



**COMMUNICATIONS  
COMPANY  
inc.**

# **IC-29 Manual**

# **PC**

**Rev E      1/31/00**

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# IC-29 MANUAL ELEMENTS

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## BECOMING FAMILIAR WITH THE IC-29

Congratulations on your purchase of the IC-29 universal, 2-station intercom. It can be used with industry standard microphones, speakers and buttons, or Communications Company IC-29 Accessories (See the information sheet called IC-29 Accessories). The IC-29 is actually two separate amplifiers, joined by a common control section and can be used in many different setups - from fast-food drive-up windows, to prison visitor booths, to hospital Cath-Lab's. Your IC-29 is capable of almost any application or setup you, or your customers can imagine.

### IC-29 DESCRIPTION (Sort of Technical)

The IC-29 is a universal two station intercom. All configurations are supported; push to talk, privacy, duplex, etc. However, the unit is optimized for VOX (voice actuated, hands-free) operation. The unit consists of two complete audio sections and a common control section. The IC-29 incorporates several unique features. It has an output amplifier that, when "OFF", has a very high output impedance so the speaker may also be used as a microphone without the need of switching contacts. It also has a limiter/volume control that prevents overload from unusually loud inputs. The changeover circuits are designed for either VOX operation, push to talk, or combinations to afford maximum versatility. A call feature is also included to both alert the user and wake up the system if it is turned off. Indication circuits are provided to enable easy testing and setup. User functions are remotable through D.C. controls. Optional accessory boards provide audio delay in the talk circuit to assure the VOX can operate without clipping words, and a dual tunable notch filter in the listen circuit to reduce feedback.

### IC-29 SPECIFICATIONS (Very Technical)

#### GENERAL

<b>TYPE</b>	Dual channel universal intercom amplifier.
<b>UL LISTED</b>	70J6 Commercial Audio Amplifier.
<b>FREQUENCY RESPONSE</b>	(± 1 dB) Mic: 250Hz ->5 kHz. Line In: 110Hz ->8kHz
<b>POWER OUTPUT</b>	5 Watts RMS, sine wave into 45 Ohms (one channel at a time) Outputs are short circuit protected.
<b>DIFFERENTIAL OUTPUT SOURCE IMPEDENCE</b>	< 4 Ohms balanced.
<b>LINE INPUT</b>	Unbalanced, adjustable, 78 mV (-20dBm) required for full output. 10K Ohms nominal impedance.
<b>MICROPHONE INPUT</b>	Balanced differential input designed for speaker or microphone compatibility. 130uV (-76dBm) input sensitivity to provide full power output. Inputs are R.F. field protected. Maximum microphone input level is -40dBm (7.8mV). 150 Ohms nominal impedance
<b>INPUT SOURCE IMPEDENCE</b>	1K Ohms.
<b>LEVEL CONTROL</b>	Front panel is user adjustable to set comfortable listening level, (remotable).
<b>LIMITER CONTROL</b>	Limiter can be adjusted to provide greater than 30 dB of compression, screwdriver adjustment.
<b>DISTORTION</b>	Less than .3% at full output.
<b>VOX</b>	Voice operated switching for hands free operaton. Threshold level provided on front panel as continuously variable screwdriver adjustment. Indicator for adjustment accuracy.
<b>ANTIVOX</b>	Anti-triping circuit eliminates speaker-microphone VOX coupling. ANTIVOX level is a continuously variable screwdriver adjustment. Indicator for adjustment accuracy.

<b>TALK/LISTEN</b>	Talk/listen switching; many priorities and schemes supported
<b>SWITCHING NOISE</b>	Sequenced change-over is designed to completely eliminate switching noise
<b>LOGIC CIRCUITRY</b>	Solid state CMOS logic, no relays. Ground switching (Active Low) input/output logic is used for ease of interface. All I/O is protected from static and R.F. fields.
<b>CALL</b>	Internal audio generator connects to listen circuit. Tone level continuously adjustable. Remoteable DC control.
<b>CONNECTORS</b>	Three removable terminal blocks and tow RCA phono connectors.
<b>POWER REQUIREMENTS</b>	105 > 125 or 210 > 250 volts, 50/60 Hz, 28 Watts. Power supply is fuse protected
<b>MOUNTING</b>	The IC-29 cabinet is supplied with rubber feet, for installation on a flat counter top. When rack mounting the IC-29, be sure the rack is provided with adequate ventilation so the internal ambient temperature does not exceed 50 C.
<b>WEIGHT</b>	6 lbs. (2.7kg)
<b>DIMENSIONS</b>	7.65" x 14" x 1.75" (194mm x 361mm x 45mm)

**FRONT PANEL CONTROLS**

<b>LEVEL</b>	Variable potentiometers for both amplifiers. (remotable)
<b>LIMITER</b>	Variable screwdriver adjustments for maximum level and compression, for both amplifiers.
<b>VOX</b>	Continuously variable screwdriver adjustments for the talk channel.
<b>ANTIVOX</b>	Continuously variable screwdriver adjustments for the decoupling of the listen channel.
<b>CALL LEVEL</b>	Continuously variable screwdriver adjustment. (remotable)

**FRONT PANEL INDICATORS**

<b>POWER</b>	Indicates unit has power.
<b>ACTIVE</b>	Both channels, indicates power amplifier is on. (remotable)
<b>THRESHOLD</b>	Both channels, indicates signal compression is on and is taking place.
<b>VOX</b>	Indicates the VOX input is active and it's level.
<b>ANTIVOX</b>	Indicates the ANTIVOX decoupling is active and it's level.

**OPTIONAL ACCESSORIES**

<b>AUDIO DELAY - IC-29DB</b>	Optional 55 ms audio delay in talk channel for VOX operation, avoids first syllable chopping.
<b>NOTCH FILTER - IC-29NF</b>	Optional notch filter available for reducing feedback and to compensate for small live-room acoustics. Two independent screwdriver adjustable filters: Channel 1 = 100 - 500Hz; Channel 2 = 500 - 2500Hz.
<b>MOUNTING - IC-29MB - IC-29RM</b>	Optional mounting hardware that allows the IC-29 to be mounted to a wall or under a shelf. Optional rack mounting panel, 1 rack space.



Figure 1 • IC-29 Front Panel

## FRONT PANEL CONTROLS AND INDICATORS

The front panel has two sections marked INSIDE and OUTSIDE. Under normal conditions, the INSIDE station is where the operator is located and the OUTSIDE station is where the customer or public is. The INSIDE knob controls the audio level inside and the OUTSIDE knob controls the audio level outside.

### ACTIVE LIGHT

Near each Level control are red lights marked "Active". When lit, they indicate the IC-29 is sending audio to the speaker on that side.

### LIMITER

There are Limiters provided in each amplifier section of the IC-29. Limiters control the loudest sound that can come out of the speaker. Turning the "Limiter" control up or down adjusts the loudest sound that will come out of the speaker. When the red light marked "Threshold" is lit, it shows that the Limiter is triggered and is reducing the sound level to the level set by the Limiter control. (See the section marked LIMITER SETUP for more information).

### VOX

The IC-29 can be set up to be a hands-free intercom. In hands-free mode, the person on the inside simply starts speaking, and the amplifier switches over by itself. This is also called VOX mode. The "VOX" light turns red if the inside amplifier is being turned on by that person's voice. The "VOX" light turns green if the person is not speaking loud enough to turn the amplifier on.

The Vox control regulates how loud a person must talk at in order to turn the amplifier on. Turning VOX control counterclockwise decreases sensitivity, thus keeping louder sounds from turning on the amplifier. Turning VOX control clockwise increases sensitivity, thus allowing quieter sounds to turn on the amplifier. (See Vox Operation Notes section).

### ANTIVOX

Automatic AntiVox is included in the IC-29. AntiVox keeps loud sounds that come through the inside speaker from turning on the VOX circuit via the inside microphone. The AntiVox light flickers red when Antivox is active, and turns green when it is not active. Adjusting the AntiVox control changes the amount of sound from the inside speaker needed to activate the Vox Circuit. (See Vox Operation Notes section).

### CALL

The IC-29 features a built in annunciator that uses the inside speaker station as its' signaling device. This feature is normally used to signal the operator that a customer is at the ticket window or at the drive-up menu board. The volume of the alarm is controlled by the "Call" control. (See Internal Jumper Settings for more information)

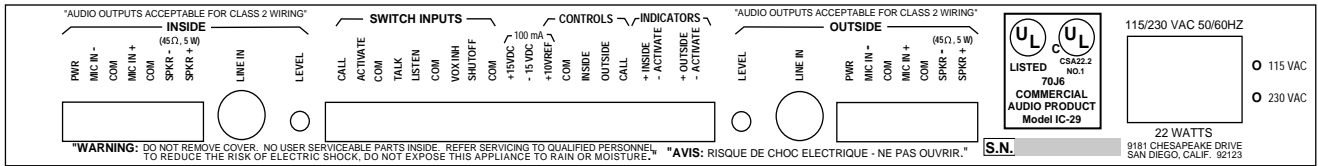


Figure 2 • IC-29 Rear Panel

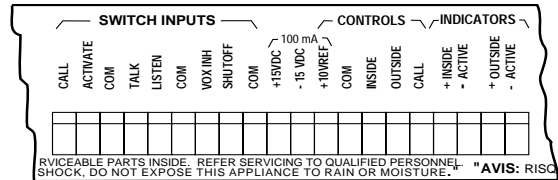
## REAR PANEL CONNECTIONS

The IC-29 has connections on the back that allow the installer to wire switches, lights and volume controls on panels away from the unit. There are *jumpers inside the unit* which must be moved in order to activate the remote volume controls. They are marked *IRL* and *ORL*. On the back of the IC-29, there are three control sections marked **CONTROLS**, **INDICATORS** and **SWITCH INPUTS**.

**CONTROLS** section of the rear panel is where connections for remote volume controls are made. The connections are marked *+10VREF*, *COM*, *INSIDE*, *OUTSIDE* and *CALL*. Volume potentiometers (10K Ohm linear taper) for the inside level, the outside level and the call level are attached here when they need to be remotied. They are attached across the *+10VREF* and *COM*, with the wiper going to *inside*, *outside* or *call*. They have the same functions as the volume controls on the front panel.

**INDICATORS** section has connections marked *INSIDE ACTIVE* and *OUTSIDE ACTIVE* for remote LED lights to show which side is active. They have the same function as the inside active and outside active lights on the front panel.

**SWITCH INPUTS** section is where the on/off buttons, talk/listen buttons and footswitches are connected. The switch inputs are marked *CALL*, *ACTIVATE*, *TALK*, *LISTEN*, *VOX INHIBIT*, *SHUTOFF*, and *COM*. The switches must be connected between any *COM* input and any switch input. For example, a switch marked "talk" must be connected to *TALK* and *COM*.



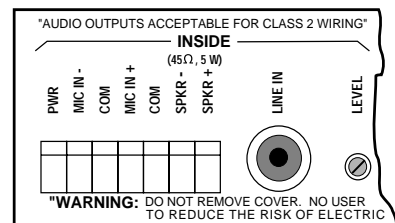
### SWITCHFUNCTIONS

- ACTIVATE** Turns on the amplifier. (Outside microphone and inside speaker)
- CALL** Turns on amplifier, (Outside microphone and inside speaker) and sounds a call tone through the inside speaker.
- TALK** Activates inside microphone and outside speaker (talk mode). Turns on the amplifier if it is off. Turns off the repeating call tone.
- LISTEN** Turns on outside microphone and inside speaker (listen mode) if amplifier is already on.
- VOX INHIBIT** Turns off vox function as long as the switch is on.
- SHUTOFF** Shuts off the amplifier.

The IC-29 has two connections marked *+15VDC* and *-15 VDC*. These provide voltage for future logic on remote panels or small lights, tone generators, etc., that require less than 100mA of current. Check the current requirement of your device or application before connecting it between here and *COM*.

**LINE IN** connections are line-level RCA phono inputs used for connecting other equipment, such as mixers or wireless headsets, to the IC-29. The *LEVEL* trim pots control the amount of line input into the IC-29.

**MICROPHONE INPUTS** (*MIC IN +*, *MIC IN -*, *COM*, *POWER*)  
 Connect your microphone to *MIC+*, *MIC-* and *COM*. *POWER* supplies 10 Volts to power a condenser microphone, and is returned at *COM*.  
 (See PHANTOM POWER in the JUMPER SETTINGS' section.)



**SPEAKER OUTPUTS** (*SPKR +*, *SPKR -*, *COM*)  
 Connect your speaker lines to *SPKR+* and *SPKR-*. *COM* is provided for a shield. If you are using your speaker as a microphone (speaker/microphone) connect it here.  
 (See OUTSIDE SPEAKER ONLY in the JUMPER SETTINGS' section)

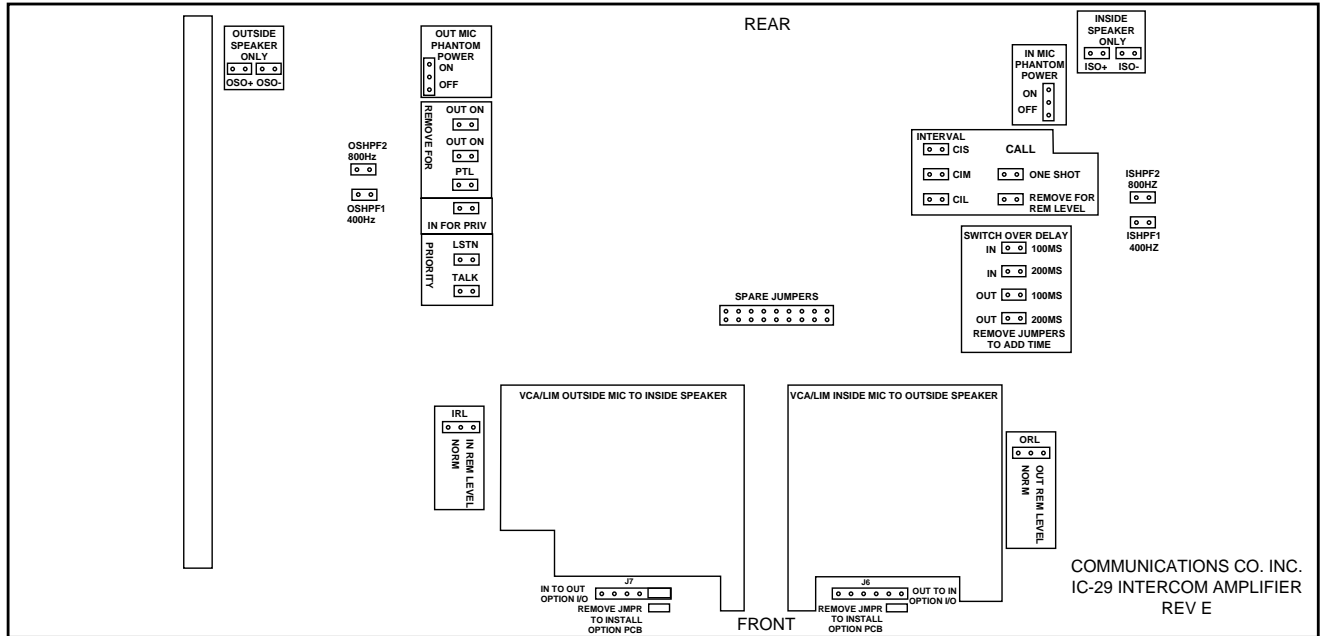
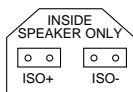
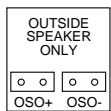


Figure 3 • IC-29 Jumper Location

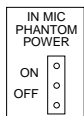
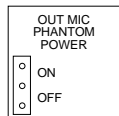
## INTERNAL JUMPER SETTINGS

The IC-29 can be used with many different types of accessories, and can be set up in hundreds of different ways. This versatility is achieved through the use of jumpers on the inside of the amplifier. A short description of each jumper is described below.



### OUTSIDE SPEAKER ONLY / INSIDE SPEAKER ONLY

Tells the amplifier that the speaker on the outside or the inside will act as a microphone when no sound is coming out of it. Both jumpers (+ and -) must be in to use this option. When using a separate microphone, these jumpers must be removed.



### OUT MIC PHANTOM POWER / IN MIC PHANTOM POWER (ON/OFF)

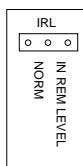
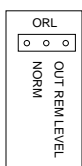
Jumper for using microphones requiring phantom power when using a separate microphone. ON supplies 10 Vdc (common mode) phantom power to the microphone. OFF is used for regular dynamic microphones, or electret microphones which require a separate power wire.



