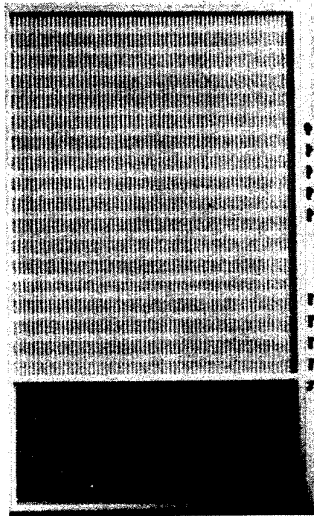


SERVICE MANUAL
NUTONE MODEL IMA-516



COMMUNICOM
BUILT-IN INTERCOM SYSTEMS

BACKGROUND MUSIC AMPLIFIER

DIRECT-A-COM 3
APARTMENT HOUSE SYSTEMS

NuTone

Madison & Red Bank Roads, Cincinnati, Ohio 45227

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Part No. FS1075

GENERAL

(1) The NuTone Model IMA-516 Amplifier and ISA-53 Inside Intercom Speaker are designed for use in residential and commercial Commu-Ni-Com intercom systems, which may, or may not, incorporate door communications, with the door speaker being operated in a "Hands Free" manner.

(1.1) The IMA-516 and ISA-53 will be supplied after 1 January 1979.

(2) The IMA-516 may be used as a "Background Music" amplifier, where the music program is supplied by one of the NuTone Radio/Intercom Master Units or by some other audio source.

(2.1) The installation instructions supplied with the Radio/Intercom Master Units give complete details for background music connection.

(3) The intercom signal switching; and background music muting capability of the IMA-516/ISA-53 permits their use in systems that include both the intercom and background music features.

(3) The IMA 516 may serve as the Control Amplifier in Direct-A-Coms 3 Apartment House Systems and is specifically recommended for use in Townhouse Apartment systems, i.e. where each apartment requires its own individual door speaker.

(4) The IMA-516 supersedes both the Model IM-516 and Model 470 Amplifiers.

(4.1) The IMA-516 can be used as a replacement for these earlier units with very little or no modification.

(4.2) Slight modifications that may be required are pointed out in the appropriate sections of this manual.

(5) The Model 470 Service Manuals (NuTone Part No's. 45126 and 46029); and the IM-516 Service Manual (NuTone Part No. 46765-000) should be used as a reference when comparing the various amplifiers and speakers.

(6) NOTE: When the IMA-516 is used to replace the Model 470 or Model IM-516 amplifiers in sys-

tems using NuTone's Model 105-N Power Transformer (120/16Vac. 15VA), the transformer must be replaced by NuTone's Model 301-N Power Transformer (120/16 Vac, 30VA). The 301-N should be used with the IMA-516 in all applications.

(7) OPTIONAL COMMU-NI-COM SPEAKERS

(7.1) In some intercom installations, especially those including background music capability, it may be desirable to use better fidelity speakers such as NuTone's Model ISB-48 8-Inch Inside Speaker with Controls.

(7.2) The NuTone Model ISA-49 5-Inch Weatherproof Speaker may be used for patio and porch installations.

(7.2.1) Additional weather-proof speakers may be used with the NuTone Model ICA-41 Weatherproof 6-Wire Speaker Remote Control.

(7.2.2) The Model ISA-46 Portable Plug-in 5-Inch Speaker; the Model ISB-47 Built-in 5-Inch Speaker/Clock Timer; and the Model ISA-44 Portable Plug-in 5-Inch Speaker/Clock Timer may also be used in the IMA-516 Commu-Ni-Com System.

(7.3) The foregoing speakers will be referred to as the "40 Series 6-Wire Speakers" in this manual, and their operation will be covered under the general heading of Inside Intercom Speakers.

(7.3.1) In the INSTALLATION WIRING DIAGRAM, Figure 1, a 40 Series 6-Wire Speaker may be substituted for any of the ISA-53 Inside Speakers.

(8) A total of ten (10) inside and outside intercom speakers may be used in the system — in any combination of ISA-53 and 40 Series 6-Wire Speakers.

(8) INSTALLATION:

(8.1) The various components of the Commu-Ni-Com; Background Music; and Apartment House Systems should be installed in compliance with their accompanying installation instructions.

(8.2) Wiring and connections may be checked against the wiring diagrams and schematics in this manual.

COMMU-NI-COM SYSTEM: OPERATIONAL CHECKOUT

(1) After the Commu-Ni-Com System has been correctly installed, it should be capable of completing the entire checkout procedure.

(1.1) Failure to complete any step in the checkout procedure indicates improper installation, and/or a mal-function in one or more of the components and/or the interconnecting wiring.

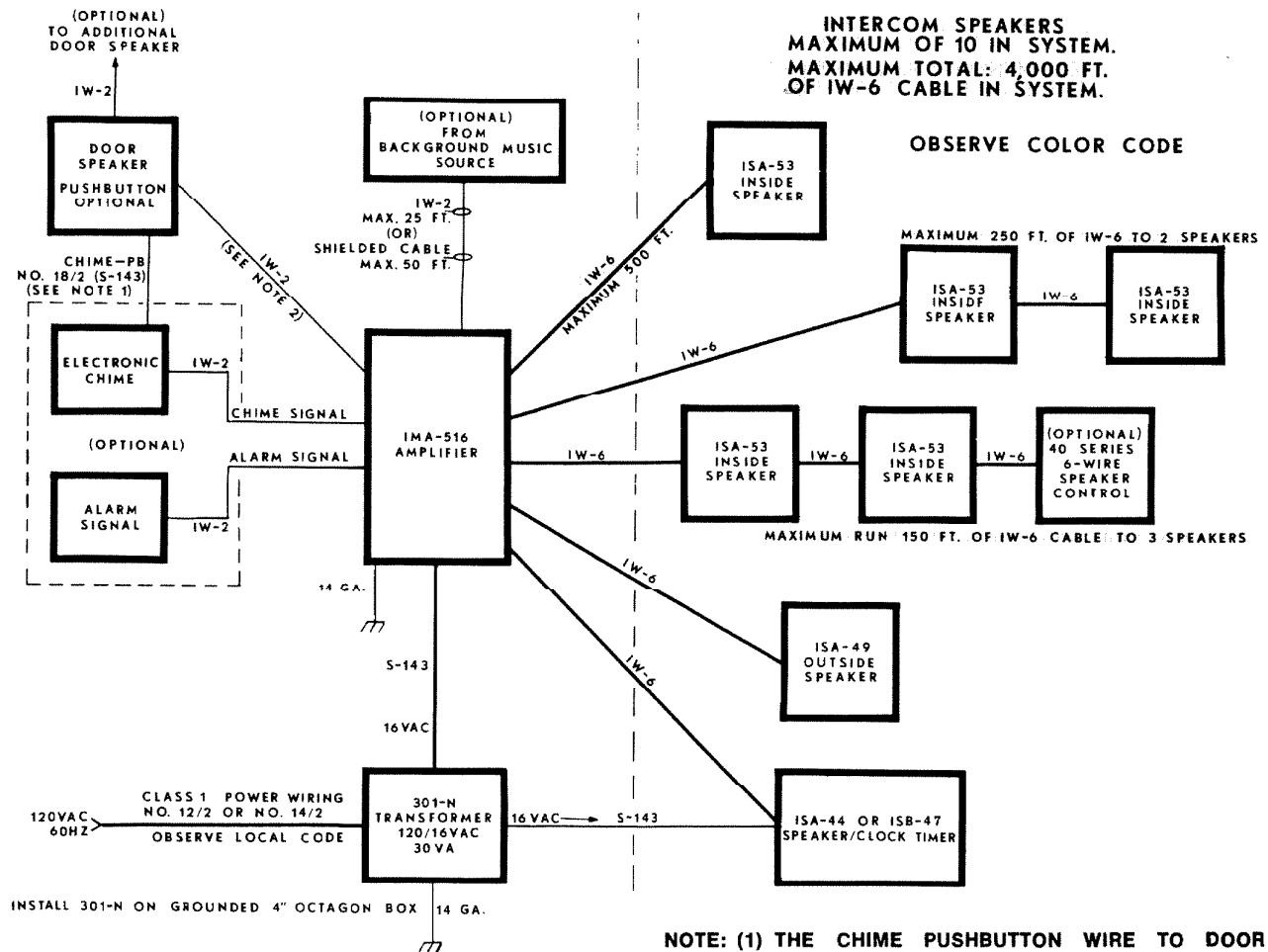
(2) At every intercom speaker (ISA-53 and/or 40 Series 6-Wire Speaker Control), set the speaker VOLUME CONTROL to maximum, i.e. full clockwise position.

(3) Remove cover from the IMA-516 Amplifier.

(4) At any ISA-53, push-down and hold the INTERCOM SWITCH in TALK position.

(4.1) Or, if call is being made at a 40 Series 6-Wire Speaker Control, activate (hold-down) the INSIDE/PATIO TALK SWITCH.

(4.2) If system includes the background music capability, the entertainment program will be muted when a switch at an intercom speaker is activated.



**INTERCOM SPEAKERS
MAXIMUM OF 10 IN SYSTEM.
MAXIMUM TOTAL: 4,000 FT.
OF IW-6 CABLE IN SYSTEM.**

OBSERVE COLOR CODE

MAXIMUM 250 FT. OF IW-6 TO 2 SPEAKERS

MAXIMUM RUN 150 FT. OF IW-6 CABLE TO 3 SPEAKERS

NOTICE: Chime and/or Alarm should be installed in regular manner — using their own power transformer according to their individual installation instructions. DO NOT power Chime nor Alarm from 301-N Transformer that is used to power the IMA-516 Amplifier.

- NOTE:** (1) THE CHIME PUSHBUTTON WIRE TO DOOR SPEAKER IS REQUIRED ONLY WHEN MODEL ISA-64 OR MODEL IS-67 DOOR SPEAKERS ARE USED
- (2) THE DOOR SPEAKERS' IW-2 CABLE MAY BE CONNECTED TO THE BLACK AND BLACK/W TERMINALS IN THE IMA-516 AMPLIFIER OR IN NEAREST INSIDE INTERCOM SPEAKER.

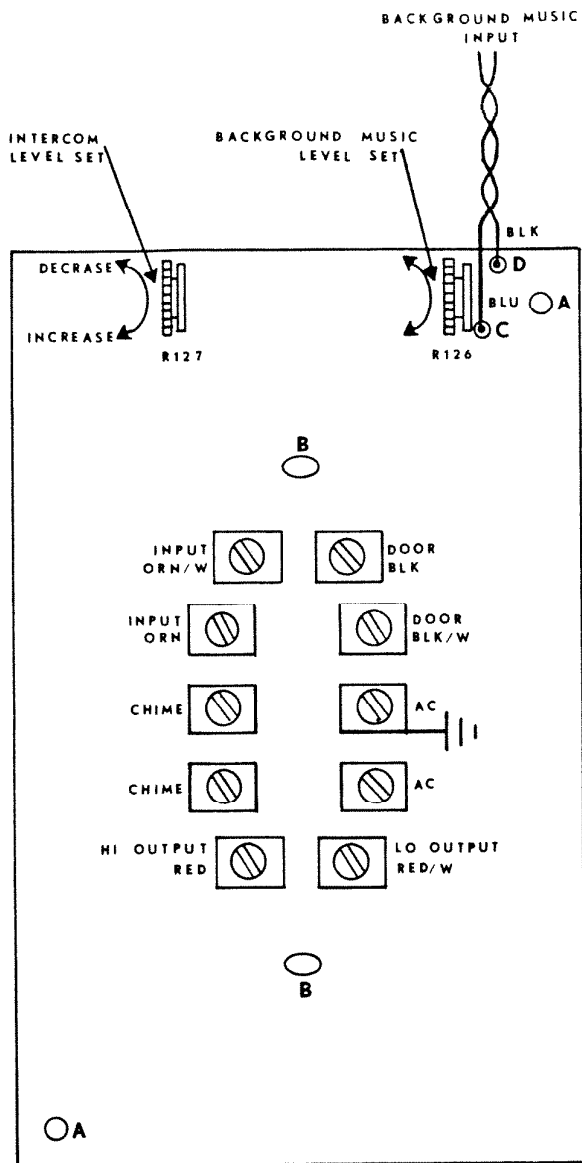
IMPORTANT
TO AID IN REDUCING HUM AND BUZZ FROM LIGHT DIMMERS, ALL REMOTE SPEAKER WIRES AND CABLES SHOULD BE RUN AT LEAST 12 INCHES FROM ANY A.C. POWER WIRING.

USE RECOMMENDED NUTONE WIRE AND CABLE

**IMA-516 COMMU-NI-COM REPRESENTATIVE SYSTEM WIRING DIAGRAM
FIGURE 1**

- (4.3) Talk into the activated speaker, the intercom message should be heard at every other intercom speaker.
- (4.4) When intercom message is completed, release the INTERCOM SWITCH. It should automatically return to its NORMAL (LISTEN) position.
- (5) The call may be answered from every other intercom speaker by following the directions in paragraphs (4) through (4.4) above.
- (6) ADJUST INTERCOM SYSTEM VOLUME:**

- (6.1) At the IMA-516, adjust the INTERCOM LEVEL SET CONTROL R127 so that the volume of the received intercom signal in the area requiring the greatest sound level is sufficient for that area.
- (6.1.1) It may be required that one person adjust R127 while another person talks into an activated intercom speaker.
- (6.2) Individually adjust the VOLUME CONTROL at every intercom speaker for the correct level in its area.



**IMA-516 PRINTED CIRCUIT TERMINAL BOARD
SHOWING CONTROLS AND CONNECTIONS
FIGURE 2**

(6.3) IN ANY CASE THE VOLUME CONTROLS AT THE SPEAKERS SHOULD BE SET AS NEAR MAXIMUM AS POSSIBLE — IN ACCORDANCE WITH THE SOUND LEVEL REQUIRED FOR ITS AREA; AND THAT IMA-516's INTERCOM LEVEL SET CONTROL BE SET TO THE LOWEST LEVEL POSSIBLE.

(6.3.1) THIS WILL HELP PREVENT OVER-DRIVING THE AMPLIFIER WHILE AT THE SAME TIME ASSURING SUFFICIENT INTERCOM SIGNAL FROM THE ORIGINATING SPEAKER. (THE SPEAKER'S VOLUME CONTROL ADJUSTS ITS INTERCOM AUDIO OUTPUT WHEN IT IS ACTING AS A MICROPHONE AS WELL AS ITS LEVEL WHEN ACTING AS A SPEAKER.)

(7) DOOR SPEAKER(S) COMMUNICATIONS:

(7.1) Door Speaker(s) are normally OFF and they can neither receive nor send intercom messages.

(7.2) AT AN ISA-53 INSIDE SPEAKER:

(7.2.1) Concurrently, hold the DOOR SWITCH in the ON position, and the INTERCOM SWITCH in the TALK position and talk into the speaker in a normal voice. The door intercom message should be heard at the Door Speaker(s) and at every other intercom speaker.

(7.2.2) While holding DOOR SWITCH in ON position, release the INTERCOM SWITCH (it will automatically return to its normal (LISTEN) position) in order to hear the Door Speaker(s) answering intercom message. The door's intercom signals should be heard at the activated ISA-53 and at all other intercom speakers.

(7.2.3) In turn, check door intercom operation at every other ISA-53 Speaker.

(7.3) AT A 40 SERIES 6-WIRE SPEAKER CONTROL:

(7.3.1) Activate (press and hold-down) the DOOR TALK SWITCH and speak into the unit in a normal voice. The intercom message should be heard at the door and at all other intercom speakers.

(7.3.2) In order to hear the Door Speaker's answer, release the DOOR TALK SWITCH and activate the DOOR LISTEN SWITCH. The door's intercom signals will be heard at the activated speaker and at all other intercom speakers.

(7.4) If system includes background music, the music program will be muted during door intercom operation.

(8) CHIME/ALARM OPERATION

(8.1) The NuTone Electric Chime should be installed with its own recommended transformer according to its installation instructions.

(8.1.1) DO NOT USE THE IMA-516 Amplifier's MODEL 301-N POWER TRANSFORMER TO POWER THE DOOR CHIME.

(8.2) The output of the chime's electronic pickup should be connected — via twisted-pair cable, NuTone IW-2 — to the Chime Terminals in the IMA-516.

