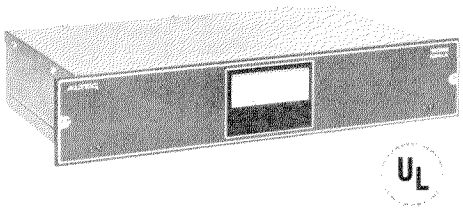
ALTEC LANSING

1605C NOALA CONTROL PANEL



OPERATING INSTRUCTIONS

RECOMMENDED SETUP PROCEDURE

The 1605 NOALA Control Panel is inserted into the gain loop of the sound system, and automatically corrects system gain as the noise level rises or subsides. To maintain intelligibility, the sound system must have sufficient power amplification to generate a sound pressure level (SPL) that is greater than the maximum noise level. This worse case condition (maximum noise level) must fall short of the clipping level of the sound system, with minimum distortion.

1. Complete necessary installation requirements as described in the Installation Section.

2. Remove two screws securing front cover; open and lower cover.

3. Set controls and switches as follows:

   POWER switch to ON (depressed)

   LEVEL AUTO/SET switch to SET (released)

   LEVEL MIN/MAX switch to MAX (released)

   MUSIC ON/OFF switch to OFF (released)

   MUSIC PRE/POST switch to PRE (depressed)

   SAMPLE PRE/PAGE switch to PAGE (released)

   NOISE SENSE control to 0

   MIN LEVEL SET control to 0

   MUSIC LEVEL control to 0

   PAGE LEVEL control to 5

4. Allow a thermal stabilization period of approximately 10 minutes.

5. Apply a 1000 Hz test signal to the paging channel at terminals 7 and 8 of TB1:

   a. If the NOALA utilizes a 15335A Bridging Transformer module in receptacle ACC1, adjust the test signal to approximately 0 dBm at terminals 7 and 8 of TB1.

   b. If the NOALA utilizes a 1588B Microphone Preamplifier module in ACC1, adjust the test signal to approximately −30 dBm at terminals 7 and 8.

6. Adjust gain of power amplifier for maximum output desired. This output should be greater than the maximum expected noise level, and short of clipping, with minimum distortion.

7. Place LEVEL MIN/MAX switch of NOALA to MIN (depressed). Adjust MIN LEVEL SET control until indicator of RELATIVE LEVEL meter reads at the lower end of the dynamic noise range.

   The dynamic noise range is the difference in dB between the maximum noise level and the minimum noise level. The maximum dynamic noise range that can be compensated by the NOALA is 30 dB.

   EXAMPLE:
   If the maximum dynamic noise range is 20 dB, the MIN LEVEL SET control is adjusted until the indicator of the RELATIVE LEVEL meter reads −20 dB.

   If the maximum dynamic noise range is not known, the RELATIVE LEVEL meter setting must be determined by best judgment.

8. Disconnect 1000 Hz test signal source.

9. Adjust noise sense circuit to the proper operating level:

   a. Place LEVEL AUTO/SET switch to AUTO (depressed).

   b. Adjust NOISE SENSE control until RELATIVE LEVEL meter reads 0 dB. This 0 dB reading is the maximum gain condition of the system to maintain intelligibility for the worst case condition (maximum noise level) as established in Step 7.

   c. With maximum noise level present in the environment where NOALA is being applied, introduce a normal paging program with the microphone. The system should produce the SPL necessary to maintain intelligibility. If necessary, refined adjustments or system gain may be made at:

      (1) Preamplifier (if used) providing input to paging channel

      (2) PAGE LEVEL control of NOALA, on either side of nominal '5' setting

      (3) Power amplifier

10. Set gain of music channel as follows:

    a. Place MUSIC ON/OFF switch to ON (depressed).

    b. With music program level of approximately 0 dBm present at terminals 4 and 5 of TB2, set MUSIC LEVEL control for desired gain of music channel. In this mode of operation, gain of the music channel is corrected automatically as the noise level rises or subsides.

    c. If it is preferred that the music channel operate at a fixed gain, place the MUSIC PRE/POST switch to POST (released). In this mode of operation, gain of the music channel is not affected by changes of noise level.

11. Select noise sampling mode as follows:

    a. With the SAMPLE PRE/PAGE switch at PAGE (released), noise sampling occurs for a period of approximately 3 seconds each time the microphone 'push-to-talk' button is *released*. Thus the NOALA corrects system gain each time a paging program is terminated. Introducing a subsequent paging program before the noise sampling period is completed will override the noise sampling function. Figure 1 illustrates the sequence of events for music program, paging program, and noise sampling.

    b. If long periods occur between paging programs, and environmental noise levels change significantly in the meantime, it may be desirable to have the NOALA sample noise level before the next paging program. In this case, place the SAMPLE PRE/PAGE switch to PRE (depressed). Noise sampling now occurs for a period of approximately 3 seconds each time the microphone 'push-to-talk' button is *pressed*. Thus the

Line/Output Connections

The loudspeakers and power amplifier are connected to the LINE/OUTPUT terminals. TB2, on the rear of the chassis (see Figure 3). A two-wire shielded cable is recommended for connecting the *input* of the power amplifier to the NOALA at terminals 6 and 7 of TB2. Connect the shield to ground at terminal 5 of TB2. The output of the power amplifier is connected to terminals 1 and 2 (70V LINE AMP) of TB2. The speaker distribution system is connected to terminals 3 and 4 (70V LINE SPKRS) of TB2. Terminals 2 and 3 are common at the low side of the 70V line.

SERVICE INSTRUCTIONS

If a malfunction occurs, service should be performed by an ALTEC Qualified Service Representative. For factory service, ship the 1605 prepaid to:

ALTEC Customer Service/Repair
10500 West Reno
Oklahoma City, OK 73126

For additional information or technical assistance, call (405) 324-5311 or Telex 68-5536.

Access

Front Panel: Remove two screws securing cover of front panel. Open and lower panel cover.

Chassis Interior: Remove nine screws securing top cover to chassis. Lift off top cover.

Meter Zero Adjustment

The Meter Zero Adjust (R82) is located within the chassis on the printed circuit board (see Figure 4). For proper adjustment, proceed as follows:

1. Set all front panel controls to full counterclockwise position. Place all pushbutton switches to released position (out).
2. Connect NOALA to line power source.
3. Press POWER switch to turn on line power and allow a 10-minute thermal stabilization period.
4. Following thermal stabilization, adjust R82 for a reading of 0 dB on RELATIVE LEVEL METER.

Meter Damping Adjustment

The Meter Damping Adjust (R136) is located within the chassis on the printed circuit board (see Figure 4). Nominal adjustment of R136 is one-fourth of the clockwise excursion, as referenced from the front of the NOALA.

Fuse Replacement

If replacementof any fuse is required, determine and correct any cause of failure before installing another fuse. Install an identical fuse (see PARTS LIST).

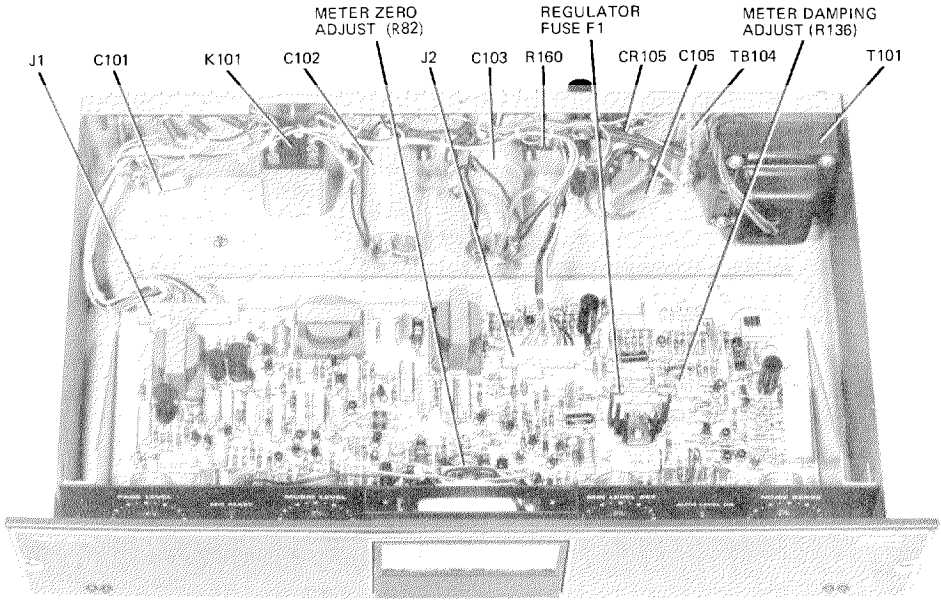


Figure 4. Chassis Components

Primary power fuses are located on the rear of the chassis. F102 is for ac power, and F101 is for battery power. See 'Rear Panel Connections and Features' of Operating Instructions.