### OSHPF1, OSHPF2 / ISHPF1, ISHPF2 (INPUT LEVEL & FREQUENCY RESPONSE)

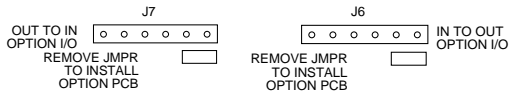
There are two functions of these jumpers. First, if both on the same side are removed (i.e. OSHPF1 and OSHPF2) then the microphone input becomes a **line level** input. If either jumper is installed, then the microphone input is a **mic level** input. The second function is pre-amp equalization. Installing both jumpers adds all the low frequencies to the mic input. Removing one or the other cuts some of the low frequencies out.

Note: if using a speaker as a microphone we recommend removing the 400Hz jumper.



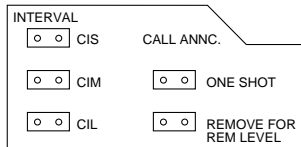
### ORL, IRL (OUTSIDE REMOTE LEVEL AND INSIDE REMOTE LEVEL)

With the jumper in the NORM position, the volume of the amplifier is controlled by the volume knob on the front panel. When the jumper is in the REM LEVEL position, the volume is controlled by a remote 10K pot attached to the back of the unit in the CONTROLS section. (See the Rear Panel Connections section).



**OPTION I/O (In to Out / Out to In)**

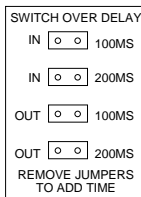
These are connections for option boards, inside and outside. When there is no option board installed, a two pin jumper **must** be installed on the right-most pins for the IC-29 to work.



**CALL ANNC (ONE SHOT / REM LEVEL / INTERVAL)**

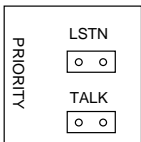
With the jumper in the ONE SHOT position, the call tone will sound one time and stop. When this jumper is removed, the call tone repeats, and is controlled by the INTERVAL jumpers.

The INTERVAL jumpers control the nature of the repeating tone. Removing or installing jumpers changes the pattern of the repeating tones. Removing all of them causes the tone to repeat indefinitely, and is not a valid combination. When "Remove for Remote Level" jumper is removed, the volume of the call tone is controlled by a 10K pot attached to the back of the unit in the CONTROLS section. (See the Rear Panel Connections section). When the jumper is installed, call volume is controlled by the screwdriver adjustment on the front panel.



**SWITCH OVER DELAY**

These jumpers are used to delay the time it takes to switch from *Inside* to *Outside* mode (or vice-versa). They are used to prevent "pop" caused by room acoustics, or "ringing" from speaker-only setups. Remove individual jumpers to add delay time. The jumpers marked "OUT" delay the switching of *Inside* to *Outside*. The jumpers marked "IN" delay the switching of *Outside* to *Inside*. NOTE: **When using an IC-29DB Delay Board, all switchover jumpers should be in.**



**PRIORITY (LISTEN / TALK)**

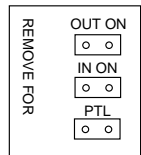
These jumpers control which side gets priority in a Push-To-Talk / Push-To-Listen setup. The LISTEN jumper gives break-in priority to the inside amplifier (outside microphone), and the TALK jumper gives break-in priority to the outside amplifier (inside microphone). With both jumpers installed, whichever button is pressed first gets priority. With both jumpers removed, which ever button is pressed last gets priority.



**IN FOR PRIVACY & REMOVE FOR PTL (PUSH-TO-LISTEN)**

These jumpers control a privacy function for the outside station. When the IN FOR PRIVACY jumper is **in** and the PTL jumper is **out**, the Push-To-Listen button must be pressed to allow the inside speaker to be turned on. -- Sort of like a "Push-To-Talk" button for the outside station. The Inside station remains on until the TALK button is pressed.

Normally, the PRIVACY jumper is **out**, and the PTL jumper is **in**. They are installed this way for VOX operation or push-to-talk applications where return-to-listen is wanted, and it allows for change over to be controlled with one "talk" switch. Confused? See a typical applications sheet that looks like your setup, and see how they are set.



**REMOVE FOR OUT ON**

If this jumper is installed, the outside speaker is on **ONLY** when the inside speaker is off. When removed, the outside speaker is on whenever the system is active, and is used for duplex, non-intercom applications.

**REMOVE FOR IN ON**

If this jumper is installed, the inside speaker is on **ONLY** when the outside speaker is off. When removed, the inside speaker is on whenever the system is active, and is also used for duplex, non-intercom applications

NOTE: *When the OUT ON & IN ON jumpers are out, the IC-29 functions as two separate amplifiers, without common control.*



## IC-29 INITIAL SETUP AND ADJUSTMENT NOTES

Your IC-29 is designed to be set up by a qualified installer and should not need to be adjusted, configured, or altered after initial setup. Your IC-29 should be trouble-free from the moment of installation until the system is removed. If future adjustments need to be made because of changes in the room (i.e. furniture changes, carpet, drop ceiling, etc.) the amplifier can be re-configured without the need to return it to the factory. Just contact a qualified installer and provide them with these setup notes.

### "LIMITER THRESHOLD" AND "LEVEL" CONTROLS

The Limiter threshold is used to set the maximum listening volume of the IC-29. The Limiter can be used to prevent sudden, loud sounds (like dropping a metal pan) from blaring through the speaker on the other side, while allowing a suitable volume for normal conversation.

An assistant is needed for Limiter, Vox, AntivoX, and Level adjustments. If no assistant is available, a portable radio tuned to a news or talk program, set at a low but natural level, can substitute for an actual person. Be sure to put the radio at a distance from the microphone similar to that of a user. A step ladder may be handy also.

### LIMITER SETUP

Turn the Limiter knob fully clockwise, then adjust the Level knob to a comfortable listening level with no feedback. Once you are satisfied with the system level, mark it with a pencil, and begin to turn the Limiter control counterclockwise until the red "Threshold" light begins to flicker. That's all! Now do the same for the other side, and you're done. With these settings, the signal compression and gain are ideal. There will be minimal background noise, and sufficient gain to accommodate normal conversation.

NOTE: The user may reduce the volume Level if desired, but if the Level knob is turned past the setting where it was initially set up, the Limiter will keep the volume down, and heavy compression (and possibly distortion) will happen. The users should be encouraged to mark the preset adjustment and to leave the Level control set at that point. If more volume is absolutely necessary, the Limiter setup procedure will have to be done again.

### VOX-ANTIVOX SETUP

Accomplish the Limiter and Level setting first, then confirm the jumpers are set for a VOX system. Turn the INSIDE Level knob all the way down, and both ANTIVOX and VOX trimpots fully counterclockwise. Have your radio or assistant speak normally on the inside microphone. Turn the VOX control clockwise until the green vox light begins to flash red. Set the inside level control back to the pencil mark (do not be disturbed if the system starts chopping). Now advance the ANTIVOX control slowly clockwise until the ANTIVOX indicator is red with brief flashes of green. When you speak into the microphone, you should easily be able to cause the system to switch modes.

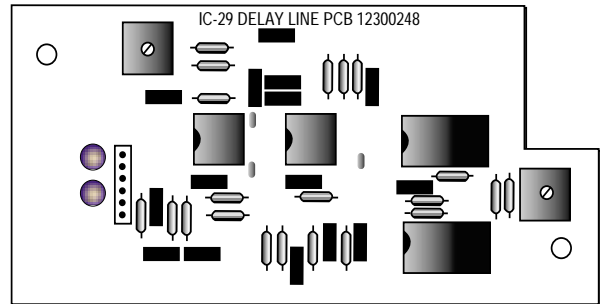
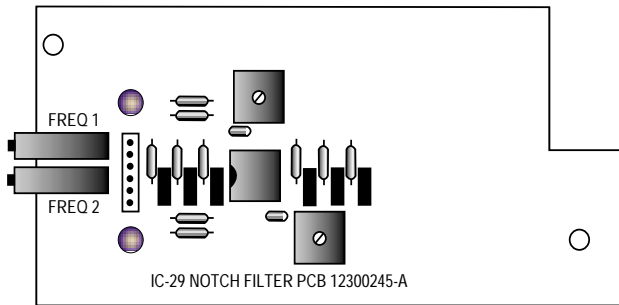
### SWITCH OVER DELAY JUMPERS

NOTE: *The outside switchover delay jumpers should never be removed for VOX operation.*

Often when the inside user stops talking, there is a "pop" or "bonk" sound. This is especially true if the outside speaker is also used as a microphone. It may be necessary to extend the switchover delay. This is easily accomplished by removing the jumpers. First remove the 100 MS jumper (adding 100 MS delay). If this is insufficient, try the 200 MS jumper or combinations of the two. Always use the minimum delay that is satisfactory.

## IC-29 OPTION BOARDS

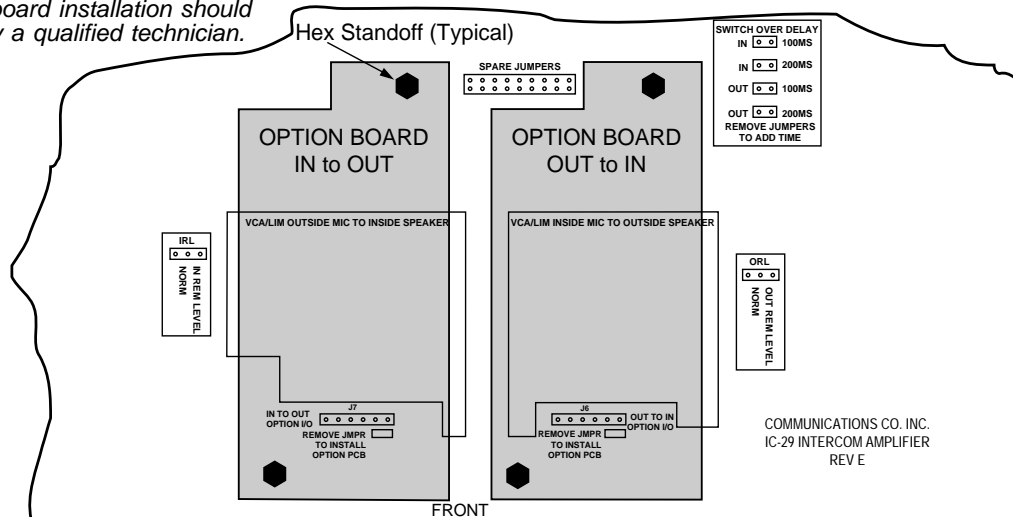
Option boards are plug-in circuit boards for the IC-29 which allow the installer fast and easy ways to fine-tune a particular installation site.



There are two option boards available for the IC-29, the Notch Filter board and the Audio Delay board. The Notch Filter board provides two screwdriver adjustable filters used to tune out feedback modes and help compensate for small live room acoustics. The Notch Filter board can be installed in either channel of the IC-29. The Audio Delay board provides 55ms of audio delay in the talk channel (In to Out) for VOX operation in order to avoid chopping the first syllable speech, this board must mount in the "In to Out" option slot.

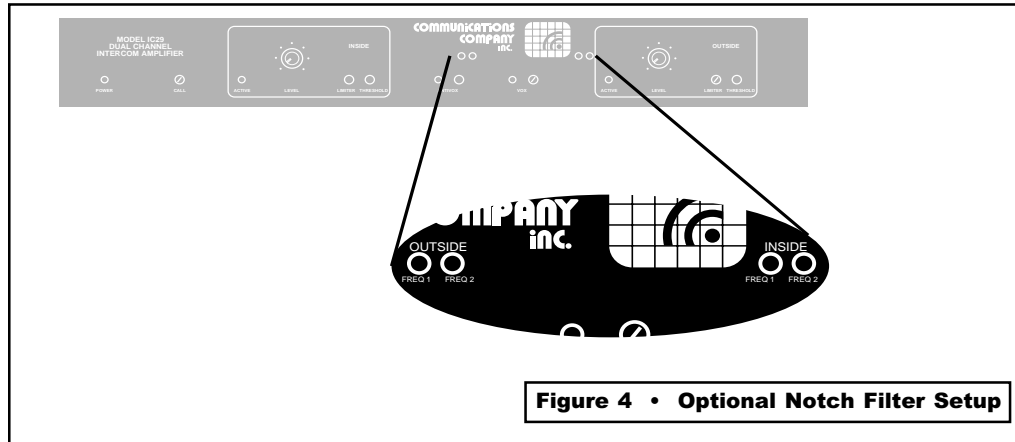
## INSTALLING AN OPTION BOARD

NOTE: Option board installation should only be done by a qualified technician.



Installation requires a 1/4" nutdriver or pliers, and a small phillips screwdriver.

1. Unplug the IC-29.
2. Remove the cover.
3. Locate the option board connector pins. They are in the center, toward the front of the IC-29.
4. Decide on which side you need to install the option board:
  - IN to OUT. Affects the inside microphone and the outside speaker.
  - OUT to IN. Affects the outside microphone and inside speaker.
  - (Usually a Delay Board is installed on the IN to OUT side only.)
5. Install the standoffs supplied with the option boards.
  - a. Unscrew and save the two phillips-head screws in the IC-29 that will be replaced by the standoffs. (See figure )
  - b. Using the 1/4" nutdriver or pliers, screw in the standoffs where you unscrewed the phillips-head screws.
6. Remove the black jumper on the pins on the right side of the option board connector.
7. Line up the two standoffs and the holes in the option board, and carefully install the option board on the connector pins, taking care not to bend the pins.
8. Take the two screws you removed earlier and screw them into the standoffs, securing the option board to the IC-29 assembly.
9. Install the cover back on the IC-29.



## OPTIONAL NOTCH FILTER SETUP

Turn both notch filters maximum clockwise (highest frequency).

Advance the inside level to maximum.

If there is feedback, reduce the level to the threshold of feedback, allowing feed-back to barely take place. Adjust one notch filter until the feedback stops. Advance the level control clockwise until feedback returns (if possible) and adjust the notch filter for minimum level.

Sometimes, when the level is advanced, the system will now feedback at a different frequency. Repeat the procedure above with the second notch without affecting the adjustment of the first.

Sometimes there is no feedback. However, the sound has a poor quality. Again, the use of a radio or assistant is useful. Even better is a noise source and a real-time analyzer.

Advance the inside level to maximum. Adjust one notch at a time to remove the peaky sound.

Since the notch filters have different ranges with some overlap, it is desirable to know at which frequency the feedback occurs. This can be accomplished by connecting a frequency counter between common and one side of the inside speaker.

## 120/240 VOLT SETUP

**Be SURE to unplug the IC-29 from main power before changing the fuse or changing jumpers!**

With the knobs facing you, the AC power jumpers are located in top left side of the unit, near the main power fuse and power cable connector.

NOTE: These jumpers are soldered in place. **Changing the power jumpers also requires a fuse change.**

**For 105-125 Volt operation:** Install both "120 Volt" jumpers, if the "240 Volt" jumper is installed remove it, then replace the existing fuse with a 1/4 Amp, 250 Volt MDL fuse

**For 210-250 Volt operation:** Remove both "120 Volt" jumpers. Install the "240 Volt" jumper, and replace the existing fuse with a 1/8 Amp 250 Volt MDL fuse.

We further recommend you note the change made on the voltage selection marking, which is located at the right rear of the IC-29 so there is an external record of the current setting.

## **COMMON SETUPS FOR THE IC-29**

The following pages provide parts lists and wiring diagrams for a few common IC-29 setups. The wiring diagrams are shown without using remote controls or indicators. (See the section marked REMOTE CONTROLS, INDICATORS, AND SWITCHES to use these options.)

The microphones, speakers, headsets, and switches shown are recommended, but almost any equipment or combinations of equipment can be used in any setup. For example, if the application recommends an IS-3022BB station, (The IS-3022BB is a 45 Ohm speaker station with two momentary push-buttons) you can replace it with any 45 Ohm speaker and any normally-open momentary switch contacts.

Please note that while the IC-29 is a universal amplifier, and will accept any type of speakers or microphones, it is maximized for use with 45 Ohm speakers and low-impedance microphones. Read your speaker or microphone data sheets for this information.

To insure quiet and proper operation of the IC-29 Intercom system, use shielded twisted pair wiring for both microphones and speakers.

