

**ALLIED**   
Broadcast Equipment

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**TELEMIX IX  
TELEPHONE SYSTEM**

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**USER'S MANUAL**

**GENTNER**  
**ENGINEERING COMPANY, INC.**

**540 WEST 3560 SOUTH  
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\*\* To be sent when available.

## 1. Introduction.

This manual provides operation and technical information for the Gentner Telephone System: **TELEMIX Model IX**. It is suggested that this manual be totally read and understood before any attempt to install or operate the unit is made.

TELEMIX IX is a fifteen-line, microprocessor-based telephone system that provides high quality telephone audio for use in all types of broadcast talk shows. This desktop unit can be operated by the talk-show talent, engineer/producer, or both.

The front panel control switches look, and operate, similar to a 10 button telephone set. Callers on the two groups of incoming lines, numbered 1 thru 9 and 10 thru 15, are selected as desired by the operator to go on the air. The top row (Group 1) and bottom row (Group 2) are each directed to separate, internal hybrids (or optional external hybrids). Callers from the two groups are then conferenced and can reliably hear each other.

There are two control knobs for operators. The left hand "Balance" control adjusts the audio balance between Group 1 and Group 2, while the right hand "Caller Control" adjusts the amount of caller dimming. Caller dimming occurs when send audio is present and is adjustable from 0 dB to 30 dB.

Telco connection is accomplished through two rear-panel 25 pair connectors. TELEMIX IX simulates any standard 10 button telephone set and can therefore be plugged directly into any 500 series KSU. Line and A-lead switching are **totally** solid state. In fact, the only mechanical components are the front panel switches.

The TELEMIX CPU can be accessed via an on-board RS-232 serial port. This port allows single pair control of the entire device from virtually anywhere. It also permits programming the system via any micro-computer (i.e. TRS-80, Apple, PC, etc.). This allows the user to control all functions of TELEMIX externally. Information such as length of calls, length of callers on hold, etc. can be easily programmed and displayed on the micro-computer.

There are six external input ports and six external output ports; these ports are used to interface TELEMIX with external timers and for control of user-defined equipment.

Since TELEMIX is a software-driven device, the user can select and program the unit to any particular requirement.

The front panel switches are also directly remotable thru a rear panel 25 pair connector.

TELEMIX IX has the following features:

- \* **15 Incoming telephone lines.** Two groups are provided for conferencing. The unit comes standard with nine lines in the first group and six in the second.
- \* **TOTAL PROGRAMMABILITY.** The entire system is software operated. This permits customer-specified functions by the simple replacement of one IC.
- \* **Easy Installation.** TELEMIX IX simulates a 10 button telephone set and can be directly connected to any KSU via two standard Ma Bell 25 pair connectors.
- \* **Easy to Operate.** Operation is similar to that of a 10 button set. Simple operation allows talent to concentrate on other, more important aspects of the telephone talk show.
- \* **Modular Design.** The system incorporates 4 major circuit boards. These boards are accessible by simply lifting the front panel on its rear hinged side. Circuits are connected using on-board headers. Internal adjustments are kept to a minimum.
- \* **Superior Audio Quality.** Gentner expertise in achieving high quality audio from the telephone line makes this device ideal for the demanding Program Director.
- \* **Total Remotability.** All switches and lamps have been brought out for total remotability.
- \* **Long Distance Remotability.** TELEMIX IX can be fully operated from any remote location using a standard dial-up telephone line.
- \* **Three Auxiliary Controls.** These customer-specified push buttons can be used for "SWEAR," DUMP, or whatever. These buttons are microprocessor based so they can be programmed to do anything.
- \* **External Input and Output Ports.** These twelve ports permit customer defined interaction with the CPU. The system comes standard with caller timer starts.
- \* **Two Group Conferencing.** Any caller on the first nine lines can be instantly conferenced to the second group of six.
- \* **Multi-line Conferencing.** Any number of lines can be button-mash conferenced.
- \* **RS-232 Port.** This port allows complete control of the unit from an external, customer supplied computer.

## 2. TELEMIX Specifications and Warranty.

### Physical-

#### Main Chassis

Dimensions: 10" Deep X 17.5" Wide X 6.5" High  
Shipping Weight: 18 lbs.

#### Power Supply

Dimensions: 7.25" Deep X 5.32" Wide X 4-11/16" High  
Shipping Weight: 8 lbs.

### Component Parts-

TELEMIX IX is shipped with the following individual components:

- (1) Main Chassis that includes (1) power cable.
- (1) SYSTEM EPROM.
- (1) Power Supply Chassis
- (1) Instruction Manual

### Power-

Line Voltage Required	115VAC
Nominal Power Required	45 watts
Internal DC Voltages	+5VDC , +15VDC , -15VDC , +24VDC Each board is self-regulated
Grounding	AC Ground at both Chassis Circuit Commons float
Protection	(1) .75A SB Fuse on Power Line (1) 1.5A FB Fuse on Return Common 1 (1) 1.0A FB Fuse on Return Common 2
Transformer to Chassis Power Cord	Nine Conductor 16 gauge Eight Feet in Length

### Central Processing Unit-

Circuit Board	Piggy-backed on Mother Board Connects via (2) 60 pin headers
Microprocessor	8085
EPROM	2716
I/O Ports	8155/8255

Serial Port                           (1) RS-232 Port  
Connects via Standard DB-25P  
Baud Rate is selectable

**Telephone Interconnection-**

Connection                           (2) 25 pair universal connectors  
(Connects as any 10 button telephone  
set)

KSU                                    Any 500 series KSU  
(Electronic KSU interface available  
in 1984)

Line Termination                    Solid State Line Switching(Meets  
Part 68)

A-Lead Switching                    Solid State Opto-isolators

Lamp Sense                           Solid State Opto-isolators

Lines                                 (9) in Group 1  
(6) in Group 2

**Audio-**

Input (Send)                         600 ohms Balanced  
-20dBm to +10dBm Input Level  
(1) Female XLR 3 Pin

Output (Callers Out)                 600 ohms Balanced  
0dBm nominal  
(2) Male XLR 3 Pin

Phone Line Bus                       (2) Bus Inputs  
(2) Hybrid Coil Systems  
Available on Rear Panel for  
External Hybrid Interaction

Phone Line Processing                Full Level Conferencing System

Controls                              "Balance" controls the audio balance  
between the upper call group and  
the lower call group.

                                      "Caller Control" Adjusts the amount  
of caller dimming in relation to  
send audio. 0 to 30dB of Change.

Hybrid Null                          20 dB typical

Frequency Response                  300hz to 3300hz within 2dB

Noise                                 better than -50dB SNR

Monitor Output                    2 Watts maximum  
                                     Internally adjustable level  
                                     Independent dimming  
                                     8 ohms minimum

**Front Panel Switches-**

OFF                                 Eliminates all directed lines  
 HOLD                               Places on HOLD all directed lines  
 1-15                               Line Direction Switches (15)  
 AUX 1                              Activates External Out 1  
 AUX 2                              Activates External Out 2  
 AUX 3                              Activates External Out 3

All front panel switches can be programmed for any function.

**External Control-**

Inputs 1,2,3                       Activates AUX 1,2,3 Lamps  
 Input 4                             Activates HOLD lamp on upper group  
 Input 5                             Activates HOLD lamp on lower group  
 Input 6                             Not Used

Output 1,2,3                       Activates on depression of AUX 1,2,3  
 Output 4                             Momentary:For timing calls on upper  
    group-

Output 5                             Momentary:For timing calls on lower  
    group-

Output 6                             Momentary:For timing calls on both  
    groups-

**Rear Panel Connectors-**

Telephone                          (2) Male 25 pair to match KSU  
 Remote Control                    (1) Female 25 pair universal  
 RS-232                              DB-25 female  
 External Control                  DB-25 male  
 Auxiliary                            Barrier Block

GENTNER ENGINEERING COMPANY, INC.

# Warranty Information

GENTNER ENGINEERING COMPANY warrants that this product is free from defects in both materials and workmanship. Should any part of this equipment be defective, Gentner Engineering Company agrees, at its option, to:

A. Repair or replace any defective part free of charge (except transportation charges) for a period of one year from the date of the original purchase, provided the owner returns the equipment to Gentner Engineering Company at the address set forth below. No charge will be assessed for parts or labor during this period.

B. Replace or furnish replacement for any defective parts in the equipment for a period of one year from the date of original purchase. Replacement parts shall be furnished without charge except for labor and transportation.

This Warranty excludes assembled products not manufactured by Gentner Engineering Company, whether or not they are incorporated in a Gentner Engineering Company product or sold under a Gentner Engineering Company part or model number.

**THIS WARRANTY IS VOID IF:**

A. The equipment has been damaged by negligence, accident or mishandling, or has not been operated in accordance with the procedures described in the operating instructions; or,

B. The equipment has been altered or repaired by other than Gentner Engineering Company personnel or an authorized service representative of Gentner Engineering Company; or,

C. Adaptations or accessories other than those manufactured or provided by Gentner Engineering Company have been made or attached to the equipment which, in the determination of Gentner Engineering Company, shall have affected the performance, safety, or reliability of the equipment; or,

D. The equipment's original serial number has been modified or removed.

NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR USE, APPLIES TO THE EQUIPMENT, nor is any person or company authorized to assume any warranty for Gentner Engineering Company or any other liability in connection with the sale of Gentner products.

Gentner Engineering Company does not assume any responsibility for consequential damages, expenses or loss of revenue or property, inconvenience or interruption in operation experienced by the customer due to a malfunction in the purchased equipment. No warranty service performed on any product shall extend the applicable warranty period.

In case of unsatisfactory operation, the purchaser shall promptly notify Gentner Engineering Company at the address set forth below, in writing, giving full particulars as to the defects or unsatisfactory operation. Upon receipt of such notice, Gentner Engineering Company will give instructions respecting the shipment of the equipment, or such other manners as it elects to honor this warranty as above provided. This warranty does not cover damage to the equipment during shipping and Gentner Engineering Company assumes no responsibility for such damage. ALL SHIPPING COSTS SHALL BE PAID BY CUSTOMER.

THIS WARRANTY EXTENDS ONLY TO THE ORIGINAL PURCHASER AND IS NOT ASSIGNABLE OR TRANSFERABLE.

**GENTNER**  
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3.    **The TELEMIX Concept.**

TELEMIX IX is the result of dozens of years of experience and research into the problems of telephone interfacing. Its multi-line handling, flexibility and simplicity of use make it a valuable tool wherever the control room is closely tied to the telephone.

Because TELEMIX is software-controlled, it may easily be set up for your own needs. The system is remotable (from the next room or across the country); auxiliary buttons may be programmed for virtually any control function. TELEMIX accepts fifteen telephone lines and mixes and balances them in two groups; lines may be assigned to either, or both, groups for complete flexibility in the set-up of your talk show operation.

The real beauty of TELEMIX, though, is its ease of operation. Hook-up to your control room and telephone system is relatively simple. TELEMIX acts like a 10-button telephone set; a line is put on the air by simply pushing a button (you won't hear the switching transients, though!). Pushing HOLD or OFF automatically cancels any lines on air in that group. A few helpful features have been added, however: you may put 2 or more lines together by simply pushing the buttons at the same time. A beep is sent down the telephone line to tell the caller he's on the air -- no more wondering or surprises!

The Caller Control knob allows you to determine the

caller/talent balance. You can set up your talk show operation for anything from full two-way conversation to full wipe-out of the caller when your talent is talking.

Headphones are no longer a necessity in your talk studio. The unique Gentner speaker dimming circuitry provides additional acoustic isolation between microphone and speaker by reducing the volume of the monitor speaker when talent is talking. This permits both talent and guest to conduct the talk show in a more natural setting, without bothersome headsets.

**4. Functional Description.**

In sections 1 thru 3 we have discussed TELEMIX in generalities. This chapter goes into great detail on exactly what this product will do.

**4.1 Telephone Lines.** TELEMIX connects to the telephone line via the two rear panel 25 pair connectors marked "Group 1" and "Group 2". Group 1 refers to the telephone lines on the top row of switches marked 1 thru 9 and Group 2 refers to the telephone lines on the bottom row of switches marked 10 thru 15. These connectors make all necessary connections to the telephone company. It is possible to disconnect a standard 10 button telephone set and plug TELEMIX directly in. For additional information on each pin of these two connectors, refer to Chapter 11 on "Pin Outs".

**4.2 Telephone Line Switching.** The goal in TELEMIX is to switch or "direct" a number of telephone lines to input of a hybrid. This call direction is done via a solid state line switch located on the mother board:

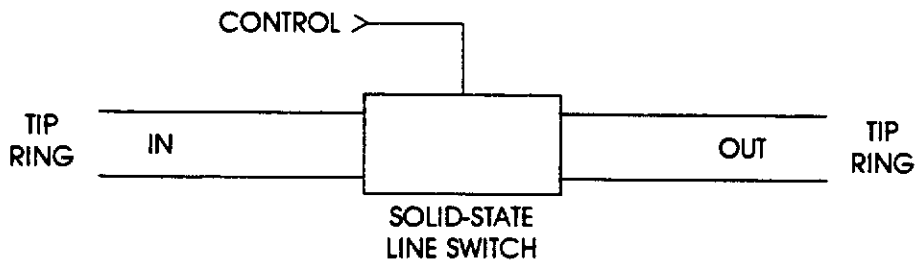


Diagram 4-A. Solid State Line Switch

This solid state switch directs the phone line when the central process unit (CPU) delivers a high. Lines 1 thru 9 are directed to a common bus while lines 10 thru 15 are directed to another common bus. Thus, we have two call direction systems or two **call directors**.