Fuse F1 is located within the chassis, on the printed circuit board. This fuse, rated at 1.5 amperes, protects regulator U2 (see Figure 4).

Printed Circuit Board Assembly

The printed circuit board assembly may be removed for service by detaching three cable connectors from the board, removing knobs and securing nuts from the four control potentiometers, and removing five screws that secure the board assembly to the chassis.

CAUTION

Do not warp, bend or twist the circuit board or the conductor may fracture.

When reconnecting cables to the board, be sure the ends of the plastic connector are flush with the ends of the circuit board connector, or individual pin plugs will not mate with the proper pin receptacles. Damage as a result of erroneous connection is not covered by warranty.

CIRCUIT DESCRIPTION

The functional diagram of Figure 5 illustrates operation of the 1605 NOALA.

Operational Modes

The 1605 operates in three basic modes; music (music channel), paging (page channel) and noise sensihg (ambient noise amplifier). Only one of the three modes may operate at a given time. While one mode operates, the other two modes are cut off automatically. The music channel typically operates while no paging is required. The ambient noise amplifier operates either immediately before or immediately after paging activity, according to selectable option. The page channel operates during paging activity, and has priority to interrupt either the music channel or the ambient noise amplifier.

Other circuits mediate the signal (music, page or noise), and provide necessary functions for proper operation of the NOALA. These circuits include the page detector/hold, music or page detector, attenuator, dc comparator, audio output, noise amplifier sample and hold, noise timer, and mic ready drive.

Music Channel

Music signals are applied through input transformer T2 to amplifier transistors Q14 and Q15. Field-effect transistor (FET) Q16 must be in the nonconducting (off) mode to allow adequate signal level to arrive at transistor Q17; when FET Q16 conducts (on mode), music signals are quenched to ground, and attenuated approximately 20 dB. With FET Q16 off, music signals pass through emitter follower Q17 and are distributed to three points; to MUSIC PRE/POST switch through potentiometer R53, to SAMPLE PRE/PAGE switch, and to the page/music detector through resistor R15.

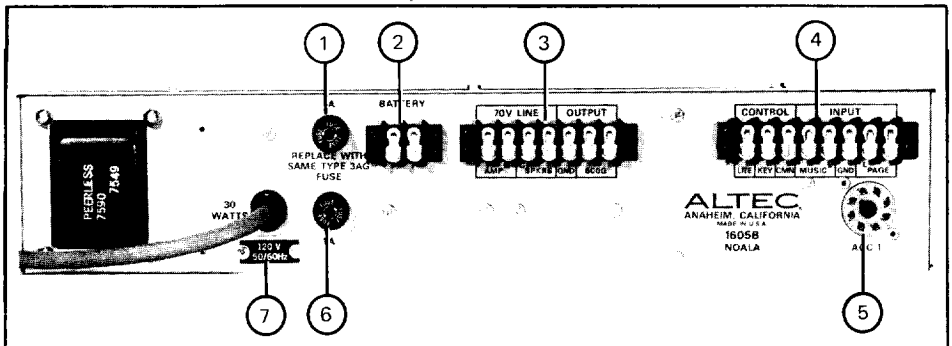
NOTE

For operation of field-effect transistors, the FET is on (conducting) with 0 voltage from gate to source, and off (not conducting) with (+) voltage from gate to source.

FET Q16 receives a control voltage from the page hold circuit to squelch music signals. Thus transistor Q16 is conducting (squelch mode) while the page channel is operating.

With the MUSIC PRE/POST switch at the PRE position, music signals pass to the attenuator via resistor R54 and capacitor C9. With the switch at the POST position, music signals bypass the attenuator via resistor R35.

REAR PANEL CONNECTIONS AND FEATURES



①	Battery power fuse	Protects NOALA from excessive current drain (battery power source). Replace only with same type 1.0-ampere fuse. Refer to qualified service personnel if fuse blows repeatedly.
②	BATTERY terminal block (TB3)	Connects external auxiliary battery power source to continue operation in the event of ac power loss.
③	70V LINE/OUTPUT terminal block (TB2)	Connects loudspeakers and power amplifier, including power amplifier input and power amplifier output.
④	CONTROL/INPUT terminal block (TB1)	Connects paging source (microphone or preamplifier), music source, and optional page-ready lamp.
⑤	ACC1 receptacle	Accepts 1588B Microphone Preamplifier accessory (direct microphone application) or 15335A Bridging Transformer accessory (when using preamplifier).
⑥	AC power fuse	Protects NOALA from excessive current drain (AC power source). Replace only with same type 1.0-ampere fuse. Refer to qualified service personnel if fuse blows repeatedly.
⑦	Voltage rating plate	Shows 120V or 240V power rating of NOALA.

Battery Connections

If desired, the NOALA may be connected to an external 24/28 volt battery with minus (−) as ground. Connection is made to the BATTERY terminals on the rear of the chassis. If ac power fails, transfer to dc power is instantaneous, automatic and silent.

Input/Control Connections

The paging source, music source and optional page-ready lamp are connected to the CONTROL/INPUT terminals, TB1, on the rear of the chassis (see Figure 3). Electrical specifications of the optional page-ready lamp are 24/28 volts at nominally 20 to 25 mA.

Two-wire shielded cable is recommended for connecting the paging source to terminals 7 and 8 of TB1, and the 600-ohm music source to terminals 4 and 5 of TB1. Connect the shields to ground at terminal 6 of TB1. The microphone key or page switch is connected to terminals 2 and 3 of TB1. The optional page-ready lamp is connected to terminals 1 and 3.

To complete the circuit of the paging channel, an appropriate plug-in module must be inserted in the ACC1 receptacle on the rear of the chassis. If the microphone is connected directly to the NOALA, use the 1588B Microphone Preamplifier accessory. If a preamplifier is used to mediate the microphone signal, use the 15335A Bridging Transformer accessory.

the chassis, is mounted to show the appropriate side specifying the connections.

If the NOALA is to be powered from a 240 volt, 50/60 Hz line, use the following procedure to change factory wiring of the primary power circuit from 120 volts to 240 volts:

1. Remove top cover from chassis.
2. Locate terminal board TB104 near power transformer T101 (see Figure 4).
3. Remove strap 'A' connecting terminals 2 and 3, and remove strap 'B' connecting terminals 4 and 5; then solder strap 'C' to terminals 3 and 4 (see Figure 2).
4. Remove voltage rating plate from chassis; reverse and reinstall to show 240V rating.
5. Install top cover on chassis.