(8.3) Activate (close) chime's pushbutton, and adjust its electronic output control so that the chime signal will override the music program, or when background music is not used, loud enough so that it can be heard through all intercom speakers.

(8.3.1) If necessary, re-adjust the INTERCOM LEVEL SET CONTROL in the IMA-516 Amplifier and/or the individual VOLUME CONTROLS at the individual intercom speakers. (Reference paragraphs (6) through (6.3.1) above.)

(8.4) If an alarm signal is also fed through the Chime Terminals of the IMA-516, activate the alarm system and make certain that alarm signals are heard at all intercom speakers. Adjust volume as noted above.

(9) INTERCOM PLUS BACKGROUND MUSIC:

(9.1) Operation of the intercom and door speakers in TALK and LISTEN modes is the same as described above.

(9.2) When the background music source is a NuTone Radio/Intercom Master Unit, the connections to the unit and the setting of its volume should be carried out in accordance with its accompanying installation instructions.

(9.3) In the IMA-516, adjust the BACKGROUND MUSIC LEVEL SET CONTROL R126 for sufficient volume at all speaker locations. (Reference paragraphs (6) through (6.3.1) above.)

(9.4) When any DOOR; INTERCOM; TALK; or LISTEN switch is operated at any intercom speaker, the background music should be muted.

(10) LISTEN-IN (MONITOR) OPERATION:

(10.1) ONLY the ISA-53 Speaker can be operated in the Listen-in mode.

(10.1.1) (The earlier Model IS-53 can be operated Listen-in, but this speaker is not recommended for Commu-Ni-Com Systems installed after 1 January 1979, i.e. those using the IMA-516 Amplifier.)

(10.2) At the ISA-53 Speaker; While holding the INTERCOM SWITCH in the TALK position, press-in the TALK LOCK PUSHBUTTON; release first the INTERCOM SWITCH, and then the TALK LOCK PUSHBUTTON. The INTERCOM SWITCH should remain "Locked" in the TALK position.

(10.2.1) If the system includes background music, the music will be muted.



ISA-53 INSIDE INTERCOM SPEAKER
FIGURE 3

(10.3) Two or more ISA-53 Speakers may be operated Listen-in at the same time.

(10.4) Sounds in the vicinity of any speaker being operated in the Listen-in mode will be heard at all other intercom speakers that are operating in their normal mode.

(10.5) While one or more speakers are operated Listen-in, the intercom and door, talk and listen functions can be initiated by the intercom speakers that are operating in their normal mode.

(10.5.1) These intercom messages will not be heard by the ISA-53 Speakers that are in the Listen-in mode.

SPEAKER/CLOCK TIMER OPERATION (OPTIONAL)

(See Figure 5)

(1) When system installation is completed and the power is first applied to the Speaker/Clock Timer, the clock display will be turned-on at a random time with the AM or PM indicator flashing at a one-second pulse rate.

(1.1) When the ISA-44 Portable Plug-in 5-Inch Speaker/Clock Timer is unplugged; moved to another location; and plugged into another IA-12 Wall Receptacle, it is the same as initially applying power to the Speaker/Clock Timer.

(1.2) If the power is interrupted for a very brief period of time (something in the order of 2-seconds), when the power resumes, the correct time will be shown, and the TIME OF DAY (AM or PM) indicator will be flashing at a one-second pulse rate.

(1.3) If the AM or PM indicator is flashing and the time shown is correct: throw TIME SET ENABLE SWITCH SW1 to SET; press-in the SLOW SET SWITCH SW6 for the briefest of times — i.e. long enough for the indicator to go to a steady state,

but not long enough for the minute digit to advance. (Note, just tap SW6). Throw SW1 to LOCK position.

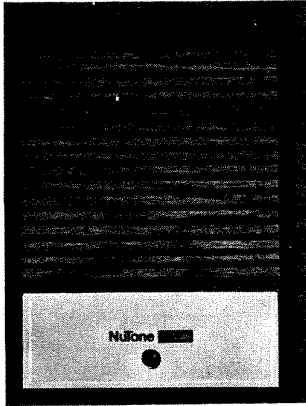
(2) The hours/minutes display CAN NOT be changed when the TIME SET ENABLE SWITCH SW1 is in the LOCK position.

(2.1) SW1 should be kept in LOCK position except when it is specifically desired to change the display. This will prevent inadvertent activation of SLOW SET SWITCH SW6 and FAST SET SWITCH SW7.

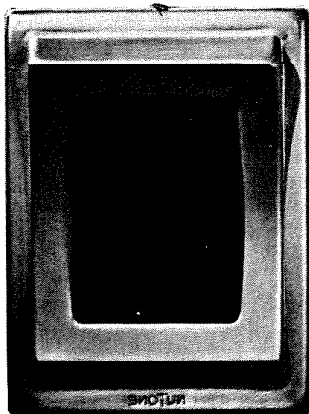
(3) SET TO CORRECT TIME OF DAY:

(3.1) The ALARM ENABLE SWITCH SW2 should be in the RADIO ON position when setting time display, this will prevent accidentally activating the alarm while advancing clock to desired time.

(3.2) Throw TIME SET ENABLE SWITCH SW1 to SET position.



IS-65



IS-61

**BUILT-IN DOOR SPEAKERS
FIGURE 4**

(3.3) For small change in time: Hold-in SLOW SET SWITCH SW6 until clock hours:minutes and time of day (AM or PM) indicator is correct. Clock minutes will advance at a 2 Hz. rate, and hours will advance one count in 30 seconds.

(3.4) If greater than incidental change is required, hold-in the FAST SET SWITCH SW7 until clock hours:minutes and time of day (AM or PM) indicator approach the correct time; release SW7. Clock minutes will advance at a 60 Hz. rate, and hours will advance at a 1 Hz. rate.

(3.4.1) Release SW7, and bring to correct time with SW6 as described in paragraph (3.3) above.

(3.5) When correct time is displayed, throw TIME SET ENABLE SWITCH SW1 to LOCK position.

(4) SET ALARM TIME:

(4.1) The ALARM ENABLE SWITCH SW2 should be in RADIO ON (center) position in order to prevent activation of alarm signal while setting to desired alarm time.

(4.2) Activate (press-in) ALARM DISPLAY SWITCH SW5, the display will show the hour:minutes and time of day (AM or PM) that the alarm is set to for activation.

(4.3) If alarm time change is desired: Throw TIME SET ENABLE SWITCH SW1 to SET position.

(4.4) While holding-in the ALARM DISPLAY SWITCH SW5 with one hand, use other hand to hold-in SLOW SET SWITCH SW6 or FAST SET SWITCH SW7 until display reads hours:minutes and time of day (AM or PM) that is desired for activating the alarm signal.

(4.4.1) MAKE CERTAIN THAT THE ALARM DISPLAY SWITCH IS HELD IN WHILE YOU ARE SETTING THE ALARM TIME WITH SW6 OR SW7. IF THE ALARM DISPLAY SWITCH IS RELEASED WHILE EITHER SW6 OR SW7 IS BEING HELD-IN, THE CLOCK TIME OF DAY WILL BE CHANGED.

(4.5) After the alarm time is set and SW6 and SW7 are released, release the Alarm DISPLAY SWITCH SW5. The display will now show the time of day.

(4.6) Throw TIME SET ENABLE SWITCH SW1 to LOCK position.

(5) ALARM OPERATION:

(5.1) Activate the ALARM DISPLAY SWITCH SW4, and read alarm set time on display, noting AM-PM indicator.

(5.1.1) If time shown on display is not time desired for activating the alarm: set alarm time as directed in paragraphs (4) through (4.6) above.

(5.2) Throw ALARM ENABLE SWITCH SW2 to WAKE ALARM position.

(5.2.1) The ALARM ARMED INDICATOR LIGHT in THE display should be turned ON.

(5.3) The Commu-Ni-Com intercom and background music features will be retained by the system when the ALARM is set.

(5.3.1) Since the music is not muted when alarm is set (as is done when Speaker/Clock Timers are used with NuTone's Radio/Intercom Systems), the WAKE MUSIC position of ALARM ENABLE SWITCH SW2 is not used with the IMA-510.

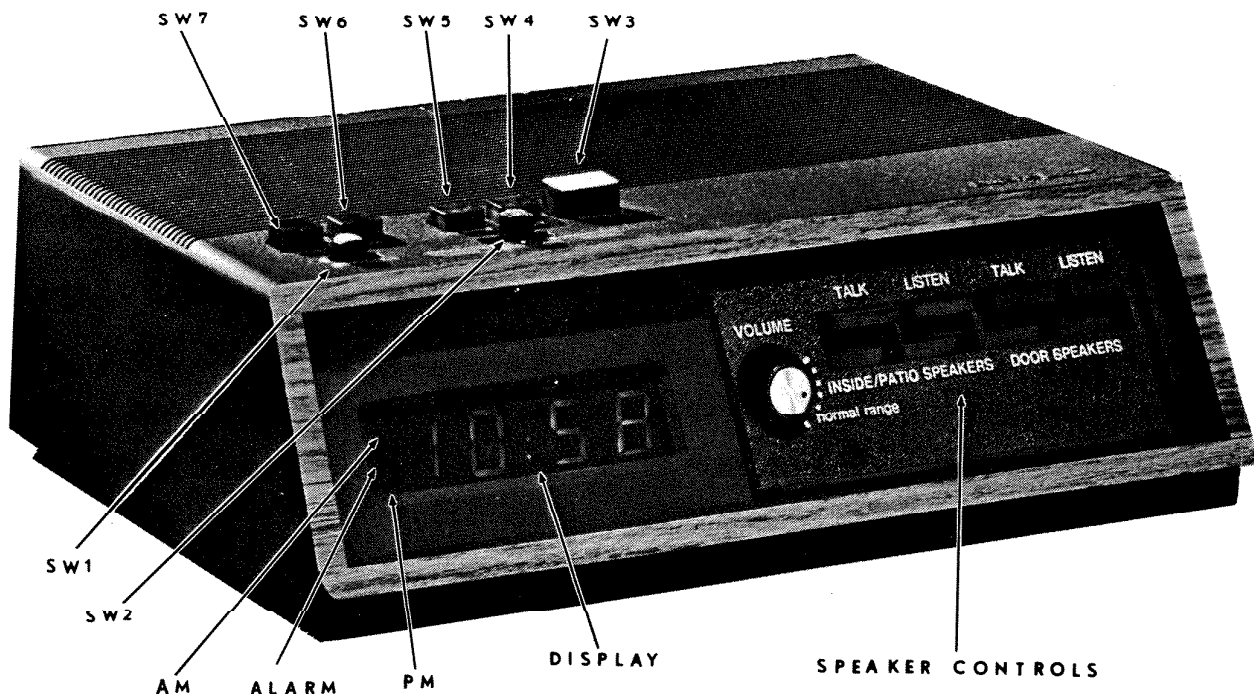
(5.4) When the clock's time of day has advanced to coincide with the alarm set time, the alarm signal in the Speaker/Clock Timer will be activated. (The alarm signal will not be heard through other speakers in the Commu-Ni-Com System.)

(5.5) To silence alarm signal, throw ALARM ENABLE SWITCH SW2 to RADIO ON (center) position.

(5.5.1) The ALARM ARMED INDICATOR LIGHT in the display will be turned OFF.

(5.5.2) If SW2 is not thrown to RADIO ON position, the alarm signal will continue for 59 minutes and then will automatically be terminated.

(5.5.2.1) When the clock time of day advances to the alarm set time (in 23 hours), the alarm signal will again be activated.



THE CONTROL PANEL FOR ALL 40 SERIES 6-WIRE SPEAKER CONTROLS IS THE SAME AS THAT SHOWN FOR MODEL ISA-44 ABOVE.

**MODEL ISA-44 PORTABLE PLUG-IN 5-INCH SPEAKER/CLOCK TIMER
FIGURE 5**

TIME AND ALARM OPERATING CHART

SELECTED DISPLAY	ACTIVATE DISPLAY	DISPLAY				SET CONTROL SW1 IN SET*	CHANGE IN DISPLAY
		DIGIT 1	DIGIT 2	DIGIT 3	DIGIT 4		
TIME**	NONE	10's OF HOURS	HOURS	10's OF MINUTES	MINUTES	SLOW SET SW6	MINUTE DISPLAY ADVANCES AT 2 HZ RATE HOUR DISPLAY ADVANCES 1 IN 30 SECONDS
						FAST SET SW7	MINUTE DISPLAY ADVANCES AT 60 HZ RATE HOUR DISPLAY ADVANCES AT 1 HZ RATE
ALARM	ALARM DISPLAY SW5	10's OF HOURS	HOURS	10's OF MINUTES	MINUTES	SLOW SET SW6	MINUTE DISPLAY ADVANCES AT 2 HZ RATE HOUR DISPLAY ADVANCES 1 IN 30 SECONDS
						FAST SET SW7	MINUTE DISPLAY ADVANCES AT 60 HZ RATE HOUR DISPLAY ADVANCES AT 1 HZ RATE
SLEEP	SLEEP DISPLAY SW4	BLANK	BLANK	10's OF MINUTES	MINUTES	SLOW SET SW6	MINUTE DISPLAY IS DECREMENTED AT A 2 HZ RATE
						FAST SET	MINUTE DISPLAY IS DECREMENTED AT A 60 HZ RATE

NOTE: (*) LOCK SET CONTROL SWITCH SW1 must be in SET position in order to enable the SLOW SET and FAST SET switches SW6 and SW7.
(**) DISPLAY Normally shows time of day in hours: minutes and AM or PM.

(6) THE SLEEP DISPLAY SWITCH AND FEATURE HAS NO FUNCTION WHEN THE SPEAKER/CLOCK TIMER IS USED WITH THE IMA-516 COMMU-NI-COM SYSTEM.

(7) SNOOZE SWITCH:

(7.1) If the clock is in an alarm armed state, and the alarm signal is turned on, activating (pressing-in and releasing) the SNOOZE SWITCH SW3 will silence the alarm signal for nine (9) minutes.

(7.2) At the end of 9 minutes the alarm signal will again be turned on.

(7.2.1) If desired the SNOOZE SWITCH may again

be activated and the alarm signal silenced for another 9 minutes.

(7.2.2) This may be repeated for the 59 minute alarm signal duration. At the end of the 59 minutes after original alarm signal turn on, the signal will be turned off as described in paragraph (5.5.2) above.

(8) MULTIPLE SPEAKER/CLOCK TIMERS:

(8.1) Two or more Speaker/Clock Timers may be used in a Commu-Ni-Com System.

(8.2) Each speaker, clock, and alarm will be individually operated and controlled as described above.

THEORY OF OPERATION

(SEE SCHEMATIC DIAGRAMS)

POWER SUPPLY

(1) When the system has been properly installed with the wiring connected as directed by the IMA-516 Installation Instructions (Part No. 48163), the power will be ON to the amplifier.

(1.1) A power ON/OFF switch is not used with the IMA-516 Amplifier.

(2) The IMA-516 should be powered by an externally mounted NuTone Power Transformer Model 301-N. The transformer should be installed and wired in compliance with local codes.

(3) The secondary of the 301-N should be connected to the AC, and AC ground Terminals on the IMA-516 PC Board.

(3.1) Use No. 18/2 cable (NuTone Model S-143) between the transformer and the amplifier for a maximum run of 150 feet.

(3.1.1) For distances greater than 150 feet, use a larger size wire; Example, for up to 300 feet, use No. 14/2 cable. (These larger size wire/cables are not supplied by NuTone.)

(4) The 301-N is rated: 120Vac primary/16Vac secondary, 60 Hz. at 30VA.

(4.1) The transformer is protected by a temperature operated overload which opens when excess current is drawn.

(4.1.1) The overload will close when temperature of transformer returns to normal.

(4.2) Do not install the 301-N Transformer in attics, crawl spaces, or other areas where a higher than normal ambient temperature may be expected.

(5) One side of the 301-N's secondary is connected to the AC ground terminal.

(5.1) The other side of the secondary is connected to the other AC terminal and then half-wave rectified by D101. C113 suppresses diode switching noises that may be generated by D101.

(5.2) The half-wave rectified voltage is filtered by C101A, and the voltage at the high-side (+) of C101A is 24Vdc.