A call director simply refers to a series of switches that directs the calls to a common bus:

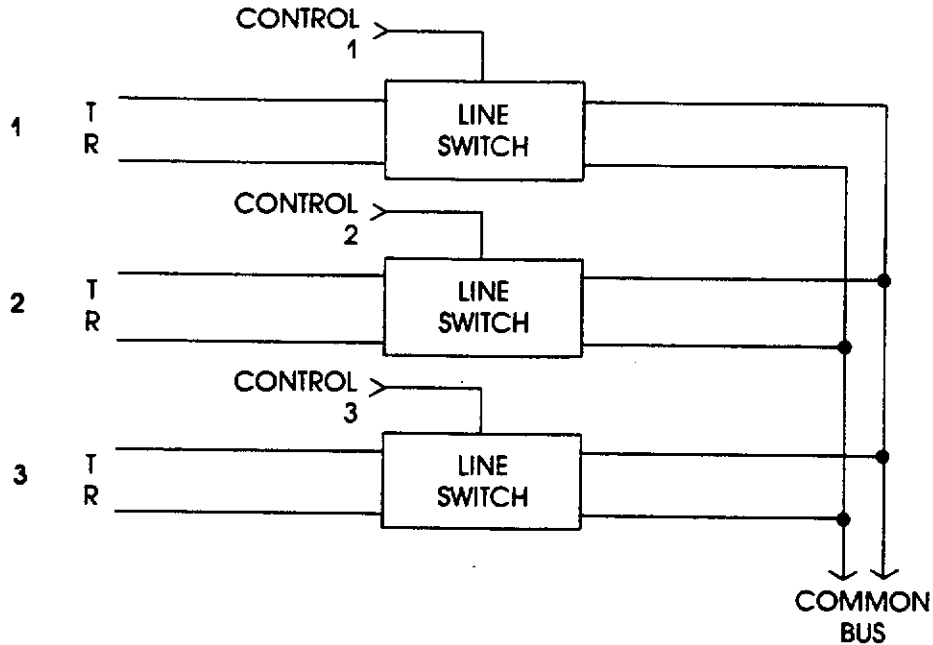


Diagram 4-B. A three line call director.

Since TELEMIX has two call directors, one for phone line group 1 and one for phone line group 2, we will refer to these two call directors as **the upper and lower call directors**.

**4.3 Telephone Hybrids.** Once the line has been directed to one of two common busses, the common bus appears at the input of a telephone hybrid. TELEMIX has two hybrids, one for each call director.

A hybrid provides separation between send and receive audio so the level of the caller can be independently controlled from the send audio:

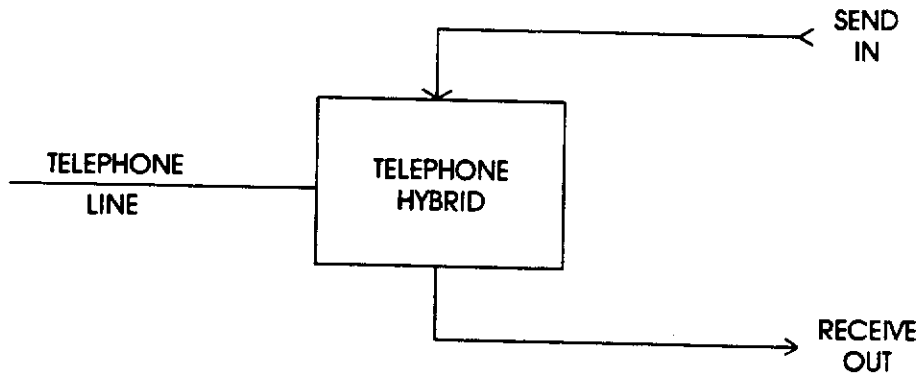


Diagram 4-C. A Telephone Hybrid.

**4.4 Send and Receive Audio.** Send audio is the audio the caller will hear. Input into TELEMIX is made on the rear panel female XLR. This audio is processed, filtered, and then delivered to the send side of the telephone hybrid. Receive or caller audio appears on the receive side of telephone hybrid. It too is processed, filtered, and then delivered to the rear panel male XLR.

**4.5 Simplified Diagram of Telephone/Audio Chain.** Refer to Diagram 4-D: The upper and lower line switches accomplish the task of directing their respective lines to a common line bus. These line busses appear at the inputs of hybrids 1 and 2. The hybrids provide the separation process so the caller outputs can be filtered, combined, and sent to the final processor. Send audio is sent to the input side of each hybrid.

This diagram is **very** basic and leaves out some important blocks for ease of explanation. It does represent the basic concept of how the telephone line is directed and what is done with the line once it has been directed.

The common line busses appear at the input of their respective hybrids. Here the separation process between send and receive audio takes place. The output or caller audio is filtered and sent to its processor. The processor will lower the level depending on the DC voltage sent from the SEND filter circuit. The amount of level reduction or "dimming" is adjusted by the front panel "CALLER CONTROL" knob. After processing, the caller audio is then sent to the output combiner which combines the two audio sources and affects the front panel "BALANCE" control knob. Audio appears on the rear panel XLR.

The caller control serves two useful purposes. First, it gives the talent the ability to over-ride or outshout the caller by having precedence. Secondly, when you have weak callers or bad phone lines the caller control artificially helps the nulling process of the hybrid.

Send audio appears at a rear panel XLR, is filtered and sent to each hybrid's combiner/processor. This block combines send and cross-feed audio, processes it and then sends it to the input of its respective hybrid.

**4.6 Monitor Output.** TELEMIX also has a monitor output that contains combined caller audio and is seperately processed for independently controlled reduction. This output is sent to an in-studio monitor system so guests can listen to callers thru speakers instead of headsets.

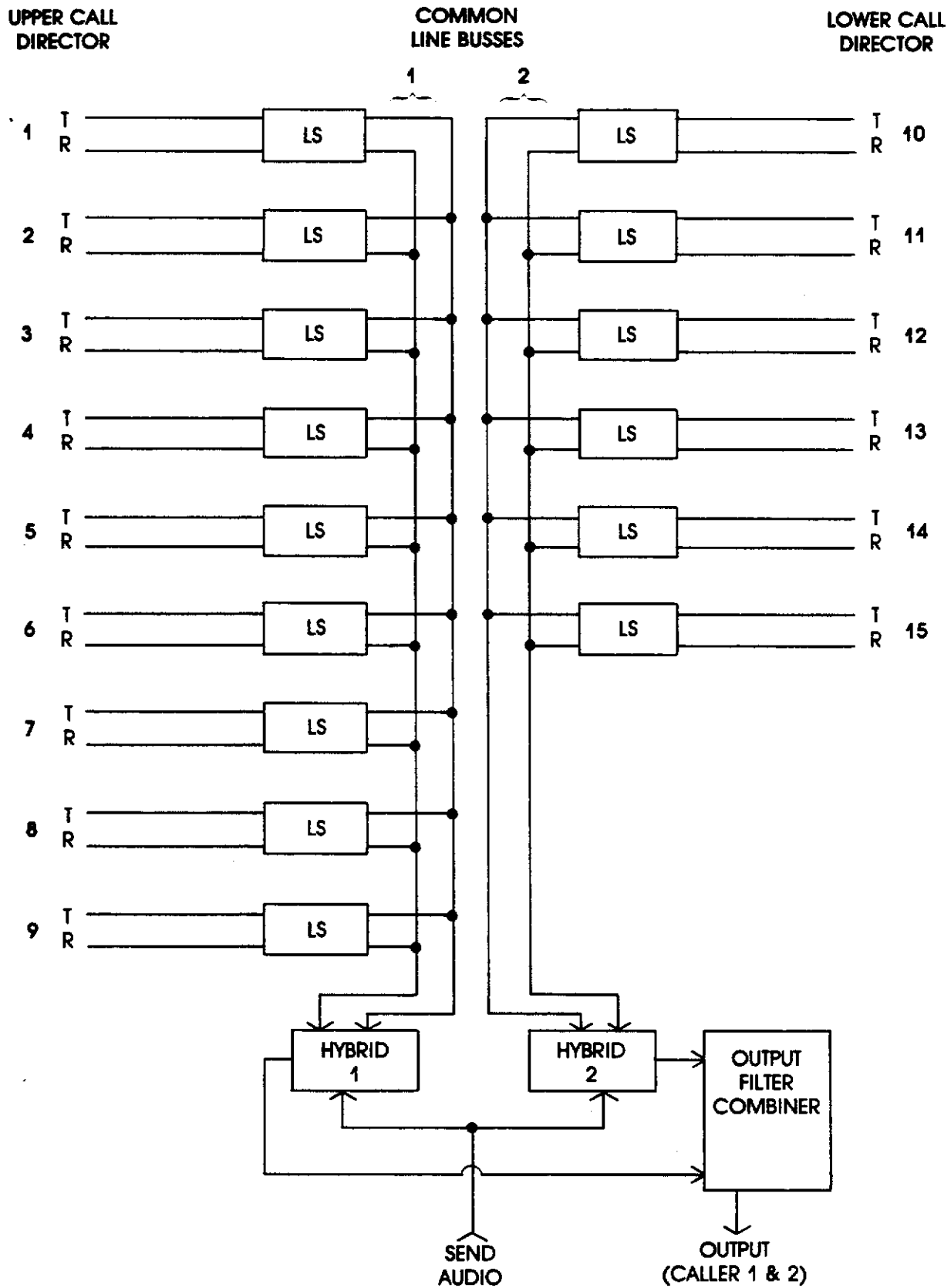


Diagram 4-D. Simplified Telephone/Audio Chain Block Diagram

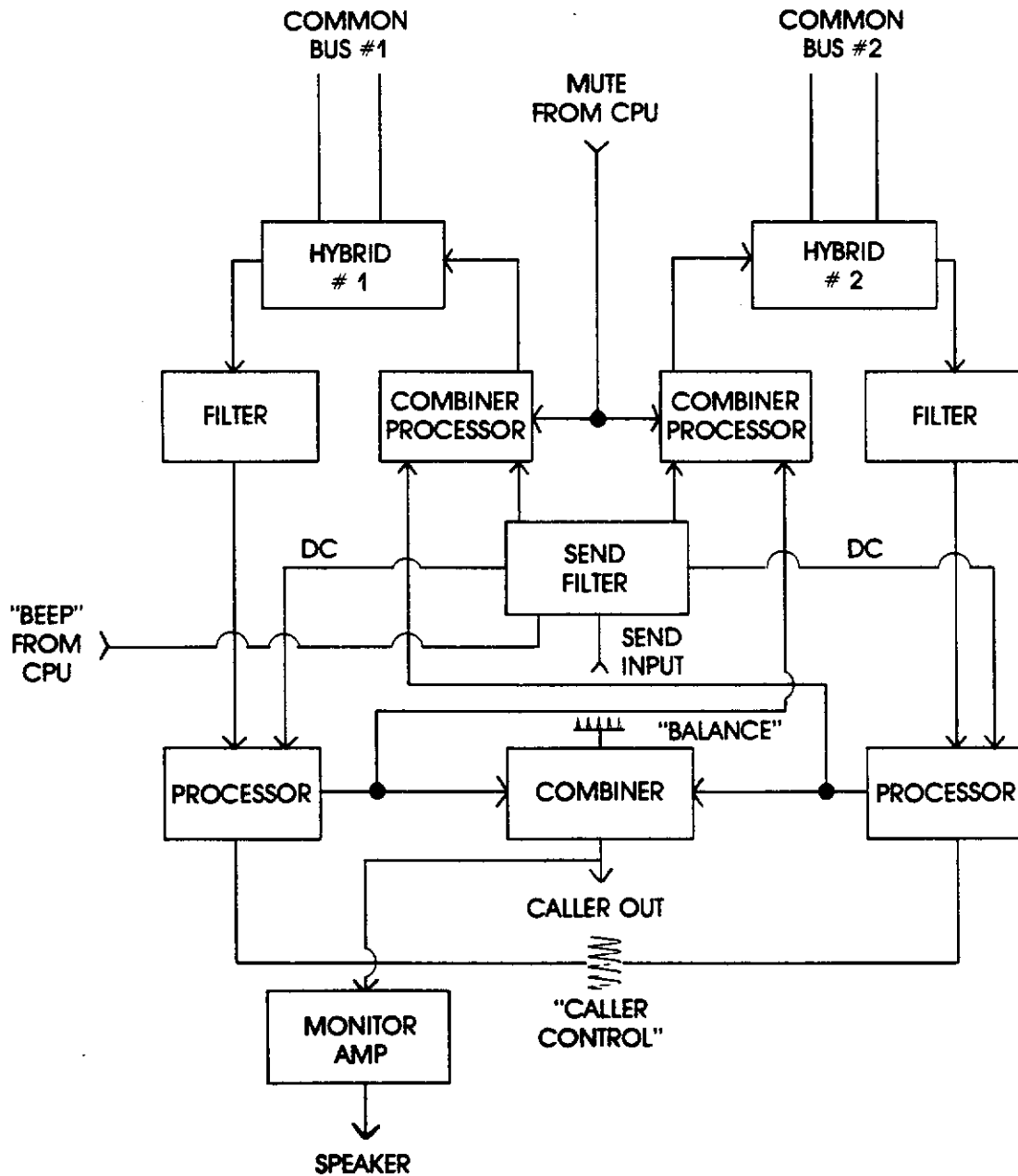


Diagram 4-E. Complete Block Diagram of Audio Chain

**4.7 Mute and Beep.** When a control high is sent from the CPU, the caller output amplifiers mute the caller audio. This is provided so that during line termination, clicks and pops don't go on the air. In addition, any time a line button is depressed, the caller is instantly muted (a fast and easy way of "shutting up" the caller). During the line termination sequence, a beep is sent down the line to the caller, alerting him that he is on the air.