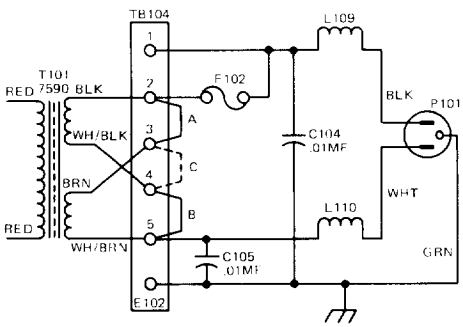


Figure 2. Converting to 240V, 50/60 Hz

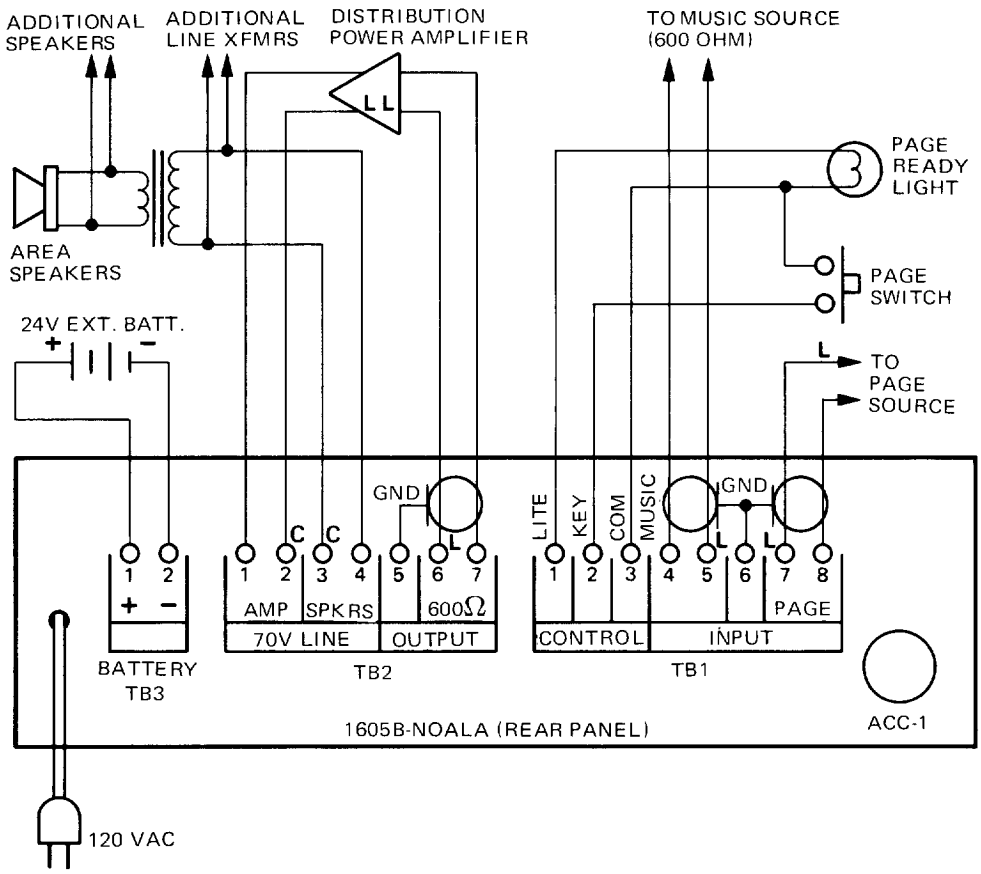
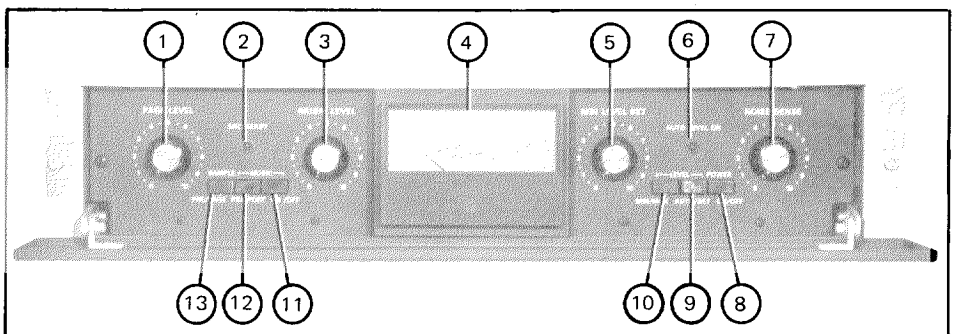


Figure 3. Typical Installation Wiring of NOALA

FRONT PANEL CONTROLS AND INDICATORS



①	PAGE LEVEL control	Controls gain level of paging channel for all modes of operation.
②	MIC READY indicator	Illuminates after noise sensing period of page channel is complete.
③	MUSIC LEVEL control	Controls gain level of music channel for MUSIC PRE/POST mode.
④	RELATIVE LEVEL meter	Indicates degree of attenuation in dB from maximum system gain. Accurate to ±3 dB.
⑤	MIN LEVEL SET control	Adjust minimum system gain from 0 to −30 dB for LEVEL MIN mode of operation.
⑥	AUTO LEVEL ON indicator	Illuminates when NOALA is in automatic mode of operation.
⑦	NOISE SENSE control	Adjusts gain of noise amplifier for correct sensitivity to environmental noise level. Operates only during interruptions of paging or music program.
⑧	POWER ON/OFF switch	Applies power to NOALA when depressed.
⑨	LEVEL AUTO/SET switch	Places NOALA in LEVEL SET mode when released. This mode is used for setting optimum system gain at preamplifier, power amplifier, etc. NOALA has only *manual* influence with system gain, and RELATIVE LEVEL meter reads 0 dB. Places NOALA in LEVEL AUTO mode when depressed. NOALA automatically adjusts paging or music program to compensate for variations in ambient noise level of the loudspeaker environment.
⑩	LEVEL MIN/MAX switch	Places NOALA in LEVEL MAX mode when released. This mode provides maximum gain of the NOAOA, and is used in conjunction with the LEVEL SET mode. Places NOALA in LEVEL MIN mode when depressed. Minimum system gain may be adjusted within the range of 0 to −30 dB with the MIN LEVEL SET control.
⑪	MUSIC ON/OFF switch	Turns off music channel when released, and turns on music channel when depressed.
⑫	MUSIC PRE/POST switch	Places NOALA in MUSIC POST mode when released. This mode provides full gain of music channel, as set by MUSIC LEVEL control. Places NOALA in MUSIC PRE mode when depressed. Gain of music channel is adjusted automatically to compensate for variations in ambient noise level of loudspeaker environment.
⑬	SAMPLE PRE/PAGE switch	Places NOALA in SAMPLE PAGE mode when released. Noise is sampled in the absence of program (no music or paging), and for 3 seconds after *release* of paging microphone button. Places NOALA in SAMPLE PRE mode when depressed. This mode of operation is similar to the SAMPLE PAGE mode except noise sampling period (nominally 3 seconds) occurs *after depressing* microphone button, and prior to talking. MIC READY indicator illuminates at conclusion of noise sampling period. Noise sampling period may be interrupted by speaking into microphone.

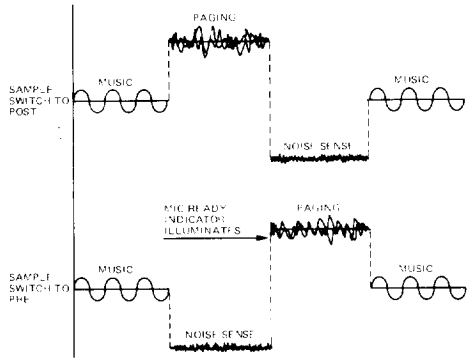


Figure 1. Noise Sampling Functional Sequence

NOALA corrects system gain just before each paging program begins (see Figure 1). The MIC READY indicator illuminates each time the noise sensing period is complete, providing a convenient cue that the paging program may begin. If necessary, the noise sensing period may be overridden by immediately introducing the paging program.

12. Close the front cover and secure with two screws previously removed.

INSTALLATION

The 1605 NOALA may be mounted in a standard 19-inch equipment rack. Vertical space required for mounting is 3½". The hinged front cover prevents inadvertent control changes; with the cover secured, only the RELATIVE LEVEL meter is exposed.

Rack Mounting

1. Remove two screws securing front cover, open and lower cover.
2. Install NOALA in equipment rack, using appropriate four screws supplied.
3. Close front cover and secure with two screws previously removed.