(6) The 24Vdc at C101A(+) is fed through R104, further filtered by C102A. From C102A(+), 23V (Vcc) is fed through R111 to the collector of intercom preamplifier Q102.

(7) **C101A & C102A:** Both these capacitors are normally rated at 1000 microfarad. Their physical height should not exceed 1.4 inches. These capacitors will normally be installed in their individual place on the PC Board.

(7.1) If when replacing these capacitors, those available are taller than 1.4 inches, substitution must be made.

(7.1.1) 470 microfarad capacitors are available from NuTone (and other sources), and two of them may be used in lieu of the 1000 microfarad capacitors. (NuTone Part numbers for these capacitors are shown in the replacement parts list.)

(7.2) C101A and C101B (each 470 microfarads) may be installed in the locations noted on the PC Board in lieu of C101A's normal 1000 microfarad unit.

(7.3) C102A and C102B (each 470 microfarads) may be installed in the locations noted on the PC Board in lieu of C102A's normal 1000 microfarad unit.

(8) The 24Vdc from C101A(+) is fed through Q101. Q101, in conjunction with 18V \pm 10% Zener

diode D18, serves as the regulator for the 17.7Vdc supply, which is filtered by C103.

(9) The regulated 17.7Vdc supplies Vcc to pin 5 of the audio amplifier IC Z102.

(10) The 17.7Vdc is fed through R105 and filtered to 15.8Vdc at C107 (+).

(11) The 15.8V supplies Vdd to pin 14 of Z101; Control Line voltage at VC1; and control voltages to the bilateral switches of Z101.

(12) Z101 is a Quad Bilateral Switch CMOS IC. Each bilateral switch is individually controlled by its own control (C) input. Motorola Type 14066 and RCA Type 4066 are used in this application.

(12.1) When the control (c) of a bilateral switch is LOW, the switch is open. When the control is HIGH, the switch is closed.

Z101 LOGIC TABLE

DEVICE	CONTROL PIN	IN/OUT PINS	SWITCH
Z101A	13	2 and 1	
	HIGH*	2=1*	CLOSED*
	LOW	2≠1	OPEN
Z101B	5	3 and 4	
	HIGH*	3=4*	CLOSED*
	LOW	3≠4	OPEN
Z101C	6	8 and 9	
	HIGH**	8=9**	CLOSED**
	LOW*	8≠9	OPEN*
Z101D	12	10 and 11	
	HIGH	10=11	CLOSED
	LOW*	10≠11*	OPEN*

NOTE: (*) Indicates normal state, i.e. when no intercom speaker is activated.

(**) When DOOR or INTERCOM speaker switch is activated, the control input Z101C-6 will be pulsed HIGH through C120 and width of pulse is determined by the RC constant (R122) (C12).

MUSIC OPERATION

(1) The music, or other entertainment program should be fed through the blue and black twisted-pair (at terminals © and ®, respectively) across the MUSIC LEVEL CONTROL R126.

(1.1) The entertainment program source should be capable of delivering an audio signal of 0.3 to 1.0 Vrms. Radio tuners; magnetic phono/tape/microphone preamps; tape outputs of hi-fidelity amplifiers; and the Background Music signals from NuTone Radio/Intercom Master Units should readily provide audio signals of this magnitude.

(1.2) See BACKGROUND MUSIC CONNECTIONS below, for recommended sources and methods of connection.

(2) The audio signals are fed from the slide tap of R126, through R108; C110; normally closed bilateral switch Z101B; and C109 to the non-inverting input terminal 1 of the Audio Amplifier IC Z102.

(2.1) The bilateral switches of Z101 are active FET devices and slight attenuation of the signal between Z101B-3 and Z101B-4 may be expected. With sufficient input signal as controlled by R126, this attenuation will have negligible effect on the background Music's audio level.

(3) The 17.7V (Vcc) is fed to Z102-5. In the quiescent state, i.e. no input to Z-102-1, the device

internally biases the inverting input Z102-2 slightly positive (+0.01V) in respect to the non-inverting input, and the output pin Z102-4 is held at ½ Vcc.

(3.1) Z102 includes audio voltage amplifiers and drivers; and Class B audio power amplifier. The device is protected against short circuits; thermal overload; open ground; and polarity reversal.

(4) The amplified audio output at Z102-4 is coupled through C104 to the red Hi Output Terminal, and from there, through the red wire(s) of the 3 twisted-pair cable(s) to the system's speakers.

(4.1) The red/w Terminal is at audio and d-c ground.

(5) The amplifier output typical ratings:
 4 watts @ 0.05% distortion into 4-ohm load
 5.4 watts @ 10% distortion into 4-ohm load
 6.2 watts @ 0.05% distortion into 2-ohm load
 8 watts @ 10% distortion into a 2-ohm load

(5.1) The amplifier's load resistance should be a minimum of 1.6 ohms. (Equivalent to 10, 16-ohm speakers.)

BACKGROUND MUSIC CONNECTIONS

(1) NuTone Radio/Intercom Master Units are supplied with provisions for Background Music. Consult the individual installation instructions and service manuals for the various models.

(1.1) The 300 and 400 Series Radio/Intercom Master Units supply Background Music signal output through a labeled blue and black twisted pair.

(1.2) Use a twisted-pair cable (NuTone IW-2) —

maximum length, 25 feet — between the blue and black twisted-pair in the Radio/Intercom Master Unit and the input blue and black twisted-pair in the IMA-516. Observe color-code, blue-to-blue and black-to-black.

(1.3) For runs greater than 25 feet (maximum 50 feet), connect an audio shielded cable between the units; center conductor of cable between blue wires; and shield of cable between the black wires.

(2) For Background Music from NuTone's Model SM-428 Stereo Radio/Intercom Master Unit: Connect the signals from channel A and B Tape Output Jacks J114 and J115, through a shielded Y connector and a shielded cable to the blue and black twisted-pair in the IMA-516 — center conductor to blue wire; and shield to black wire.

(3) When the Background Music Source is a hi-fidelity amplifier or radio tuner, connect — as in paragraph (2) above — from tape output jacks, or from preamplifier outputs, using the Y connector with stereo units.

(4) The background music signal output, at the

source, should be before the unit's volume control, so that a flat audio level is used, and this level should not be altered when tone and/or volume controls on the source device are adjusted.

(5) Set the MUSIC LEVEL R126 in the IMA-516 and the VOLUME CONTROL at the individual speakers. (Reference paragraphs (6) through (6.3.1) under COMMU-NI-COM SYSTEM: OPERATIONAL CHECKOUT, above.)

(6) When a magnetic phonograph cartridge; tape head; or microphone is the source, a properly equalized preamp connected via shielded cables to the IMA-516 is required.

INTERCOM OPERATION

(1) The intercom speakers and door speakers should be connected to the IMA-516 as directed by the Commu-Ni-Com installation instructions. (See Wiring Diagram, Figure 1, and Schematic Diagrams in this manual.)

(2) Point VC1 on the amplifier PC board is connected through R114; CONTROL LINE; Black Terminal and the black wire in IW-6 cable(s) to the Black Terminal in all ISA-53 and 40 Series 6-Wire Speakers.

(2.1) Point VC1 is also connected through R114; CONTROL LINE; R113; Black/W Terminal; and the black/w wire in IW-6 cable(s) to the Black/W Terminal in all ISA-53 and 40 Series 6-Wire Speakers.

(3) INTERCOM TALK — CONTROL LINE:

(3.1) When, at an ISA-53 Speaker, the INTERCOM SWITCH S2 is activated (held in TALK position), the CONTROL LINE is connected from its Black Terminal through R2 and S1C-7/8, and from its Black/W Terminal through S1A-2/1 and R1 to S2D-12.

(3.1.1) With S2 in TALK, VC1 is then connected through S2D-11; Red/W Terminal and wire to the Red/W Terminal in the IMA-516 and thence to ground.

(3.2) When, at a 40 Series 6-Wire Speaker Control, the I/P TALK SWITCH S4A/S4B is activated (held down), the CONTROL LINE will be connected from its Black Terminal, through S4B5/6 and its Red/W Terminal and wire to the Red/W Terminal in the IMA-516 and thence to ground.

(3.3) In either case, when the CONTROL LINE is connected to ground, the potential at VC1 will decrease to something less than 1 volt, i.e. logic LOW.

(4) When VC1 goes LOW, the control inputs Z101A-13 and Z101B-5 go LOW, and these bilateral switches are opened, i.e. inputs do not equal outputs.

(5) Background Music Muting: When Z101B is opened, the entertainment program is no longer fed through C109 to Z102-1.

(6) Point Y and VC2 are normally connected to ground through Z101A, but when its control (C) goes LOW and it is opened, they go to approximately 15.8 volts (through R109), i.e. logic HIGH.

(7) When VC2 goes HIGH, Z101D's control (C) goes HIGH, the bilateral switch is closed, R115 is shorted, and the full output of Q102, as controlled by INTERCOM LEVEL SET CONTROL R127, is connected through C109 to Audio Amplifier IC input Z102-1.

(8) When VC2 is first switched HIGH, a HIGH pulse is coupled through C120 to the control (C) of Z101C.

(8.1) The HIGH to the control pin will decrease at an exponential rate as determined by the time constant of R122 and C120. In something approaching 0.1 and 0.2 second, Z101C-6 will go LOW — below turn-on of the bilateral switch.

(8.2) While the bilateral switch is closed, the junction of D104 and C112 is grounded and signals fed through the intercom input transformer T101 are attenuated.

(8.2.1) This feature is included in order to cancel "Key-Clicks" that may be generated when a door or intercom talk or listen switch, in an intercom speaker control, is activated.

(9) With the ISA-53 INTERCOM SWITCH S2 in the TALK position, the common side of VOLUME CONTROL R3 and Speaker SP1 is connected through S2A-3/2 to its Orange Terminal and wire. The high-side of R3 is connected through S2C-9/8 to its Orange/W Terminal and wire.

(9.1) With the 40 Series 6-Wire Speaker Control I/P TALK SWITCH S4A/S4B activated, the common side of VOLUME CONTROL R1 and Speaker is connected through S2A-5/4; S3A-2/1; and S4A-5/6 to its Orange Terminal and wire. The high-side of R1 is connected through S2B-5/4; S3B-5/4; and S4B-2/3 to its Orange/W Terminal and wire.

(9.2) The orange and orange/w input twisted-pair is connected to the Orange and Orange/W Terminals in the IMA-516 and then across the primary of the intercom input transformer T101.

(10) Audible sounds in the vicinity of these speakers in the INTERCOM TALK mode will be coupled through the secondary of T101; C112; and R117 to the base of Q102.

(10.1) The level of these signals at the primary of T101 is controlled by the setting of the individual speaker VOLUME CONTROLS, and for this reason the controls should be set as high as possible. (Reference paragraphs (6.3) and (6.3.1) under COMMU-NI-COM SYSTEM: OPERATIONAL CHECKOUT above.)

(11) The signals to the base of Q102 are amplified and fed from its collector, through C111; closed Z101D; and C109 to the input of the Audio Amplifier IC, Z102-1, where they are amplified and fed to all intercom speakers that are being operated in the LISTEN mode.

(12) NOTE: When an ISA-53 is being operated in the LISTEN-IN mode, the INTERCOM SWITCH S2 is locked in the TALK position. The CONTROL LINE is connected to ground, and the input audio signals are controlled as described above.

(13) The level of the audio signals to the input of Z101D is controlled by INTERCOM LEVEL SET CONTROL R127.

(13.1) R127 should be operated at a setting that is as low as possible consistent with sufficient volume at all intercom speakers (and door speakers as required).

(13.2) The setting of R127 must be high enough to allow the signals from an electronic chime and/or an alarm signal, to be passed through R115 when Z101D is in its quiescent mode, i.e. switch open.

(13.3) When R127 is set to maximum and Z101D is open, the gain of the IMA-516 is approximately equal to that of the earlier Model IM-516 Amplifier.

(14) When intercom message is completed, release the INTERCOM SWITCH at the ISA-53. S2 will automatically return to its normal (LISTEN) position.

(15) TALK TO DOOR:

(15.1) The Door Speaker(s) is/are normally OFF and they do not hear Background Music nor intercom signals between ISA-53 and/or 40 Series 6-Wire Speakers.

(15.1.1) Door Speaker(s) may be connected (via NuTone's IW-2 Twisted-Pair Cable) to the Black and Black/W Terminals in the IMA-516 or to the Black and Black/W Terminals at any intercom speaker control — ISA-53 or 40 Series 6-Wire Speaker.

(15.2) At ISA-53, initiate communications with Door Speaker(s). All Door Speakers are connected in common and operate in the same mode.

(15.2.1) Activate (hold-down) DOOR SWITCH S1 in ON position, and at same time activate (hold-down) INTERCOM SWITCH S2 in TALK position.

(15.3) The Door Black/W lead is connected

through S1B-6/5 and S2B-6/5 to the Red — amplifier high output lead.

(15.3.1) The Door Black lead (and CONTROL LINE) is connected through S1C-9/8 and S2D-12/11 to the Red/W — amplifier low output, and d-c ground for CONTROL LINE.

(15.4) The Background Music will be muted, and intercom signals from the amplifier output will be heard at the door speaker(s) and at all other intercom speakers that are being operated in the LISTEN position.

(15.5) The common side of the speaker in the ISA-53 will be connected through S2A-3/2 to the Orange lead side of the Intercom input transformer T101.

(15.5.1) The other side of the speaker will be connected through the tapped portion of R3 and S2C-9/8 to the Orange/W lead side of T101.

(15.5.2) Intercom signals from the speaker in the ISA-53 will be amplified through the IMA-516 and fed to the Door Speaker(s) and to other intercom speakers operating in LISTEN mode.

(15.6) If TALK TO DOOR is initiated at a 40 Series 6-Wire Speaker: Activate (hold-down) DOOR TALK SWITCH S2A/S2B.

(15.6.1) The Door Speaker's Black side is connected through S1-2/1; and S2A-2/3 to the Red/W — amplifier low output and CONTROL LINE d-c ground.

(15.6.2) The Door Speaker's Black/W side is connected through S1-5/4 and S2B-2/3 to the RED — amplifier high output.

(15.6.3) Signals from the 40 Series 6-Wire Speaker will be heard at the Door Speaker's and at other intercom speakers that are operating in their normal (LISTEN) position. The Background music will be muted.

(16) LISTEN TO DOOR:

(16.1) At ISA-53, throw DOOR SWITCH S1 to ON position. INTERCOM SWITCH S2 should be in its normal (LISTEN) mode.

(16.1.1) The CONTROL LINE and Door Speaker(s) Black side will be connected through S1D-11/12 and S2A-1/2 to the Orange side of T101, and to d-c ground through transformer's center-tapped primary.

(16.1.2) The CONTROL LINE and Door Speaker(s) Black/W side will be connected through S1A-2/3 and S2C-7/8 to the Orange/W side of T101, and to d-c ground through the primary center-tap.

(16.1.3) The speaker in the ISA-53 remains connected across the (red and red/W) amplifier output in its LISTEN mode.

(16.2) At 40 Series 6-Wire Speaker Control, activate the DOOR LISTEN SWITCH S1.

(16.2.1) The CONTROL LINE and Door Speaker(s) Black side will be connected through S1-2/3 to the

Orange side of T101, and to d-c ground through transformer's center-tapped primary.

(16.2.2) The CONTROL LINE and Door Speaker(s) Black/W side will be connected through S1-5/6 to the Orange/W side of T101, and to d-c ground through the primary center-tap.

(16.2.3) The speaker with the 40 Series 6-Wire Control will remain connected across the (red and red/W) amplifier output in its LISTEN mode.

(16.3) In either case, the Door Speakers are connected across the intercom input transformer and audio signals will be amplified and fed to the activated speaker and to all other intercom speakers operating in the LISTEN mode.

(16.3.1) With the CONTROL line being grounded through T101's center-tap, the background music will be muted, Z101D will be closed and the amplifier will operate at full gain as determined by the setting of INTERCOM LEVEL SET CONTROL R127.

40 SERIES 6-WIRE SPEAKER CONTROL OPERATIONAL NOTE

(1) The INSIDE/PATIO LISTEN SWITCH S3A/S3B should not be used when these speakers are incorporated in the IMA-516 Commu-Ni-Com System.

(2) If this switch is activated, the speaker/R1 common point will be connected through S2A-5/4 and S3A-2/3 to the Orange side of the intercom input transformer T101.