### TYPICAL SPEAKER-TO-SPEAKER INTERCOM

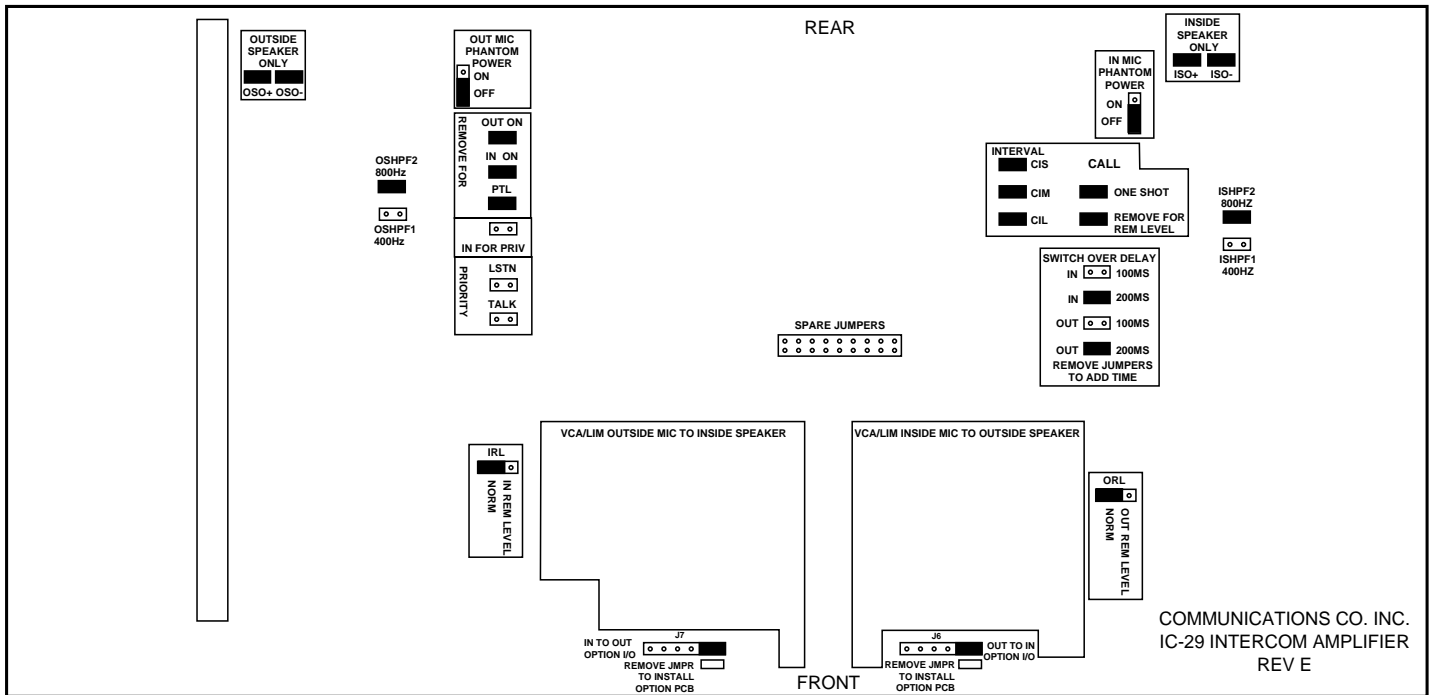
**PARTS:**

- 1) IC-29 Amplifier
- 1) IS-3022BB Speaker Station\*
- 1) IS-3100 Vandal-Resistant Speaker Station

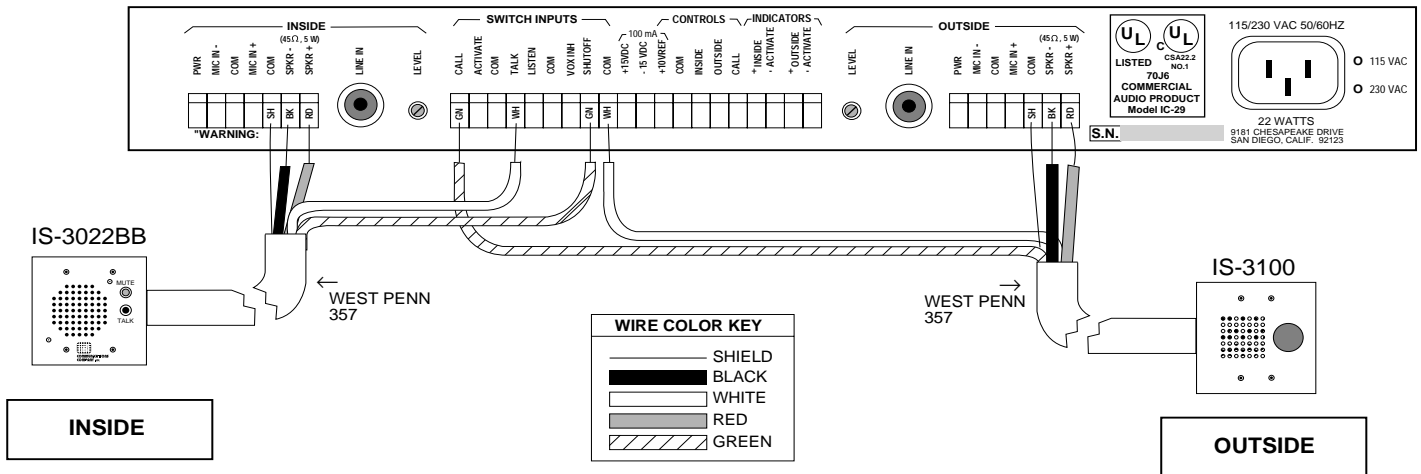
\*Can be flush-mounted in the wall or used with the BB-302 surface-mount backbox.

This setup is used most often in vandal-resistant applications, or where separate microphones cannot be installed because of wiring or space restrictions. This system is Push-To-Talk from the inside, with Return-To-Listen to the outside. A call button on the IS-3100 turns on the amplifier and alerts the inside with a call tone.

The necessary jumpers are shown in black in the diagram below.



The intercom accessories are connected to the back of the IC-29 like this:



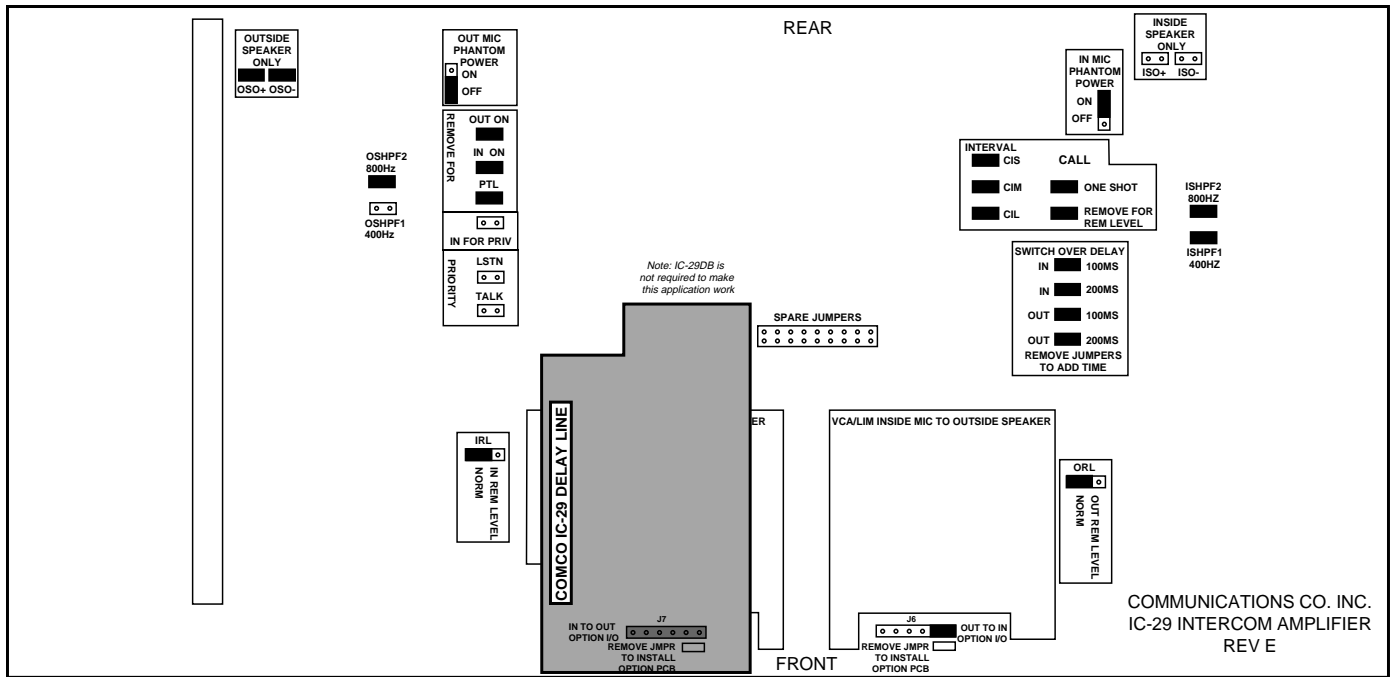
**TYPICAL TICKET WINDOW SETUP**

**PARTS:**

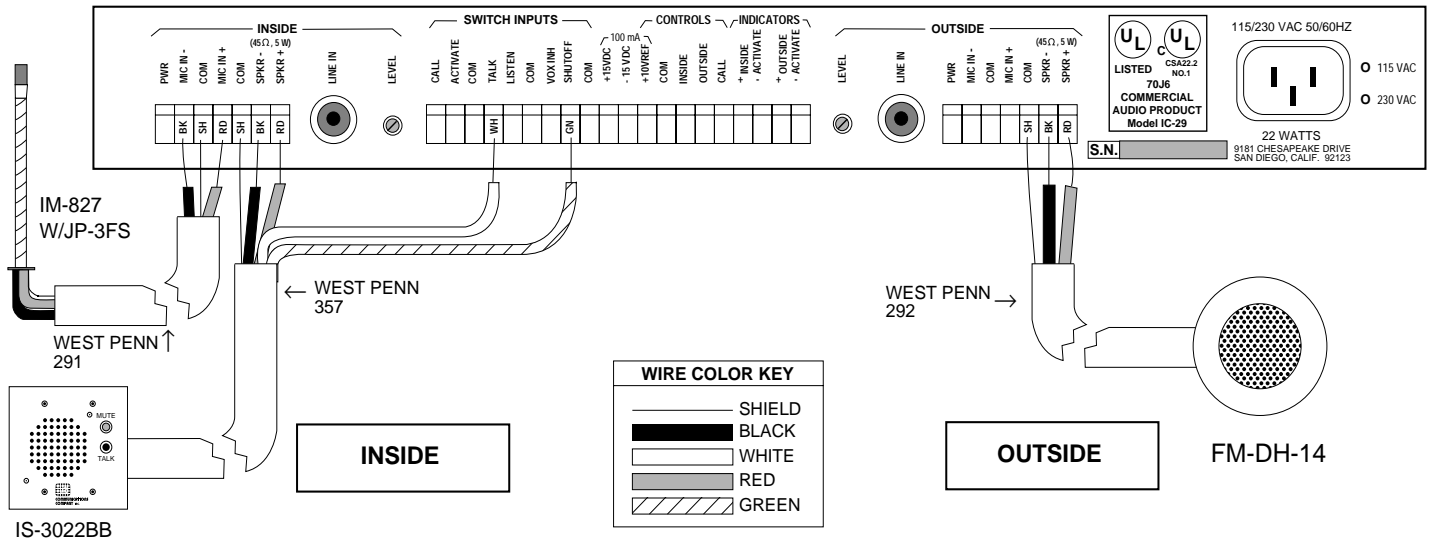
- |                                |  |   |
|--------------------------------|--|---|
| 1) IC-29 Amplifier             | 1) FM-DH-14 Window Speaker               | * Can be flush-mounted in the wall or used with the BB-302 surface-mount backbox. |
| 1) IM-827 Gooseneck Microphone | 1) IC-29 Delay Board ( <i>Optional</i> ) |   |
| 1) IS-3022BB Speaker Station*  | 1) JP-3FS Flush Mount Receptacle         |   |

This setup is for a typical hands-free ticket window intercom where the ticket taker has break-in priority over the customer. The system is voice-controlled from the inside, and returns to listening to the outside. Turning the VOX and ANTIVOX adjustments on the front controls the switching sensitivity. Two buttons are provided on the inside for muting and re-establishing the conversation. The FM-DH-14 is designed for mounting in a clear-glass window.

The necessary jumpers are shown in black in the diagram below.



The intercom accessories are connected to the back of the IC-29 like this:



**TYPICAL CATH-LAB SETUP WITH HEADSET - FULL DUPLEX OPERATION**

**PARTS:**

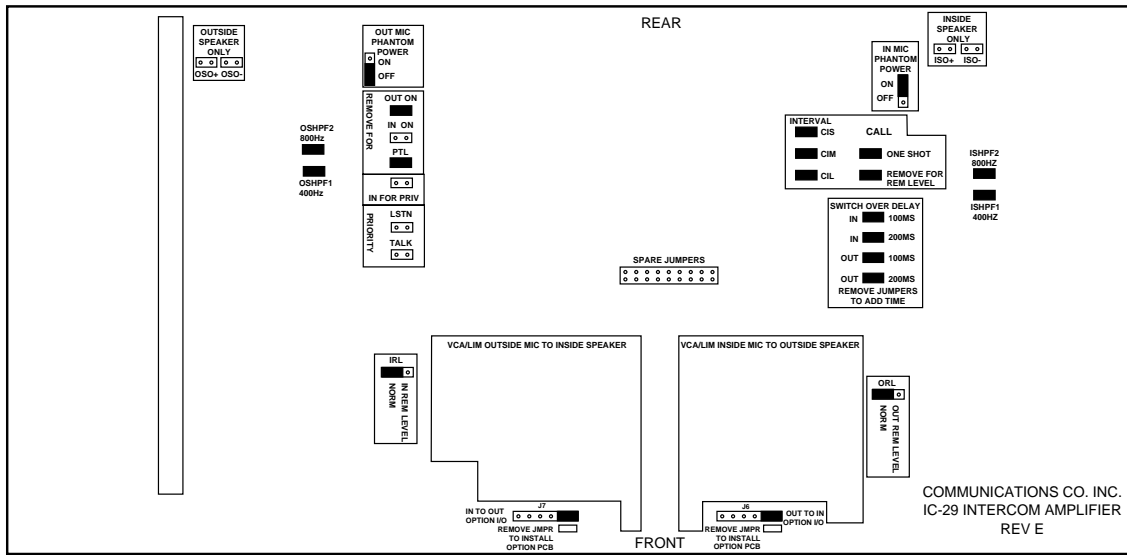
- 1) IC-29 Amplifier
- 1) IM-827 Gooseneck Microphone
- 1) DT-108 Headset w/ HC-414
- 1) IS-3002 Control Room Speaker\*
- 1) OS-161-4WP Speaker
- 1) BB-198 Backbox (Optional)
- 1) JP-101F Headset Jack
- 1) FS-77 Footswitch
- 1) IM-831C Cath-Lab Hanging Microphone
- 1) JP-3FS Flush Mount Receptacle

\* Can be flush-mounted in the wall or used with the BB-302 surface-mount backbox.

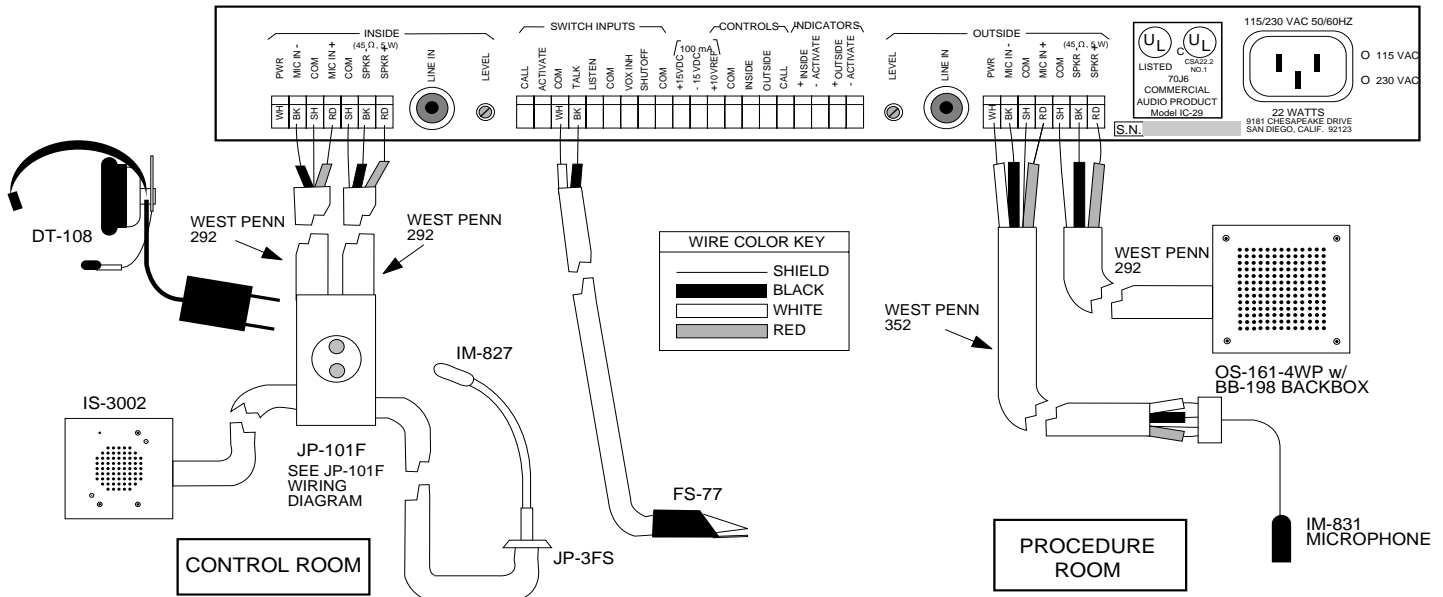
This setup is for a typical hospital Cath-lab where the control room operator is always listening to the procedure room, and can step on a footswitch to talk out to the procedure room. The procedure room is completely hands-free. The control room operator can choose between wearing a headset or using a speaker/microphone combination. The control room speaker and microphone are disconnected when the headset is plugged into the headset jack.