Ventilation

The NOALA should not be placed too close to heat-generating equipment or in areas where ambient temperature exceeds 55°C (131°F). If the NOALA is mounted in an equipment rack or cabinet with heat-producing equipment mounted above and/or below, space must be provided between the units to prevent excessive temperature rise.

120 Volt, 50/60 Hz Power Connections

Equipment supplied for domestic use is provided with the power transformer primary strapped for 120 volts. The voltage rating nameplate, adjacent to the power cord on the chassis, is mounted to show the appropriate side specifying the connections. Verify that line voltage is in accordance with the voltage rating *before* connecting the NOALA to line power.

240 Volt, 50/60 Hz Power Connections

Export equipment, specified, is provided with the power transformer primary strapped for 240 volts. The voltage rating nameplate, adjacent to the power cord on

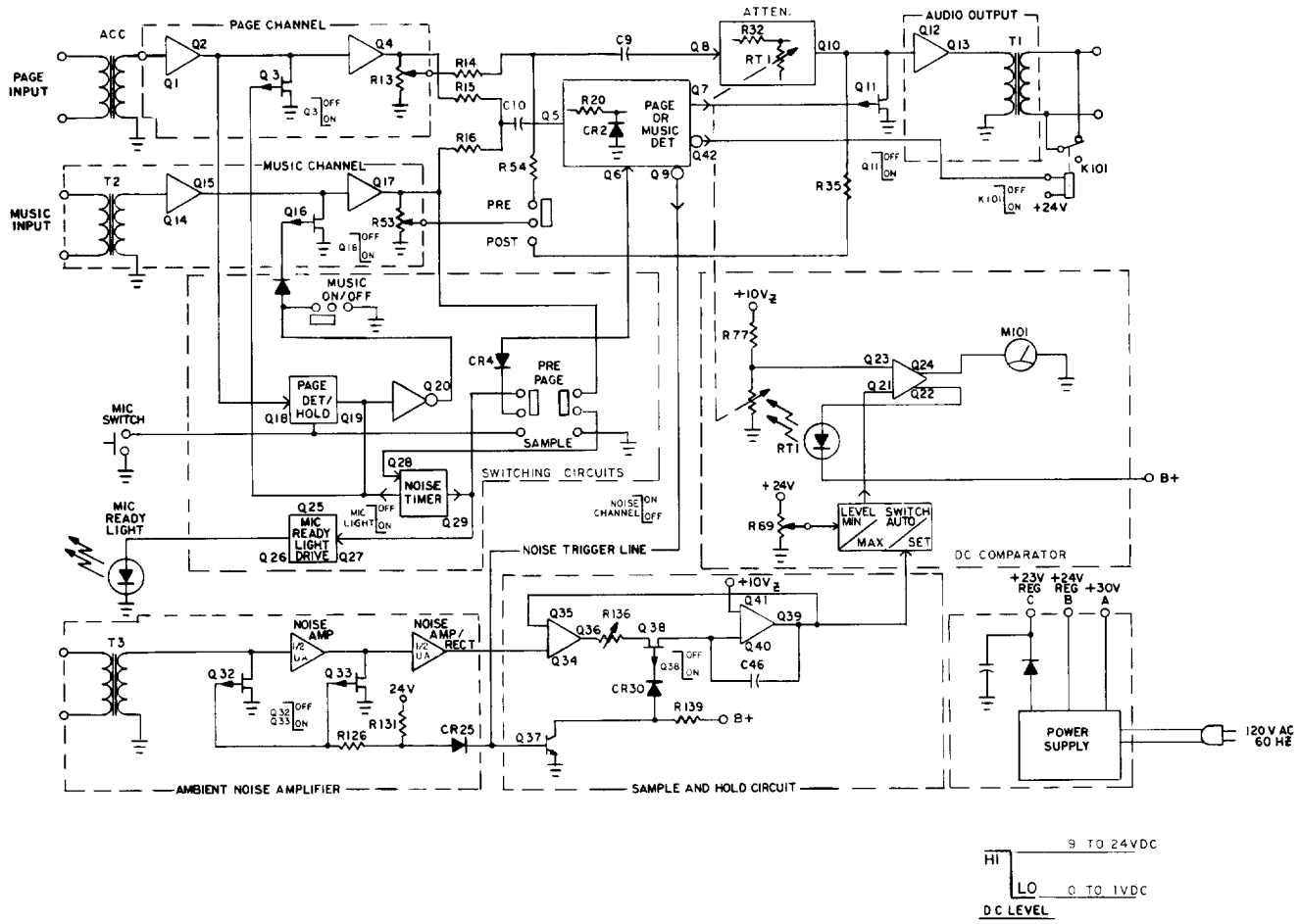


Figure 5. Functional Block Diagram

If music stops for more than 1 second, the NOALA automatically switches to the noise-sense mode. When music returns, the NOALA immediately reverts to the music mode.

Page Channel

Paging signals are applied through an accessory transformer or microphone preamplifier to amplifier transistors Q1 and Q2. FET Q3 must be in the nonconducting (off) mode to allow paging signal level to arrive at transistor Q4; when FET Q3 conducts (on mode), paging signals are quenched to ground, and attenuated approximately 20 dB. With FET Q3 off, paging signals pass through emitter follower Q4 and are distributed to two points: to the attenuator through potentiometer R13, resistor R14 and capacitor C9; and to the page/music detector through resistor R15.

FET Q3 receives a control voltage from the page detector and hold circuit to squelch noise in the page channel. Thus FET Q3 should be on (squelch mode) while the music channel is operating; this prevents noise arriving at the page/music detector from the page channel. The noise timer also provides a control voltage to FET Q3 while noise is being sampled by the sample and hold circuit.

Page/Music Detector

The page/music detector circuit senses the presence or absence of music or paging signals. During absence of paging or music, the circuit generates a low voltage to energize relay K101 to disconnect the power amplifier to the 70-volt line. During presence of paging or music, the circuit applies a quench signal to the ambient noise amplifier, and allows either music or page signals to pass through the audio output stage. During the noise-sampling interval, a quench voltage is applied to the audio output.

Page or music signals pass through capacitor C10 and amplifier Q5 to the base of transistor Q6. Transistor Q6 is turned on by the presence of positive peaks of music or page signals, and turned off by the absence of these signals. While transistor Q6 is turned off, a positive charge is introduced into capacitor C12 through resistor R23. Because of the large value of resistor R23, charge time of capacitor C12 is approximately 1 second before voltage level rises sufficiently to turn on transistor Q7. This is the delay time before the NOALA automatically changes to the noise-sense mode. If page or music signals reappear to turn on transistor Q6, capacitor C12 quickly discharges through diode CR3.

If music or page signals remain off for more than 1 second, transistor Q7 turns on and turns off transistor Q42 to deenergize (open) relay K101. Transistor Q11 is turned on to quench the audio circuit to ground. In addition, transistor Q9 is turned off, which turns on the noise amplifier. The noise amplifier continues to detect noise as long as no paging or music is applied, and the microphone switch is not activated.

When music or paging reappears, transistor Q7 turns off and triggers transistor Q42 to energize (close) relay K101. Transistor Q11 is turned off, which allows audio signals to pass through the audio output stage.

Attenuator Circuit

The attenuator circuit adjusts gain of music or page signals according to the signal received from the sample and hold circuit. An increase of noise signal causes an increase of gain; a decrease of noise signal causes a decrease of gain.

Music or page signals pass through capacitor C9 to emitter followers Q8 and Q10. Between transistors Q8 and Q10 is photosensitive element RT1, which, in conjunction with resistor R32, functions as a voltage divider. Depending on the dc control current established at light-emitting diode (LED) RT1, gain is increased or decreased. The dc control voltage is received from the comparator circuit. As long as the dc control voltage remains constant, element RT1 remains stabilized at a fixed value.

Although the attenuator circuit receives either page or music signals through capacitor C9, the two signal types are never mixed at this point because operation of one circuit (music or page channel) produces a squelch signal for the other circuit.