(2.1) The other side of speaker will be connected through the tapped portion of R1; S2B-5/4; and S3B-5/6 to the Orange/W side of T101.

(3) The amplifier's CONTROL LINE will be connected through the Black/W side; S1-5/4 and S2B-2/1, where it is open-ended (floating) at S2B-1.

(3.1) The amplifier's CONTROL LINE will be connected through the Black side; S4B-5/4; 10K resistor R2; and S3A-5/6 to the Orange side of T101, and thence through its primary center-tap to d-c ground.

(4) The speaker, connected across the input transformer T101 will act as a microphone and audio sounds in its vicinity will be sent through the transformer and amplified by Q102.

(5) When the CONTROL LINE is connected to d-c ground through the 10K resistor R2 in the speaker control the voltage at VC1 will go to approximately 45.7% of Vdd. This may or may not cause transfer of the bilateral switches Z101A; Z101-B; and Z101D. The pulse through C120 may or may not transfer Z101C in order to mute the key clicks.

(5.1) The bilateral switches noise immunity is rated: guaranteed 30%; typical 45%; maximum 70%. Under these conditions transfer of the output state can not be guaranteed with the 45.7% Vdd at VC1.

(6) Muting of the background music signal can not be guaranteed, nor can the closing of Z101D be guaranteed and the signal to Z102-1 may be so low that the IC does not amplify the audio signals from the activated speaker.

CHIME AND/OR ALARM SIGNALS

(1) The NuTone Electronic Chime must be installed in its regular manner and powered by its own 120/16Vac transformer as directed by the installation instructions that are supplied therewith.

(1.1) DO NOT USE THE 301-N TRANSFORMER, THAT POWERS THE IMA-516 COMMU-NI-COM SYSTEM, TO SUPPLY THE ELECTRONIC CHIME.

(1.2) Connect a 22 ga. twisted-pair (NuTone IW-2) between the Electronic pick-up terminals in the Electronic Chime and the Chime Terminals in the IMA-516.

(1.2.1) The amplitude of the signal from the pick-up terminals may be controlled by the LEVEL SET CONTROL in the Electronic Chime.

(2) Alarm systems should be installed in their regular manner, powered by its own power supply and operated as directed by the instructions that are furnished therewith.

(2.1) The signals should be coupled from the alarm master unit or alarm device by a 22 ga. twisted-pair (NuTone IW-2) to the Chime Terminals in the IMA-516.

(2.1.1) The alarm signal level is not controlled and is run at full amplitude to the Chime Terminals.

(3) Chime and/or alarm signals are fed through R120/R121; and T101 to base of Q102, where they are amplified and fed to the high-side of R127.

(4) Normally these signals will arrive at the high-side of LEVEL SET CONTROL R127 when the IMA-516 is operating in a background music mode, i.e. with Z101D open.

(4.1) In this case, the signals from the high-side of R127 will be fed through the 68K resistor R115, and will require that R127 be set high enough so that the signals can be heard through the intercom speakers and if background music feature is being used, high enough to override the entertainment program signals.

(5) After the chime and/or alarm signals are set for sufficient volume, it may be necessary to readjust the MUSIC LEVEL SET CONTROL R126 and the VOLUME CONTROL at the intercom speakers.

(5.1) R127 and R126 should still be operated as low as possible, with the volume controls at the individual intercom speakers being operated as high as possible.

APARTMENT HOUSE SYSTEMS

(1) TOWNHOUSE APARTMENTS: Multiple entry systems in which each apartment communicates only with its own individual Door Speaker(s).

(1.1) The system block wiring diagrams are shown with the fold-out drawings in this manual.

(1.1.1) The speaker schematic and detailed wiring diagram is also shown in this section.

(1.2) The black and black/w pair of wires in the 3 twisted-pair cable (NuTone IW-6) must not be connected at the IMA-516 amplifier nor at the apartment speaker.

(1.3) Using 22 ga. twisted-pair cable (NuTone IW-2), connect the Door Speaker(s) to the Black and Black/W terminals in the Apartment Speaker that is installed in its individual townhouse.

(1.4) Since the CONTROL LINE can not be activated (the black and black/w wires are not connected), bilateral switch Z101D will remain open and the output of Q102 at the high-side of R127 will be fed through R115 to the input of the audio amplifier IC at Z102-1.

(1.4.1) R127 will normally be run near its maximum setting. When R127 is at its maximum setting the overall gain of the IMA-516 is approximately equal to that of the earlier models IM-516 and 470 amplifiers.

(1.5) When used in townhouse apartment systems, the MUSIC LEVEL CONTROL R126 should be set at its minimum position to prevent random noise pickup and amplification through the background music amplifier circuit.

(2) GARDEN APARTMENTS: Multiple apartment system with one entry. Each apartment individually capable of communication with door speaker.

(2.1) The system block wiring diagrams are shown with the fold-out drawing in this manual.

(2.2) Note: Since the introduction of NuTone's Direct-A-Com System 4 (using the Model 478 Amplifier), the Direct-A-Com 3 system is not specifically recommended for multiple apartment — single entry systems. The Model 478 Amplifier and Model 485 Apartment Speaker will provide a more economical system.

(2.3) The IMA-516 can be used to replace the IM-516 and 470 Amplifiers used in earlier garden apartment systems.

(2.4) When used in this system the connection to the apartment house speaker is essentially the same as shown for townhouse systems, except that the black and black/W pair of wires in the IW-6 cable must be connected at the IMA-516 Amplifier

and at every apartment speaker. MATCH COLOR CODE.

(2.5) Since the amplifier's CONTROL LINE is connected through the black and black/w wires to the apartment speakers, one of these wires will be grounded when an apartment speaker establishes communications with the entry speaker.

(2.5.1) When the CONTROL LINE is grounded, the bilateral switches are operated, and Z101D closes. The signal is fed through the switch and the full gain of the IMA-516 can be utilized. The INTERCOM LEVEL SET CONTROL R127 should be adjusted in the regular manner.

(3) DIRECT-A-COM 3 APARTMENT SPEAKERS: See Apartment Speaker Schematic Diagram.

(3.1) Model 482BX with signal buzzer and door lock release switch.

(3.2) Model 482B with door lock release switch.

(3.3) Model 481 metal frame, with signal buzzer and door lock release switch. Volume control — no front panel control, screw driver adjustment from rear of panel.

(3.4) In normal not-in-use state, speaker is off and door speaker is off.

(3.5) When caller activates the pushbutton at the door (or individual pushbutton in directory for single entry systems), the buzzer (or chime) in the called apartment is activated.

(3.5.1) The tenant holds TALK/LISTEN SWITCH S1 in TALK position while talking into the speaker in a normal voice. The message is heard at the door speaker.

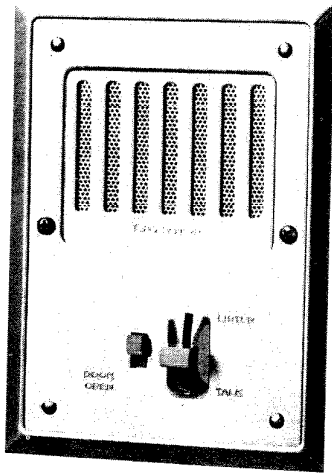
(3.5.2) To hear door speaker reply, tenant throws S1 to LISTEN position.

(3.5.3) Note: if tenant in another apartment throws his speaker's S1 to LISTEN, he will hear the signals between the door and other apartment speaker.

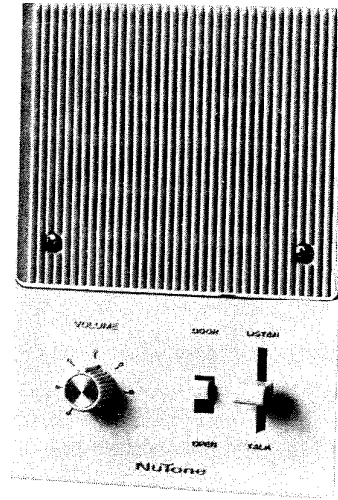
(3.6) In systems using a NuTone Door Chime instead of the speaker's signal buzzer, the chime may be powered by the 301-N Transformer that is used to power the IMA-516 Amplifier.

(3.6.1) The 301-N is also used to power the door lock release and postal lock release when used.

(3.7) DOOR SPEAKERS: A variety of built-in and surface mounted are supplied by NuTone. (See current NuTone Catalogue.) Model ISA-64 Surface Mounted Door Speaker with Pushbutton, and Model IS-67 Built-in Door Speaker with Lighted Pushbutton are also supplied.



MODEL 481B METAL FRAME



MODEL 482B/482BX

**DIRECT-A-COM 3 APARTMENT SPEAKERS
FIGURE 6**

SERVICE AND TROUBLE SHOOTING

GENERAL

- (1) Although a standard 20 Kohm/volt multi-meter will suffice for most voltage and resistance measurements in this system, it is suggested, that when available, a high-impedance input meter (such as a VTVM or DIGITAL READOUT) be used.
- (2) A high-impedance input meter with a d-c scale of 0 to 1.5 volts will be especially useful when measuring base and emitter voltages.
- (3) The voltages shown on the schematic diagram may vary $\pm 10-20\%$. THE RATIO BETWEEN THE VOLTAGES ON THE DIFFERENT ELEMENTS SHOULD REMAIN CLOSE TO THOSE SHOWN IN ORDER TO ACHIEVE DESIGN PERFORMANCE.
- (4) To prevent leakage paths when measuring resistance of some components, it may be necessary to disconnect one side of the component under measurement.
- (5) MAKE CERTAIN THAT POWER IS REMOVED WHEN MEASURING RESISTANCE OR WHEN REMOVING OR REPLACING COMPONENTS ON THE PRINTED CIRCUIT BOARD.
- (6) OBSERVE POLARITY WHEN MAKING RESISTANCE MEASUREMENTS IN TRANSISTOR CIRCUITS. IMPROPER POLARITY MAY RESULT IN FALSE READINGS AND IN SOME CASES THE VOLTAGE OF THE OHM METER MAY EXCEED THE REVERSE BREAKDOWN RATINGS OF THE DEVICE.
- (7) Treat all printed circuit boards with care. Do not burn or mutilate when making or breaking solder connections. Use "Solder Sucker" tool. Be extremely careful of the foil paths.
- (7.1) Consult the schematic diagrams and PC Board Layout illustrations when servicing.

BENCH SERVICING

- (1) The IMA-516 Amplifier must be powered by the 120/16Vac transformer — NuTone 301-N.
- (2) If an ISA-53 Speaker is available, connect to amplifier via color coded IW-6 cable; and connect an 8-16 ohm speaker to the Black and Black/W Terminals in the amplifier.
- (3) Check background music function with program source or tone generator. Connect to blue and black input twisted-pair via shielded cable or twisted-pair as required.
- (4) Muting operation (bilateral switches) can be checked by grounding the Black or Black/W Terminal to the Red/W Terminal. Voltage levels (High or Low) can be checked at the pins of Z101 and compared against those shown in the schematic diagram.

IN THE FIELD

(1) SYSTEM DEAD:

CHECK: Setting of individual speaker volume controls; and setting of Intercom Level Set Control R127, and when required Music Level Set Control R126 in the IMA-516.

Wiring between amplifier and speakers for shorts and/or opens.

Make certain that all wiring connections are firm and secure. Observe Color Code.

16Vac supply to AC and AC Ground terminal in IMA-516.

120Vac power to Transformer 301-N.

DC voltages at high (+) side of C101A; C102A; C103; C107; on elements of the various solid-state devices; and CONTROL LINE voltage at VC1 and Black and Black/W Terminals.

Check for change in VC1 voltage when Black or Black/W Terminal is shorted to ground at Red/W Terminal. Should go from 15.8V_{dd} to approximately zero.

(2) INTERCOM OPERATION BETWEEN INSIDE SPEAKERS IS NORMAL — NO INTERCOM WITH DOOR SPEAKERS.

CHECK: Door Speaker(s).

Wiring between Door Speaker and Black and Black/W Terminals in IMA-516 and/or intercom speakers.

If mal-function is not from all inside intercom speakers, check DOOR SWITCH S1, and INTERCOM SWITCH S2 at mal-functioning intercom speakers.

(3) HIGH PITCH SQUEAL

CHECK: For shorts between Red (Output) wires and Orange (Input) wires.

(4) HIGH PITCH SQUEAL WHEN INTERCOM SWITCH S2 IS ACTIVATED

CHECK: S1 and S2 and intercom wiring connections at defective speaker.

(5) SQUEAL WHEN DOOR SPEAKER IS TURNED ON WITH S1

CHECK: Switches S1 and S2 at mal-functioning inside intercom speakers

For shorts between black and orange wires, and between black and red wires.

(6) LOW LEVEL FEEDBACK BETWEEN SPEAKERS DURING INTERCOM OPERATION

CHECK: Speakers must not be installed back-to-back on a common wall.

Volume setting of individual speakers; raise or lower if possible in order to prevent acoustical coupling.

Reduction of volume at selected speaker(s) may alleviate condition.

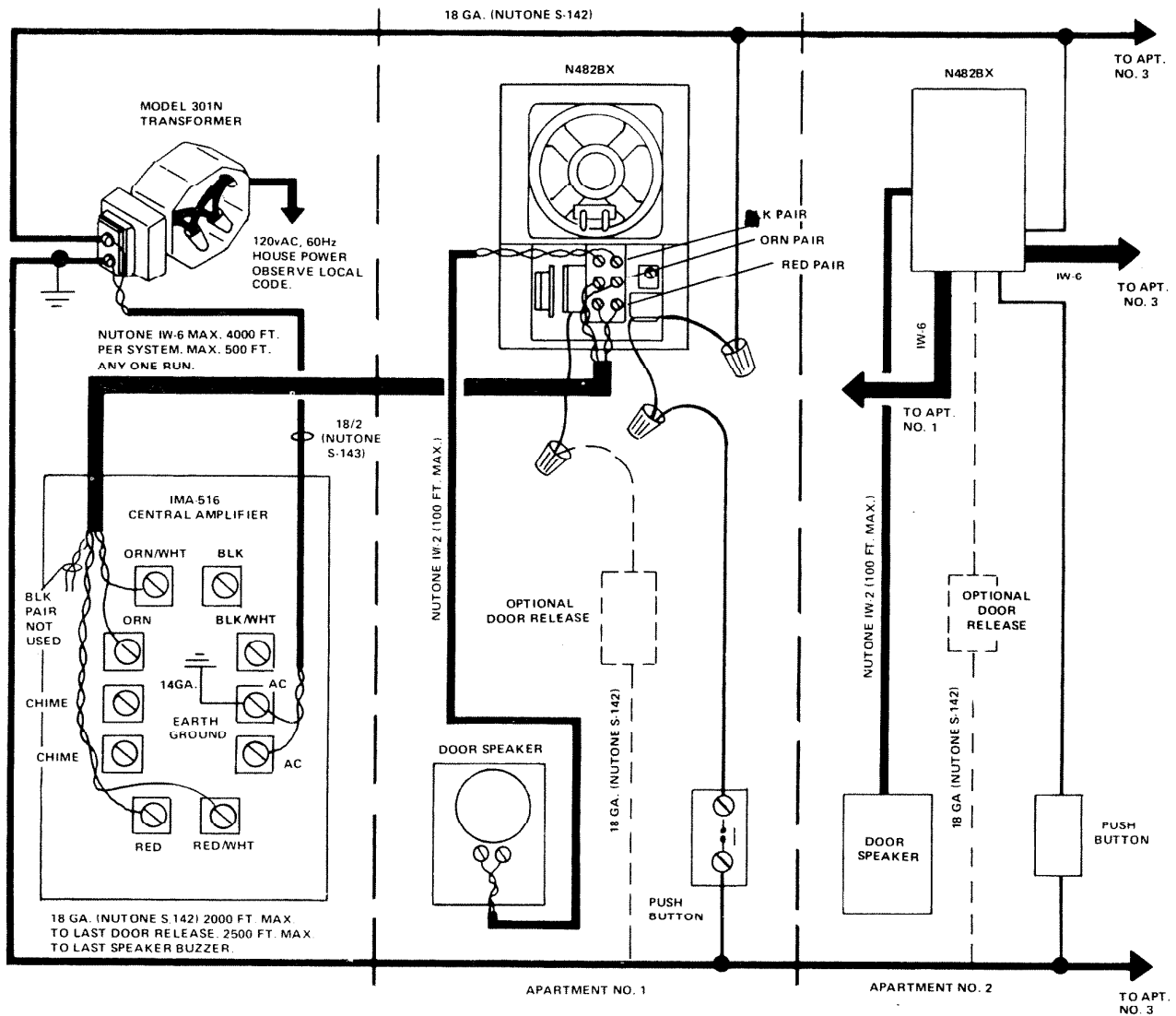
(7) When an intercom or an apartment system is mal-functioning, it should be determined whether the IMA-516 is at fault or whether the defective component is the interconnecting wiring and/or speakers.