The necessary jumpers are shown in black in the diagram below.

**NOTE:** Early versions of the IC-29 (Rev D) required a modification to the circuit board for this setup.



The intercom accessories are connected to the back of the IC-29 like this:



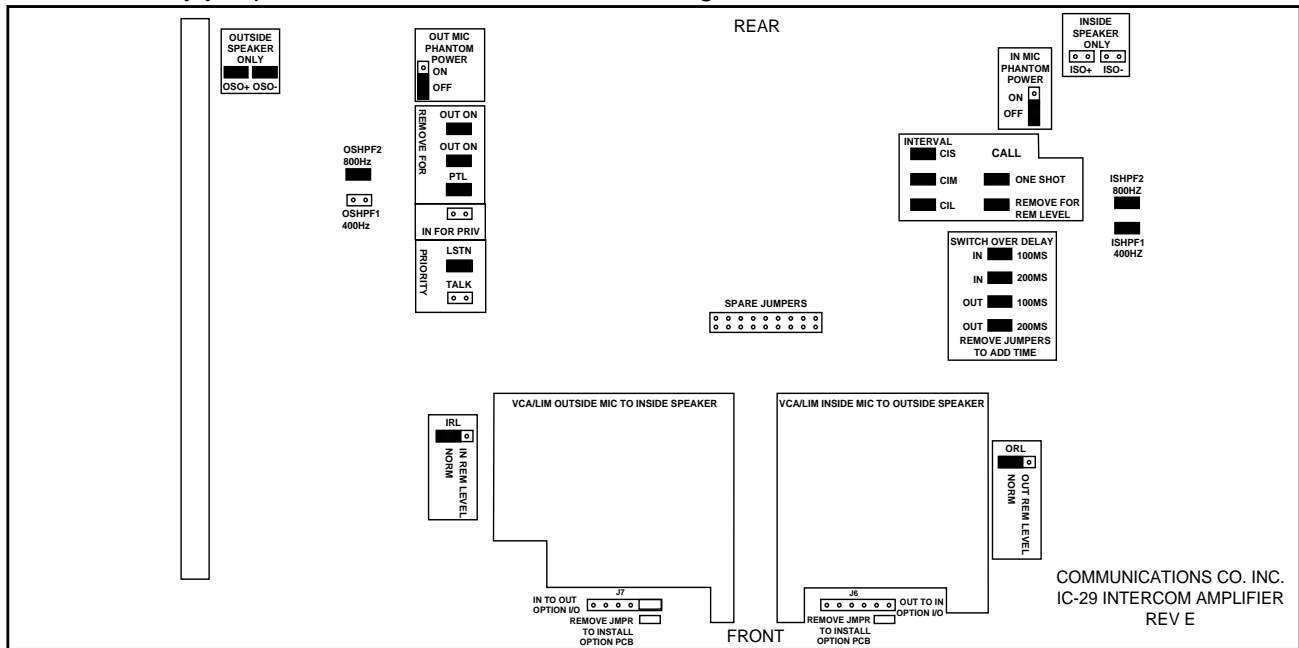
**TYPICAL MULTI-CELL MONITORING SYSTEM**

**PARTS:**

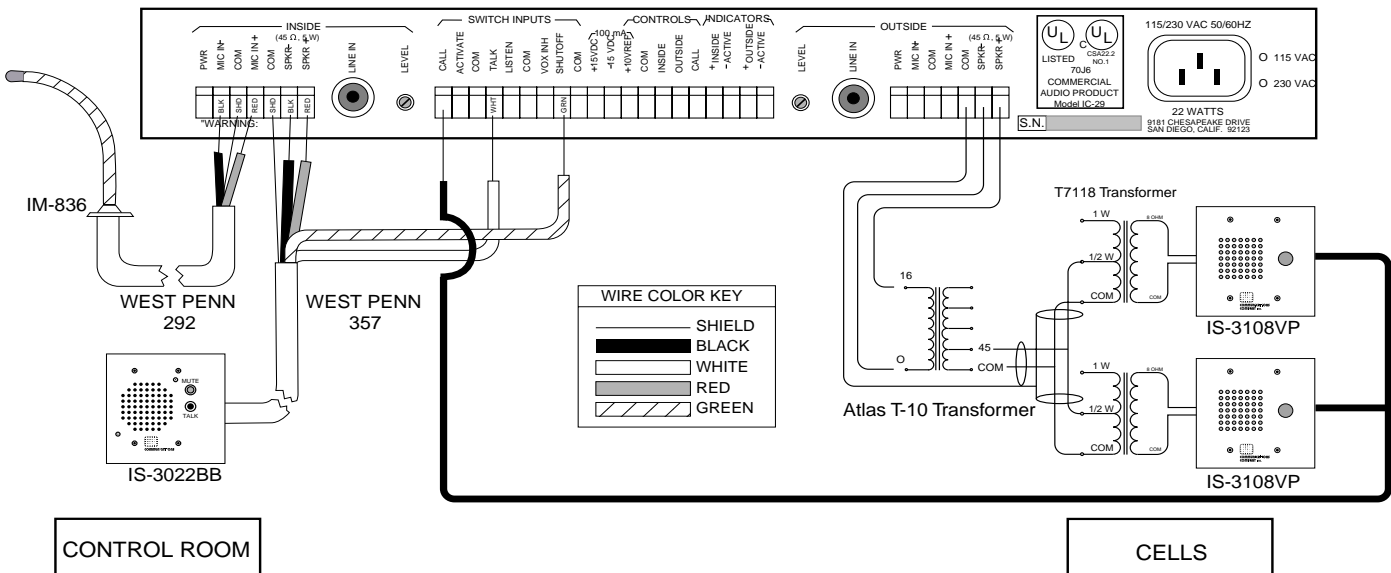
- 1) IC-29 Amplifier
- 1) IM-836 Gooseneck Microphone
- 1) IS-3022BB Speaker Station
- IS-3108VP Station w/ T-7118 Transformer (As Required)
- 1) Atlas T-10 Transformer per IS-3108VP

This setup allows monitoring of a group of cells and communications to all the cells in the group. The Atlas T-10 transformer converts the IC-29 standard 45 ohm output to 25 volt, allowing the addition of multiple stations. This drawing shows call in switch's on the IS-3108VP stations, the system can be converted to listen only by elimination of the call in switch. The buttons on the IS-3022BB allow the operator to use the system as Push-to-Talk and the ability of turning the system off. There is no alert tone in the cells when monitoring. This technique suffers from increasing noise floor as you add stations to the system, until it is difficult to hear anything above a shout.

The necessary jumpers are shown in black on the diagram below



The intercom accessories are connected to the back of the IC-29 like this





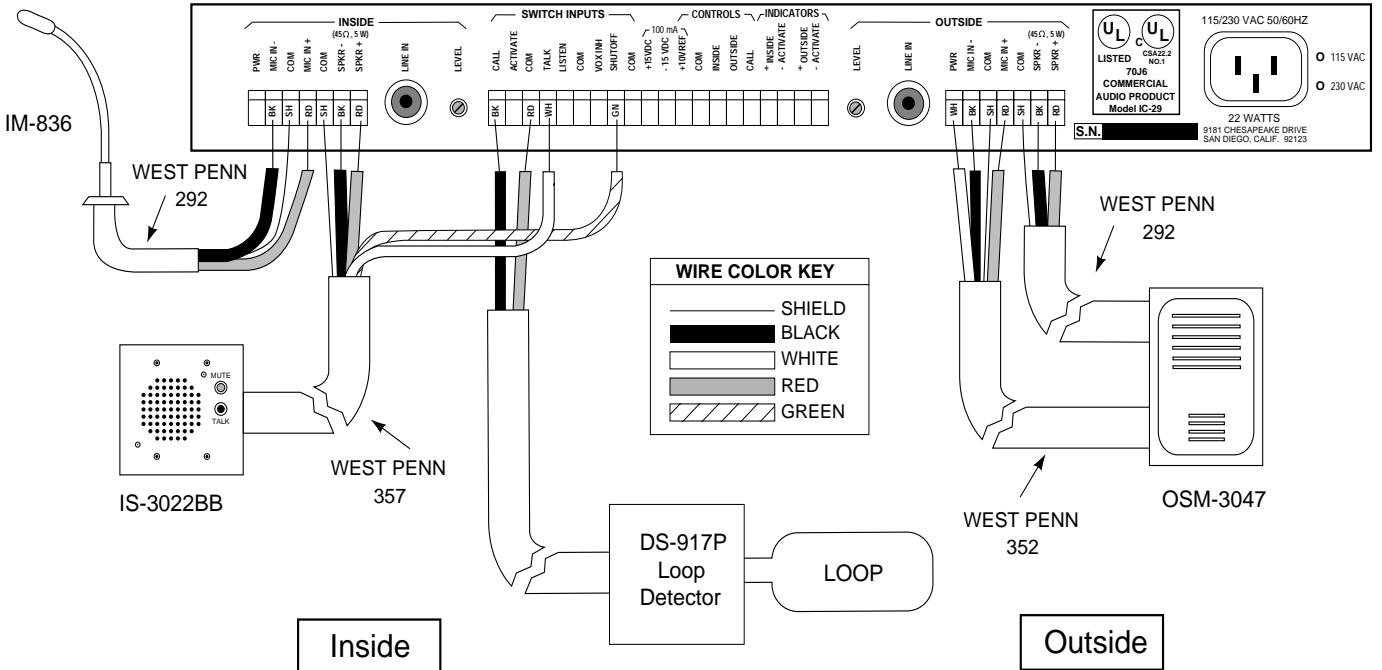
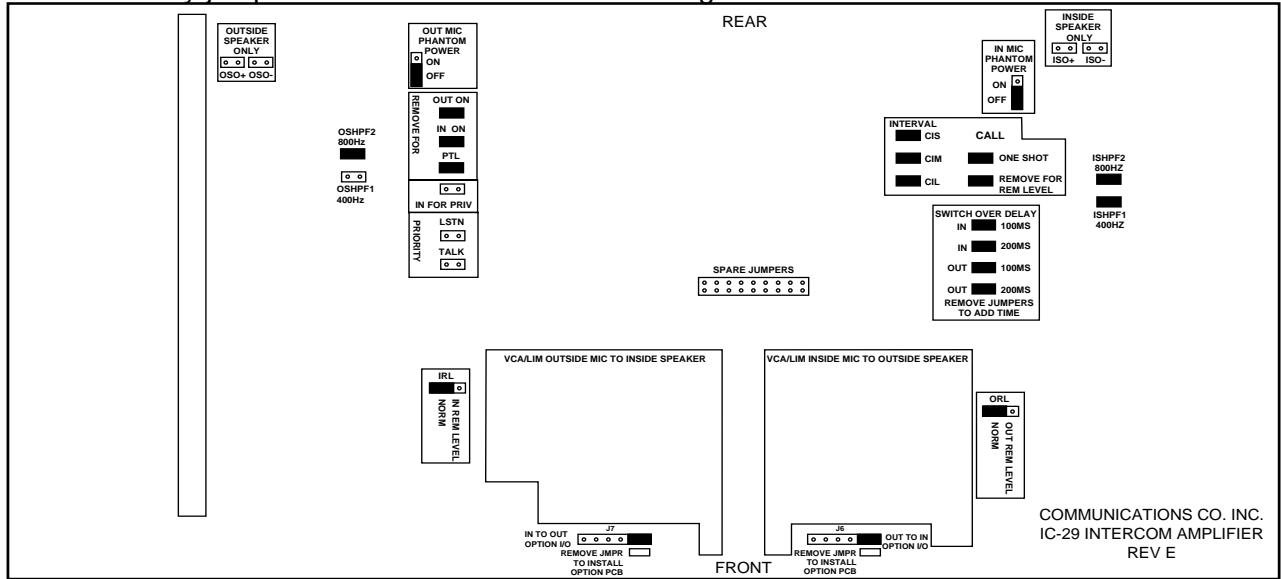
TYPICAL DRIVE-THROUGH WINDOW SYSTEM

PARTS:

- 1) IC-29 Amplifier
- 1) IS-3022BB Speaker Station\*
- 1) DS-917P Magnetic Loop-Detector
- 1) OSM-3047 Outside Speaker/Microphone
- 1) IM-836 Gooseneck Microphone

\* Can be flush-mounted in the wall or used with the BB-302 Surface Mount Backbox

This setup is for a typical Drive-Through intercom. A car driving over the magnetic loop-detector, alerts the inside with a call tone and turns on the amplifier. The system is Push-to-Talk from the inside with Return-to-Listen to the outside. A Mute button is provided on the IS-3022BB to turn off unwanted engine noise coming from the outside. (NOTE: The PHS-16 pneumatic switch can be substituted for the magnetic loop detector system in applications where budget is a factor. The necessary jumpers are shown in black on the diagram below



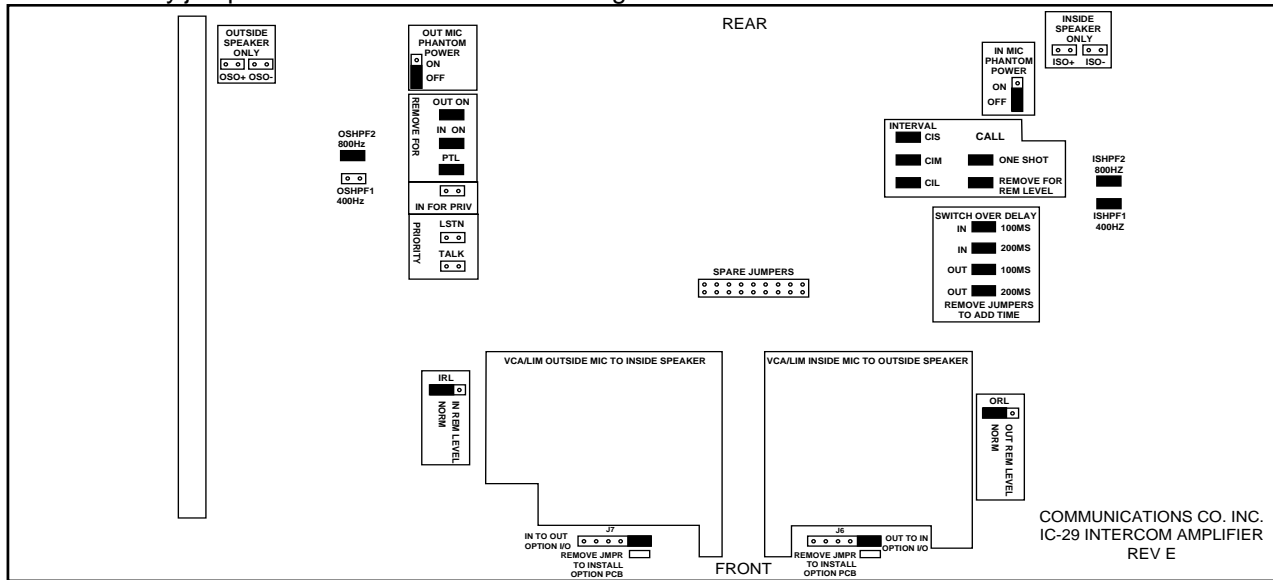
## TYPICAL DRIVE-THROUGH SYSTEM WITH MULTIPLE INSIDE STATIONS

**PARTS:**

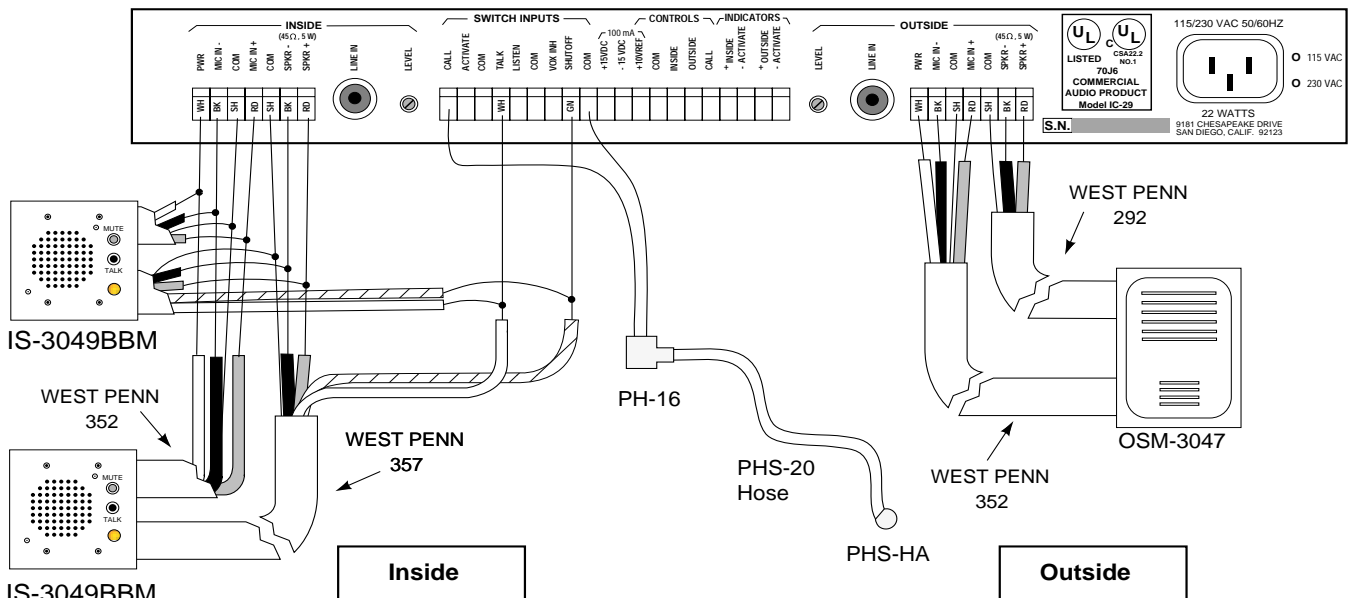
- 1) IC-29 Amplifier
  - 1) PH-16 Pneumatic Switch
  - 2) IS-3049BBM Microphone/Speaker Stations\*
  - 1) PHS-HA Hose Anchor
  - 1) OSM-3047 Outside Speaker/Microphone
  - PHS-20 Flex Hose (as needed)
- \* Can be flush-mounted in the wall or used with the BB-302 Surface Mount Backbox

This setup is used in push-to-talk applications where people working inside can be at a number of different locations, yet be able to talk to the outside from any locations. For example, in a fast-food restaurant where there is a cashier's station and a cook's station on the inside and the drive-up menu board on the outside. This system is shown with the PH-16 Pneumatic switch and accessories for the car drive up call circuit.