DC Comparator Circuit

The dc comparator circuit determines the dc control level to be used by the

attenuator circuit. The dc control voltage level from the sample and hold circuit is compared to a dc reference voltage; the higher dc voltage is used to adjust gain of the attenuator circuit.

When the LEVEL AUTO/SET switch is placed to the AUTO position, the dc control voltage from the sample and hold circuit is applied across resistor R75 and compared with the dc reference voltage at resistor R72. The dc reference voltage is adjusted by potentiometer R69 (MIN LEVEL SET), and is the minimum voltage level used to control gain of the attenuator; i.e., minimum gain set to operate the attenuator. If the dc reference voltage is higher than the dc control voltage from the sample and hold circuit, the attenuator remains at minimum gain. If the dc control voltage is higher than the dc reference voltage, then the increase of voltage is sensed at the base of transistor Q21, resulting in an increase of gain.

When transistor Q21 senses increased voltage at the base, Q21 conducts less, causing transistor Q22 to conduct less. This causes less current in LED element RT1. With low current, light output is low and the resistor values of RT1 tend to go high. This increases voltage to the base of transistor Q23. Differential amplifier Q21 and Q23 compare voltages at their corresponding bases. Transistor Q23 is connected through resistor R78 to a 10-volt reference supply. The photosensitive resistor of RT1 changes until the voltage on the base of transistor Q23 is equal to the voltage on the base of transistor Q21; this is accomplished by the feedback loop between Q21, Q23, Q24, and LED RT1. The dc comparator determines the resistive value of photosensitive cell RT1, which in turn determines the degree of attenuation of the audio output circuit.

Audio Output Circuit

The audio output circuit applies music or paging signals to the power amplifier of the sound system. Audio signals are cut off (greatly attenuated) during the interval of noise sampling.

Music or page signals are amplified through transistors Q12 and Q13, and passed through output transformer T1. As long as music or page signals are available at transistor Q12, FET Q11 is off (nonconducting), so that the audio signal is not quenched to ground. FET Q11 receives a control voltage from transistor Q7 to quench the audio signal during the interval of noise sampling.

Ambient Noise Amplifier

When relay K101 is deenergized, ambient noise signals pass through transformer T3, diodes CR19 and CR20, to emitter follower Q43. Diodes CR19 and CR20 limit incoming noise signal amplitude to 0.6 volt, preventing excessive signal to feed the noise amplifier.

Emitter follower Q43 feeds dual operational amplifier U1. The first stage of U1 is a small signal amplifier, and the second stage is an amplifier and positive peak detector.

When the page or music channel is operating, a low dc control voltage is transmitted from the page/music detector over the noise trigger line through diode CR25 and resistor R126. This causes transistors Q32 and Q33 to conduct, quenching signals of the noise amplifier to ground.

When paging or music signals stop for a sufficient time (approximately 1 second), a rise in dc control voltage reverse biases diode CR25, turning off transistors Q32 and Q33. This allows noise signals to pass through the ambient noise amplifier to the sample and hold circuit.

Sample and Hold Circuit

The sample and hold circuit samples incoming noise from the ambient noise amplifier. A dc voltage is generated that fluctuates with noise signal level. This control voltage is used to operate the attenuator circuit and a meter circuit.

The rise and fall of the positive level of noise signals from the ambient noise amplifier charges and discharges capacitor C43. Differential amplifier Q34/Q35 and output transistor Q36 compare voltage at the base of Q34 and at the base of Q35. When voltage at capacitor C43 increases, transistor Q36 turns on. Transistor Q38 is turned on during the noise-sense interval, causing transistor Q40 to have low gate voltage, which translates at transistor Q41 as low drain voltage, which in turn tends to turn off transistor Q39. Collector voltage of transistor Q39 increases, and is sensed at the base of transistor Q35. When transistor Q35 senses that base voltages of Q34 and Q35 are equal, transistor Q36 momentarily turns off. Transistor Q36 collector voltage tends to increase and is reflected to differential amplifier Q40/Q41 and transistor Q39. This voltage tends to turn on transistor Q39 and lowers Q39 collector voltage, which is sensed by transistor Q35. Transistor Q35 quickly compensates the voltage differential and maintains equilibrium. Transistors Q36 and Q39 function as a switch turning on and off, alternating with one side on and the other side off. This process maintains close track of incoming noise signal level, and generates a compensating dc control voltage at the collector of transistor Q39, which controls the dc comparator circuit.

Differential amplifier circuit Q40, Q41 and Q39 has capacitor C46 connected between input and output, and functions like a voltage integrator with resistors R136 and R138. The integrator has a slow time constant, to follow average incoming signal changes rather than rapid signal excursions. It is this integrated control voltage that is transmitted from the collector of transistor Q39 to the dc comparator circuit.

When the page or music channel is operating, a low dc control voltage is transmitted from the page/music detector over the noise trigger line through diode CR27 and CR28. This causes transistor Q37 to turn off, which in turn turns off FET Q38. During this time, the sample and hold circuit maintains a fixed level of dc control voltage at the collector of transistor Q39.

When the noise-sampling interval begins, a rise in dc voltage reverse biases diode CR27, turning on transistor Q37. The resulting low voltage at the collector of transistor Q3 turns on FET Q38. During this time, the sample and hold circuit determines a new dc control voltage to match any changes in incoming noise signal level.

Relay Circuit

High voltage at the collector of transistor Q7 (page/music detector) impresses a high voltage on the base of transistor Q42, causing low voltage on the collector. Low collector voltage of transistor Q42 energizes relay K101 and connects audio to the sound system.

When relay K101 energizes, contacts 3 and 9 open to allow audio to pass to the input of the power amplifier. Contacts 1 and 7 close to connect the output of the power amplifier to the 70-volt line.

Low voltage of transistor Q7 impresses a low voltage on the base of transistor Q42, causing high voltage on the collector. High collector voltage of transistor Q42 deenergizes relay K101 and disconnects audio and the power amplifier from the sound system. The 70-volt line then functions somewhat as a microphone, picking up ambient noise and introducing the resulting signals to the NOALA.

Switching Circuit

The switching circuit consists of a page detector and hold circuit, a noise timer to determine the noise-sampling period, and other components to facilitate switching functions.

When the microphone switch is activated, a ground is placed between diode CR6 and resistor R55. Any charge existing in capacitor C25 is discharged rapidly to ground through resistor R61. Transistor Q19 is turned off, sending a turnoff voltage from the collector to the gate of FET Q3. Transistor Q3 turns off to remove squelch, allowing page signals to pass through the page channel.

When transistor Q19 is turned off, inverter Q20 turns on and sends a low voltage to FET Q16. FET Q16 conducts to quench the music channel.

When the microphone switch is deactivated and page is off, the ground is removed from diode CR6. Since no page signals pass through the page detector, transistor Q18 is off. A high collector voltage at transistor Q18 initiates a slow charge of capacitor C25 through resistor R60. This is the 3-second timing circuit that determines the interval for the NOALA to revert to the music mode after the paging mode is ended. When capacitor C25 contains enough charge, transistor Q19 turns on. Low collector voltage of transistor Q19 quenches the page channel at FET Q3 and turns off transistor Q20. High collector voltage of transistor Q20 reverse biases FET Q16 to turn off squelch and allow music to pass through.

When the microphone switch is activated and the SAMPLE PRE/PAGE switch is placed to the PRE position, and if no

paging signals appear for 3 seconds, the NOALA automatically changes to the noise-sampling mode. High collector voltage from transistor Q19 turns on the noise timing circuit (transistors Q28 and Q29). Capacitor C27 begins to charge slowly through resistor R95. This is the 3-second timing circuit that determines the interval of noise sensing. After 3 seconds, capacitor C27 has enough charge to turn on transistor Q29. Low collector voltage from transistor Q29 turns on the mic ready drive circuit and illuminates the MIC READY indicator.