(7.1) At the amplifier, disconnect the speaker wiring. Check 16Vac at terminals.

(7.2) Connect an ISA-53 inside intercom speaker — via a length of IW-6 cable to the amplifier. Connect an 8-ohm speaker to the Black and Black/W Terminals.

(7.3) Check intercom operation between these units. If amplifier and speakers check ok, the wiring and/or speakers in the system should be checked — if possible one speaker or wiring run at a time being added to amplifier.

USE RECOMMENDED NUTONE WIRE AND CABLE

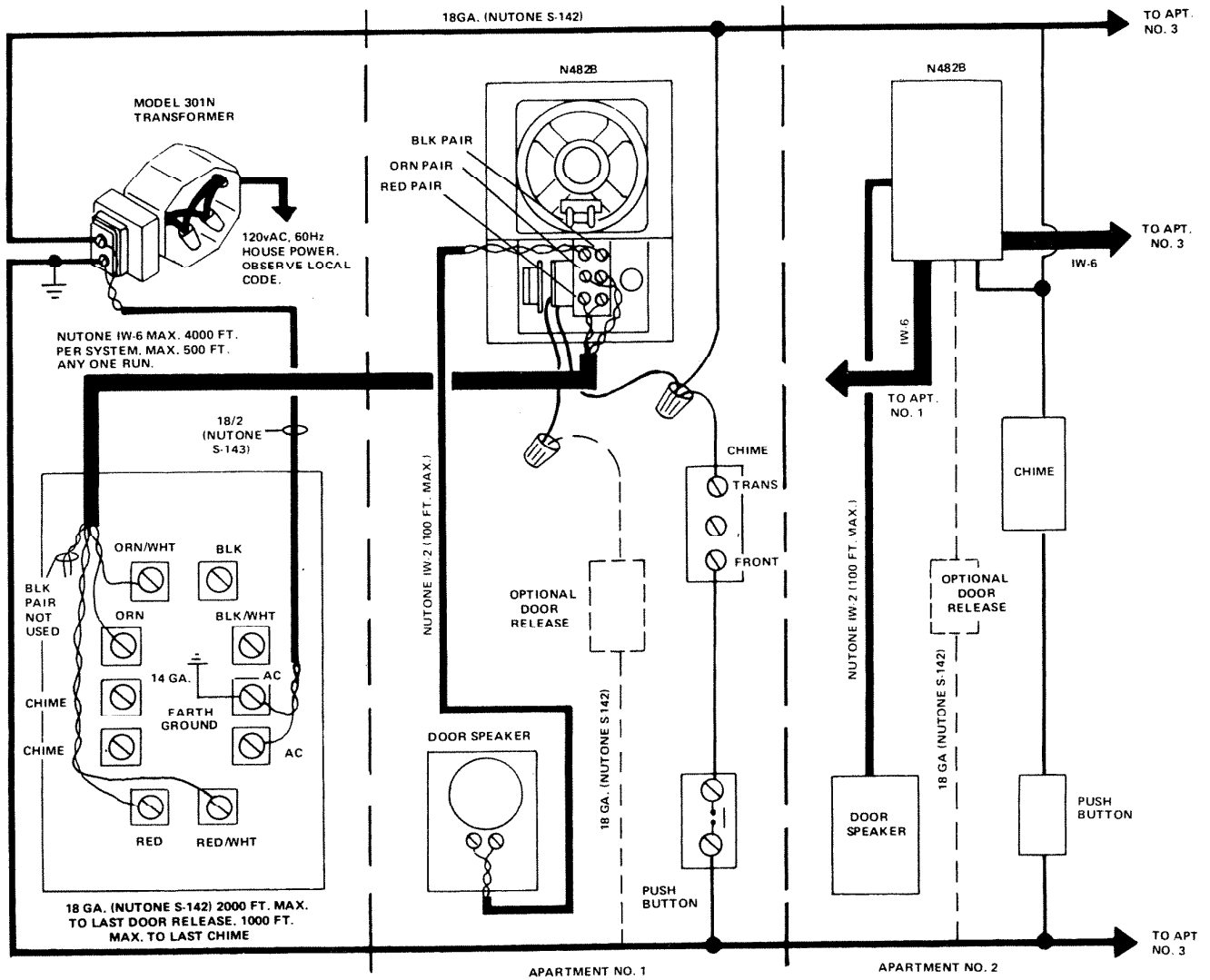


USE INDIVIDUAL SIGNAL BUZZER IN EACH APARTMENT SPEAKER

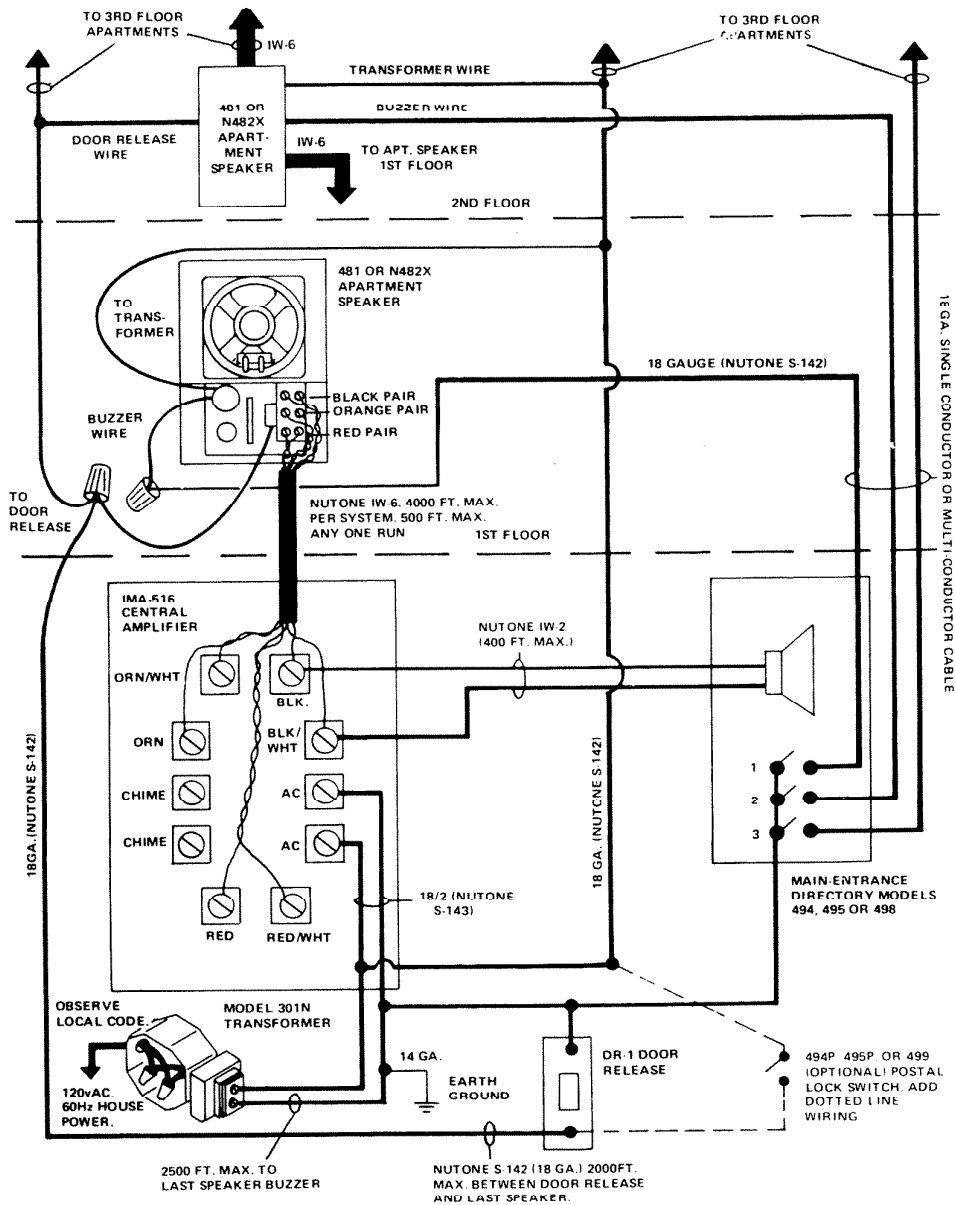
DIRECT-A-COM 3 REPRESENTATIVE TOWNHOUSE APARTMENT SYSTEM WIRING

EACH APARTMENT SPEAKER COMMUNICATES ONLY WITH ITS OWN INDIVIDUAL DOOR SPEAKER

SEPARATE PUSHBUTTON NOT REQUIRED WITH ISA-64 NOR IS-67 DOOR SPEAKERS



USE INDIVIDUAL NUTONE DOOR CHIME IN EACH APARTMENT

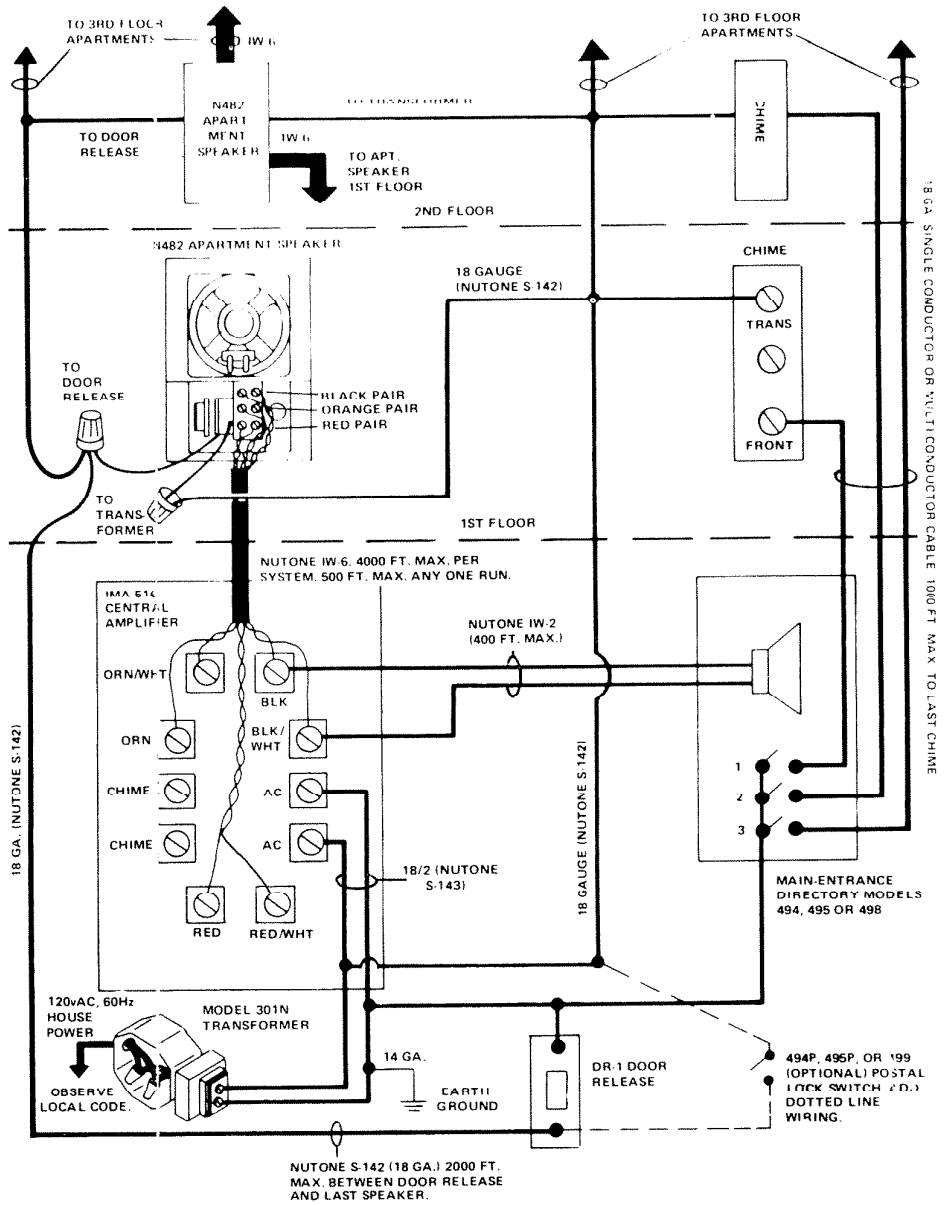


USE INDIVIDUAL SIGNAL BUZZER IN EACH APARTMENT SPEAKER

DIRECT-A-COM 3 REPRESENTATIVE GARDEN APARTMENT SYSTEM WIRING

EVERY APARTMENT SPEAKER CAN INDIVIDUALLY COMMUNICATE WITH DOOR SPEAKER