When a line switch is depressed, the caller output amplifier is muted. Next, the beep goes down the line. After the beep is done the caller output amplifier is unmuted and the caller is now on the air.

**4.8 System Block Diagram.** Refer to the overall block diagram of TELEMIX on the next page:

As you can see, in TELEMIX, almost everything interfaces through the mother board. The mother board provides interfacing to the central processing unit (CPU) board. The CPU makes all decisions. Thus, any switch, lamp, line control, external, etc. functions of TELEMIX are a function of the CPU.

The CPU is a small computer that logically makes all of the decisions for TELEMIX. It interfaces to the mother board through two large ribbon cables. The CPU is made up of the following blocks:

1. EPROM (Erasable/Programmable Read Only Memory). This is the software of TELEMIX. To program the unit all you do is replace this chip.
2. I/O Ports. These ports provide all of the necessary interfacing between the mother board and the CPU.
3. RS-232 Port. This is a serial I/O port that allows TELEMIX to communicate with the outside world via a single pair cable.
4. Microprocessor. This is the brain of TELEMIX. It makes all of the decisions based on its programmed software and external I/O information.



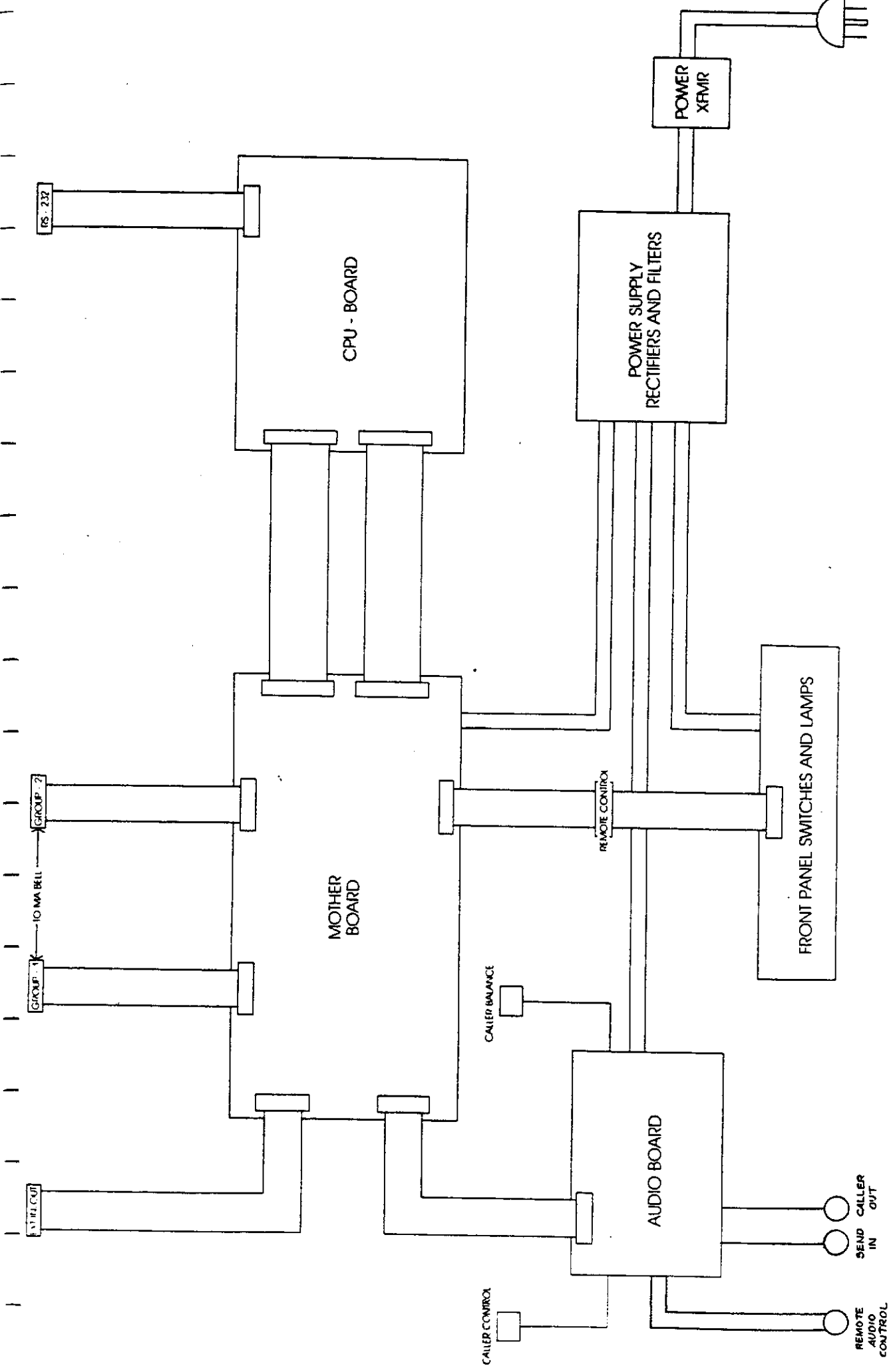


Diagram 4-F. TELEX System Block Diagram

The **switch board** is located on the rear of the front panel switches. Its ribbon cable fans down to the rear panel "remote control" connector and then to the Mother Board. The "remote control" connector permits local remoting of all the switches and lamps.

The **audio board** processes the telephone lines as previously described. It connects directly to the Mother Board, which provides interfacing to the CPU. The "Caller Control" and "Balance" pots are wired directly from this board.

The **power supply** is made up of two sections. The transformer is isolated and is connected directly to the internal power supply board. This board rectifies and filters the DC to be sent to the respective internal circuit boards. Each board has its own set of regulators.

The **mother board** is the functional heart of TELEMIX. It provides all of the interfacing for the device which can be broken down as follows:

1. Telephone Lines, Lamps and A-lead Control. As noted above, the telephone lines are accessed via solid state line switches. The A-leads and lamp sensors are interfaced using opto-isolators:

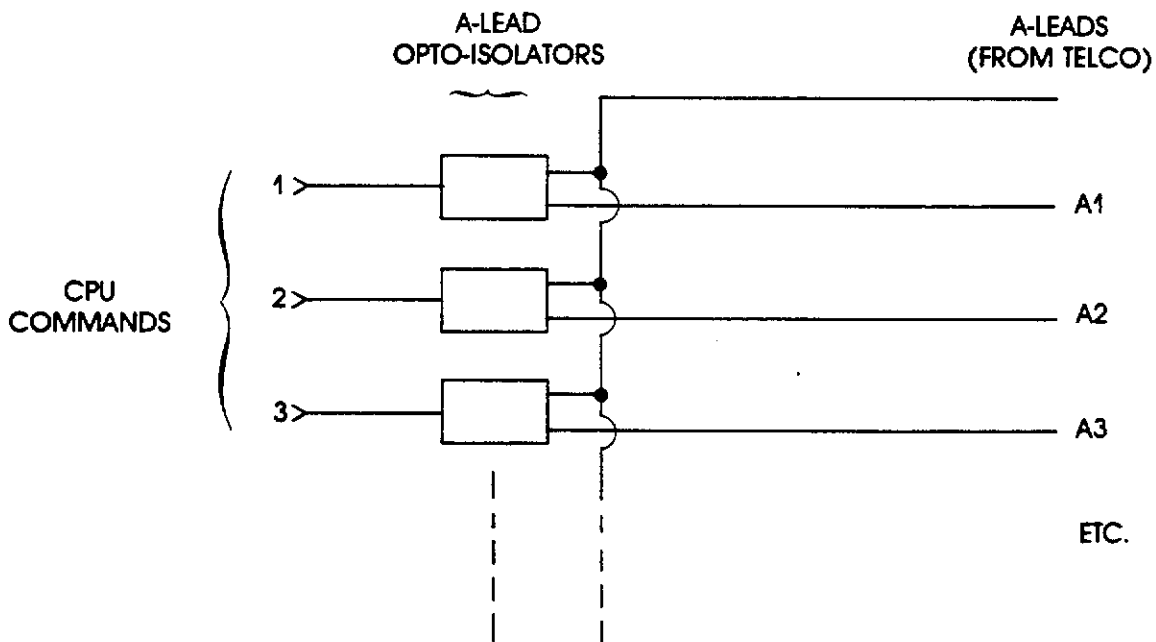


Diagram 4-G. A-Lead Interfacing

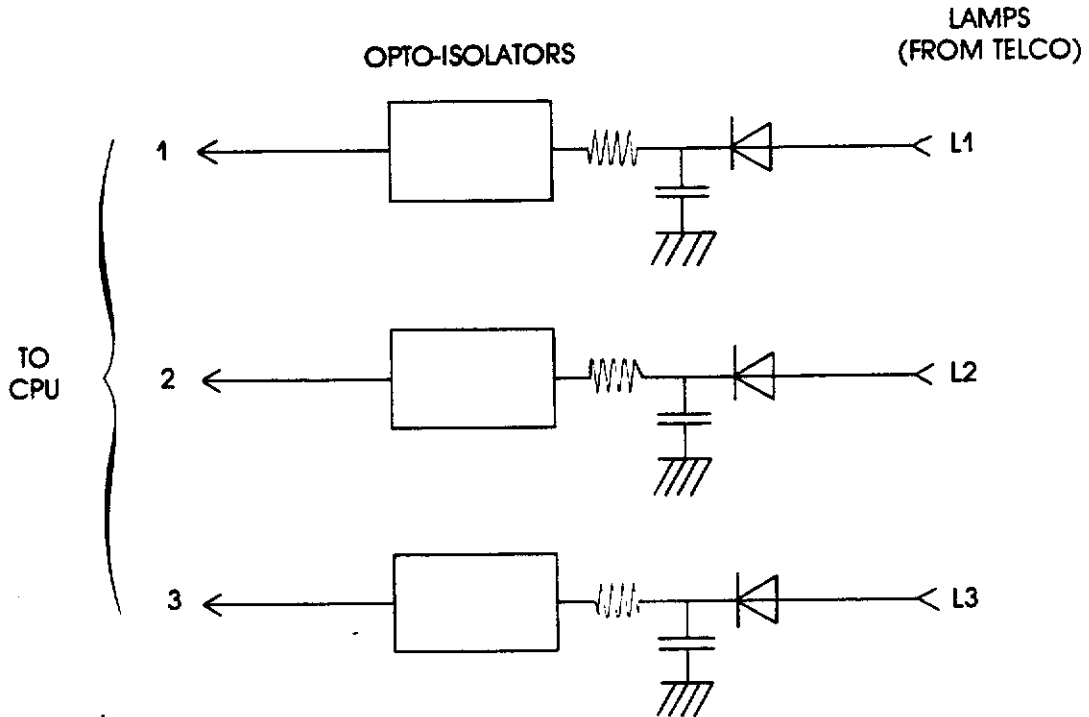


Diagram 4-H. Lamp Interfacing

The remote and internal switches are interfaced directly to the CPU board while the lamps use lamp drivers to provide sufficient current to drive two sets of lamps (interior and remote).

The only other interfacing is for external control. External input and output ports are provided so you can connect equipment to TELEMIX that supports your particular requirement. There are six external inputs. These inputs are accessed by a simple closure at the appropriate input pin. External outputs use an open collector buffer amplifier for interface purposes.

## 5. Installation.

The installation of TELEMIX is straight forward; however, it is suggested that a complete understanding of TELEMIX be achieved before any attempt is made to install the system. Installation instructions are broken down as follows:

- 5.1 Unpacking and familiarization of internal circuit boards.
- 5.2 Connection to the user's telephone system.
- 5.3 Audio connection.
- 5.4 Remote control, external I/O, RS-232, & Auxiliary connection.

**5.1 Unpacking and Internal Familiarization.** Carefully remove the system from its shipping carton. There should be two boxes, one that holds the actual TELEMIX chassis and another one that holds the power supply chassis. Inspect both chassis' for any damage. **IF DAMAGE HAS OCCURED, CONTACT THE SHIPPING COMPANY IMMEDIATELY AND CONTACT GENTNER ENGINEERING COMPANY.**

Open the hinged front panel by removing the three hold down screws on the flat portion of the front edge of the panel. Swivel the front panel back on it's hinged side so the front edge rests on the table and the circuit boards are visible.

The internal circuit configuration is as follows:

A. **The power supply circuit board** is located on the left hand side and is mounted vertically. It takes AC power from the nine conductor AC power cord that comes from the external power supply chassis. It supplies power to the other circuits via Mascon headers. This board rectifies and filters the DC before sending it to the other various boards. All regulation is done on each individual board.

B. **The audio board** is located on the right hand side and is also mounted vertically. It is comprised of two printed circuit boards. The main board provides all of the audio control and amplification while the "piggyback" board contains all of the sophisticated audio filters required to provide the necessary audio processing. These boards are connected via headers from the main or "mother" board and are connected internally via a header. Mascon headers provide connection to the control pots, input/output jacks, and to the rear panel auxiliary barrier block.

C. **The mother board** is the largest horizontally mounted circuit board. It provides all the necessary interfacing among the audio board, CPU board, and the outside world. It is connected via a series of headers.

D. **The CPU board** is piggybacked on the mother board. It is the brain of TELEMIX and is connected via two on board headers directly to the mother board. Locate the on-board EPROM

(Erasable Programmable Read Only Memory). It is marked with a sticker which identifies the interior software.