Low collector voltage from transistor Q29 also initiates a signal to turn off the noise amplifier. The low voltage passes through the PRE PAGE switch to diode CR4. Capacitor C12 discharges to generate a high voltage at the collector of transistor Q7, which turns on transistor Q9. Low collector voltage from transistor Q9 passes along the noise trigger line to turn off the noise amplifier.

TIMING DIAGRAMS

The timing diagrams of Figures 6 and 7 show functional relationships of key circuit components during switching and time delay.

Pre-Page Mode (Figure 6)

As the time scale on the pre-page mode of the timing diagram begins, the NOALA is operating in the music mode (MUSIC SIG). At time tA, the MIC SWITCH is closed and MUSIC SIG is immediately quenched. Capacitor C12 of the page/music detector begins to charge, and after approximately 1 second attains sufficient voltage level to turn on transistor Q7 (Q7 COL). This causes transistor Q9 (Q9 COL) to turn off, which turns on transistor Q37 (Q37 COL) of the sample and hold circuit. The interval in which transistor Q37 conducts is the noise detection time.

When transistor Q7 (Q7 COL) conducts, a high voltage at the collector of transistor Q42 (Q42 COL) deenergizes relay K101. This disconnects the power amplifier output from the 70-volt line. The 70-volt line then feeds ambient noise to the NOALA.

When the MIC SWITCH was closed at time tA, FET Q3 (PAGE Q3 GATE) turned off to allow page signals to go through. Paging is thus available as soon as the MIC SWITCH is closed, and remains available as long as the MIC SWITCH remains closed.

Noise detection time is determined by a fixed timer (capacitor C27 and resistor R95 of the noise timer circuit). After approximately 3 seconds from MIC SWITCH closure, capacitor C27 attains sufficient charge to turn on the mic ready light drive circuit, and illuminate the MIC LIGHT. The noise detection time is now concluded; transistor Q29 of the noise timer turns on and begins to discharge capacitor C12. As the voltage of capacitor C12 drops, transistor Q7 turns off, transistor Q9 turns on, transistor Q37 turns off, and transistor Q42 turns on. The page channel is now active and remains active as long as the MIC SWITCH is on.

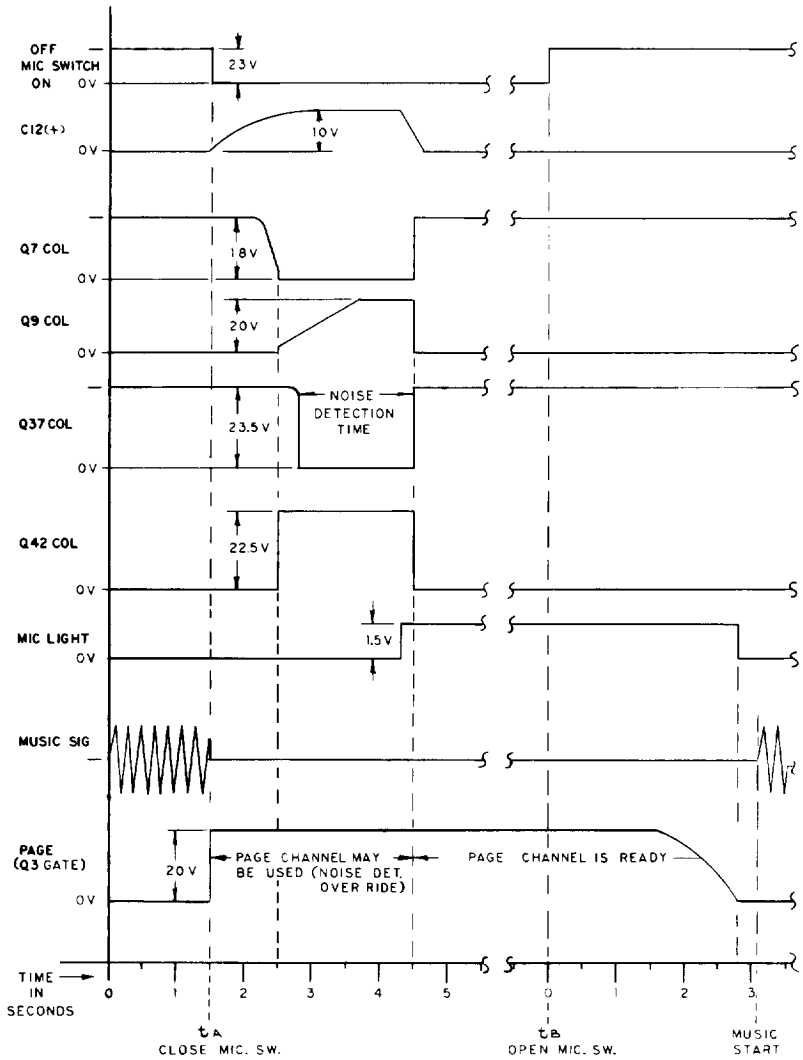


Figure 6. Pre-Page Mode Timing Diagram

When the MIC SWITCH is opened at time tB, a timing circuit (capacitor C25 and resistor R60 of the page detector and hold circuit) holds the page channel available for operation for 3 seconds. After 3 seconds, FET Q3 (PAGE Q3 GATE) turns on to squelch the page channel and the NOALA reverts to the music mode.

Sample-Page Mode (Figure 7)

The NOALA is operating in the music mode (MUSIC SIG) until the MIC SWITCH is closed at time tC, whereupon the MUSIC SIG is immediately quenched. FET Q3 (PAGE Q3 GATE) turns off to allow page signals to go through. Paging is thus available as soon as the MIC SWITCH is closed, and remains available as long as the MIC SWITCH remains closed.

When the MIC SWITCH is opened at time tD, capacitor C12 of the page music detector begins to charge, initiating the same sequence of events described in the pre-page mode of the NOALA. Noise detection occurs for the usual time, after which transistor Q29 turns on to initiate discharge of capacitor C12. Transistor Q7 turns off, transistor Q9 turns on, transistor Q37 turns off, and transistor Q42 turns on. FET Q3 (PAGE Q3 GATE) turns on to squelch the page channel, and the NOALA reverts to the music mode. The MIC LIGHT has no applicable function for the sample-page mode, although it is operated by the same circuitry as for the pre-page mode.

If the MUSIC SIG is interrupted during the music mode (time tE), the NOALA changes to the noise-sense mode by the sequence of events previously described. The noise-sense mode will remain operating until the MUSIC SIG is restored (time tF).