WHEN DR-1 DOOR RELEASE IS USED, EACH APARTMENT SPEAKER CAN UNLOCK DOOR

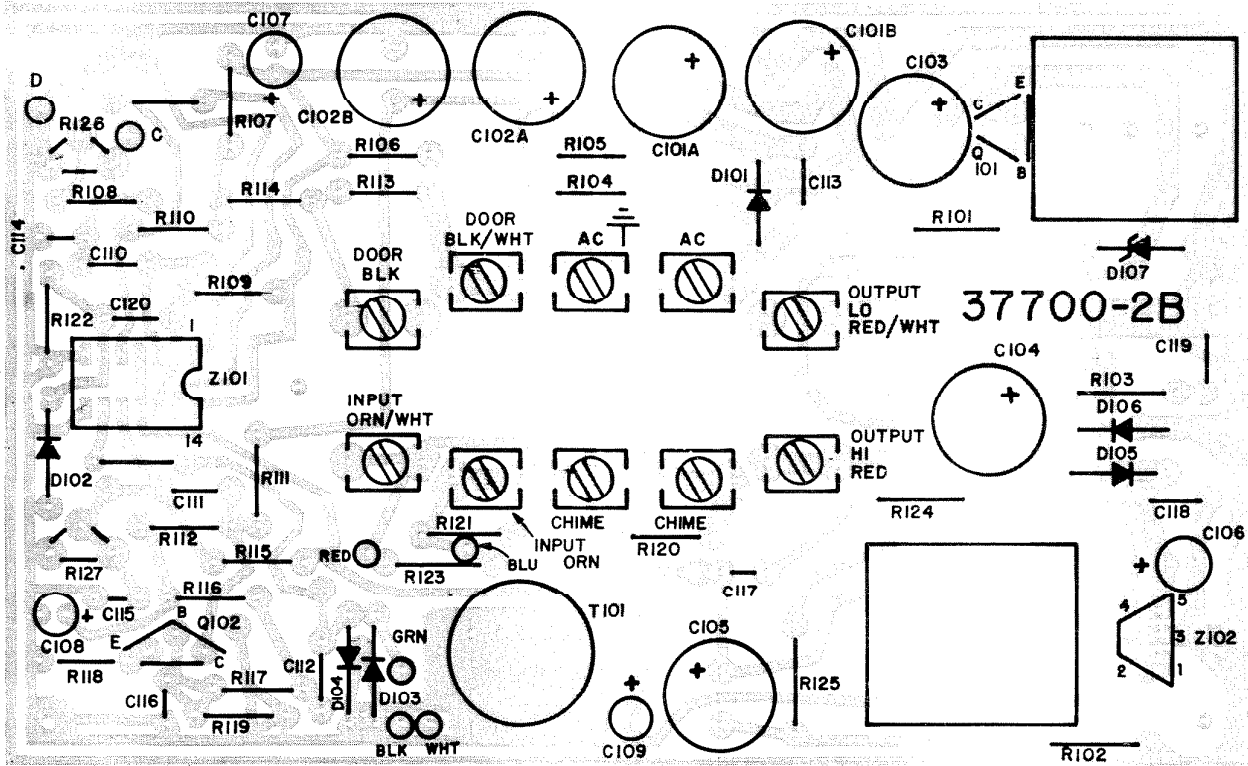


USE INDIVIDUAL NUTONE DOOR CHIME IN EACH APARTMENT

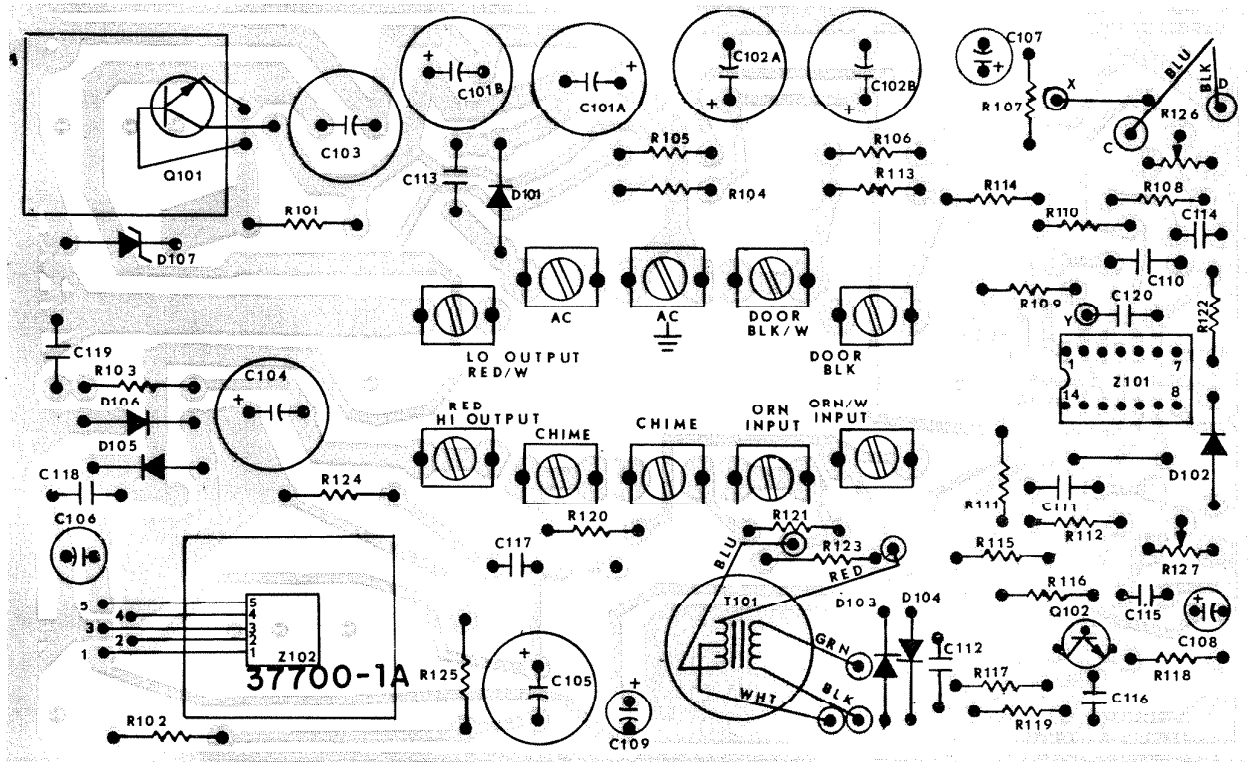
WIRING

SPEAKER

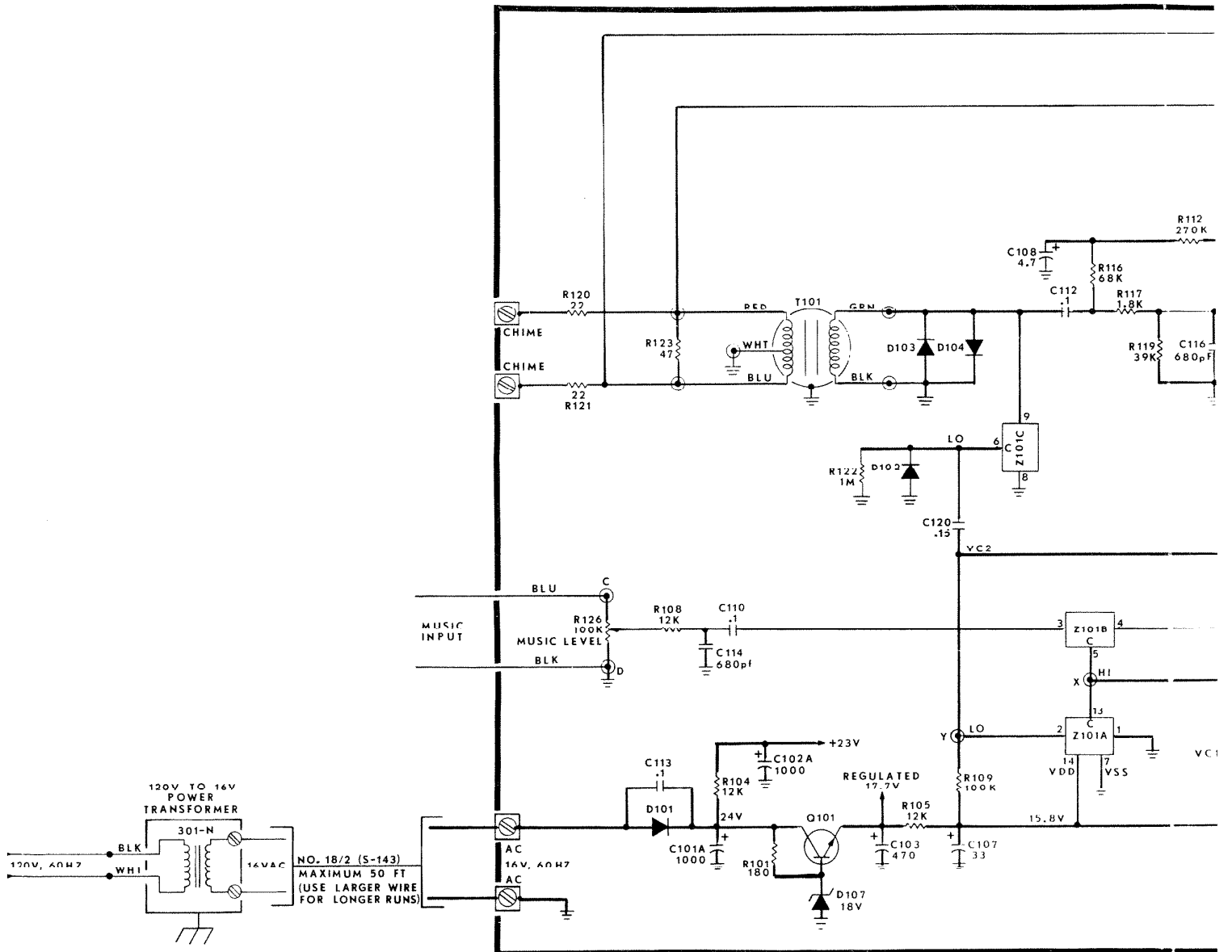
DOOR



TOP VIEW: IMA-516 PRINTED CIRCUIT TERMINAL BOARD COMPONENT LOCATION



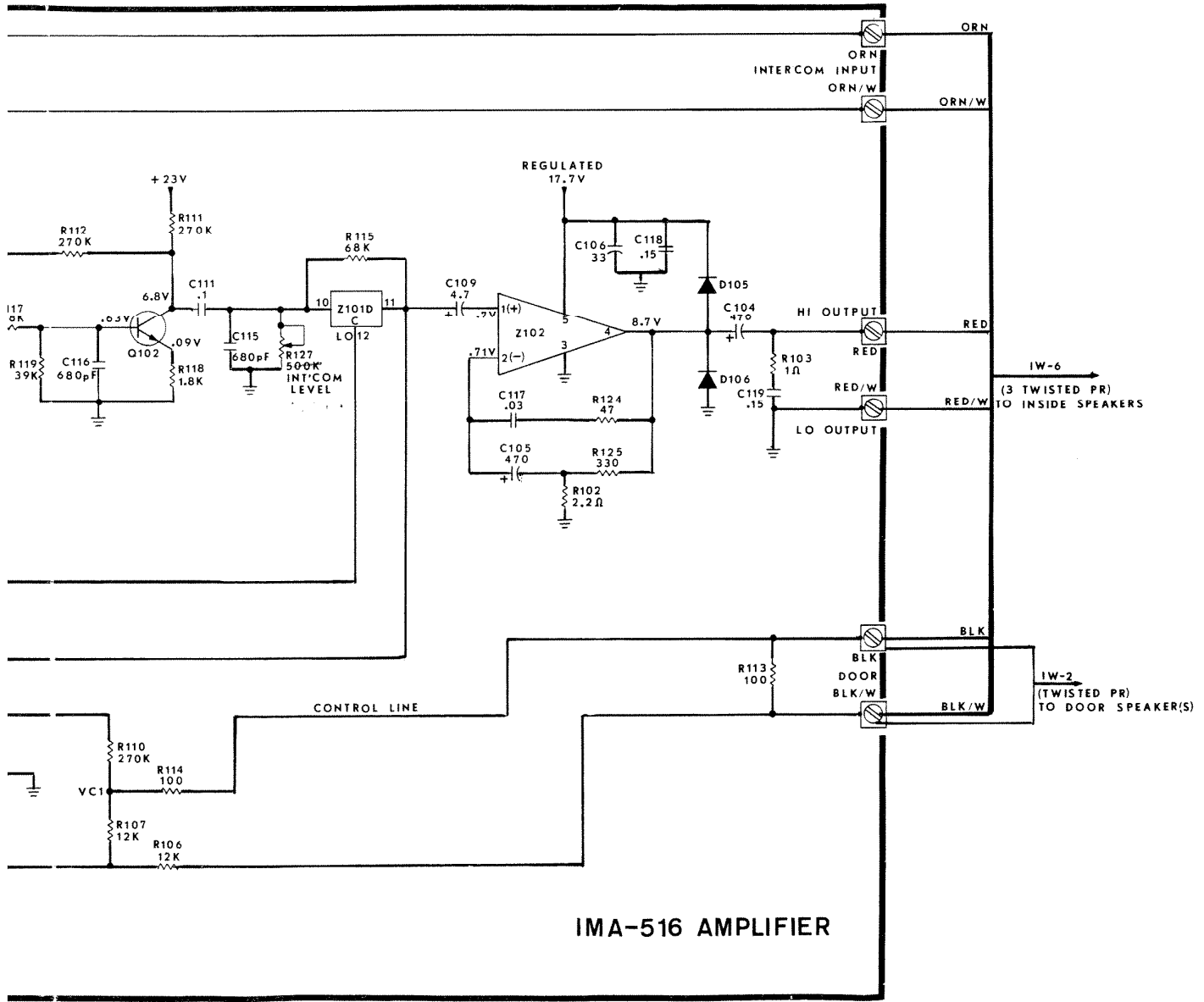
BOTTOM VIEW: IMA-516 PC PATH/COMPONENT CONNECTIONS



Z101 LOGIC TABLE

DEVICE	CONTROL PIN	IN/OUT PINS	SWITCH
Z101A	13 HIGH*	2 and 1 2 = 1*	CLOSED*
	LOW	2 ≠ 1	OPEN
Z101B	5 HIGH*	3 and 4 3 = 4*	CLOSED*
	LOW	3 ≠ 4	OPEN
Z101C	6 HIGH**	8 and 9 8 = 9**	CLOSED**
	LOW*	8 ≠ 9	OPEN*
Z101D	12 HIGH	10 and 11 10 = 11	CLOSED
	LOW*	10 ≠ 11*	OPEN*

NO1

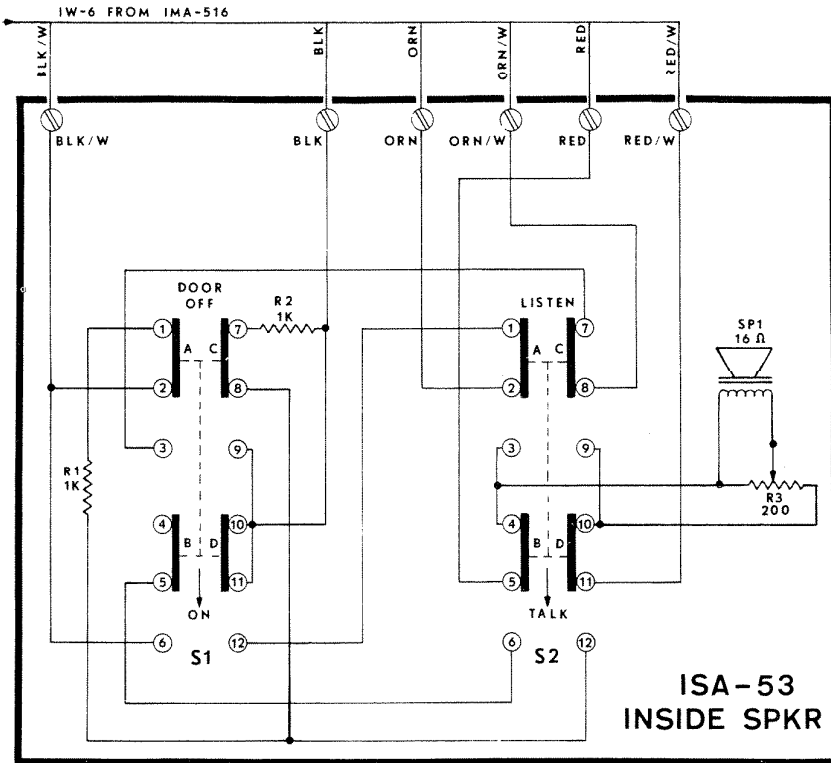


IMA-516 AMPLIFIER

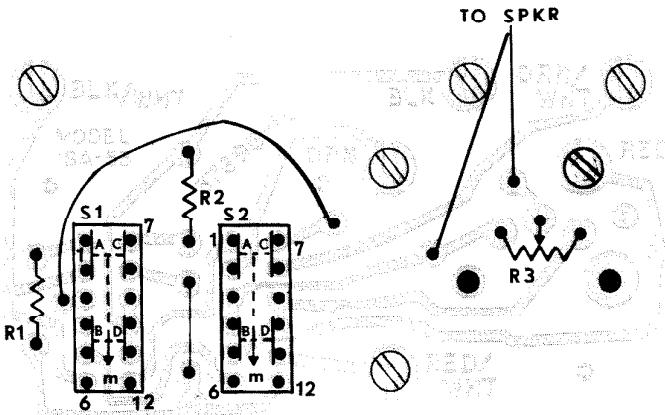
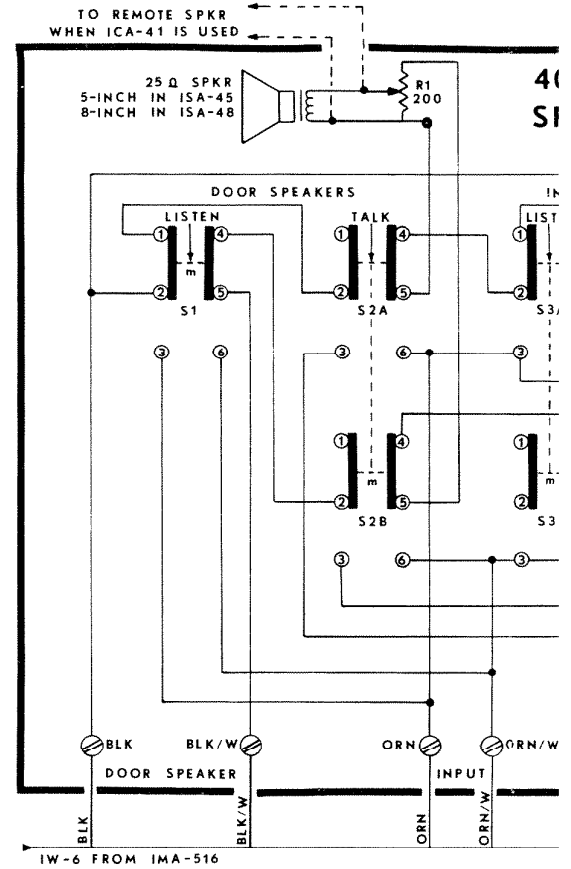
NOTE: (*) Indicates normal state, i.e. when no intercom speaker is activated.
 (**) When DOOR or INTERCOM speaker switch is activated, the control input Z101C-6 will be pulsed HIGH through C120 and width of pulse is determined by the RC constant (R122) (C12).