**5.2 Connection to your Telephone System.** Because TELEMIX simulates two standard 10 button telephone sets, you can unplug any of your standard 10 button telephone sets and plug TELEMIX in its place. It's just that simple!!

There are some options you have, though, that will make TELEMIX even more useful. We suggest that once you've decided how you want your system configured, that you contact your local telephone company for cable installation.

There are two groups of telephone lines coming into TELEMIX. On the rear panel you'll notice the two 25 pair universal plugs are marked "Group 1" and "Group 2". These groups refer to the telephone lines grouped in the upper set of buttons (group 1) and the telephone lines grouped in the lower set of buttons (group 2). Thus, whatever you plug into the group 1 connector will only appear in the top buttons.

Therefore, you're going to need two connectors for telephone connections to TELEMIX.

If you're creative about how you connect TELEMIX, the flexibility will make the device even more useful. Here are some of the options you have:

1. **Paralleling groups 1 and 2.** This can be done with one 10 button cable and a Y-connector that parallels all connections to the two rear panel connectors.

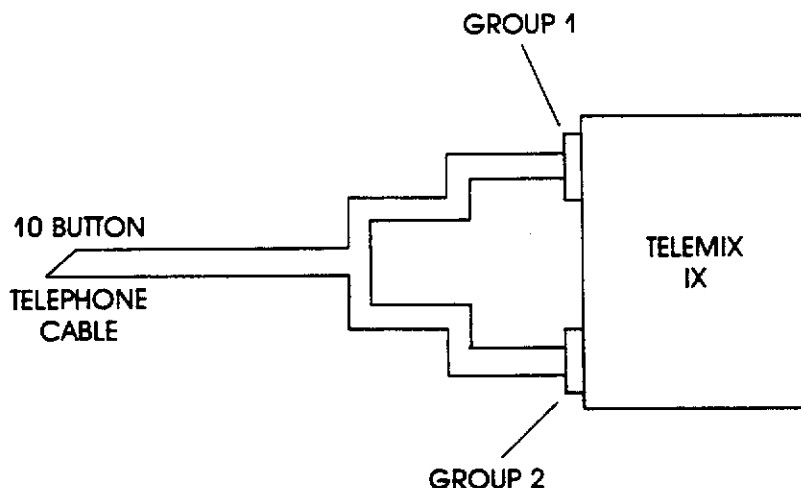


Diagram 5-A. Option 1, Paralleling Groups 1 and 2.

This system permits full level conferencing of any two lines. It also allows you to take any line on either bus. This is really the most flexible way to use TELEMIX. It does present the

problem of being able to only duplicate six of nine lines on the bottom group.

If you have six or less lines, we suggest you use the following option:

**2. Individual grouping of lines.** This option allows to specify what lines go where on TELEMIX. Order the cables from the telephone company as if you were ordering 10 button telephone sets. The major disadvantage to this system is the inability to take a call on either group, (you're restricted to the assigned group.) This is a minor problem and you should always be able to work around it.

**3. Continuous Programmability of Lines.** This option is the most complicated. To use this option, you must install a punch block in line with TELEMIX at a convenient location. With this option, you can (without the help of the telephone company), reprogram or rearrange the line configuration to your own specifications. This system permits TELEMIX line reconfiguration without changing the line assignments to the other telephones in your office. To do this, refer to Chapter 11, Pin Outs.

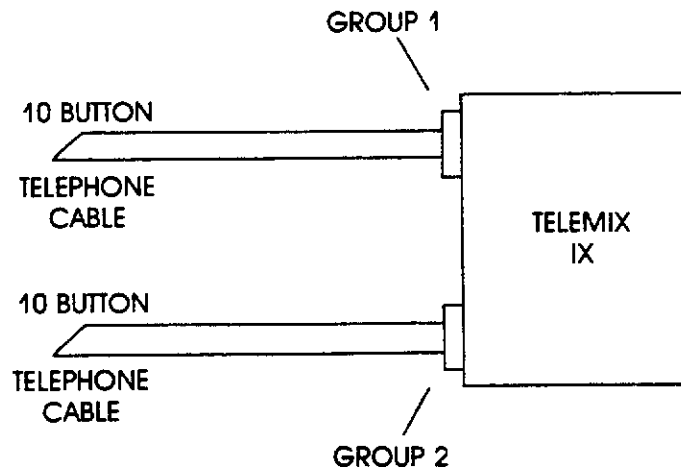


Diagram 5-B. Individual grouping of Lines.

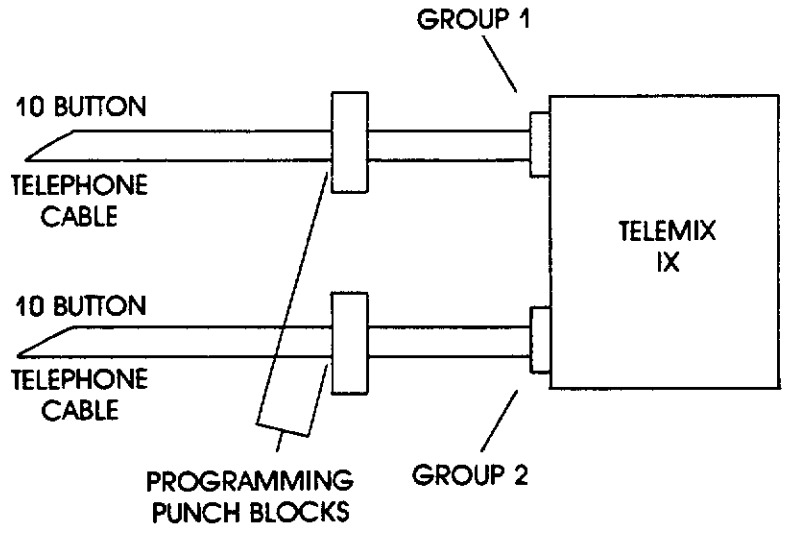


Diagram 5-C. Line Programming of TELEMIX.

You may want to install a telephone (maybe two) along side TELEMIX. This can be accomplished without running another cable. All you have to do is install the telephone in parallel with TELEMIX. This may be done because the system draws very little current from the lamp drivers of the KSU.

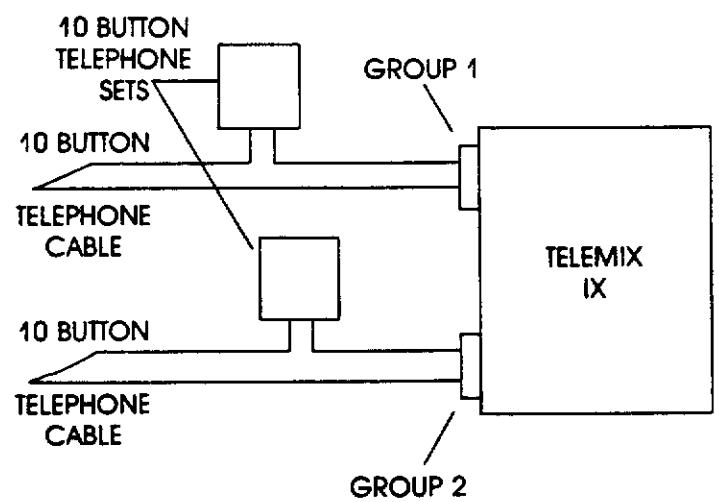


Diagram 5-D. Paralleling of a Telephone Set.

**ALL ABOVE CABLING SYSTEMS ARE AVAILABLE FROM GENTNER ENGINEERING.**

**5.3 Audio Connection.** First connect the output of TELEMIX to the input of your equipment. There is one male XLR provided for this purpose. The audio should be balanced and connected to pins 2 and 3 on the XLR. If you are connecting to an unbalanced input, use either pins 3 and 1 or pins 2 and 1. Pin 1 is ground.

The input level to your console will be about 0dBm with a source impedance of 600 ohms.

Now connect the send or input audio to TELEMIX using the female XLR. If the audio is balanced, use pins 2 and 3. If it is unbalanced, use either pins 3 and 1 or pins 2 and 1. Pin 1 is ground. The input levels to TELEMIX should be between -20dBm and +10 dBm.

Call someone and connect him to TELEMIX. Talking to him through your equipment (the console), adjust the "send level" trim pot on the audio board for a comfortable listening level. You might want to call a number of people to achieve a consensus of opinion.

**Please Note: THE AUDIO THAT APPEARS ON THE INPUT OR SEND JACK OF TELEMIX CANNOT CONTAIN ANY OF THE OUTPUT AUDIO OF TELEMIX. IN THE EVENT THIS DOES OCCUR, A HOLLOW SOUND WILL APPEAR AND THE DEVICE MAY TEND TO OSCILLATE.**

Now connect a speaker to pins 8 and 9 on the rear panel barrier strip marked auxiliary. This optional speaker is provided so guests and/or talent will not have to wear headsets to hear incoming callers. If you would like to have an external monitor pot connect it as follows:

Pin 5    High Side of 10K ohm Pot  
Pin 6    Wiper of Pot  
Pin 7    Low Side of Pot

You will notice a 10K resistor across pins 7 and 5 and a jumper between 6 and 7. This sets the gain of the internal amp to a preset level. There is an internal speaker level adjustment used to preset the speaker volume. Adjust the "monitor" level adjustment on the internal audio board for a comfortable listening level. Mount the speaker in an acoustically strategic location providing the best acoustical isolation between in-studio microphones and the speaker.

TELEMIX IS NOW READY FOR USE!

**5.4 Remote Control, External I/O, RS-232, Auxiliary.** These rear panel connectors provide various options that make TELEMIX very flexible. There are various chapters dedicated to the description and use of each these connections. Briefly, these connectors do the following:

1. **Remote Control.** Permits local remote control of all of the front panel switches.

2. **External I/O.** Allows external control of various equipment and external input to the CPU of TELEMIX. The device comes standard with three timer starts, HOLD and AUX 1,2,3 lamp flashing and three external commands when the AUX 1,2,3 buttons are depressed.



3. The **RS-232 port** provides a serial data port directly to the CPU permitting long distance remote control of the device and the ability to program TELEMIX using a microcomputer.

4. The **Auxiliary** connector has various connections including the monitor (above) and connections for external hybrids.

**5.5 High RF Fields.** Under certain high RF conditions it may be necessary to install bypass capacitors on the common telephone busses. This is accomplished by installing (4) four .01uF 50V mylar capacitors from pins 1,2,3 and 4 to pin 7 (ground) of the "auxiliary" connector.

Chapter 6. OPERATION

1. **To put a caller on the air**, push the corresponding line button. As you depress the line button, a "beep" is sent to the caller, letting him know he's on the air. At the same time, TELEMIX is muting the audio going to the console. After about a half second the beep is gone and the caller is on the air.

2. **To put two callers on the air at the same time**, push the desired line buttons on the top and bottom groups. The callers will be conferenced; they will be able to hear each other as if they were on the same line.

TELEMIX was designed to conference callers between the upper and lower groups. When this takes place, both callers will hear each other at the full level. It is possible, however, to conference lines on the same group and to have a multiple number of callers on the air simultaneously. Thus:

3. **To conference lines on the same group or a multiple of lines**, depress all the desired line buttons (button mash conference). This will work but the conferencing levels will not be as good as when conferencing between the upper and lower groups.

4. **To drop a line**, either push the "OFF" button or another line button. **EVERY LINE IN A GROUP WILL BE DROPPED WHEN YOU PUSH THE OFF BUTTON FOR THAT GROUP, EXCEPT THE LINES ON HOLD.**

Therefore, if you wish to keep one line in a group on the air while dropping others, depress that button while pushing "OFF".

5. To put a line on hold, depress the "HOLD" button. All lines in that group will be placed on hold. If you wish to keep one or more lines on the air while putting others on hold, push the desired line button(s) while pushing HOLD.

6. To mute a caller without dropping his line, depress and hold that line button down. The caller will be muted until you release the button.

7. The **BALANCE control knob** balances the volume level between the upper and lower groups of telephone lines. It amplifies weak callers and reduces the level of stronger calls to produce an equal sound.

8. The **CALLER CONTROL** adjusts the balance between talent and callers by reducing the volume of the caller when talent is speaking. In the counterclockwise position, caller and talent are both there at all times; as the knob is turned clockwise the amount of caller reduction is increased. Use of this control will permit control over the conversation and will help clean up the sound of a bad telephone line.

9. **AUXILIARY BUTTONS** are user-defined and may be set up for whatever control functions your operation requires.

## 7. External Hybrids.

As previously discussed, TELEMIX comes standard with two internal hybrids and all of the audio and control support circuitry for clean, clear telephone audio. It is possible, however, to bypass this internal circuitry and install **external hybrids** to process the telephone lines.

This is accomplished by making a simple change on the audio board and then routing tip and ring to your hybrids. The following steps will accomplish this:

1. Open the front panel and locate the audio board. Locate the Mascon connector that routes to the rear panel barrier block. Near this connector you will find four jumpers on the board. These jumpers route tip and ring for both telephone busses to the internal hybrids. You will not want the internal hybrids connected when using external hybrids. Therefore:

2. Remove the jumper board so tip and ring are no longer routed to the internal hybrids.

3. Locate pins 1 thru 4 on the rear panel barrier block. Pins 1 and 2 are tip and ring for the upper telephone group (group 1) and pins 3 and 4 are tip and ring for the lower telephone group (group 2).

4. Connect your hybrids to these pins.

TELEMIX will take care of A-lead control but you will need to terminate the phone line. Most commercial hybrids provide such termination.