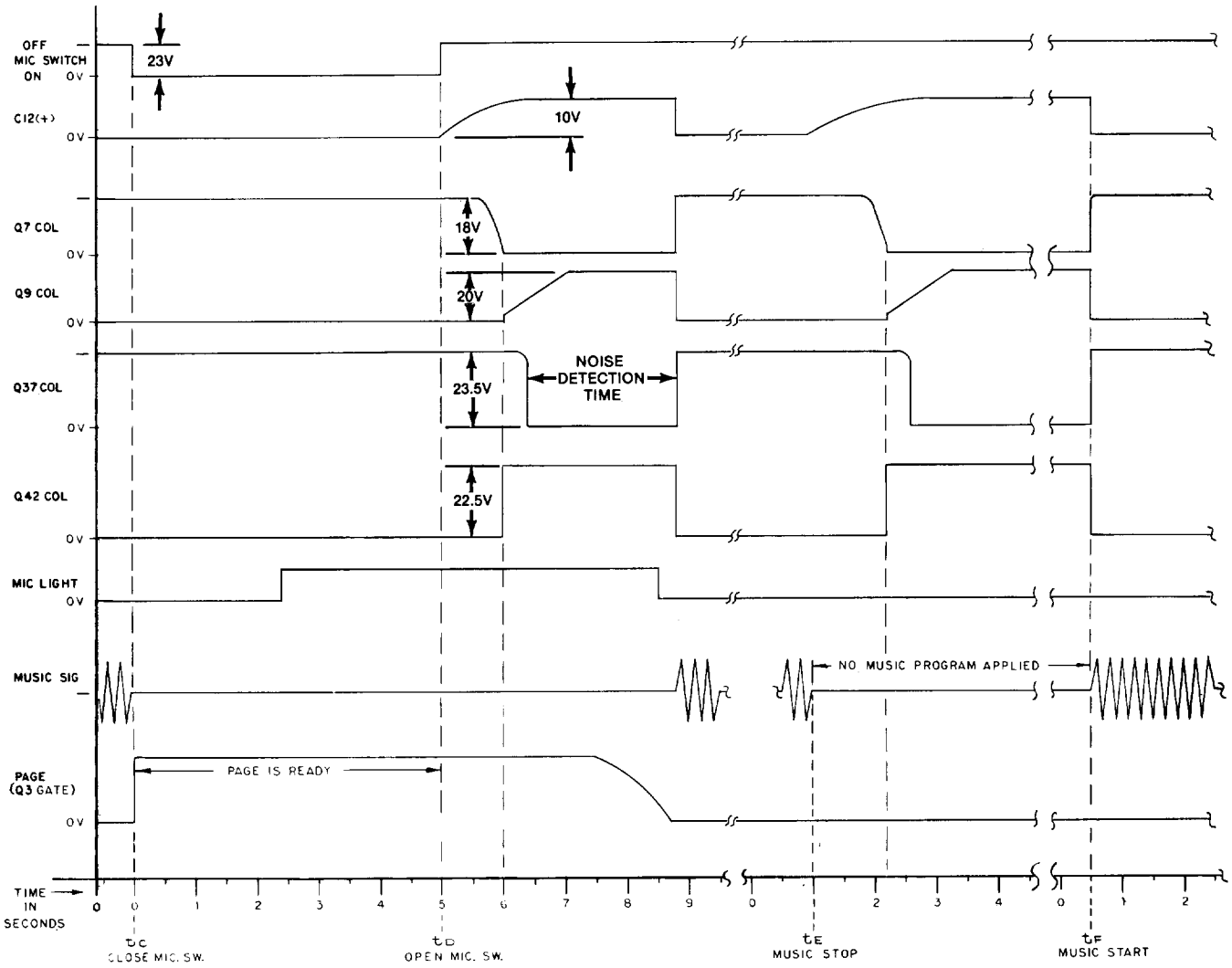


Figure 7. Sample-Page Mode Timing Diagram

PARTS LIST

MAIN CHASSIS

Reference Designator	Ordering Number	Name and Description
—	24-04-100526-01	Knob, control, 1" diameter
—	27-01-044290-12	PCB assembly
ACC101	21-02-100973-01	Socket, octal
C101	15-06-100111-01	Cap., 0.1 μF ± 10%, 100V
C102, 103	15-01-107430-01	Cap., 4000 μF, 35V
C104, 105	15-02-121767-01	Cap. 0.01 μF ± 20%, 1400V
CR101, 102	39-01-112201-01	Lamp, solid state, 1.8V, 20 mA
CR104	48-02-042787-01	Rect., silicon, 1A, 400 PIV
CR105	48-02-108577-01	Rect., bridge, 1.5A, 100 PIV, SCBR-1/BERB11 SEM TECH
DS101, 102	39-01-122182-01	Lamp, 28V, 40 mA
F101, 102	51-04-113242-01	Fuse, slo-blo, 1A
F103	51-04-121417-01	Fuse, slo-blo, 1A, pigtail
K101	45-01-100188-03	Relay, 2 form C, 24V

Reference Designator	Ordering Number	Name and Description
L101, 102, 103, 104, 105, 106, 107, 108	56-01-043100-01	Choke, ferrite bead
L109, 110	56-01-044110-01	Choke, ferrite bead
M101	29-01-044423-04	Meter, relative level dB
P101	60-06-012636-04	Cord, 3 conductor, 18 GA
TB101	21-04-113171-01	Terminal Board, 8-terminal
TB102	21-04-101047-01	Terminal Board, 7-terminal
TB103	21-04-101034-01	Terminal Board, 2-terminal
TB104	21-04-101013-02	Terminal Board, 5-terminal
TB105	21-04-101020-01	Terminal Board, 1-terminal
T101	56-08-007590-03	Transformer, power

PARTS LIST (Continued)