NOTE: IN TOWNHOUSE SYSTEM, I.E. SYSTEM USING AN INDIVIDUAL DOOR SPEAKER FOR EACH APARTMENT:
DO NOT CONNECT THE BLK-BLK/W PAIR OF THE IW-6 CABLE(S) AT THE IMA-516 NOR AT THE INSIDE SPEAKERS;
DO NOT CONNECT IW-2 BETWEEN DOOR SPEAKERS AND IMA-516.

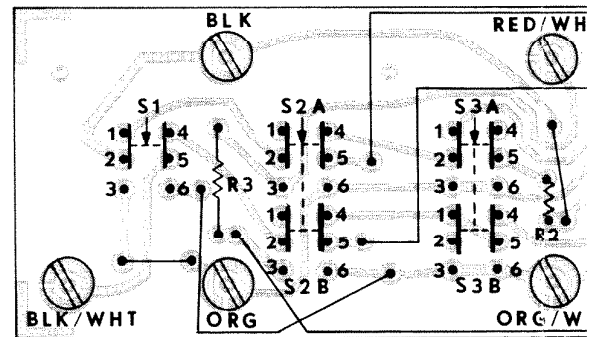
IN COMMU-NI-COM SYSTEMS, THE DOOR SPEAKER(S) MAY BE CONNECTED TO THE BLK & BLK/W TERMINALS IN THE IMA-516 OR TO THE BLK & BLK/W TERMINALS AT AN INSIDE SPEAKER



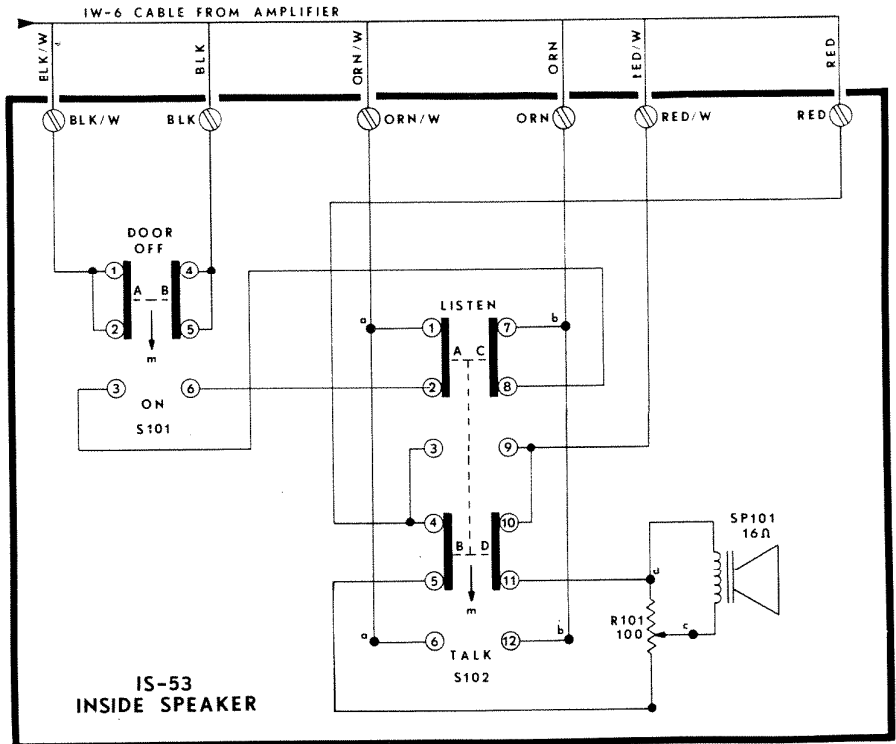
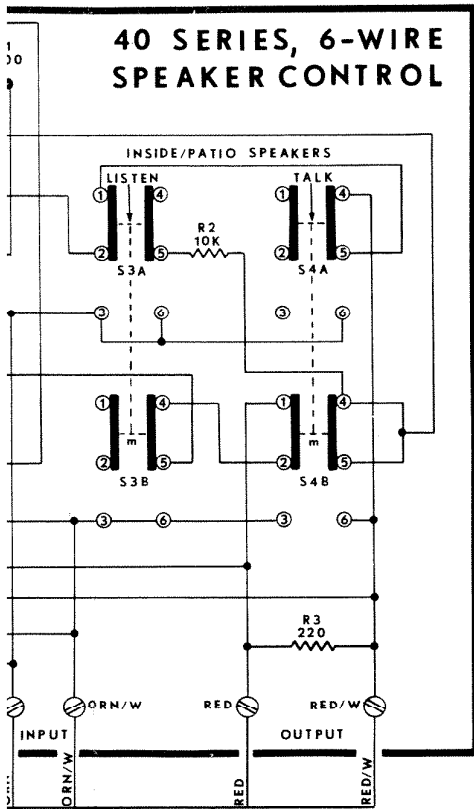
MAY BE USED AS DIRECT REPLACEMENT FOR MODEL IS-53



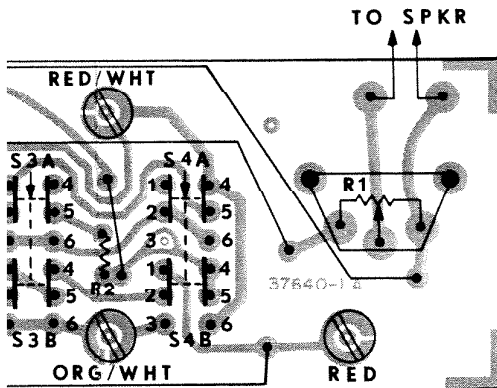
ISA-53 PRINTED CIRCUIT TERMINAL BOARD



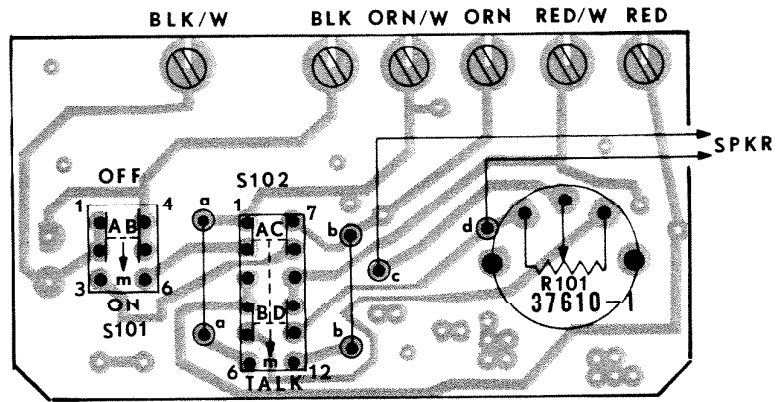
40 SERIES 6-WIRE SPEAKER PRINTED CIRCUIT TERMINA



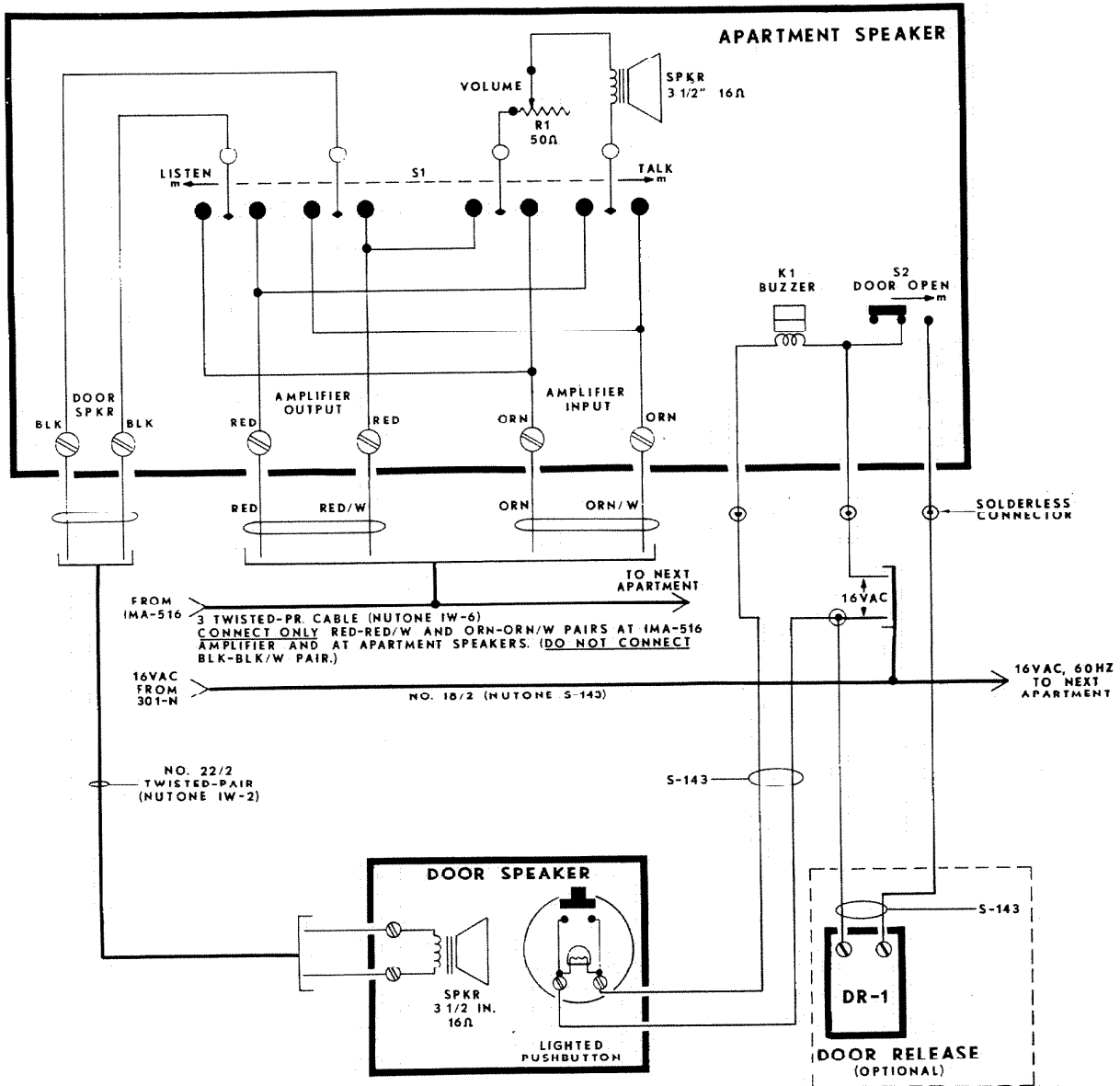
USED IN COMMU-NI-COM SYSTEMS PRIOR TO 1 JANUARY 1979



**SPEAKER CONTROL
TERMINAL BOARD**

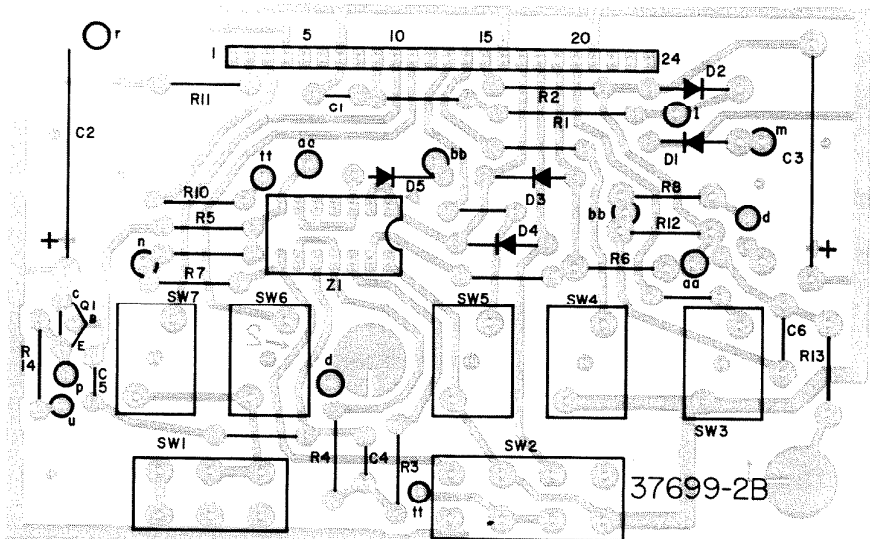


IS-53 PRINTED CIRCUIT TERMINAL BOARD

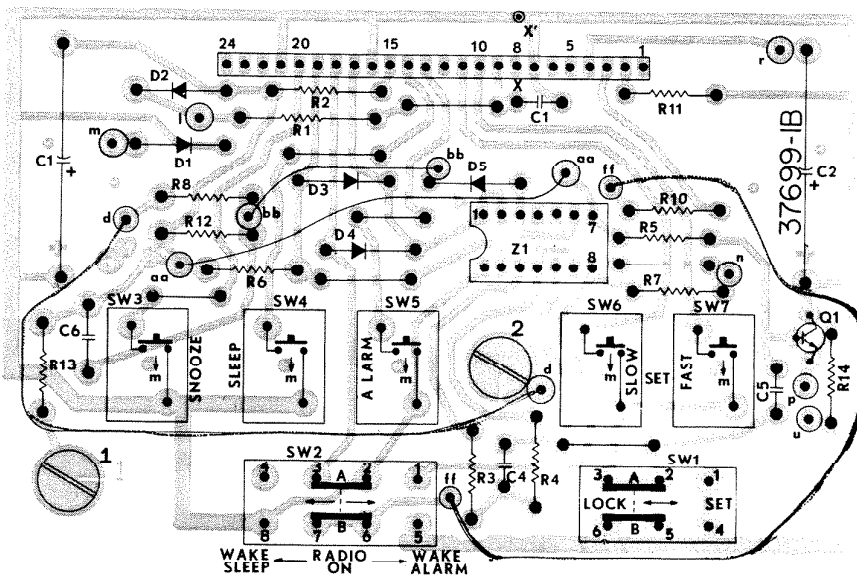


MODELS 481-B, 482B, and 482BX
BUZZER K1 NOT USED IN MODEL 482B
VOLUME CONTROL R1 REAR PANEL SCREW DRIVER ADJUST IN MODEL 481B

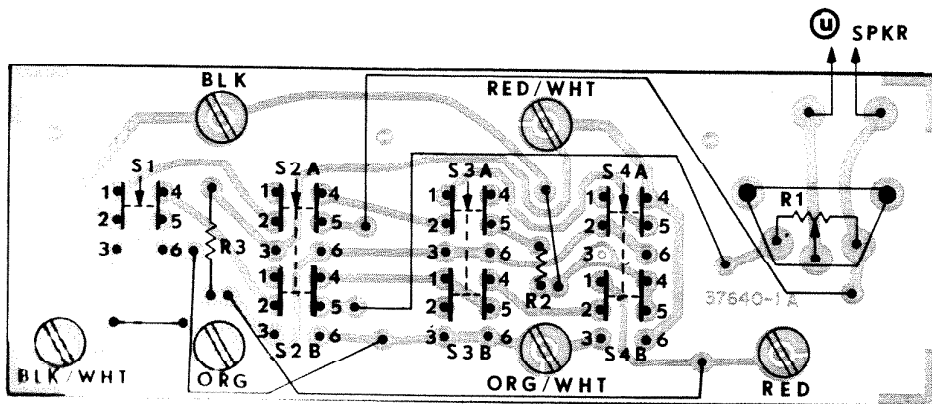
DIRECT-A-COM TOWNHOUSE APARTMENT SPEAKER AND WIRING