The following functions of TELEMIX will not work when using an external hybrid:

1. Muting.
2. Beep down the line.
3. Conferencing between groups.

Such functions are accomplished on the audio board itself.

**8. External Ports**

TELEMIX provides six input and six output ports for external interaction with other equipment. Such ports can be used for a variety of customer specified functions including:

1. Censor Switch
2. Producer and Talent Cueing
3. Remote start and stop of tape machines
4. Caller timer starts
5. Commercial breakaway start.

**8.1 External Inputs.** All six external inputs interact with the CPU via optoisolators providing isolation of the CPU from improper hook-up voltages. To turn on an external input, a common is applied to the appropriate input. After the common is applied, the CPU interrupts the command and executes the appropriate response.

The standard TELEMIX software package provides the following internal responses to the six external input commands:

Rear Panel	Function
Pin 8	Auxiliary #1 Lamp On
Pin 9	Auxiliary #2 Lamp On
Pin 10	Auxiliary #3 Lamp On
Pin 11	Upper Group Hold Lamp On
Pin 12	Lower Group Hold Lamp On
Pin 13	Not Programmed

Pins 14-25 are COMMON

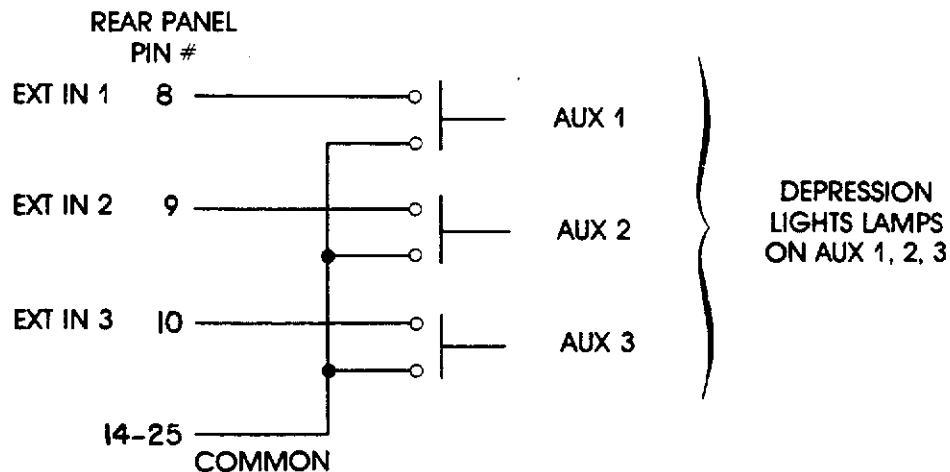
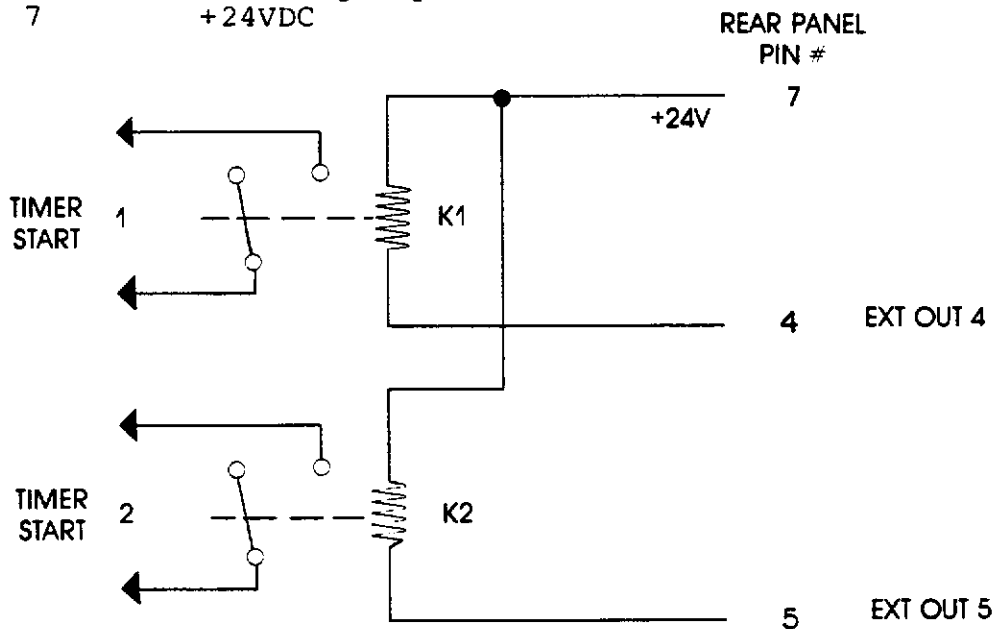


Diagram 8-A External Input Hook-up Example

**External Outputs.** All six external outputs interact with the CPU via open collector buffer amplifiers. When the CPU executes an external output, the appropriate external output amplifier will provide up to, but not exceeding, 200 MA of current. **Therefore, any attempt to sink more than 200 MA will destroy the amplifier.** (A standard KHU series relay draws 100 mA.)

The standard TELEMIX software provides the following external outputs:

Rear Panel	Function
Pin 1	Auxiliary #1 Switch depression
Pin 2	Auxiliary #2 Switch depression
Pin 3	Auxiliary #3 Switch depression
Pin 4	Group 1 Timer start (for timing calls on the upper group)
Pin 5	Group 2 Timer start (for timing calls on the lower group)
Pin 6	Both Group Timer start (for timing calls on either group)
Pin 7	+24VDC



K1, K2 KHU17D11/24VDC

Diagram 8-B External Output Example

Both the input and output external ports can be modified (reprogrammed) to accept any user defined function.

**9. Remote Control.**

TELEMIX is designed to be remoted locally (within a few feet of the actual unit) and from a distant location. This remotability and the methods used to achieve it are the subject of this section.

**9.1 Local Remotability.** To achieve this end, a simple connection is made to the rear panel 25 pair connector. An example of how to interface to the local remote control connector follows:

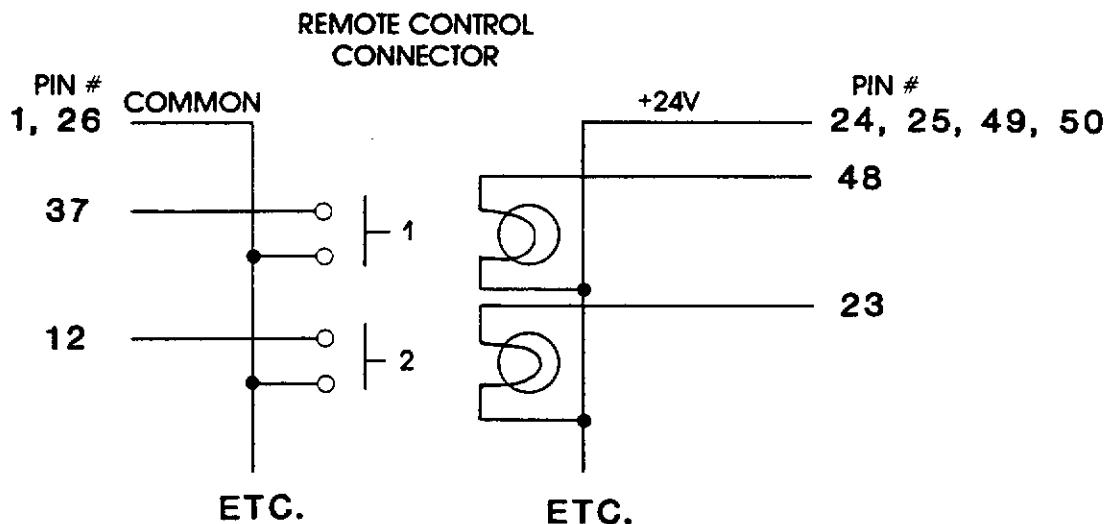


Diagram 9-A Local Remote Connection Example

The actual pin outs for the remote control connector is as follows:

Rear Panel Pin #	Function
1, 26	Common
24, 25, 49, 50	+24VDC
48	Line 1 Lamp
23	Line 2 Lamp
47	Line 3 Lamp
22	Line 4 Lamp
46	Line 5 Lamp
21	Line 6 Lamp
45	Line 7 Lamp
20	Line 8 Lamp
44	Line 9 Lamp
19	Line 10 Lamp
43	Line 11 Lamp

18	Line 12 Lamp
42	Line 13 Lamp
17	Line 14 Lamp
41	Line 15 Lamp
16	Aux 1 Lamp
40	Aux 2 Lamp
15	Aux 3 Lamp
39	HOLD (Group 1) Lamp
14	HOLD (Group 2) Lamp
38	OFF (Group 1) Lamp
13	OFF (Group 2) Lamp
37	Line 1 Switch
12	Line 2 Switch
36	Line 3 Switch
11	Line 4 Switch
35	Line 5 Switch
10	Line 6 Switch
34	Line 7 Switch
9	Line 8 Switch
33	Line 9 Switch
8	Line 10 Switch
32	Line 11 Switch
7	Line 12 Switch
31	Line 13 Switch
6	Line 14 Switch
30	Line 15 Switch
5	Aux 1 Switch
29	Aux 2 Switch
4	Aux 3 Switch
28	HOLD (Group 1) Switch
3	HOLD (Group 2) Switch
27	OFF (Group 1) Switch
2	OFF (Group 2) Switch



Diagram 9-B. Remote Control Connector Pin # System

It is possible to use an exterior power supply by paralleling commons and using the exterior +24VDC in place of the existing +24VDC. This may be required if you use it to run more than one remote unit.



10. PIN OUTS**MAIN CONTROL CABLE**CONNECTOR #1

LOCATION: :  
 Mother/Switch board :  
 TYPE: 50 pin :  
       header :

CONNECTOR #2

LOCATION: :  
 Rear Panel :  
 Remote Control :  
 TYPE: 25 pair :  
       universal :

<u>PIN</u>		:	<u>PIN</u>	
#	FUNCTION	:	#	FUNCTION
1:	Common	:	1:	
2:	Common	:	26:	
3:	Off-Group 2	:	2:	Switch
4:	Off-Group 1	:	27:	Switch
5:	Hold-Group 2	:	3:	Switch
6:	Hold-Group 1	:	28:	Switch
7:	Aux 3	:	4:	Switch
8:	Aux 2	:	29:	Switch
9:	Aux 1	:	5:	Switch
10:	Line 15	:	30:	Switch
11:	Line 14	:	6:	Switch
12:	Line 13	:	31:	Switch
13:	Line 12	:	7:	Switch
14:	Line 11	:	32:	Switch
15:	Line 10	:	8:	Switch
16:	Line 9	:	33:	Switch
17:	Line 8	:	9:	Switch
18:	Line 7	:	34:	Switch
19:	Line 6	:	10:	Switch
20:	Line 5	:	35:	Switch
21:	Line 4	:	11:	Switch
22:	Line 3	:	36:	Switch
23:	Line 2	:	12:	Switch
24:	Line 1	:	37:	Switch
25:	Off-Group 2	:	13:	Lamp
26:	Off-Group 1	:	38:	Lamp
27:	Hold-Group 2	:	14:	Lamp
28:	Hold-Group 1	:	39:	Lamp
29:	Aux. 3	:	15:	Lamp
30:	Aux 2	:	40:	Lamp

## MAIN CONTROL CABLE PAGE 2

<u>CONNECTOR #1</u>		<u>CONNECTOR #2</u>	
LOCATION:	:	LOCATION:	:
Mother/Switch Board	:	Rear Panel	:
	:	"Remote Control"	:
TYPE: 50 pin	:	TYPE: 25 pair	:
header	:	universal	:
	:		:
<u>PIN</u>	:	<u>PIN</u>	:
#	:	#	:
FUNCTION	:	FUNCTION	:
	:		:
31: Aux. 1	:	16: Lamp	:
32: Line 15	:	41: Lamp	:
33: Line 14	:	17: Lamp	:
34: Line 13	:	42: Lamp	:
35: Line 12	:	18: Lamp	:
36: Line 11	:	43: Lamp	:
37: Line 10	:	19: Lamp	:
38: Line 9	:	44: Lamp	:
39: Line 8	:	20: Lamp	:
40: Line 7	:	45: Lamp	:
41: Line 6	:	21: Lamp	:
42: Line 5	:	46: Lamp	:
43: Line 4	:	22: Lamp	:
44: Line 3	:	47: Lamp	:
45: Line 2	:	23: Lamp	:
46: Line 1	:	48: Lamp	:
47: +24VDC	:	24:	:
48: +24VDC	:	49:	:
49: +24VDC	:	25:	:
50: +24VDC	:	50:	:

**TELEPHONE CABLES J1 (GROUP 1), J2 (GROUP 2)**

<u>CONNECTOR #1</u>		<u>CONNECTOR #2</u>	
LOCATION: Rear Panel		LOCATION: Mother	
"Group 1"/"Group 2"		Board	
TYPE: 25 pair		TYPE: 50 pin	
universal		header	
<u>PIN</u>	<u>FUNCTION</u>	<u>PIN</u>	<u>FUNCTION</u>
#		#	
1:	R1/R10	50:	
2:	A-Com	48:	
3:	L1/L10	46:	
4:	R2/R11	44:	
5:	A9	42:	
6:	L2/L11	40:	
7:	R3/R2	38:	
8:	A8	36:	
9:	L3/L12	34:	
10:	R4/R13	32:	
11:	A7	30:	
12:	L4/L13	28:	
13:	R5/R14	26:	
14:	A6/A15	24:	
15:	L5/L14	22:	
16:	R6/R15	20:	
17:		18:	
18:	L6/L15	16:	
19:	R7	14:	
20:		12:	
21:	L7	10:	
22:	R8	8:	
23:	L9	6:	
24:	L8	4:	
25:	R9	2:	
26:	T1/T10	49:	
27:	A1/A10	47:	
28:	L1/L10 Com.	45:	
29:	T2/T11	43:	
30:	A2/A11	41:	