The necessary jumpers are shown in black in the diagram below



The intercom accessories are connected to the back of the IC-29 like this



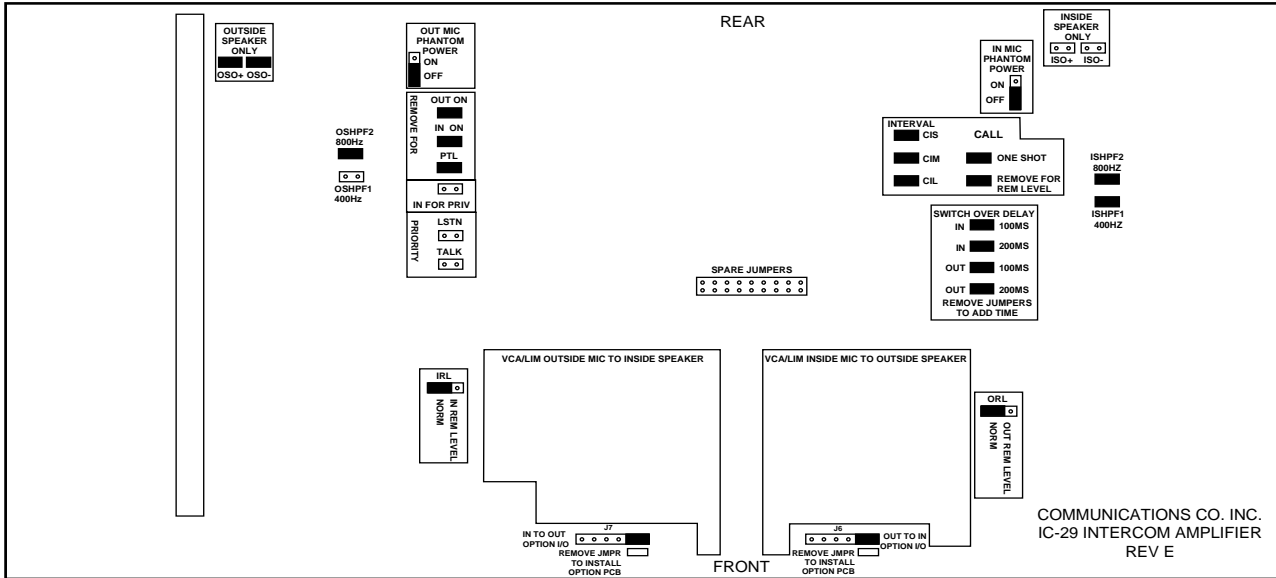
## TYPICAL GUARD INTERCOM SYSTEM WITH HANDSET ON THE INSIDE

**PARTS:**

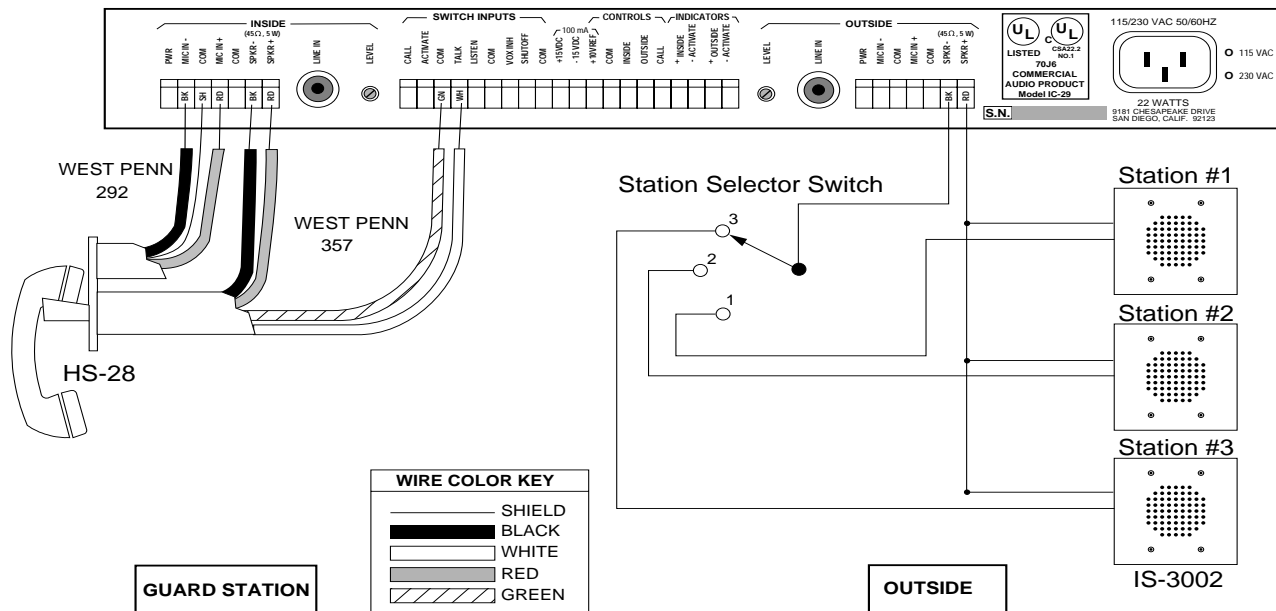
- 1) IC-29 Amplifier
- 1) HS-28 Handset
- IS-3002 Speaker Stations (as needed)
- 1) Rotary Station Selector Switch

This is a typical guard station intercom system, that can be used in conjunction with a video surveillance system. The guard uses a push-to-talk telephone handset to speak to the selected outside station. The diagram below shows multiple outside stations with a rotary switch to allow the guard to select the station they desire to talk to, although only one outside station is necessary. The handset can be modified to annunciate in the earpiece or a IS-3002 can be wired in parallel if call buttons are added to the outside stations.

The necessary jumpers are shown in black in the diagram below



The intercom accessories are connected to the back of the IC-29 like this



## **APPLICATIONS TO BE DONE**

# TROUBLESHOOTING HINTS

SYMPTOM	REMEDY
Microphone not working.	Check microphone for (phantom) power requirements. Check front panel level. Check for proper termination.
No lights on the front panel, amp dead.	Check AC power connection & fuse.
System not switching with voice activation.	Check VOX and ANTIVOX level adjustments on front.
Hum on the signal line.	Make sure all mic and speaker/mic cables are shielded.
Line input dead.	Check line level volume adjustment on the back.
Speaker/mic not working as a microphone.	Make sure OSO & ISO have jumpers.
No sound coming out of inside speaker.	Check speaker connections, make sure INSIDE ACTIVE light on the front panel is on. Check outside microphone. If you are using the outside speaker as a microphone, check OSO jumpers.
No sound coming out of outside speaker.	Check speaker connections, make sure OUTSIDE ACTIVE light on the front panel is on. Check inside microphone. If hands-free, check VOX adjustment.
Microphone volume not loud enough.	Make sure high-pass filter jumpers are in. (OSHPPF/ISHPPF)
Excessive noise on the line input.	Remove high-pass filter jumpers on that side.
(Remote) volume controls not working.	Make sure remote level jumpers are in the correct position. (ORL, IRL)
Amp keeps switching back and forth.	Adjust Vox and/or Antivox sensitivity.

# **GLOSSARY OF TERMS**

## **ANTIVOX**

Allows for the decoupling of the inside speaker and microphone so the sounds coming from the inside speaker can be rejected by the inside microphone Vox circuit.

## **CIL (call interval long)**

Annunciator call-in tone repeat interval, 1.6 sec on, 1.6 sec off.

## **CIM (call interval medium)**

Annunciator call-in tone repeat interval, 800 ms on, 800 ms off.

## **CIS (call interval short)**

Annunciator call-in tone repeat interval, 400 ms on, 400 ms off.

## **CONDENSER MICROPHONE**

A microphone with an active condenser element. Requires a separate power connection or phantom power to operate.

## **DUPLEX OPERATION**

A system that allows a simultaneous two-way conversation between two given points.

## **DYNAMIC MICROPHONE**

A microphone with a electro magnetic diaphragm-type element. Does not require any outside voltage or phantom power to operate.

## **ELECTRET CONDENSER MICROPHONE**

See - Condenser Microphone.

## **INSIDE**

The station whose listening volume is controlled by the INSIDE level knob. Usually the operator side.

## **LINE LEVEL**

An audio signal level between 78 mV (-20dBm) and 7.8 V (+10 dBm). Very large as compared to a MIC LEVEL signal. A line level signal usually comes from the output of audio equipment, such as mixers, wireless units and pre-amps.

### MIC LEVEL

An audio signal level between .78 mV (-60 dBm) and 7.8 mV (-40 dBm). Very small as compared to a LINE LEVEL signal. A mic level signal must be pre-amplified before connecting to a line level input.

### OUTSIDE

The station whose listening volume is controlled by the OUTSIDE level knob. Usually the customer side

### PHANTOM POWER

A voltage required by some electret condenser microphones which appears equally between mic+ and mic- (pins 2&3). Pin 1 remains ground and circuit minus.

### PUSH-TO-TALK (PTT)

When a person either desires to talk to another station or override the Vox operation, pushing the "talk" button provides "Push to Talk / Release to Listen" function.

### RETURN-TO-LISTEN (RTL)

When the person speaking is done, or the TALK button is released, the amplifier automatically switches back to listening to the other person.

### SEPARATE MICROPHONE

1. A microphone which is not a speaker.
2. A microphone not on the same plate as a speaker.

### SEPARATE SPEAKER

1. A speaker which does not double as a microphone.
2. A speaker not on the same plate as a microphone.

### SIMPLEX OPERATION

A system that allows conversation in either direction, alternating, but only one direction at a time.

### SPEAKER/MICROPHONE

A speaker which doubles as a microphone. A 45 ohm speaker works best for this application.  
NOTE: *Using a 45 ohm speaker as a microphone does not deliver the same sound quality as a separate microphone.*

### VOX

Voice activated switching. When in VOX mode, the person on the inside simply starts speaking, the amplifier automatically switches on, causing their voice to come through the outside speaker.

## Configuration Notes

This IC-29 has been configured at the factory as follows

- Push to Talk / Release to Listen (also known as Simplex Mode)
- Out on, In on and PTL jumpered
- Unpowered Dynamic microphones
- 45 Ohm speakers on each amplifier

If your amplifier requires a different configuration, here are some simple changes you can make to the internal jumper settings to meet your needs.

For condenser microphones that require phantom power, move the phantom power jumper to the "ON" position on the side that requires it.

In situations where there is only a speaker on the outside, add two jumpers to the position marked "Outside Speaker Only (OSO+ OSO-).

To eliminate the "bonk" sound caused by outside speaker only applications. Start by removing the switchover delay jumpers marked "100ms", if that does not work re-install the "100ms" jumper, then remove "200ms" jumper. Remember, less is better.

For Hands-Free Vox operation from the inside, adjust the VOX and ANTIVOX sensitivity on the front of the amplifier.

To convert to a Full-Duplex system, remove the jumper marked "Out On".

To convert to a Half-Duplex system, i.e. operator always listening (typical of Cath-Labs), remove the "In On" jumper.

To convert for use with handsets on both sides, remove the "Out On", "In On" jumpers. If you desire PTT(Push to Talk) connect to the "Talk" connectors on the rear panel.

To get rid of unwanted low frequency feedback (rumble or low-pitch drone) in a Full or Half-Duplex system, try removing the high-pass filter jumpers (400Hz or 800Hz) one at a time, do not remove both simultaneously as that will convert the microphone input to a line level input.

When using a 45 ohm speaker as a microphone, we suggest removing the 400Hz jumper on the side that the speaker is being used on. This engages the "800Hz" filter, which increases the intelligibility of the speaker.

To use remote level controls, move the "ORL" and/or the "IRL" jumpers to the "REM" position.

These simple setup changes are for the most common configurations. If you require more detailed information or have advanced setups, please consult the manual or call Communications Company Technical Support personnel.



## Vox Operation Notes:

For Vox to work, the following conditions must be present:

The INSIDE station must have a separate speaker in addition to a microphone. For example, an IM-827 gooseneck microphone and a IS-3022BB speaker station. For optimum Vox operation, the microphone must be placed so that it picks up as little of the sound as possible from the inside speaker station and the most sound from the person talking. That means having the microphone on one side of the talker and the speaker on the other. A unidirectional (cardioid) gooseneck microphone works best for this application.

The OUTSIDE station can be any combination of speaker stations and microphones, that the installation requires. The outside speaker can even be used as a talk-back microphone, eliminating the need for a dedicated microphone, however, a separate microphone and speaker will always work better and sound better than a speaker only.

Vox setup can experience feedback problems when there is a direct path through the air between the OUTSIDE speaker and the INSIDE microphone. Examples are half-height windows, cutouts, pass-through-trays, all of which will contribute to feedback in the system. Also, excessive volume in the OUTSIDE speaker will cause feedback.

Solutions to fixing feedback.

- 1) Careful adjustments to the Vox and AntiVox controls.
- 2) Reduce the level of the OUTSIDE speaker.
- 3) Remove the direct-air path.
- 4) Consider using a IC-29 DB delay board.
- 5) Or portions of the above.
- 6) If you can't do any of the above, consider using a headset for the inside operator.

Also feedback can occur, when there is sound bouncing off the rear or side walls. Consider some type of damping materials, or a book shelf to interrupt the surface.

If the feedback is at a constant frequency every time, a notch-filter (IC-29 NF) board is available to notch out specific frequencies. If the feedback is a low rumble, (usually caused by counter or window vibration) try removing either the 800Hz or 400Hz low-pass filter jumpers (ISHPF1 or ISHPF2) on the inside channel.

