584BCP
Z703	36644-000	Quad NOR, CD4001UBE
Z704	36660-000	Triple Input NOR
Z705	36755-000	Triple Input OR
Z706	36630-000	Quad AND, SCL4081-AE
Z707	36754-000	Optical Coupler
Z708, Z710	36658-000	Quad Bilateral, CD4066AE, CD4066BE
Z709	36701-000	Quad OR, MC14071BCP
Transistors		
Q701	36598-000	NPN Silicon, MPS6532
Q702, Q703	36613-000	NPN Silicon, MPS-A20
Q704	36590-000	NPN Planar Silicon, MPS-A13
Q705	36738-000	N Channel Silicon, J230
Connectors		
P701	39339-103	Connector Receptacle
P702	39338-111	Connector Post Assembly
IAA-22 ELECTRONIC CHIME BOARD		
(Late Production Units)		
	42801-000	Complete Assembly
	37789-000	PC Board Only
Diodes		
D701, D702	36617-000	Silicon, IN914 or IN4148
D703	36763-000	Zener, IN4733A
Resistors		
R701, R702	33082-332	3.3K
R703	33082-473	47K
R704-R706	33082-332	3.3K
R707	33082-104	100K
K708	33082-472	4.7K
R709, R719	33082-103	10K
R710	33082-223	22K
R711	34050-000	Potentiometer, Trim 5K
R712	33028-470	47, 2W
R713-R715	33082-470	47
Capacitors		
C701	35091-131	Electrolytic, 10
C702, C705	35091-120	Electrolytic, 2.2
C703	35100-162	27 pF
C704	35129-107	.01
C706, C709	35129-104	.1
C707, C708	35129-102	.047
Integrated Circuits		
Z701	36725-000	Microprocessor

Schematic Symbol	NuTone Part No.	Description
Z702	36629-000	Quad NOR, CD4001AE
Z703	36747-000	Hex Open Drain, NM74C906
Transistors		
Q701, Q702	36613-000	NPN Silicon, MPS-A20
Q703	36590-000	NPN Planar Silicon, MPS-A13
Miscellaneous		
CR701	39913-000	Ceramic Resonator, 4 Mhz
J701	39339-000	Connector Receptacle
	39747-000	Socket — 28 Pin I.C.
	48946-000	Instruction Sheet

CHANGES IAA-22 CHIME BOARD

	Oct., 1984	Complete Assembly, Part No. 43089-000 replaced 42801-000. All October, 1984 changes improved lightning protection.
37789-000	Oct., 1984	Changed to PC Board 37883-000.
R716-R718	Oct., 1984	Added 100K Resistors, 33082-104.
R720	Oct., 1984	Added 330 ohm Resistor. 33082-331.
R721	Oct., 1984	Added 1.1K Resistor, 33082-112.
C710-C712	Oct., 1984	Added .1 mF Capacitors, 35129-104.
C713, C714	Oct., 1984	Added 2.2 mF Capacitors, 35091-120.
D704, D705	Oct., 1984	Added Silicon Diodes, 36617-000, IN914 or IN4148.

IT-10 TELEPHONE COUPLER BOARD

	13810-900	Complete Assembly
	35205-000	Base
	42685-000	PC Board Assembly
	37778-000	PC Board
Diodes		
D1	36751-000	Zener, Type IN5254B
D2-D11	36549-000	Rectifier, Type IN4002
D12-D15	36688-000	Type IN4004
Resistors		
R1	33082-560	56
R2	33082-102	1K
R3, R4	33082-103	10K
R5	33082-101	100
R6	33082-222	2.2K
R7	33082-221	220
R8, R11	33082-106	10M
R9	33082-272	2.7K
R10	33082-331	330
R12	33082-332	3.3K
R13, R16	33082-563	56K
R14, R17	33082-106	10M
R15, R18	33082-103	10K
R19	33082-104	100K
R20	33082-362	3.6K

REPLACEMENT PARTS

Schematic Symbol	NuTone Part No.	Description
R21 R22	33082-821 33082-512	820 5.1K
Capacitors		
C1-C4 C5	35091-120 35055-111	Electrolytic, 50V, 2.2 Mylar, .1
Integrated Circuits		
Z1, Z2 Z3 Z4	36124-000 36126-000 36123-000	Optical Coupler, CNY17-2 Optical Coupler, H11AA1 Photon Coupled Isolator, 4N29
Transistors		
Q1 Q2	36590-000 36733-000	NPN Planar Silicon, MPS-A13 NPN Silicon, National Semi. TN2219A
Miscellaneous		
TB1 K1	36127-000 39337-000 10895-900 39247-000 35206-000 49018-000	Connector, 6 Pin Relay — Reed, Wabash Inc. 118-7-2 Dialer Harness Cable Clamp Cover Instruction Sheet

CHANGES — TELEPHONE COUPLER

R13, R16	April, 1983	Replaced 56K Resistor with 22K Resistor, 33082-223.
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C6, C7	April, 1983	Added 0.1 Capacitor, 35076-110.
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IT-10C TELEPHONE COUPLER BOARD (CANADIAN)

	42835-000 35205-000 42836-000 37792-000	Complete Assembly Base PC Board Assembly PC Board
Diodes		
D1 D2-D11 D12-D15	36751-000 36549-000 36688-000	Zener, Type IN5254B Rectifier, Type IN4002 Type IN4004
Resistors		
R1 R2 R3, R4 R5 R7, R26 R8 R13, R16 R14, R17	33082-560 33082-102 33082-103 33082-101 33082-221 33082-106 33082-563 33082-106	56 1K 10K 100 220 10M 56K 10M

Schematic Symbol	NuTone Part No.	Description
R15, R18 R19, R27 R21 R23, R24 R25 R28, R31 R29 R30 R32	33082-103 33082-104 33082-821 33082-272 33082-821 33082-561 33082-272 33082-472 34072-000	10K 100K 820 2.7K 820 560 2.7K 4.7K Trim Potentiometer, 10K
Capacitors		
C1-C4 C5 C6-C8 C9-C12	35091-120 35055-111 35129-104 35091-120	Electrolytic, 50V, 2.2 Mylar, .1 .1 ± 20% Electrolytic, 50V, 2.2
Integrated Circuits		
Z1, Z2 Z3 Z4	36124-000 36126-000 36123-000	Optical Coupler, CNY17-2 Optical Coupler, H11AA1 Photon Coupled Isolator, 4N29
Transistors		
Q1 Q2 Q3	36590-000 36733-000 36748-000	NPN Planar Silicon, MPS-A13 NPN Silicon, National Semi. TN2219A
Miscellaneous		
TB1 K1	36127-000 39337-000 31967-000 35206-000 32732-000 49018-000	Connector, 6 Pin Relay — Reed, Wabash, Inc. 118-7-2 Cable Clamp Cover Plug Assembly Instruction Sheet

CHANGES — TELEPHONE COUPLER (CANADIAN)

R2	April, 1983	Replaced 1K Resistor with 47 ohm Resistor, 33082-470.
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R13, R16	April, 1983	Replaced 56K Resistors with 22K Resistors, 33082-223.
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R21	April, 1983	Replaced 820 ohm Resistor with 560 ohm Resistor, 33082-561.
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R25	April, 1983	Replaced 820 ohm Resistor with 330 ohm Resistor, 33082-331.
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