## TELEPHONE CABLES J1, J2 PAGE 2

CONNECTOR #1		CONNECTOR #2	
LOCATION: Rear Panel		LOCATION: Mother	
"Group 1"/"Group 2"		Board	
TYPE: 25 pair		TYPE: 50 pin	
universal		header	
PIN		PIN	
#	FUNCTION	#	FUNCTION
31:	L2/L11 Com.	39:	
32:	T3/T12	37:	
33:	A3/A12	35:	
34:	L3/L12 Com.	33:	
35:	T4/T13	31:	
36:	A4/A13	29:	
37:	L4/L13 Com.	27:	
38:	T5/T14	25:	
39:	A5/A14	23:	
40:	L5/L14 Com.	21:	
41:	T6/T15	19:	
42:		17:	
43:	L6/L15 Com.	15:	
44:	T7	13:	
45:		11:	
46:	L7 Com.	9:	
47:	T8	7:	
48:	L9 Com.	5:	
49:	L8 Com.	3:	
50:	T9	1:	

**J3 - MOTHER TO CPU BOARD**

<u>CONNECTOR #1</u>		<u>CONNECTOR #2</u>	
LOCATION:	Motherboard	LOCATION:	CPU
TYPE:	60 pin header	TYPE:	60 pin header
<u>PIN #</u>	<u>FUNCTION</u>	<u>PIN #</u>	<u>FUNCTION</u>
1:	Line 1	1:	To Line Control Hardware on motherboard
2:	Line 2	2:	
3:	Line 3	3:	
4:	Line 4	4:	
5:	Line 5	5:	
6:	Line 6	6:	
7:	Line 7	7:	
8:	Line 8	8:	
9:	Line 9	9:	
10:		10:	
11:	Line 10	11:	
12:	Line 11	12:	
13:	Line 12	13:	
14:	Line 13	14:	
15:	Line 14	15:	
16:	Line 15	16:	
17:	Lamp 1	17:	To Lamp Drivers on motherboard
18:	Lamp 2	18:	
19:	Lamp 3	19:	
20:	Lamp 4	20:	
21:	Lamp 5	21:	
22:	Lamp 6	22:	
23:	Lamp 7	23:	
24:	Lamp 8	24:	
25:	Lamp 9	25:	
26:		26:	
27:	Lamp 10	27:	
28:	Lamp 11	28:	
29:	Lamp 12	29:	
30:	Lamp 13	30:	

## J3 - MOTHER TO CPU BOARD PAGE 2

CONNECTOR #1		CONNECTOR #2
LOCATION:	Motherboard	LOCATION: CPU
TYPE:	60 pin header	TYPE: 60 pin header
PIN #	FUNCTION	PIN # FUNCTION
31:	Lamp 14	31: }
32:	Lamp 15	32: }
33:	Aux. 1 Lamp	33: }
34:	Aux. 2 Lamp	34: }
35:	Aux. 3 Lamp	35: } To Lamp Drivers
36:	HOLD (TOP) Lamp	36: } on motherboard
37:	HOLD (BOT) Lamp	37: }
38:		38: }
39:	OFF (TOP) Lamp	39: }
40:	OFF (BOT) Lamp	40: }
41:	Ext. 1 Out	41: }
42:	Ext. 2 Out	42: }
43:	Ext. 3 Out	43: } To Open Collector
44:	Ext. 4 Out	44: } Buffers on
45:	Ext. 5 Out	45: } Motherboard
46:	Ext. 6 Out	46: }
47:		47: }
48:		48: }
49:	Aux. A	49: } To Drivers
50:	Beep A	50: } On Motherboard
51:	Mute A	51: }
52:	Group 1 HOLD	52: To HOLD hardware on Motherboard
53:	Aux. B	53: }
54:	Beep B	54: } To Drivers on
55:	Mute B	55: } Motherboard
56:	Group 2 HOLD	56: To HOLD hardware on Motherboard
57:		57: }
58:		58: }
59:		59: }
60:		60: }

**J4 - MOTHER TO CPU BOARD**

<u>CONNECTOR #1</u>		<u>CONNECTOR #2</u>	
LOCATION:	Motherboard	LOCATION:	CPU
TYPE:	60 pin header	TYPE:	60 pin header
<u>PIN #</u>	<u>FUNCTION</u>	<u>PIN #</u>	<u>FUNCTION</u>
1:		1:	
2:		2:	
3:		3:	
4:		4:	
5:		5:	
6:		6:	
7:	Beep-Square Wave	7:	From CPU to Integrator circuit on Motherboard
8:		8:	
9:		9:	
10:		10:	
11:		11:	
12:		12:	
13:	Button 1	13:	} CPU Data from Switches
14:	Button 2	14:	
15:	Button 3	15:	
16:	Button 4	16:	
17:	Button 5	17:	
18:	Button 6	18:	
19:	Button 7	19:	
20:	Button 8	20:	} CPU Data from Switches
21:	Button 9	21:	
22:		22:	
23:	Button 10	23:	
24:	Button 11	24:	
25:	Button 12	25:	
26:	Button 13	26:	
27:	Button 14	27:	
28:	Button 15	28:	
29:	Button Aux. 1	29:	
30:	Button Aux. 2	30:	

## J4 - MOTHER TO CPU BOARD PAGE 2

CONNECTOR #1		CONNECTOR #2	
LOCATION: Motherboard		LOCATION: CPU	
TYPE: 60 pin header		TYPE: 60 pin header	
PIN #	FUNCTION	PIN #	FUNCTION
31:	Button AUX 3	31:	} CPU Data from Switches
32:	Button HOLD (T)	32:	
33:	Button HOLD (B)	33:	
34:		34:	} CPU Data From Switches
35:	Button OFF (T)	35:	
36:	Button OFF (B)	36:	
37:	Lamp 1 Sense	37:	} From Motherboard Lamp Sensing Hardware
38:	Lamp 2 Sense	38:	
39:	Lamp 3 Sense	39:	
40:	Lamp 4 Sense	40:	
41:	Lamp 5 Sense	41:	
42:	Lamp 6 Sense	42:	
43:	Lamp 7 Sense	43:	
44:	Lamp 8 Sense	44:	
45:	Lamp 9 Sense	45:	
46:		46:	} From Motherboard Lamp Sensing Hardware
47:	Lamp 10 Sense	47:	
48:	Lamp 11 Sense	48:	
49:	Lamp 12 Sense	49:	
50:	Lamp 13 Sense	50:	
51:	Lamp 14 Sense	51:	
52:	Lamp 15 Sense	52:	} To External Input Hardware
53:	Ext. 1 In	53:	
54:	Ext. 2 In	54:	
55:	Ext. 3 In	55:	
56:	Ext. 4 In	56:	
57:	Ext. 5 In	57:	
58:	Ext. 6 In	58:	} Aux. Input from Audio Board
59:	Aux. A In	59:	
60:	Aux. B In	60:	



## J5 - RS-232

<u>CONNECTOR #1</u>		<u>CONNECTOR #2</u>	
LOCATION: CPU Board	:	LOCATION: Rear Panel	
	:	RS-232	
TYPE: 4 pin Mascon	:	TYPE: 25 pin	
	:	DB connector	
:		:	
PIN #	FUNCTION	PIN #	FUNCTION
1:	Receive	3:	
2:	Transmit	2:	
3:	Common	7:	
	:		:

**J6 - MOTHER BOARD TO AUDIO BOARD**

<u>CONNECTOR #1</u>		<u>CONNECTOR #2</u>	
LOCATION: Motherboard	:	LOCATION: Audio	:
	:	Board	:
TYPE: 26 pin header	:	TYPE: 26 pin header	:
	:		:
	:		:
<u>PIN</u>	:	<u>PIN</u>	:
#	FUNCTION	#	FUNCTION
1:	Ring - Bus A	1:	
2:	Tip - Bus A	2:	
3:	Common	3:	
4:	Ring - Bus B	4:	
5:	Tip - Bus B	5:	
6:	Common	6:	
7:	Aux. A Out	7:	
8:	Beep A Out	8:	
9:	Mute A Out	9:	} From Motherboard Drivers
10:	Aux. B Out	10:	
11:	Beep B Out	11:	
12:	Mute B Out	12:	
13:	Aux. A In	13:	} Control to CPU board
14:	Aux. B In	14:	
15:	+5VDC	15:	
16:		16:	
17:	Beep	17:	} From Beep integrator On Motherboard
18:	Beep Common	18:	
19:		19:	
20:		20:	
21:		21:	
22:		22:	
23:		23:	
24:		24:	
25:		25:	
26:		26:	

**J7 - EXTERNAL I/O CABLE**

<u>CONNECTOR #1</u>		<u>CONNECTOR #2</u>	
LOCATION: Motherboard		LOCATION: Rear Panel	
		"External"	
TYPE: 26 pin header		TYPE: 25 pin DB	
<u>PIN</u>	<u>FUNCTION</u>	<u>PIN</u>	<u>FUNCTION</u>
1:	Ext. In 6	13:	
2:	Common	25:	
3:	Ext. In 5	12:	
4:	Common	24:	
5:	Ext. In 4	11:	
6:	Common	23:	
7:	Ext. In 3	10:	
8:	Common	22:	
9:	Ext. In 2	9:	
10:	Common	21:	
11:	Ext. In 1	8:	
12:	Common	20:	
13:	+24 VDC	7:	
14:	Common	19:	
15:	Ext. Out 6	6:	
16:	Common	18:	
17:	Ext. Out 5	5:	
18:	Common	17:	
19:	Ext. Out 4	4:	
20:	Common	16:	
21:	Ext. Out 3	3:	
22:	Common	15:	
23:	Ext. Out 2	2:	
24:	Common	14:	
25:	Ext. Out 1	1:	
26:	Common		

**AUDIO BOARD TO AUXILIARY CABLE**

<u>CONNECTOR #1</u>		<u>CONNECTOR #2</u>	
LOCATION:	Auxiliary	LOCATION:	Audio Board
TYPE:	10 Pin Barrier Block	TYPE:	Mascon Mini 6 (total of two)
<u>PIN #</u>	<u>FUNCTION</u>	<u>PIN #</u>	<u>FUNCTION</u>
1:	Group	1:	Ring
2:	A	2:	Tip
3:	Group	4:	Ring
4:	B	5:	Tip
5:	10K pot-High	1:	Monitor Pot
6:	10K pot-Wiper	2:	Wiper
7:	Ground	3:	Ground
8:	Speaker	4:	Monitor Out
9:	Speaker Common	5:	Ground
10:	Not Used		

**AUDIO BOARD I/O CABLE**

<u>CONNECTOR #1</u>		<u>CONNECTOR #2</u>	
LOCATION:	Audio Board	LOCATION:	Rear Panel XLR
TYPE:	Mascon Mini 6	TYPE:	XLR
<u>PIN #</u>	<u>FUNCTION</u>	<u>PIN #</u>	<u>FUNCTION</u>
1:	Send In	3:	} Female XLR
2:	Send In	2:	
3:	Ground	1:	
4:	Caller Output	3:	} Male XLR
5:	Caller Output	2:	
6:	Ground	1:	

**AUDIO BOARD POWER CABLE**

<u>CONNECTOR #1</u>		<u>CONNECTOR #2</u>	
LOCATION: Power Supply :		LOCATION: Audio Board	
TYPE: Mascon 7 pin :		TYPE: Mascon 5 pin	
PIN #	FUNCTION	PIN #	FUNCTION
1:	+8 VDC		N/C
2:	Common #1		N/C
3:	+27 VDC		N/C
4:	+18 VDC	1:	
5:	N/C		N/C
6:	-18 VDC	2:	
7:	Common #2	4:	

**MOTHER POWER CABLE**

<u>CONNECTOR #1</u>		<u>CONNECTOR #2</u>	
LOCATION: Power Supply :		LOCATION: Motherboard	
TYPE: Mascon 7 Conductor :		TYPE: 7 Conductor	
PIN #	FUNCTION	PIN #	FUNCTION
1:	+8 VDC	1:	Red
2:	Common #1	2:	Green
3:	+27 VDC	3:	Orange
4:	+18 VDC	4:	Blue
5:	N/C	5:	N/C
6:	-18 VDC	6:	Yellow
7:	Common #2	7:	Black

**MOTHERBOARD TO CPU POWER CABLE**CONNECTOR #1

LOCATION: Motherboard :

TYPE: Mascon 5 Conductor :

PIN #	FUNCTION
1:	+8 VDC
2:	N/C
3:	+18 VDC
4:	-18 VDC
5:	Common

CONNECTOR #2

LOCATION: CPU

TYPE: Mascon 5 Conductor

PIN #	FUNCTION
1:	Red
2:	
3:	Blue
4:	Yellow
5:	Green

**POWER SUPPLY TO TELEMIX MAIN CHASSIS**CONNECTOR #1

LOCATION: Power Supply Chassis :

TYPE: 10 pin Cinch :

PIN #	FUNCTION
1:	8 VAC
2:	8 VAC
3:	Common #1
4:	Chassis Ground
5:	27 VAC
6:	27 VAC
7:	18 VAC
8:	18 VAC
9:	Common #2

CONNECTOR #2

LOCATION: Power Supply PCB

TYPE: Mascon 9 Conductor

PIN #	FUNCTION
1:	Black
2:	White
3:	Red
4:	Chassis Ground
5:	Brown
6:	Blue
7:	Orange
8:	Yellow
9:	Purple

## 12. Audio board Adjustments

TELEMIX IX comes adjusted and tested from the factory. It may, however, require readjustment to conform to your particular installation and telephone system requirements.