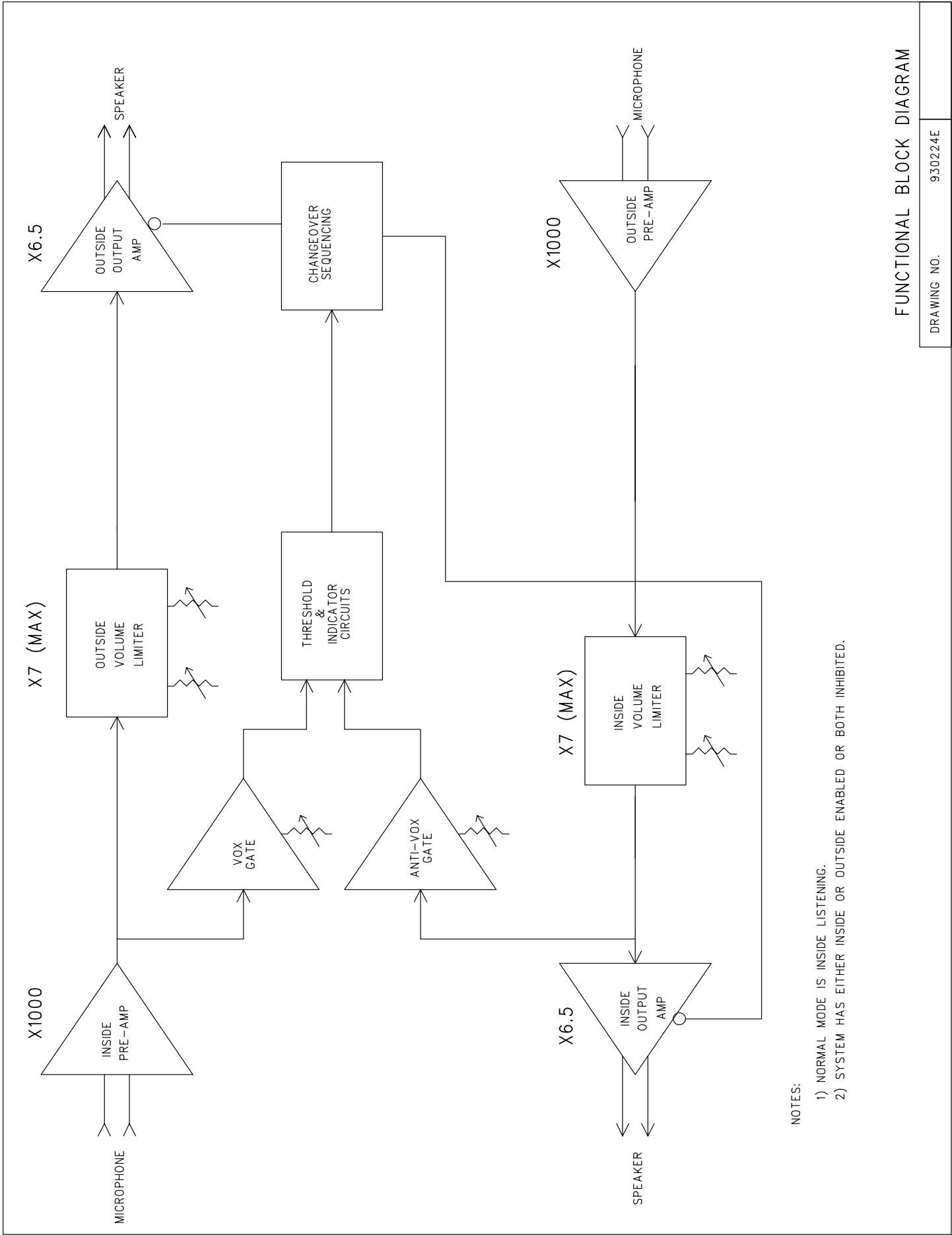
The AntiVox circuit samples the sound coming through the inside speaker, and compares it to the sound entering the inside microphone. If the two samples match up, the Vox circuit will not trip on that sound. This keeps the outside customer from activating the Vox circuit on the inside microphone if they talk to loud. Note: As the AntiVox adjustment increases, the sensitivity of the Vox circuit decreases. Keep the inside volume low for maximum Vox/AntiVox effectiveness.

For maximum Vox sensitivity in applications where there is no eye contact with the outside station, a 55 ms delay (IC-29 DB) board option is available to avoid first syllable chopping of words or sentences. The delay board may cause confusion when the customer can see the operator, because of the slight delay in the audio relative to the lips moving, and is not recommended for glass-window applications.

# APPENDIX A

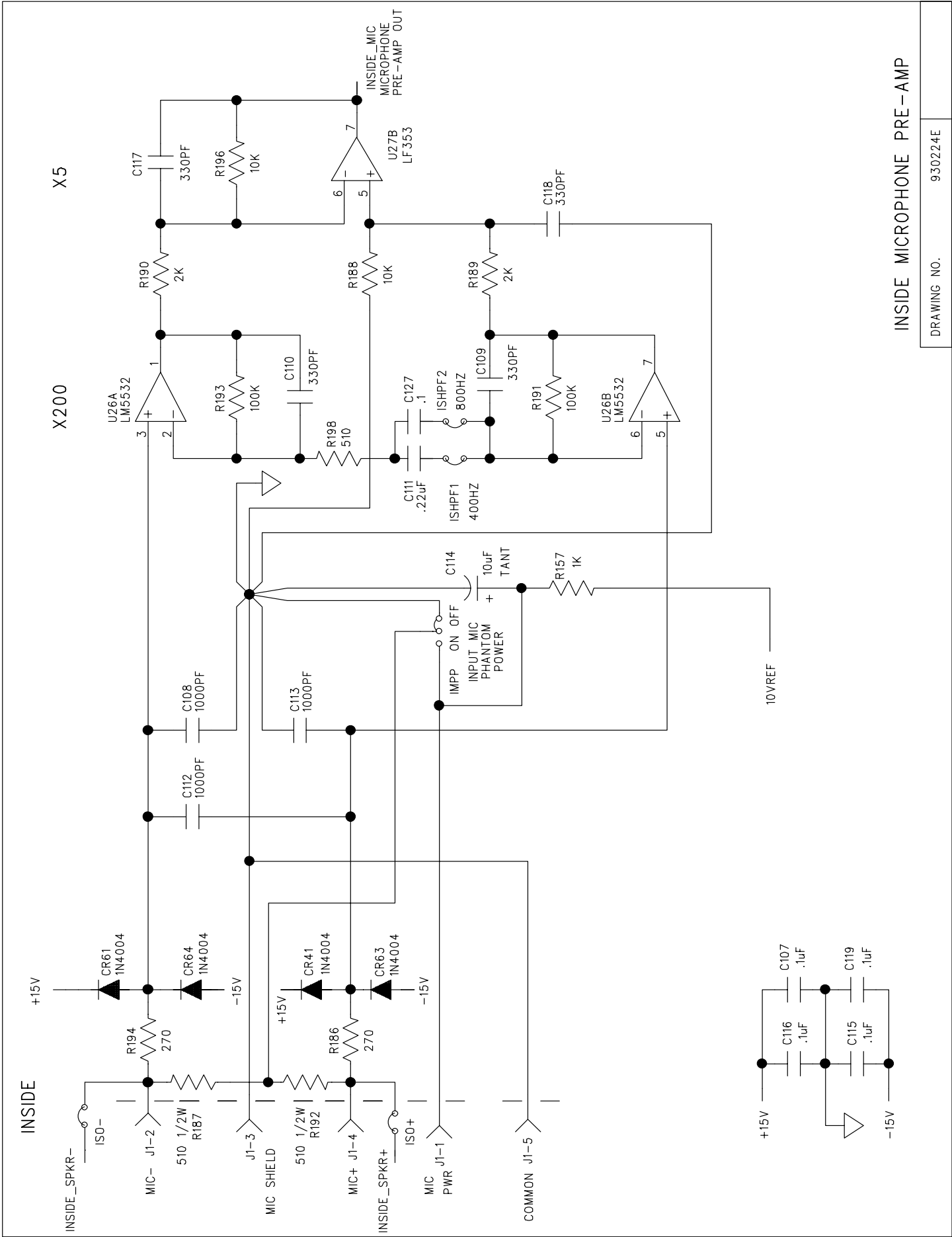
## IC-29 SCHEMATIC ELEMENTS

Function Block .....	i
Inside Microphone Pre-Amp .....	ii
Inside Gain and Limiter .....	iii
Inside Power Amplifier .....	iv
Outside Microphone Pre-Amp .....	v
Outside Gain and Limiter .....	vi
Outside Power Amplifier .....	vii
Vox and Anti-Vox .....	viii
Push to Talk/Listen .....	vx
Shutoff Logic .....	x
Call Circuit .....	xi
Power Supply .....	xii
IC-29NF Notch Filter .....	xiii
IC-29DB Delay Board .....	xiv



NOTES:

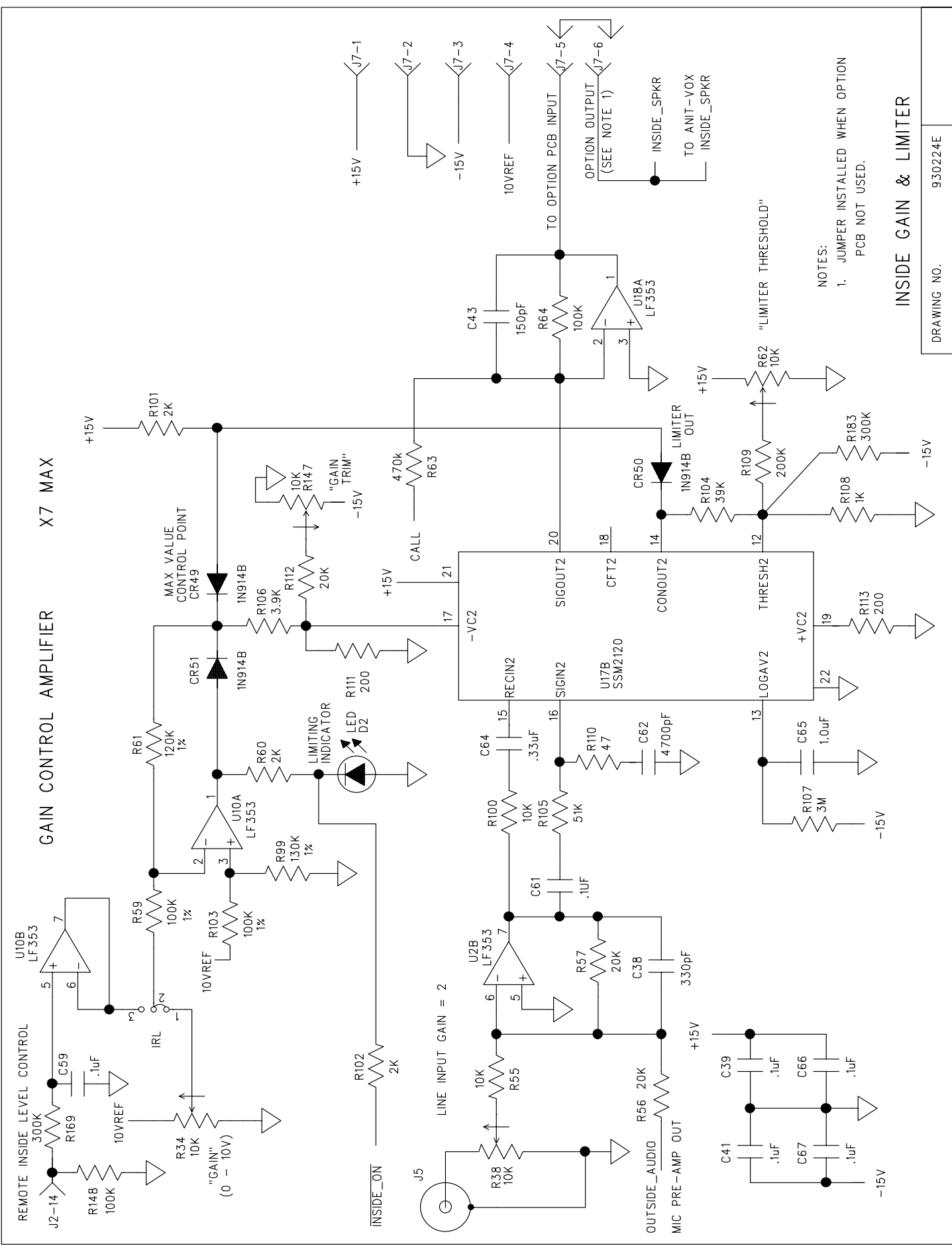
- 1) NORMAL MODE IS INSIDE LISTENING.
- 2) SYSTEM HAS EITHER INSIDE OR OUTSIDE ENABLED OR BOTH INHIBITED.



INSIDE MICROPHONE PRE-AMP

DRAWING NO. 930224E

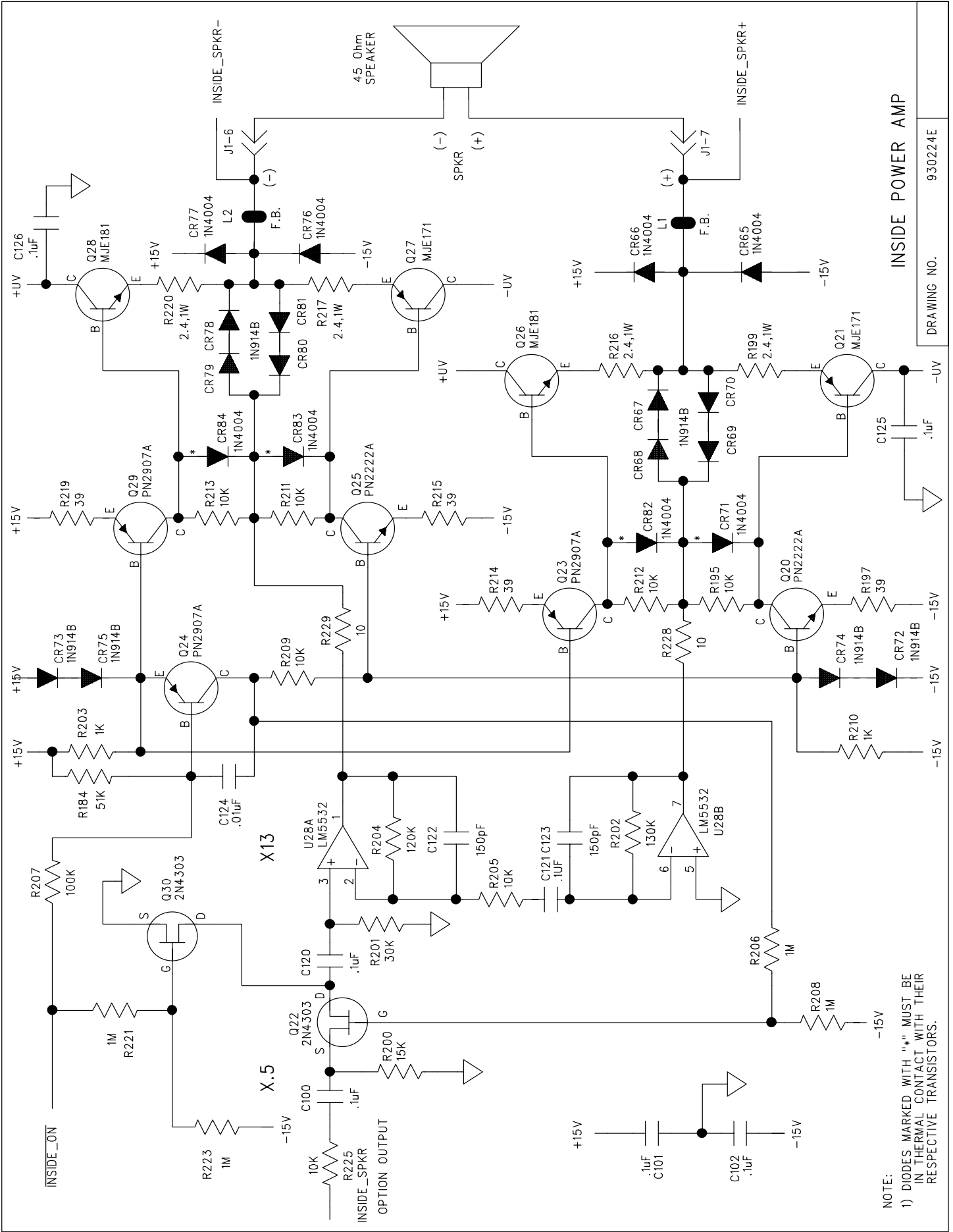
# GAIN CONTROL AMPLIFIER X7 MAX



NOTES:  
 1. JUMPER INSTALLED WHEN OPTION PCB NOT USED.