PCB ASSEMBLY

Reference Designator	Ordering Number	Name and Description
C1, 8, 10, 16, 19, 24,	15-01-100190-01	Cap., 5 μF, 25V
C2, 20	15-02-100304-01	Cap., 0.001 μF ± 10%, 100V
C3, 21, 35, 39	15-01-100255-01	Cap., 100 μF, 20V
C4	15-01-108925-01	Cap., 50 μF, 25V
C5, 6, 7, 9, 11, 14, 15, 17, 22, 23, 26, 50	15-06-108173-01	Cap., 0.47 μF ± 20%, 100V
C12, 37	15-01-100156-01	Cap., 1 μF, 20V
C13, 29, 40	15-02-100109-02	Cap., 0.1 μF ± 20%, 100V
C18, 28	15-01-107501-01	Cap., 25 μF, 50V
C25, 27, 42, 45	15-01-109413-01	Cap., 5 μF, 15V
C30, 36	15-02-107470-01	Cap., 220 pF ± 10%, 100V
C31	15-02-100307-01	Cap., 0.01 μF ± 20%, 100V
C32, 33	15-06-112129-01	Cap., 0.022 μF ± 10%, 250V
C34, 43, 49	15-06-107354-01	Cap., 0.22 μF ± 20%, 100V
C38	15-06-100064-01	Cap., 0.0047 μF ± 10%, 100V
C41	15-06-100084-01	Cap., 0.015 μF ± 10%, 100V
C46	15-06-050797-02	Cap., 2.65 μF ± 5%, 100V
C48	15-06-100139-01	Cap., 0.33 μF ± 10%, 100V
CR1	48-01-100881-03	Diode, STB-567
CR2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 21, 22, 23, 25, 26, 27, 29, 30, 31, 33, 36	48-01-107017-01	Diode, 1N456A, 25V, 100 mA
CR14	48-01-100876-01	Diode, 1N270, 80V, 200 mA
CR18	48-01-113386-02	Diode, Zener, 18V ± 10%, IN720
CR19, 20, 34, 35, 37	48-02-042787-01	Rect., silicon, 1A, 400 PIV
CR24	48-01-107429-02	Diode, STB-568, 12V
CR28, 38	48-01-108484-02	Diode, MPD-300, 60V
CR32	48-01-100856-01	Diode, Zener, 10V ± 5%, 2W
F1	51-04-120411-01	Fuse, 1.5A, pigtail slo-blo
Q1, 14	48-03-109714-02	Transistor, TZ81
Q2, 13, 15	48-03-107102-02	Transistor, 2N3906
Q3, 11, 16, 32, 33, 38, 40, 41	48-03-108574-02	Transistor, 2N4360
Q4, 5, 6, 7, 8, 9, 10, 12, 17, 18, 19, 20, 28, 29, 37, 42	48-03-119140-02	Transistor, 2N5308, selected
Q21, 23, 34, 35	48-03-118651-01	Transistor, MPS-A66
Q22, 24, 26, 30, 36, 39, 43	48-03-101098-04	Transistor, 2N2712, selected
Q25, 31	48-03-108577-05	Transistor, 2N5367, selected
Q27	48-03-107447-04	Transistor, 2N5320, selected
R1, 42, 64, 73, 98	47-01-102131-01	Res., 150 KΩ ± 5%, ¼W
R2, 12, 18, 19, 30, 33, 43, 52, 79, 141	47-01-102078-01	Res., 1KΩ ± 5%, ¼W
R3, 44, 76	47-01-102105-01	Res., 15KΩ ± 5%, ¼W
R4, 28, 29, 45, 75, 99, 143	47-01-102119-01	Res., 47KΩ ± 5%, ¼W
R5, 14, 17, 20, 22, 26, 27, 38, 46, 54, 57, 58, 61, 65, 67, 70, 71, 72, 80, 89 93, 94, 97, 100, 106, 107, 112, 113, 118, 135	47-01-102102-01	Res., 10KΩ ± 5%, ¼W
R6, 47	47-01-102074-01	Res., 680Ω ± 5%, ¼W
R7, 48	47-01-102066-01	Res., 330Ω ± 5%, ¼W
R8, 11, 23, 25, 31, 49, 63, 95, 96, 102 122, 123, 124, 130, 132, 137, 138	47-01-108491-01	Res., 1MΩ ± 5%, ¼W
R9, 34, 35, 50, 77, 78, 117	47-01-102110-01	Res., 22KΩ ± 5%, ¼W
R10, 21, 51, 55, 59, 66, 92, 103, 108, 120, 126, 133, 148	47-01-102127-01	Res., 100KΩ ± 5%, ¼W
R13, 53, 69	47-06-044042-01	Pot., 10KΩ ± 30%
R15, 16, 84	47-01-102100-01	Res., 8.2KΩ ± 5%, ¼W
R24, 62, 91	47-01-108586-01	Res., 8.2MΩ ± 5%, ¼W
R32	47-01-102113-01	Res., 30KΩ ± 5%, ¼W
R36, 56, 114, 140	47-01-109204-01	Res., 470KΩ ± 5%, ¼W
R37	47-01-100483-01	Res., 1.5MΩ ± 10%, ¼W
R39	47-01-102070-01	Res., 470Ω ± 5%, ¼W
R40	47-01-102060-01	Res., 180Ω ± 5%, ¼W
R41, 86	47-01-102054-01	Res., 100Ω ± 5%, ¼W
R53, 69	47-06-044042-01	Pot., 10KΩ ± 30%
R60	47-01-108933-01	Res., 1.2MΩ ± 5%, ¼W
R68, 115, 146, 150	47-01-102086-01	Res., 2.2KΩ ± 5%, ¼W
R74	47-01-102062-01	Res., 220Ω ± 5%, ¼W
R81	47-01-102098-01	Res., 6.8KΩ ± 5%, ¼W
R82	47-06-120240-01	Pot., 1KΩ ± 30%
R83	47-01-102063-01	Res., 240Ω ± 5%, ¼W
R85	47-01-100649-01	Res., 1KΩ ± 10%, 1W
R87	47-01-102081-01	Res., 1.3KΩ ± 5%, ¼W
R88	47-01-102046-01	Res., 47Ω ± 5%, ¼W
R90, 144, 149	47-01-102272-01	Res., 2.2KΩ ± 5%, ½W
R104	47-01-102625-01	Res., 10KΩ ± 10%, 1W
R105	47-01-104541-01	Res., 330KΩ ± 5%, ¼W
R109, 110	47-01-102082-01	Res., 1.5KΩ ± 5%, ¼W
R111	47-01-102130-01	Res., 130KΩ ± 5%, ¼W
R116	47-06-044041-02	Pot., 50KΩ ± 50%
R119	47-01-102111-01	Res., 24KΩ ± 5%, ¼W
R121, 125, 139 151	47-01-102094-01	Res., 4.7KΩ ± 5%, ¼W
R127	47-01-102112-01	Res., 27KΩ ± 5%, ¼W
R128	47-01-102121-01	Res., 56KΩ ± 5%, ¼W
R129, 142	47-01-107373-01	Res., 10MΩ ± 10%, ¼W
R131	47-01-102088-01	Res., 2.7KΩ ± 5%, ¼W
R134	47-01-102096-01	Res., 5.6KΩ ± 5%, ¼W
R136	47-06-108934-01	Pot., 1MΩ ± 20%, ¼W
R145	47-01-102104-01	Res., 12KΩ ± 5%, ¼W
R147	47-01-102084-01	Res., 1.8KΩ ± 5%, ¼W
RT1	37-02-119533-03	Cell, LED
S1, S2	51-02-119901-01	Switch assembly, pushbutton
T1	56-05-015444-03	Transformer, line
T2, 3	56-05-015443-04	Transformer, matching
U1	17-01-119310-02	Circuit, MC1458CP1
U2	17-01-119178-02	Circuit, UA7824

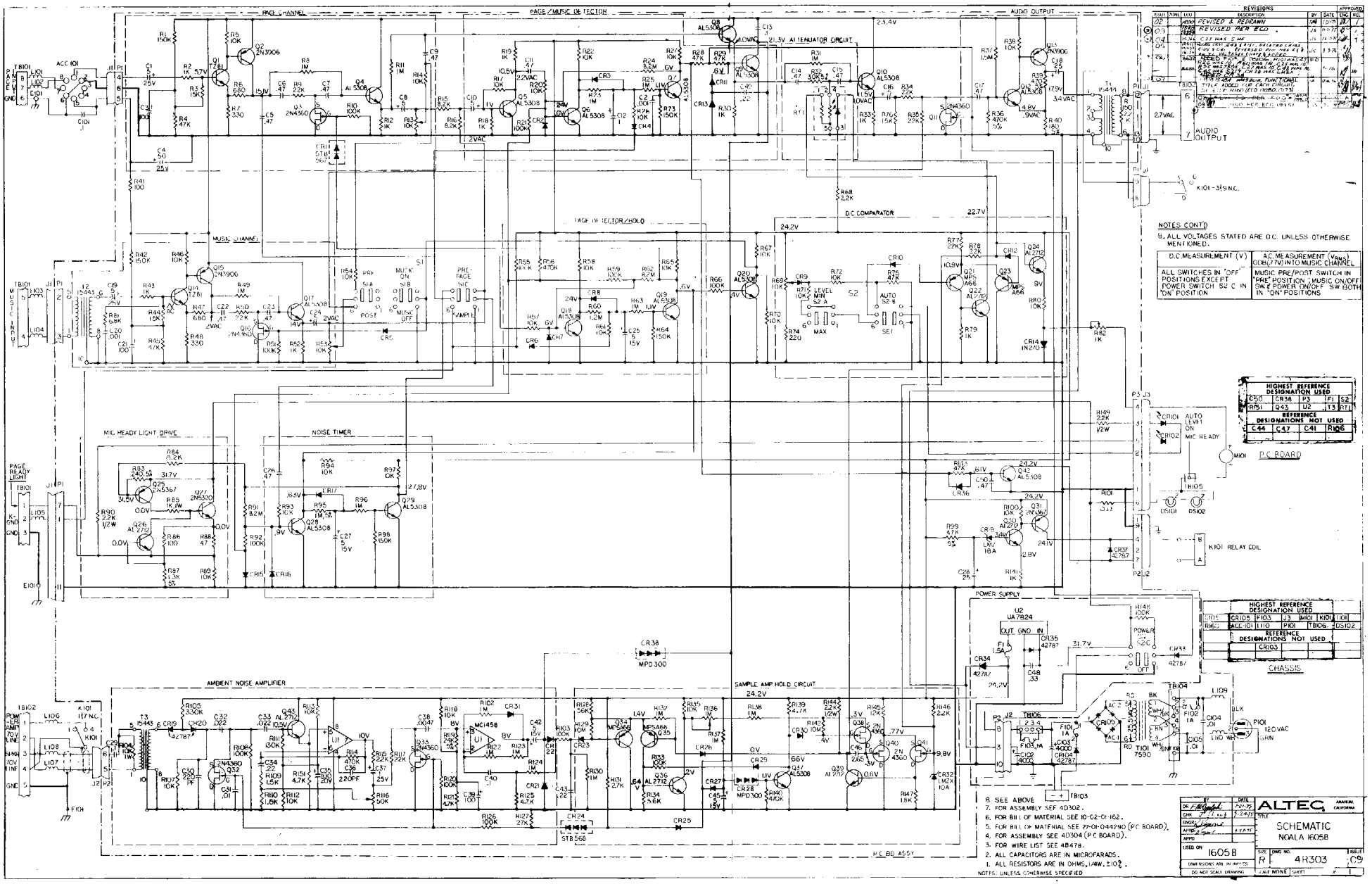


Figure 8. Schematic (4R303-9), 1605B NOALA Control Panel