Adjustment is as follows:

1. **NULLING.** Connect TELEMIX IX to the KSU. Using a standard phone, pick up a line that appears on Group 1 and dial a line that appears on Group 2. Put both lines on HOLD. Apply a 1KHz, 0dBm tone to the send input. Connect an A.C. voltmeter to the caller output. Switch all capacitor switches on the large audio board to the OFF position. Rotate the FINE 1 and FINE 2 pots (R4 and R6) fully counterclockwise. These pots should remain in this position if you are connected to a Western Electric (standard Ma Bell) Central Office (SXS, Crossbar or ESS). Pick up the holding line on Group 1 and adjust the NULL Group 1 pot (R5) for a minimum reading on the voltmeter. Once a null is reached, add capacitance with switches 1-4 to obtain the deepest null. Push the HOLD button for Group 1 and pick up the holding line on Group 2. Null the Group 2 hybrid using the NULL Group 2 pot (R7) and capacitance switches 4-8.

2. **SEND and SQUELCH.** Connect send audio from your console Mix Minus bus to the send input of TELEMIX. The audio level to this input must be between -20 to +10 dBm. Rotate the SQUELCH pot (R9) fully clockwise. Have someone call the TELEMIX; answer the line and apply nominal level speech to the console. Adjust the SEND control until the caller can comfortably hear the audio.

**It is very important to not "over send" - hybrids are not perfect devices and every dB of increased send audio degrades the hybrid return loss or null by 1 dB.**

Adjust the squelch pot (R9) so that the LED remains lit all the time during speech. Be careful not to make the squelch too sensitive; otherwise, it will trigger on extraneous studio noise. Clockwise rotation of R9 makes the squelch more sensitive.

All other audio board adjustments as summarized below have been factory set but may be adjusted to suit your particular application:

1. **SEND LEVEL.** This adjusts the level of audio going back to the caller. Keep it as low as possible. Remember that this adjustment interacts with the squelch control.

2. **BALANCE OUT.** This adjusts the output level of the device. Adjust it for whatever level your console requires. This has been factory-set for -20 dBm Telco level; it produces 0 dBm at CALLER OUT.

3. **SPEAKER LEVEL.** This adjusts the volume level of the speaker. It is in series with the external monitor pot. TELEMIX is shipped with a 10K ohm resistor in place of the external pot. If you want to install the external pot, wire the high side to pin 5, the wiper to pin 6, and the low side to pin 7 of the auxiliary connector block. With the external pot wired in, the internal speaker level pot acts as a maximum monitor level adjustment.

4. **FINE 1 AND NULL 1.** These are null adjustments for the group 1 hybrid. See the NULLING section on page 45.

5. **FINE 2 AND NULL 2.** This is the same as for Group 1.

6. **MAXIMUM XMIT.** This adjusts the maximum send level to be applied to the telephone line. It was factory set at -9 dBm into the phone line. This is the recommended setting, but the pot may be readjusted to conform to your individual requirements. FCC regulations specify a maximum of -9 dBm.

7. **SQUELCH.** This adjusts the level at which the send audio triggers the caller and speaker dimming circuitry. Adjust it to trigger at a threshold 10-15 dB below the nominal send audio.

8. **SPEAKER DIMMING.** The monitor speaker dimming is factory set for 10 dB of dimming. the Speaker Dim pot can be adjusted to produce 0 to -40 dB of speaker dimming to suit your requirements. The Monitor Speaker pot is used to set the maximum volume limit for the built-in monitor amp. Speaker dimming provides for a better null in the acoustic environment.



### 13. TECHNICAL DESCRIPTION

Discussion of the operation of the various TELEMIX circuit boards will proceed in the following order:

- 13.1 Power Supply.
- 13.2 Mother Board.
- 13.3 Audio Board.
- 13.4 C.P.U. Board.

It is suggested that section 5.1 of this manual be referred to for a description of locations of the various circuit boards and connectors.

**13.1 Power Supply.** TELEMIX power supply consists of two sub systems: A) the power transformer which is mounted in a separate 19" rack or wall mountable chassis and B) the rectifier and filter circuit board which is mounted inside the main TELEMIX chassis. Voltage regulation is done as needed on each individual circuit board.

**A. Power Transformer.** The primary of the power transformer is fused with a 3/4 A. slo-blow fuse. The secondaries consist of three independent center tapped windings. All AC outputs of the transformer are connected to a 10 pin Cinch Jones connector. Ground returns from the power supply circuit board are returned through a 2.0 A and a 1.5 A standard fuse on the transformer chassis.

**B. Rectifier and Filter Circuit Board.** The A.C. from the transformer is fed to the TELEMIX main chassis through the 10 pin Cinch-Jones connector on the transformer chassis to the 9 conductor power cord then to the rectifier and filter circuit board via a 9 pin Mascon connector. The circuit board contains three rectifiers and filters to provide TELEMIX with unregulated +8 V at 2 A, +28 V at 1.5 A, +25 V at 1.0 A and -25 V at 1.0 A. The 8 V and 28 V supplies use 2 diodes in a standard full wave rectifier configuration with adequate filtering obtained with filter capacitors. The ground for these two supplies is common but is left floating with respect to the main chassis. The remaining voltages are derived from a standard bridge rectifier with the +25 V available on the common cathodes of the bridge and the -25 V available on the common anodes. A filter capacitor is in each leg of these supplies and the grounds are common but left floating relative to the main chassis. The unregulated voltages are available on two 7 pin Mascon connectors. Power for the mother board and the audio board comes via these connectors. Power for the C.P.U. is looped from the power supply board through the mother board to an identical 7 pin Mascon connector.

**13.2 Mother Board.** In TELEMIX, a series of independent circuits control or are controlled by a microprocessor (the C.P.U.). For example, the front panel buttons function only as data inputs to the microprocessor. Each function TELEMIX performs is controlled by a high or low control voltage from the microprocessor to an

interface circuit which converts this control voltage to the appropriate action, for example turning on a lamp or turning on an A line. The interface circuits are located on the mother board and will be discussed as follows:

- A. Front Panel Buttons.
- B. Front Panel Lamps.
- C. Phone Line Lamp Detectors.
- D. A-Line Control.
- E. Phone Line Tip and Ring control.
- F. External Control.
- G. Beep Integrator.

**A. Front Panel Buttons.** All 22 normally open contacts on the 22 front panel switches are looped to the 50 pin amphenol connector on the rear panel labeled "Remote Control" and then on to the mother board through J5 pins 3-24. Each line is connected to a 10K pull up resistor which pulls the line to +5 V when its corresponding button is not pushed. When a button is pushed, its line is pulled to ground potential. These lines become 22 digital inputs to the C.P.U. board and are routed directly to the C.P.U. board via J4 pins 13-36. The front panel buttons are not connected to any other circuitry. Their function is monitored only by the microprocessor program.

**B. Front Panel Lamps.** All 22 front panel button lamps are looped to the 50 pin rear panel Amphenol connector labeled "Remote Control" and then to the mother board through J5 pins 25-46. Each line is connected to separate outputs of a UNL 2203 which is used as a lamp driver. Power for the lamps comes from a 24V variable voltage regulator on the mother board. Digital input to the lamp driver I.C. comes from the C.P.U. via J3 pins 17-40. When one of these lines is low or at ground potential its corresponding button lamp will be turned off and when the line is high or at +5 V its lamp will be turned on. There is no other connection to the lamps. The on/off status of the lamps is controlled totally by the microprocessor program.

**C. Phone Line Lamp Detectors.** Each of the 15 phone line lamp voltages are monitored by 15 photo isolators whose outputs become 15 independent inputs to the C.P.U. board. Lamp voltage from the 15 phone lines are routed through the two rear panel 50 pin Amphenol connectors labeled "Group 1" and "Group 2" to J1 and J2 on the mother board. On the mother board each lamp voltage line is routed to one of 15 MCA 1161 photo isolators through a 1N4148 A.C. blocking diode and a 2.2 K current limiting resistor. The open-collector output of the photo isolators is pulled high through a 10 K pull-up resistor to +5 V and routed to the C.P.U. board through J4 pins 37-52. When any of the phone line lamps are on, it results in a low level signal to its corresponding input to the C.P.U. An off lamp becomes a high input. There are no other connections from the phone line lamps.

**D. A-Line Control.** The A-line common of each group of phone lines is tied through 1N4148 steering diodes to two sets of MCA 1161 photo isolator I.C.'s. Each photo isolator ties one of the 15 A-lines to its associated A-line common. The logic level to operate the photo isolators comes from one of four 74LS366 tri-state drivers which are in turn driven from the C.P.U. board through J6 pin 1-5. A high level control voltage from the C.P.U. board connects its associated A-line with its associated group A-line common. There is no other connection to the A-lines.

**E. Phone Line Tip and Ring Control.** Audio is coupled between the two hybrids on the audio board and the phone lines through 15 high voltage MOS switches. These switches act very much like DPST relays in that a control voltage connects or disconnects two sets of contacts. The switches are connected in two groups corresponding to the two groups of phone lines. Tip and ring contacts on each group of switches are connected together and tied to the two tip and two ring lines on the audio board through J6 pin 1-5, which is the same set of contacts as the A-line drivers. Thus the control signals from the C.P.U. board which activate an A-line also connect the same lines tip and ring to its groups hybrid on the audio board. The 74LS336 buffers that control the tip and ring lines are tri-state buffers and the enable lines for each set of buffers associated with each of the two groups of phone lines can be controlled by the C.P.U. board. J3 pins 52 and 56 connect to a 74LS04 inverter and to the enable pins of the buffers. A high level control signal from the CPU to the control line will disconnect all tip and ring lines in the associated group. This flexible design enables the C.P.U. board under microprocessor program control to put any or all lines in a group on hold.

**F. External Control.** Just as the front panel buttons and lamps are only inputs and outputs to the C.P.U. board, the external control lines are also only inputs and outputs to the C.P.U. board. The function of the external controls is determined totally by the microprocessor program. Six external input and six external output lines are available on the rear panel male DB-25 connector labeled "external control." The six input lines go to J7 and are isolated from direct connection to the C.P.U. board by MCA-1161 photo isolators. Each line is connected to a 1N4148 isolation diode. A 1K resistor limits the current through the isolation LED in the photo isolator. The output of the photo isolator is pulled high through a 10K resistor to +5 V and is routed to the C.P.U. board through J4. A ground potential on any of the external input lines will result in a low level on the corresponding line to the C.P.U. board. The six output lines come from six open collector outputs of a UNL-2003 driver. Also available on the rear panel auxiliary connector is +24V from the mother board power supply. Inputs to the output drivers come from six output control lines from the C.P.U. board via J3.

**G. Beep Integrator.** An square wave signal whose frequency and waveform can be controlled by the microprocessor program is routed

to the mother board through J4. A 74LS04 buffers this signal and it is sent to a 5532 wired as an integrator. The output of the integrator is a triangle wave which is sent to the audio board via J6 pins 16 and 17. This signal can be used as an audible cueing tone sent to the phone lines.

**13.3 Audio Board.** The two circuit boards mounted vertically on the right side of TELEMIX contain all of the analog circuitry necessary to perform the audio function of TELEMIX. These two circuit boards contain the following:

- Telephone Hybrid - Group 1
- Telephone Hybrid - Group 2
- Send Gated Compressor
- Send Equalizer
- 2 Receive Equalizers
- Receive Mix and Balance Circuit
- Caller Control
- Monitor Amplifier
- Muting Logic
- Beep Logic