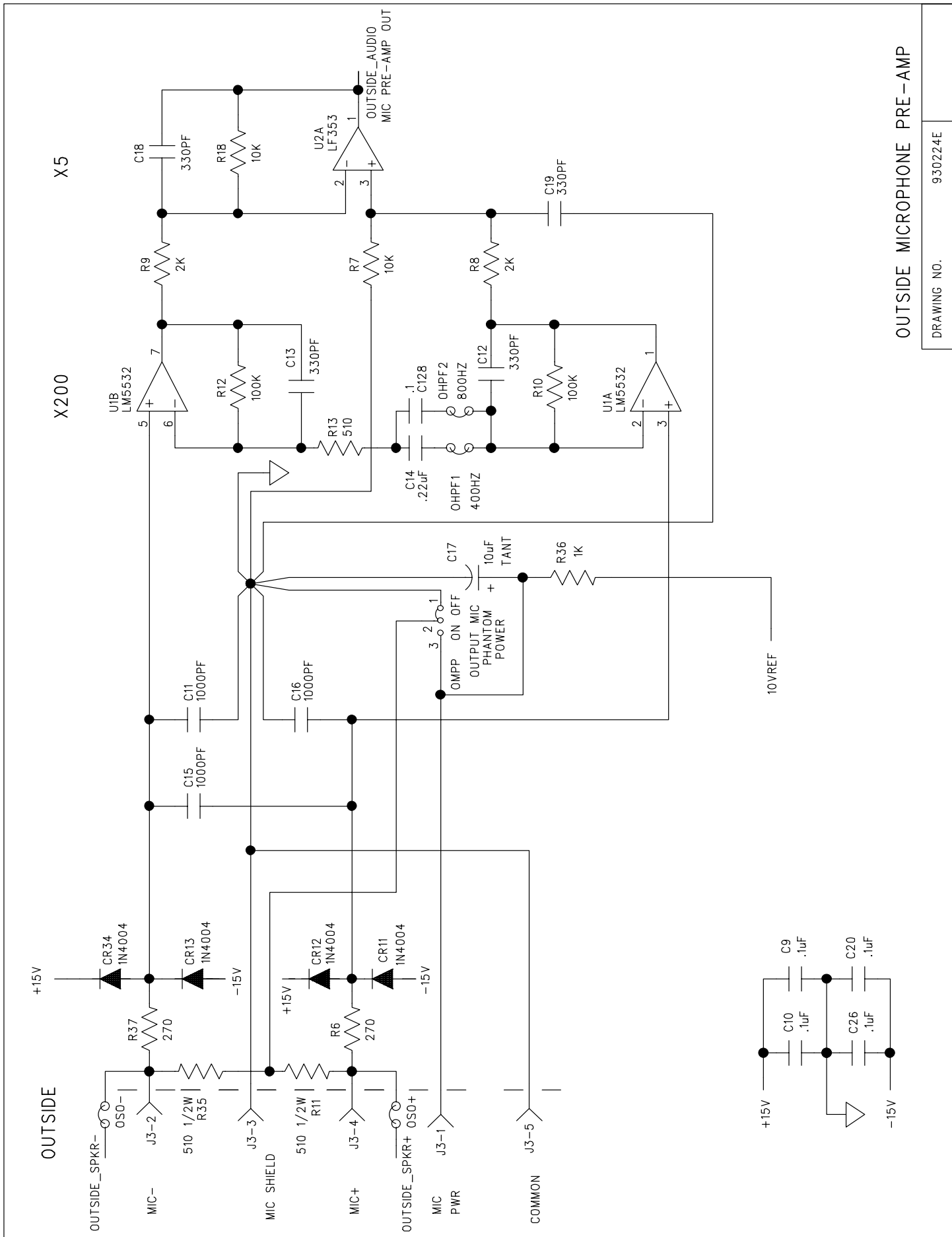
## INSIDE GAIN & LIMITER

DRAWING NO. 930224E



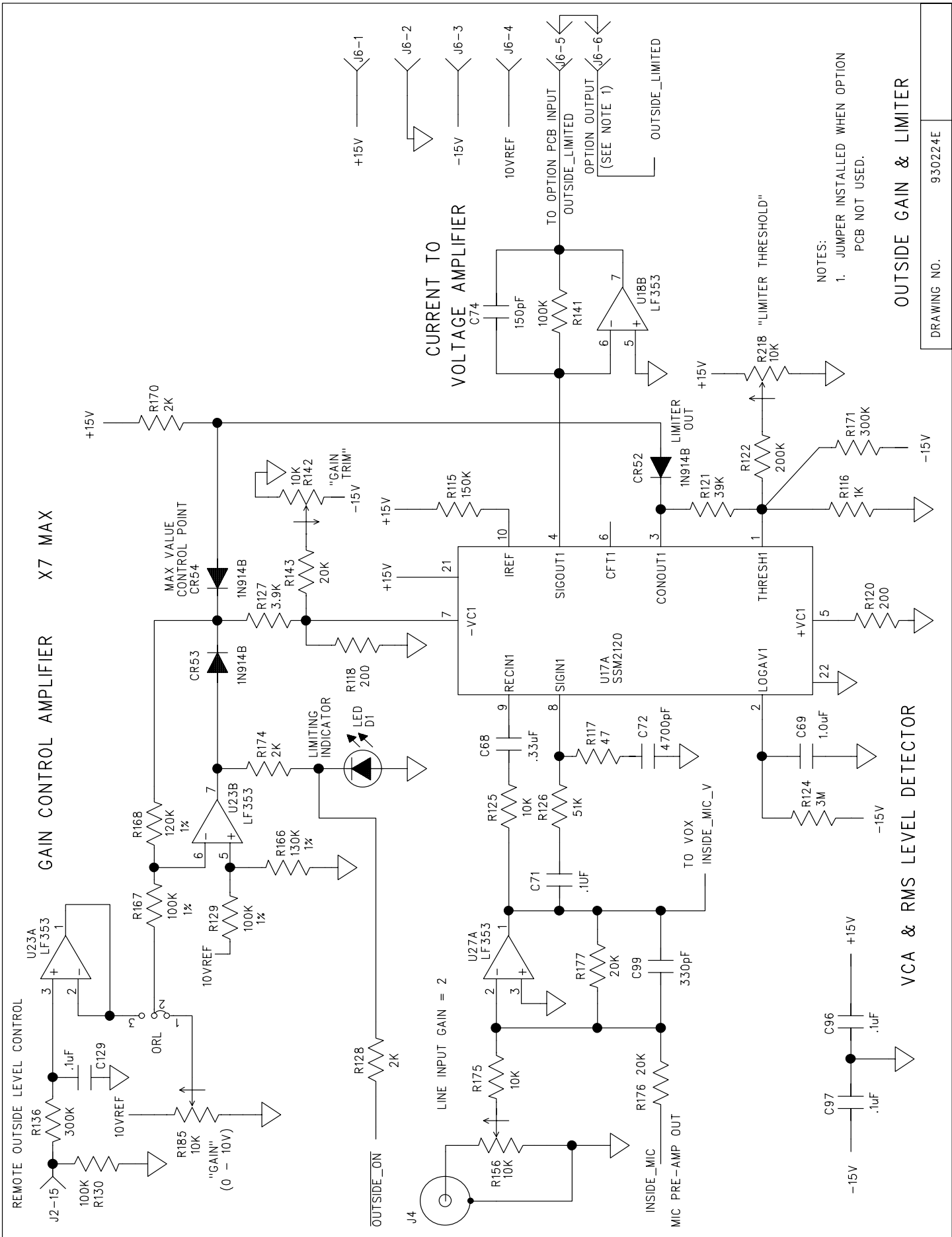
INSIDE POWER AMP

DRAWING NO. 930224E



OUTSIDE MICROPHONE PRE-AMP

DRAWING NO. 930224E



GAIN CONTROL AMPLIFIER X7 MAX

CURRENT TO VOLTAGE AMPLIFIER

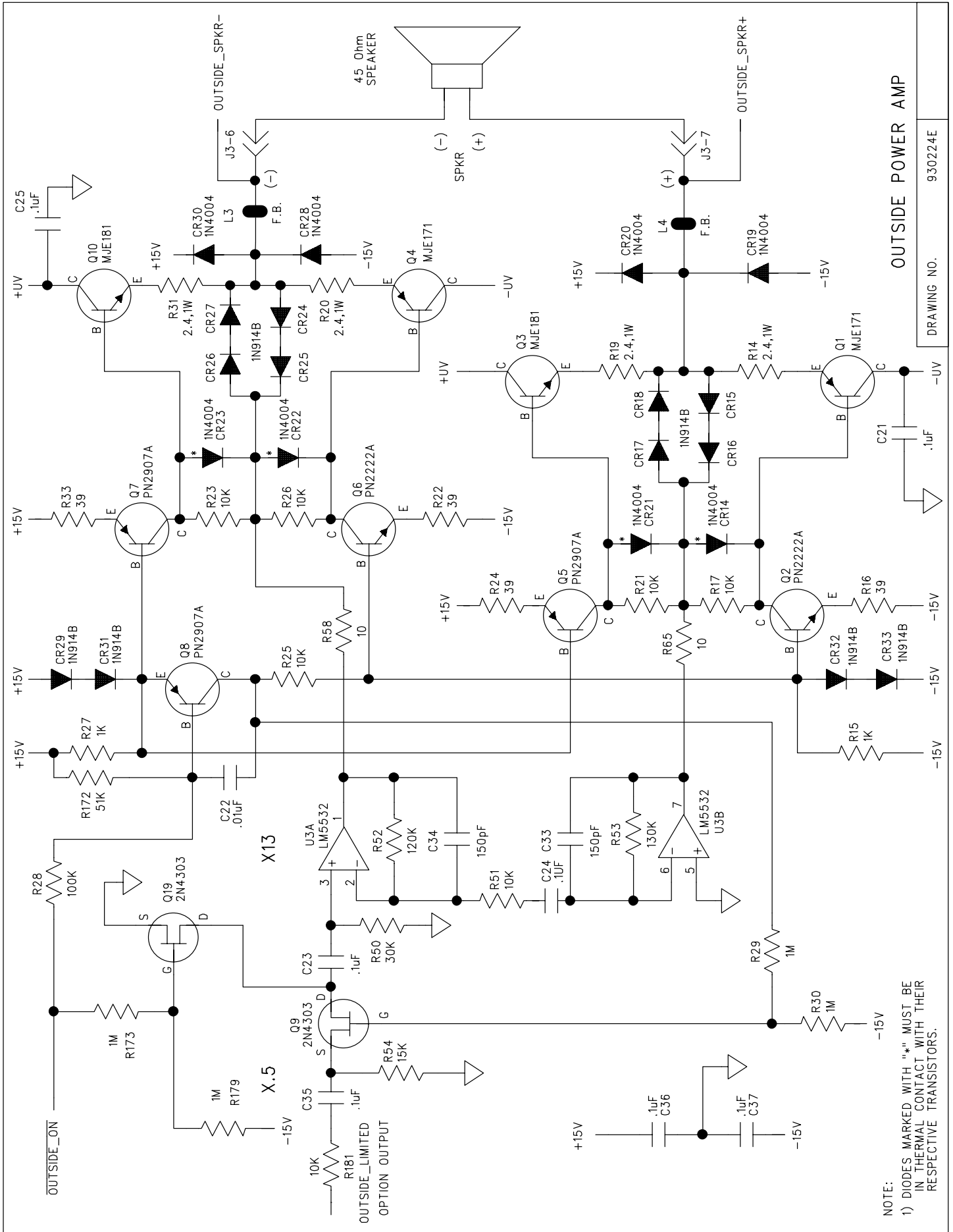
VCA & RMS LEVEL DETECTOR

OUTSIDE GAIN & LIMITER

NOTES:  
1. JUMPER INSTALLED WHEN OPTION PCB NOT USED.

DRAWING NO. 930224E

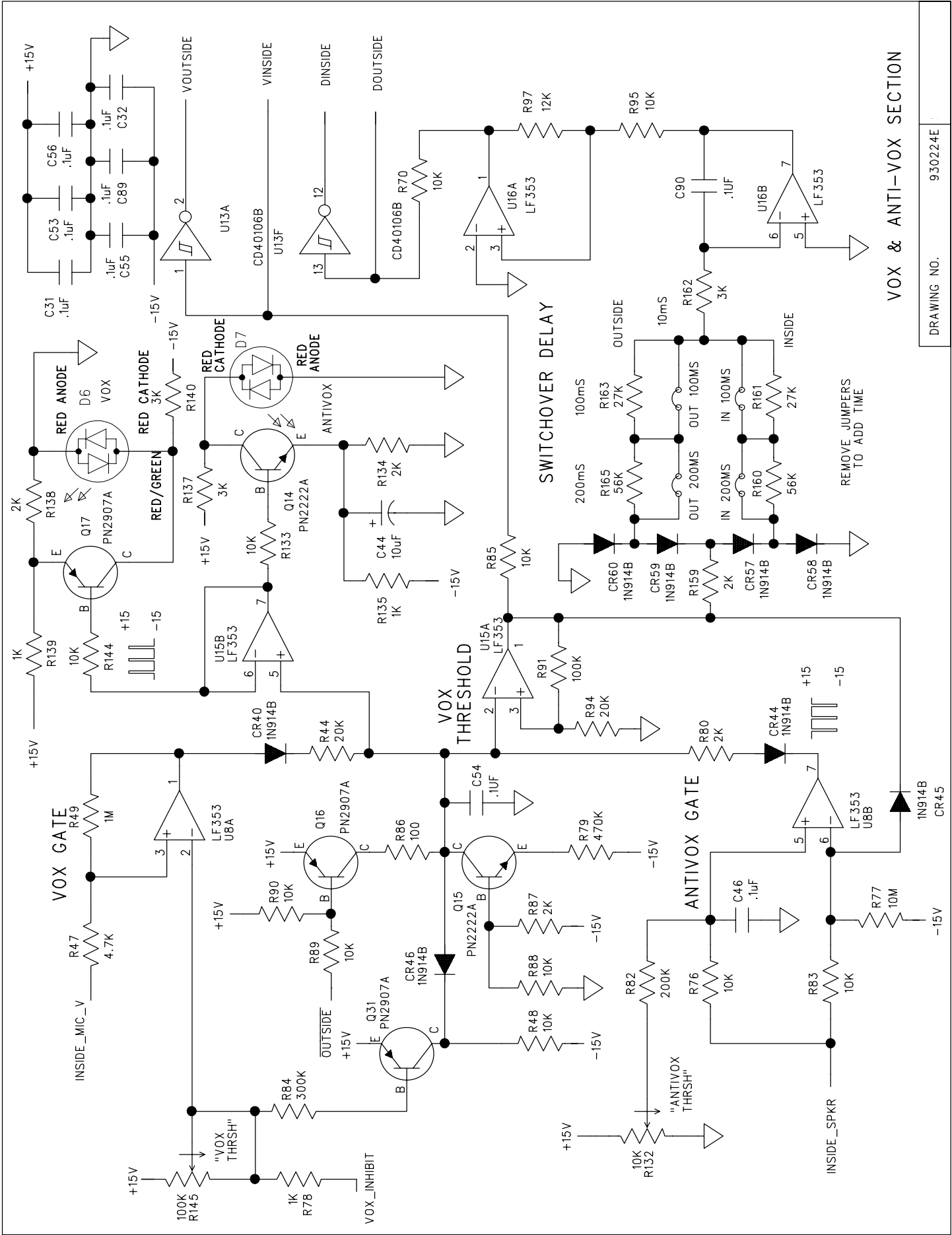




NOTE:  
 1) DIODES MARKED WITH "\*" MUST BE IN THERMAL CONTACT WITH THEIR RESPECTIVE TRANSISTORS.