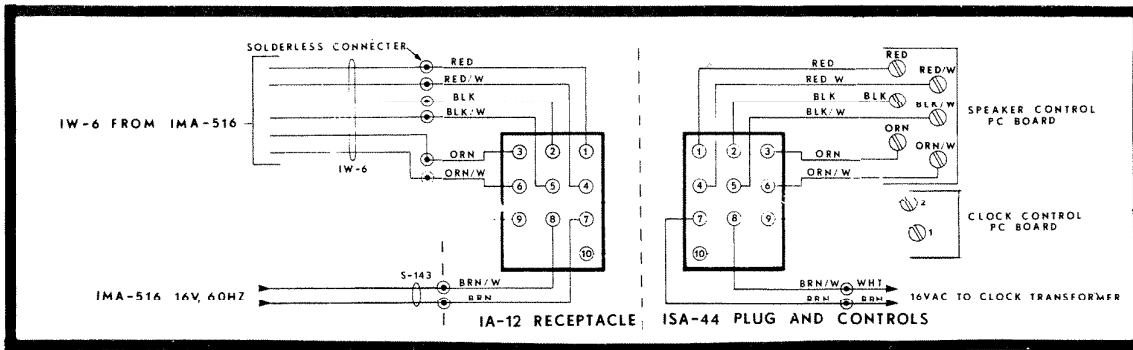
TOP VIEW: CLOCK/ALARM CONTROL PC BOARD — COMPONENT LOCATION



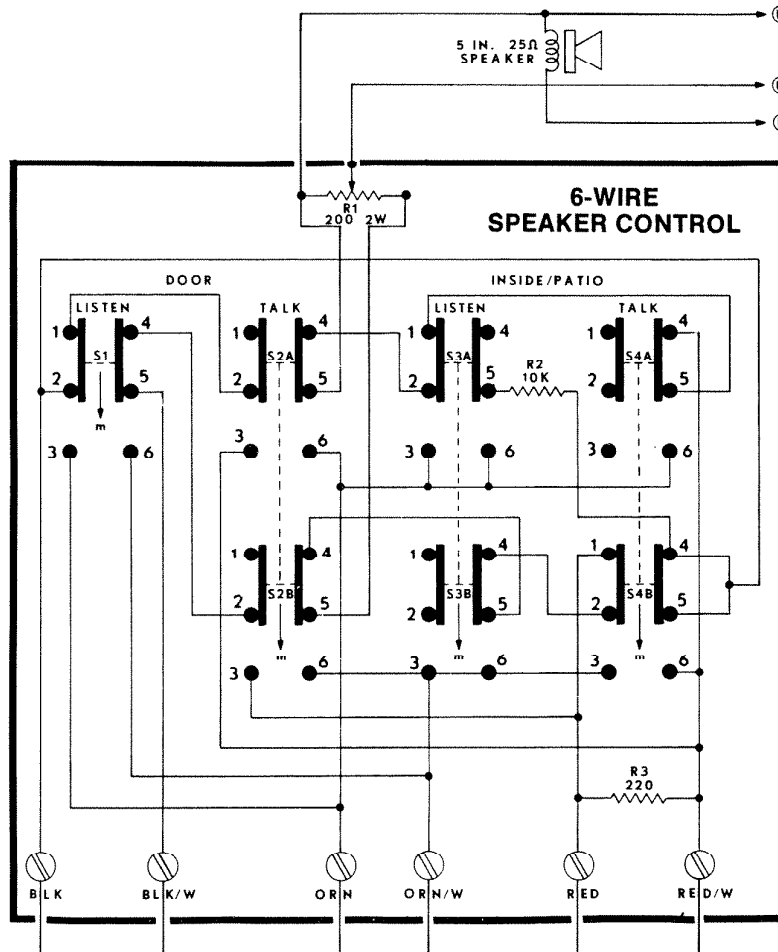
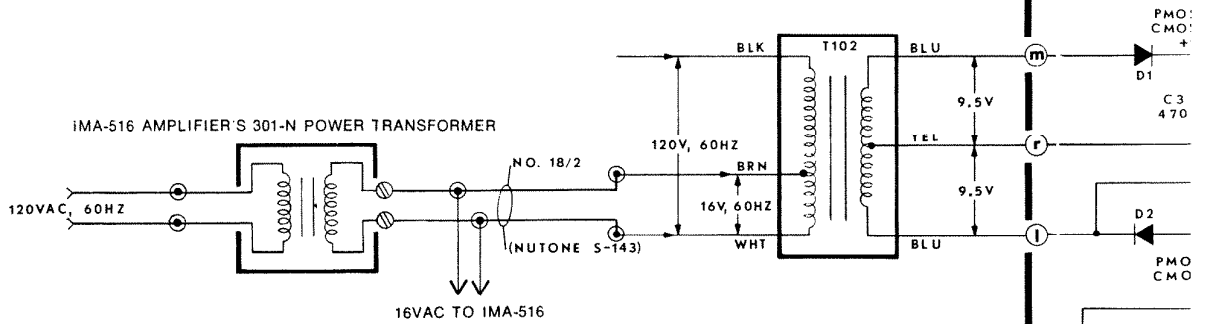
BOTTOM VIEW: CLOCK/ALARM PC BOARD — FOIL PATH/COMPONENT CONNECTION



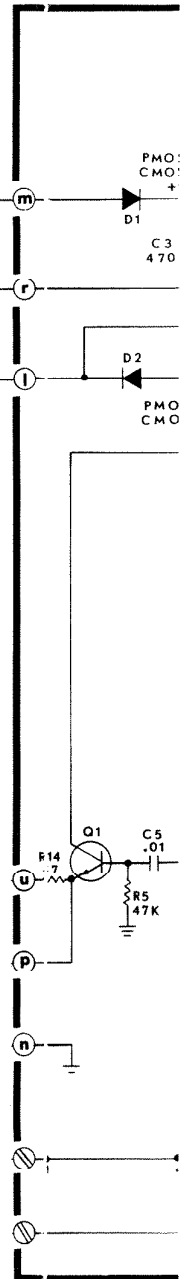
6-WIRE SPEAKER CONTROL PRINTED CIRCUIT TERMINAL BOARD



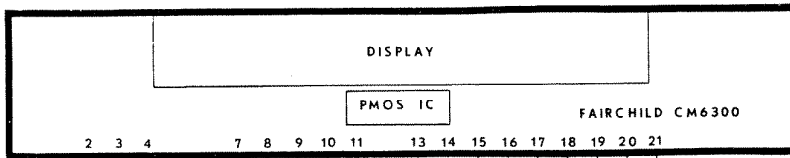
IMA-516 — IA-12 — ISA-44 INSTALLATION WIRING



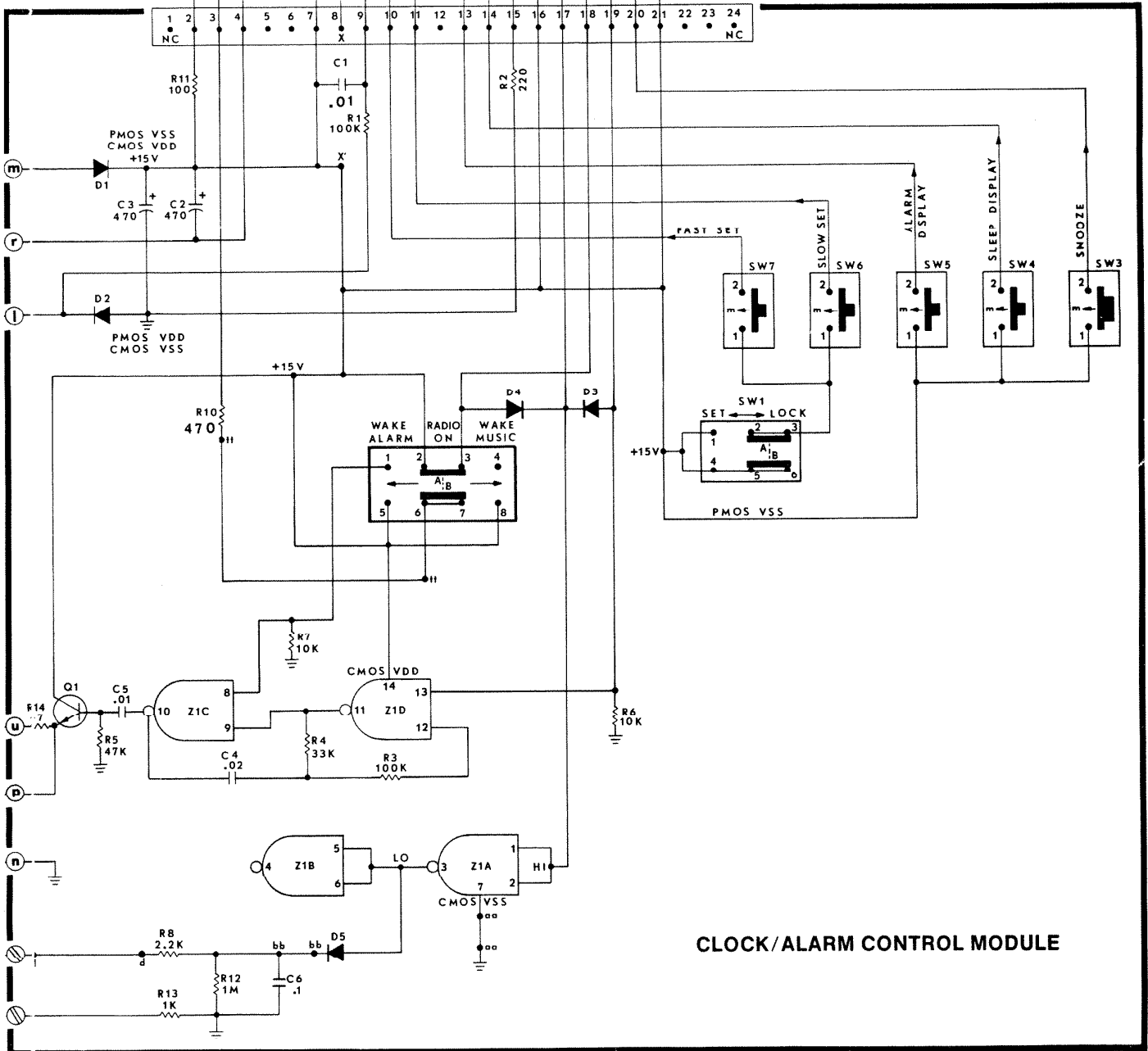
CLOCK TIMER PROTECTION CIRCUIT NOT USED WITH IMA-516



IW-6 FROM IMA-516



NOTE:
FOR 50HZ OPERATION,
CONNECT X TO X' (PIN 8 TO +15V PMOS VSS)



ISA-44/ISB-47 6-WIRE SPEAKER CLOCK TIMER

REPLACEMENT PARTS LIST

RESISTORS: Value in ohms $\pm 5\%$, $\frac{1}{4}$ watt carbon film, unless otherwise specified.
K = Kilo = 10^3 M = Mega = 10^6

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

Schematic Symbol	NuTone Part No.	Description
	42292-000	Amplifier Cover Assembly (including ornament & Info label)
	42293-000	Amplifier Base and PC Board Assembly
	32302-000	Amplifier Base
AMPLIFIER PC BOARD		
	42293-000	Complete PC Assembly
CAPACITORS		
C101A	35091-117	1000, +100%, -10%, 35WVDC Electrolytic (Maximum height above top of PC board = 1.4")
C101A/C101B	35091-101	ALTERNATE FOR C101A ABOVE
C102A	35091-117	470, +100%, -10%, 35WVDC Electrolytic (use both to rereplace C101A above) (Max. replace C102A above) (Max. 1000, +100%, -10%, 35WVDC Electrolytic (Maximum height above top of PC board = 1.4")
C102A/C102B	35091-101	ALTERNATE FOR C102A ABOVE
C103-C105	35091-105	470, +100%, -10%, 35WVDC Electrolytic
C106, C107	35091-115	33, +100%, -10% 35WVDC Electrolytic
C108, C109	35091-103	4.7, +100%, -10%, 25WVDC Electrolytic
C110-C113	35100-127	.1, +80%, -20%, 100V
C-114-C116	35100-164	680pf $\pm 20\%$
C17	35100-191	.03 $\pm 20\%$, 50V
C18-C20	35055-102	.15 $\pm 20\%$, 100V Polyester Film
DIODES		
D101	36608-000	Silicon Rectifier, 3Adc, PIV200 Motorola MR-502 General Inst. IN540Z
D102-D106	36549-000	Silicon Rectifier, 1Adc, 100PIV
D7	36639-000	Type IN4002 Silicon Zener 18V $\pm 10\%$ Type 1N4746
TRANSISTORS		
Q101	36614-000	NPN Silicon, Single Diffused, Power. Voltage Regulator Motorola MJE-520
Q102	36580-000	NPN Planar Silicon, Low-Noise Intercom Audio Amplifier Texas Inst. SKA4220 Motorola SPS1216 National Semi. SMO7329
RESISTORS		
R101	33039-181	180 $\pm 10\%$, 1 Watt, Wirewound
R102	33039-002	2.2 $\pm 10\%$, 1 Watt, Wirewound
R103	33039-010	1 $\pm 10\%$, 1 Watt, Wirewound
R104-R108	33082-123	12K
R109	33082-104	100K
R110-R112	33082-274	270K
R113, R114	33082-101	100
R115, R116	33082-683	68K
R117, R118	33082-182	1.8K
R119	33082-393	39K
R120, R121	33082-220	22

Schematic Symbol	NuTone Part No.	Description
R122	33082-105	
R123, R124	33101-470	47 $\pm 10\%$, $\frac{1}{2}$ Watt, Carbon Comp.
R125	33101-331	330 $\pm 10\%$, $\frac{1}{2}$ Watt, Carbon Comp.
R126	34043-000	MUSIC LEVEL SET CONTROL 100K $\pm 30\%$, 0.1 Watt, Linear Taper Potentiometer
R127	34042-000	C.T.S. Corp Type X-201 INTERCOM LEVEL SET CONTROL 100K $\pm 30\%$, 0.1 Watt, Linear Taper Rheostat C.T.S. Corp Type X-201
TRANSFORMERS		
		Power Transformer: 120Vac/16Vac, 30VA. NuTone Model 301-N — not supplied with IMA-516.
T101	30592-000	Intercom Input, primary center-tapped. Primary 0.180 ohms d-c, Secondary 600 ohms d-c. Better Coil No. 7468
INTEGRATED CIRCUIT		
Z101	36658-000	CMOS Quad Bilateral Switch RCA CD4066AE -
Z102	36682-000	Motorola 14066CP Audio Amplifier Type TDA2002AH -
MISCELLANEOUS		
	38613-000	Heat Sink for Q101 and Z102
	39599-004	Screw, #4-40 x 7/16" Slotted Heat Sink Mounting
	11159-003	Nut, #4-40 Hex
	39516-000	Terminal, PC Board Wire Connectors
	31669-003	Screw, #6 x 3/8 Slotted, Wire to Terminal Connector
	11253-003	Screw, Machine #6-32 x 1 1/8" Slotted Round Head
	11077-003	Nut, #6-32 Hex
	10378-000	Washer, #6
	31906-003	Screw, #6-20 x 11/32", Slotted Pan Head
	65364-000	PC Board to Base Mounting Envelope Assembly, includes 2 Screws, #8 x 1 1/4" Zinc Plate Installation Mounting
	48161-000	Label, Info Instruction
	46761-000	Label, Low Level Connection
	48162-000	Homeowners Instructions
	48163-000	Installation Instructions
ISA-53 INSIDE SPEAKER		
	42254-000	Speaker Panel Assembly, Complete
PC TERMINAL BOARD		
	42256-000	Complete Assembly
	37698-000	PC Board Only
RESISTORS		
R1, R2	33082-102	1K
R3	34059-000	200 $\pm 20\%$, 1.5 Watt, Wirewound, Linear Taper Potentiometer
	39294-000	VOLUME CONTROL C.T.S. Series INS-115 Knob, Volume Control

Schematic Symbol	NuTone Part No.	Description
SWITCHES		
S1, S2	34636-000	4Pdt, Momentary Contact. S1, DOOR OFF/ON, Normally in OFF position. S2, INTERCOM TALK/LISTEN, Normally in LISTEN position. Break before Make Alps Electric #3339156
	39398-000	Switch Button, for S1 and S2
	38914-000	Pushbutton, Lock for S2
SPEAKER		
SP1	36076-000	3½", 16 Ohm Voice Coil
	39384-000	Screw, #8-18 × 9/32", Phillips, Speaker Mounting
MISCELLANEOUS		
	39209-003	Screw, #6-20 × ¾", Slotted Terminal, wire connecting
	40966-000	Envelope Assembly, includes 2 screws, #6 × 1¼" Phillips, Installation Mounting
	48119-000	Installation Instructions