OUTSIDE POWER AMP

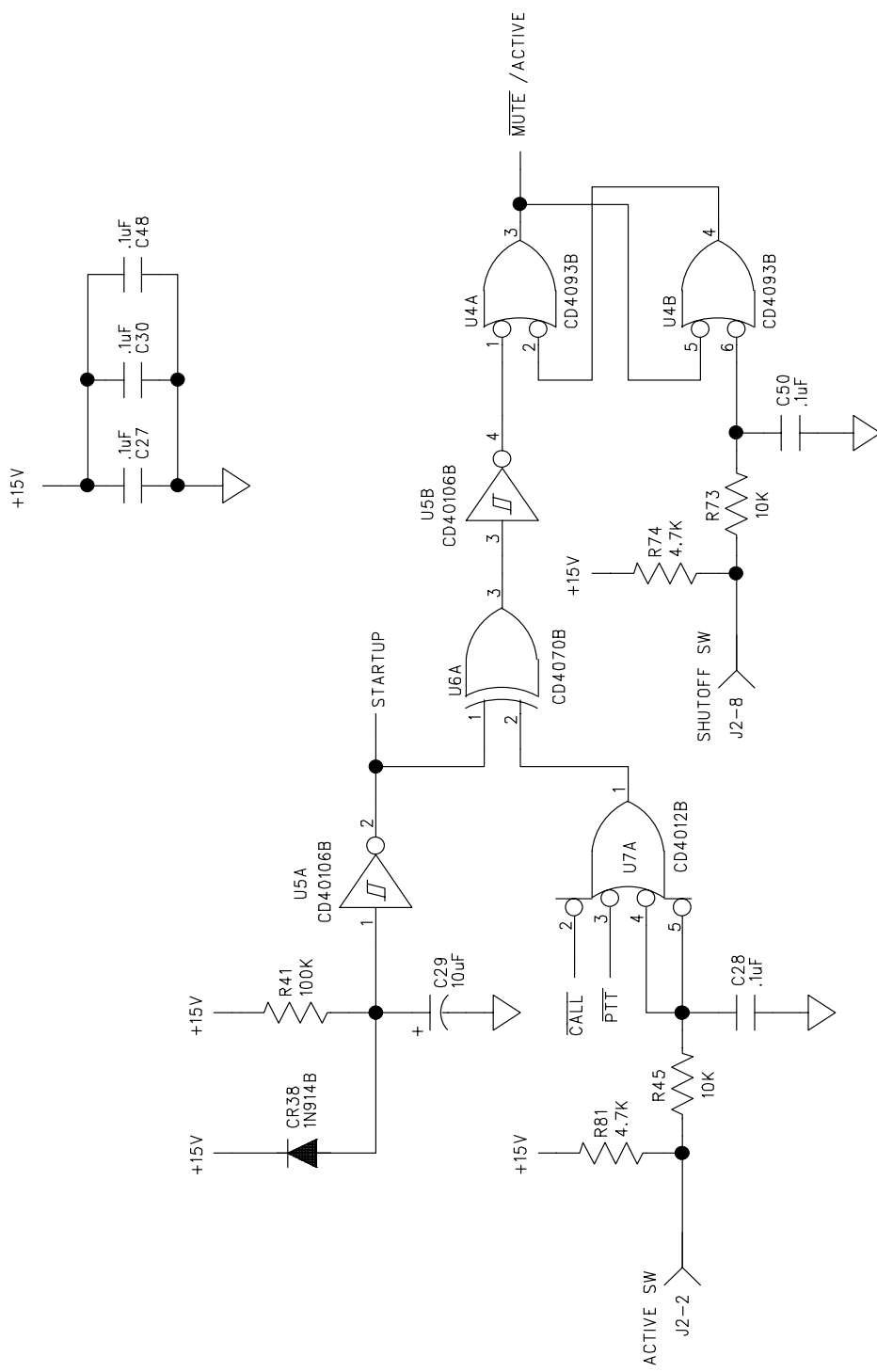
DRAWING NO. 930224E



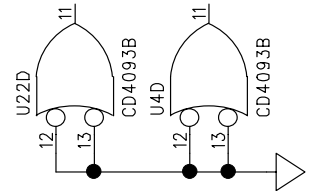
VOX & ANTI-VOX SECTION

DRAWING NO. 930224E



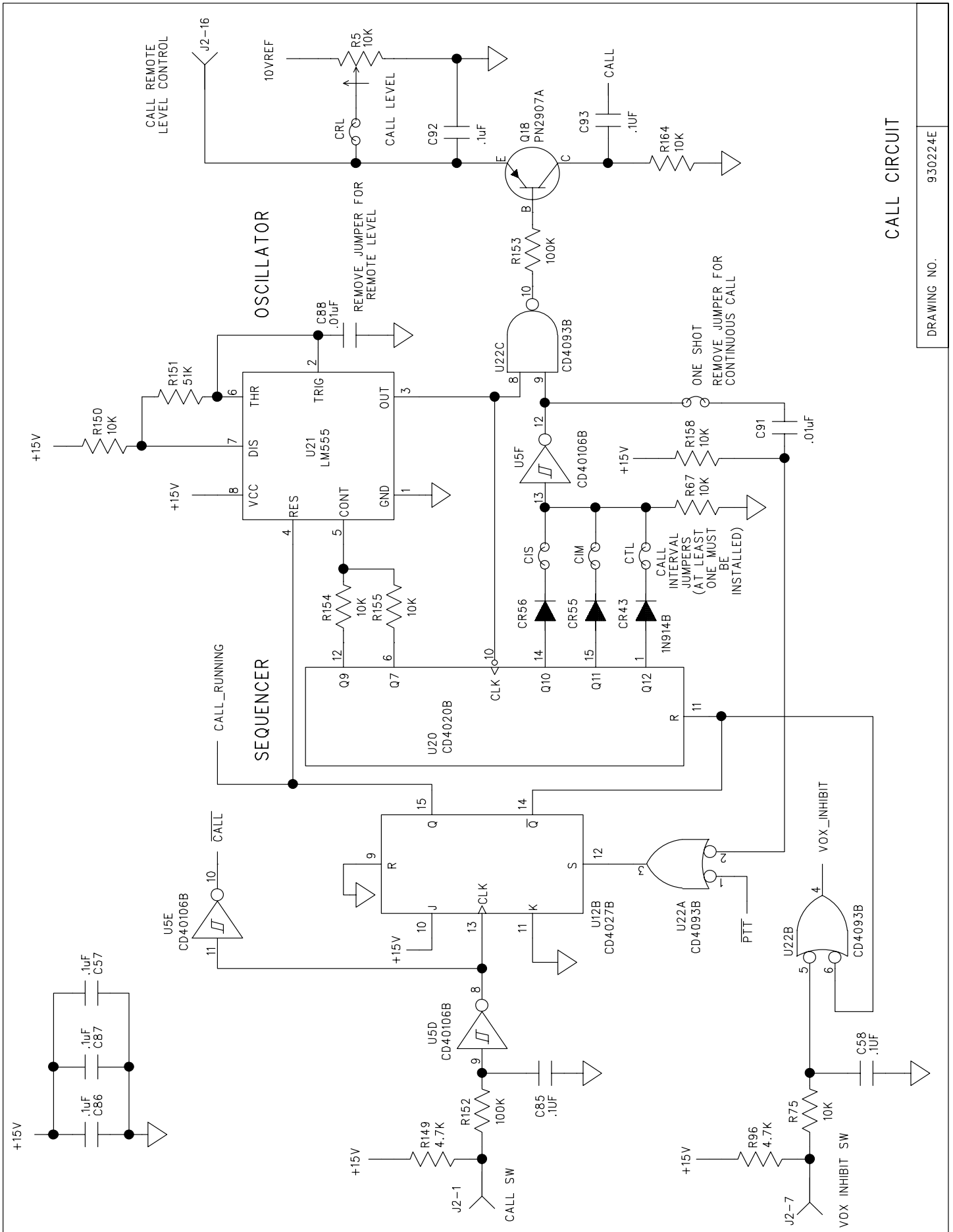


NOTE:  
1) "ACTIVATE" OVERRIDES "SHUTOFF"



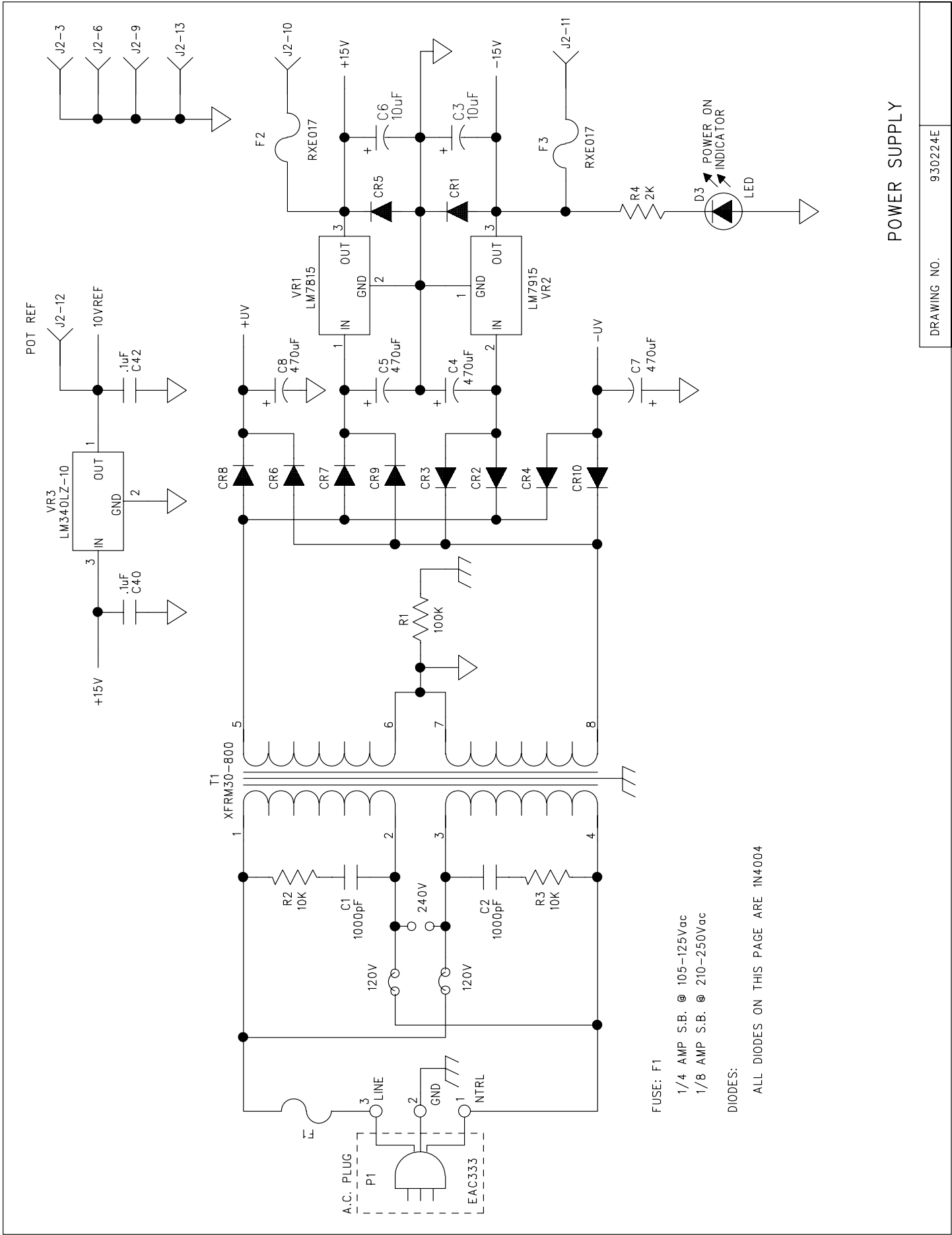
SHUTOFF LOGIC

DRAWING NO. 930224C



CALL CIRCUIT

DRAWING NO. 930224E

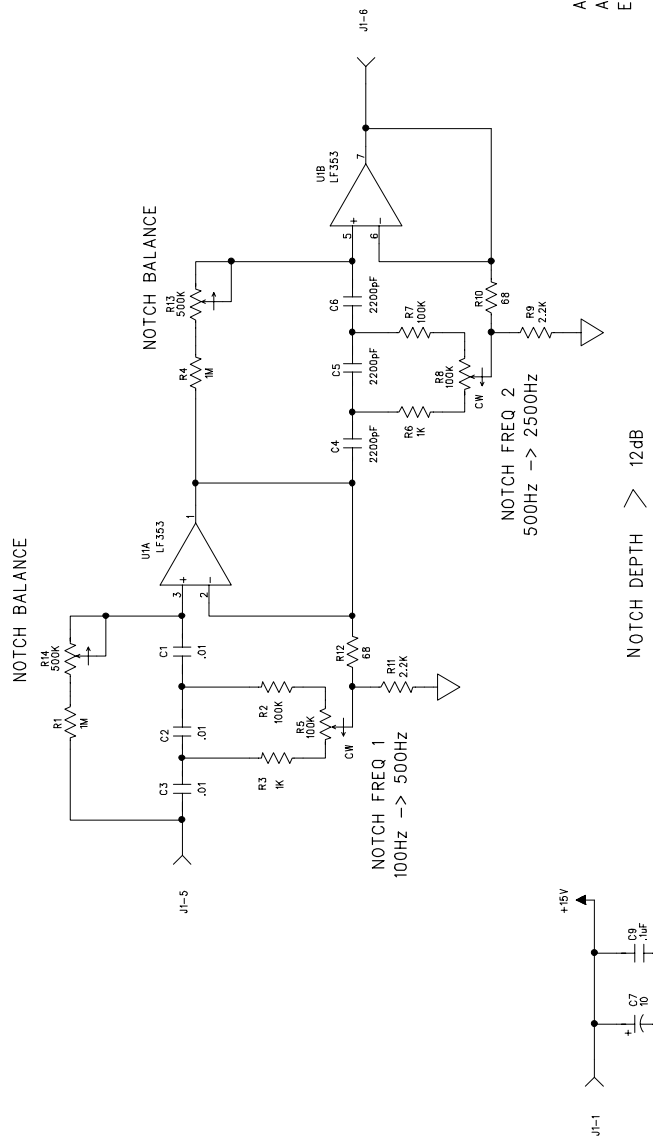


FUSE: F1  
 1/4 AMP S.B. @ 105-125Vac  
 1/8 AMP S.B. @ 210-250Vac

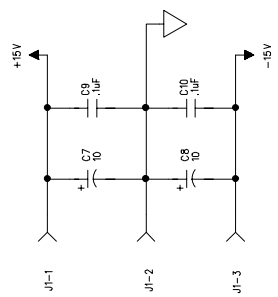
DIODES:  
 ALL DIODES ON THIS PAGE ARE 1N4004

POWER SUPPLY

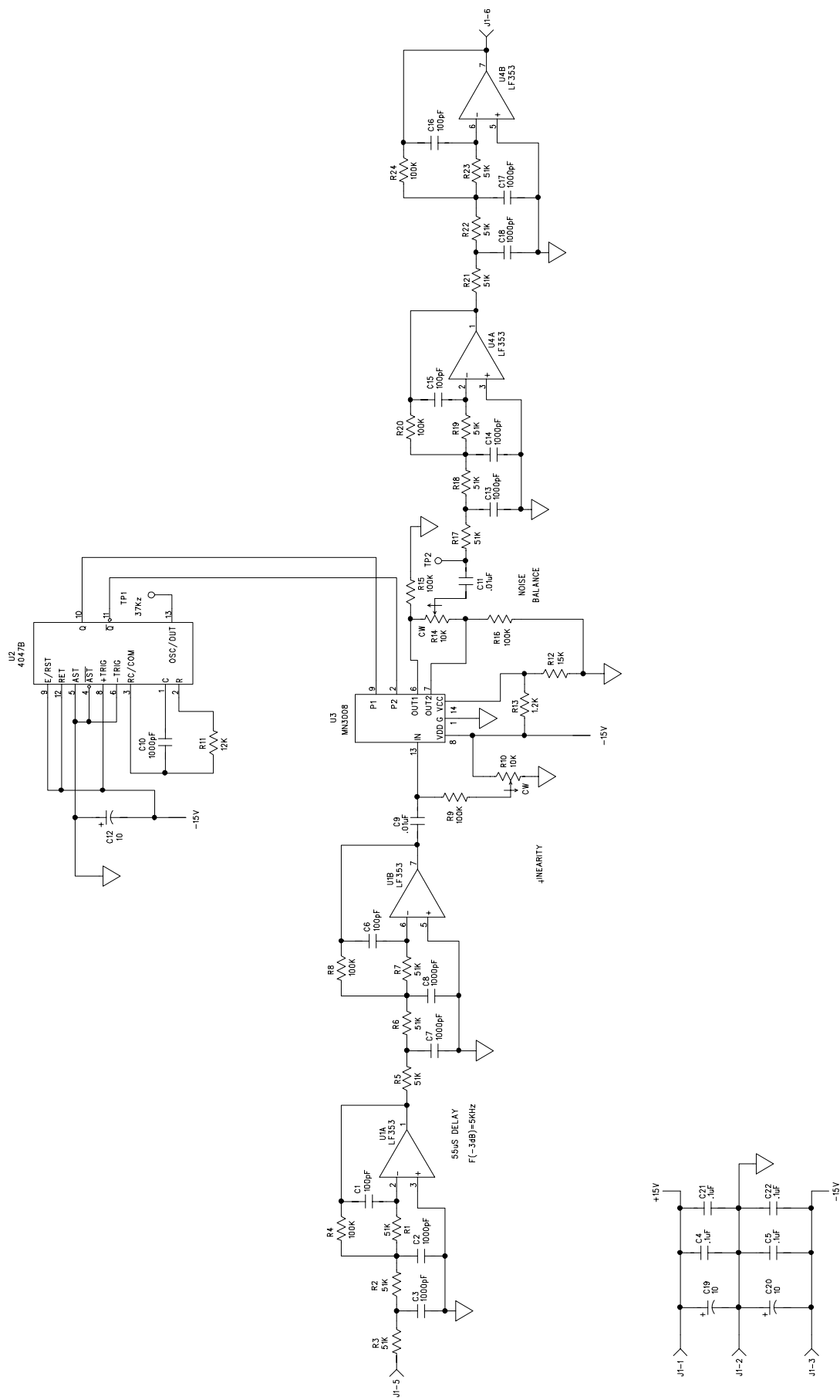
DRAWING NO. 930224E



ADJUST "NOTCH BALANCE" TRIMPOTS  
AT LOWEST FREQUENCY OF  
EACH NOTCH FILTER



APPROVALS		DATE	IC-29NF	
DRAWN	BWT	5 MAY 95	NOTCH FILTER	
			SCALE	SIZE
			NONE	C
			DRAWING NO. 12300245	
			COMMUNICATIONS COMPANY INC.	



APPROVALS		DATE
DRAWN		11 OCT 93
R&D DESIGN		
SCALE		NONE
SIZE		C
DRAWING NO.		12300247

COMMUNICATIONS COMPANY INC.

IC-290B  
DELAY BOARD