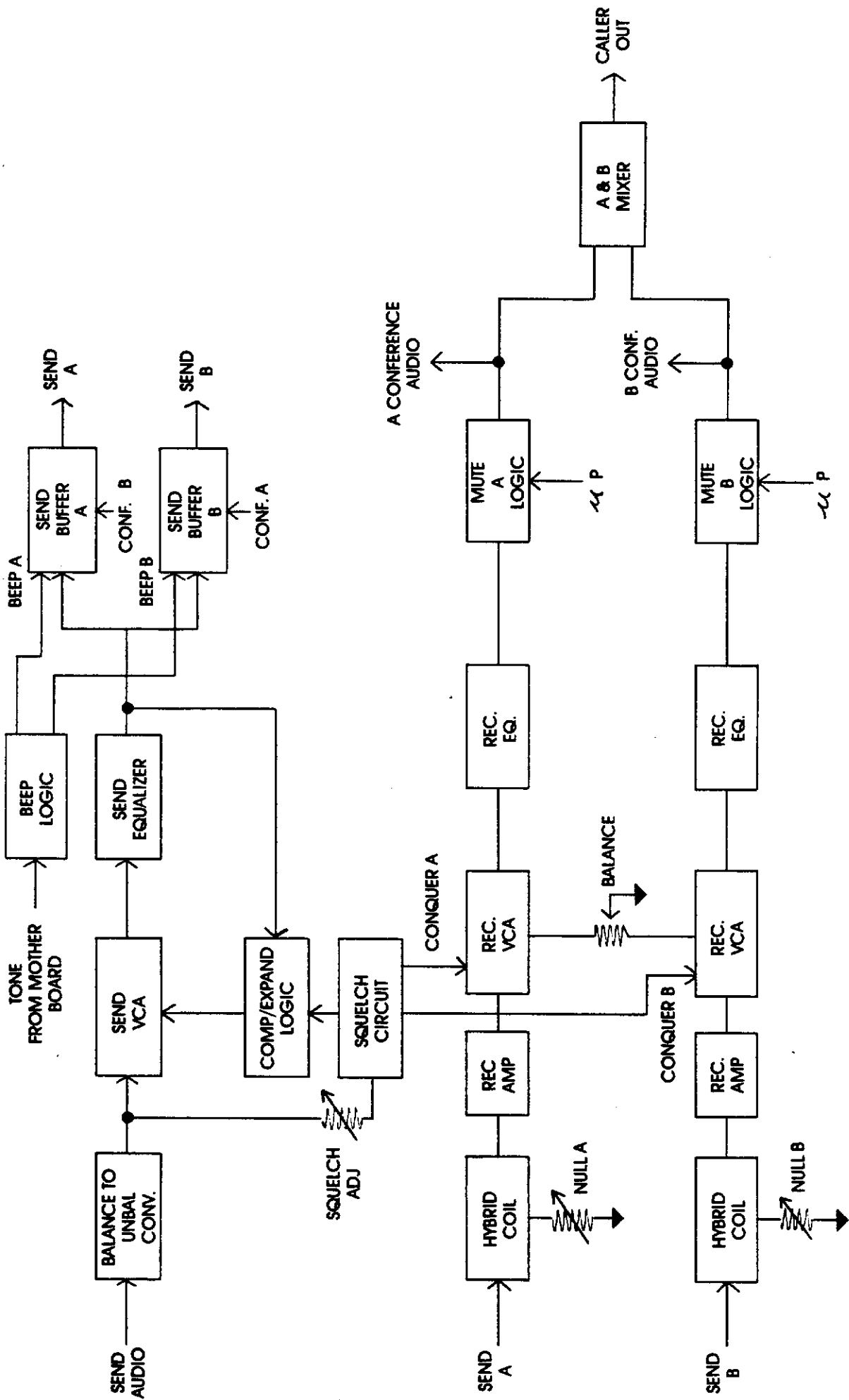
The signal flow for the processing of the audio is illustrated by the block diagram on the following page. Refer to this diagram and the audio board schematic for best application of the technical description:

A. The balanced to unbalanced conversion of the send audio is implemented by U1A. Unbalanced audio is fed to the send trimmer and then amplified by U1B to the proper level for driving U3A, the send VCA. The amplified audio is also applied to the squelch trimmer. U6D amplifies the squelch audio to a level sufficient for driver rectifiers D3, D5 and D7. The rectified audio is integrated and compared against a fixed DC level by U6A, U6C and U9D. Three logic signals, all derived from the send audio level, now exist.

1. Caller Control drive from U6A
2. Monitor Speaker Dimming drive from U6C
3. Expander Threshold drive from U9D

B. The output of the send VCA is filtered for application to the phone line by U11A, U11B, U11C, U11D and the associated reactive components. A sample of this filtered audio is amplified by U9B, rectified and integrated and applied to U9C as the compressor drive voltage. U9C is a servo amplifier that combines the gating and compressor drive signals into the composite control voltage for U3A, the send VCA.

C. The equalized send audio is applied to SEND 1 and 2 buffers, U5A and U4A, respectively. The caller cue beep tone from the mother board is gated to the appropriate send buffer via bilateral switches U7A and U7D under the control of the microprocessor. Buffers U5A and U4A then drive the group 1 and 2



TELEMIX AUDIO CIRCUITS

hybrid coils with send audio.

D. Receive audio from hybrid coils T2 and T1 is amplified by U5B and U4B, respectively. The receive audio is then applied to the receive VCAs U15A and U15B, which control the receive audio gain providing for Balance control and Caller "Control", or ducking. Caller control drive from U6A is adjusted and timed by U14C and then applied to the input of U12D. To obtain the proper control range this input is negative-clamped to 1.5 VDC provided by U12C and D10. This amplified DC control voltage is then varied differentially by the Balance pot R501, buffered by U12A and U12B and applied as a control voltage to the receive VCAs U15A and U15B.

E. Receive audio from the VCAs is amplified by U14A and U14B, and bandpass-filtered by U10A, U10B, U10C and U10D for Group 1 receive audio and U13A, U13B, U13C and U13D for Group 2 receive audio.

F. Equalized receive audio is fed to bi-lateral switches U7B and U7C, which provide muting of the receive audio under control of the microprocessor. Audio at the output of the muting switches is then cross-fed by R61 and R63 to the send audio buffers to provide conferencing between callers on Group 1 and Group 2.

G. Receive audio from both groups is mixed by U2B for a combined caller output. The mixed receive audio is also applied to U2A which acts as a voltage inverter to provide a balanced line level output. The mixed receive audio is also sent to U3B, a VCA that provides the dimming of the monitor speaker output. This VCA derives its control voltage from the dimming drive at U6C via U6B, which acts as a range control amplifier. U8 is an audio power amplifier that provides 2 watts of output power for driving the monitor speaker.

**13.4 C.P.U. Board.** The TELEMIX C.P.U. board is a general purpose C.P.U. board designed around an 8085 microprocessor. It is of conventional design. The C.P.U. board has the following features:

- Power on reset
- 6.144 MHz. clock
- Selectable 2K or 4K ROM (2716 or 2732A)
- 512 bytes scratch pad RAM
- 13 independently programmable 8 bit I/O ports
- 2 independently programmable 6 bit I/o ports
- 1 programmable clock output
- 1 RS-232 serial port with programable baud rates

The C.P.U. ROM can be either a 2716 or 2732A EPROM. A jumper on the board selects which type is installed. On board address decoding enables the ROM during the low order 4K addresses therefore the ROM is selected during power on reset.

Parallel I/O is controlled by 2 8155's and 3 8255's. 8155's and 8255's are programmable I/O controllers with a variety of I/O configurations available all under program control. It is beyond the scope of this manual to detail how they are programmed, but in summary, 22 I/O lines are available for each 8155 and 24 I/O lines for each 8255. These lines are available on J3 and J4. Serial I/O is through U1 and U2, an 1489 and 1488 RS-232 transmitter and receiver operated by U7, an 8251 programmable UART. The receive and transmit clock come from the programmable timer of U9, one of the 8155's. Optional dip switches may be connected to the 6 bit I/O port of U11, one of the 8255's. The position of these switches may be read under program control and can be used to set software options; in the case of TELEMIX the switches are used to set the serial port baud rate.

The programmable timer output of the 8155's is a square wave output whose duty cycle and frequency can be programmed. The timer output of U9 is used as a baud rate generator and the timer output of U8 is available on J3 pin 57. It also is routed to an optional jumper location where it can be jumpered to one of the restart inputs for the 8085 microprocessor.

Although the CPU board is very flexible as to I/O designation, timer options, and RS-232 function, in TELEMIX the function of the I/O lines and various options is very structured. Listed below is a summary of each I/O port function, addressing, etc. Under program control, each I/O controller sets up each of its I/O ports as either input or output. The 8251 is programmed and the baud rate switches are read and the baud rate set. Hardware restrictions dictate the necessary I/O configuration. Summarized on the next two pages is a list of all I/O port configurations.

If desired, an assembly listing of the TELEMIX software is available from the factory.

U8 - 8155

PORT TYPE	PORT ADDRESS	PORT FUNCTION		BIT							
				7	6	5	4	3	2	1	0
OUT	11H	SOLID STATE LINE RELAYS	LINE #	8	7	6	5	4	3	2	1
			IC PIN #	28	27	26	25	24	23	22	21
			J3 PIN #	8	7	6	5	4	3	2	1
OUT	12H	SOLID STATE LINE RELAYS	LINE #	15	14	13	12	11	10	—	9
			IC PIN #	36	35	34	33	32	31	30	29
			J3 PIN #	16	15	14	13	12	11	10	9
IN	13H	BAUD RATE SWITCH	SWITCH	—	—	—	—	—	3	2	1
			IC PIN #	—	—	5	2	1	39	38	37
			J4 PIN #	—	—	6	5	4	3	2	1

U9 - 8155

PORT TYPE	PORT ADDRESS	PORT FUNCTION		BIT							
				7	6	5	4	3	2	1	0
OUT	21H	BUTTON LAMPS	LAMP	8	7	6	5	4	3	2	1
			IC PIN #	28	27	26	25	24	23	22	21
			J3 PIN #	24	23	22	21	20	19	18	17
OUT	22H	BUTTON LAMPS	LAMP	15	14	13	12	11	10	—	9
			IC PIN #	36	35	34	33	32	31	30	29
			J3 PIN #	32	31	30	29	28	27	26	25
OUT	23H	TONE ENABLE	ENABLE	—	—	—	—	—	—	—	1
			IC PIN #	—	—	5	2	1	39	38	37
			J4 PIN #	—	—	12	11	10	9	8	7

U10 - 8255

PORT TYPE	PORT ADDRESS	PORT FUNCTION		BIT							
				7	6	5	4	3	2	1	0
OUT	30H	BUTTON LAMPS	LAMP	OFF B	OFF A	—	HOLD B	HOLD A	AUX 3	AUX 2	AUX 1
			IC PIN #	37	38	39	40	1	2	3	4
			J3 PIN #	40	39	38	37	36	35	34	33
OUT	31H	EXT OUT	EXT	—	—	6	5	4	3	2	1
			IC PIN #	25	24	23	22	21	20	19	18
			J3 PIN #	48	47	46	45	44	43	42	41
OUT	32H	HOLD MUTE BEEP AUX	H.M.B.A.	HLD-B	MUT-B	BEP-B	AUX-B	HLD-A	MUT-A	BE-P-A	AUX-A
			IC PIN #	10	11	12	13	17	16	15	14
			J3 PIN #	56	55	54	53	52	51	50	49

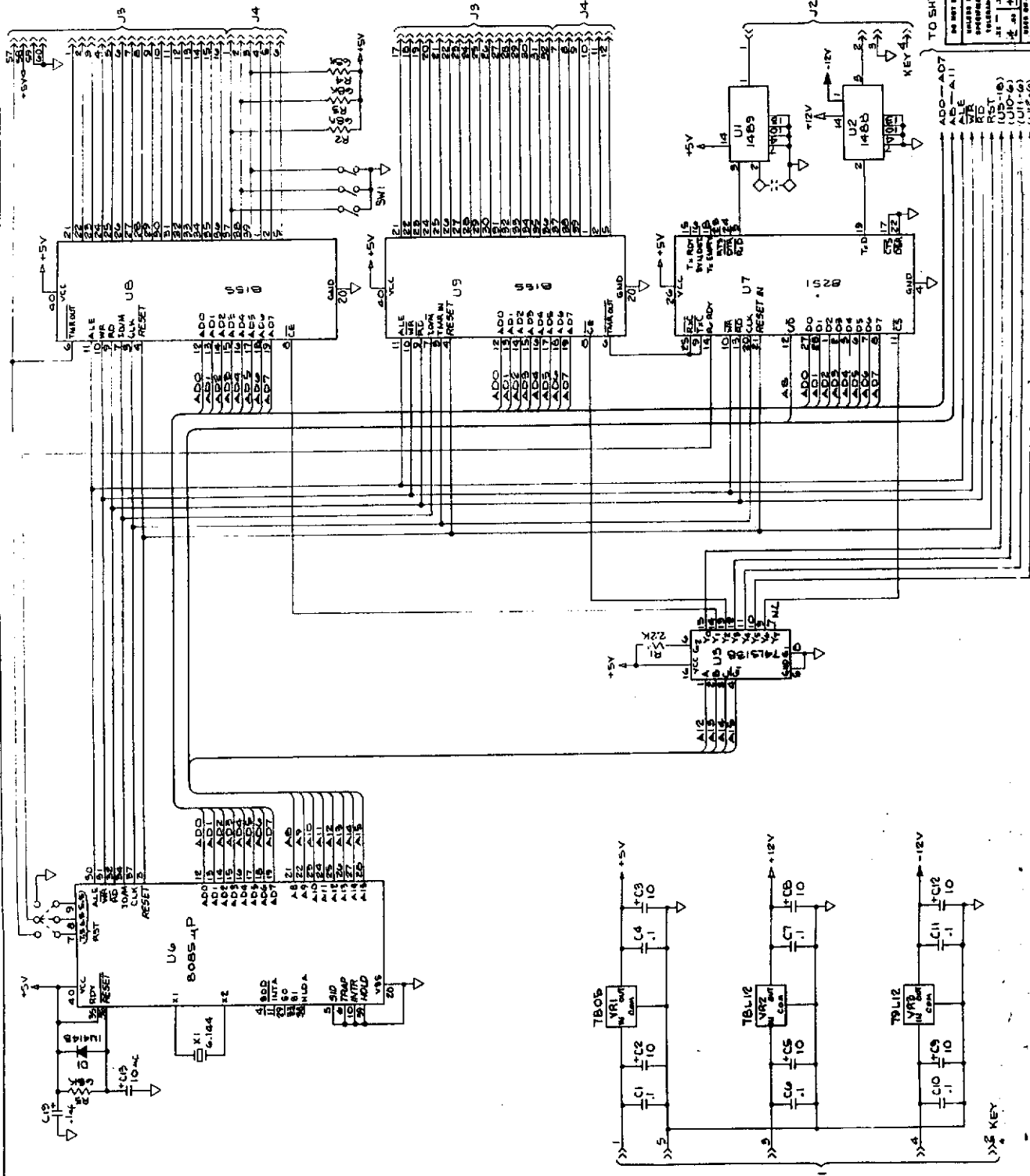


## U11 - 8255

PORT TYPE	PORT ADDRESS	PORT FUNCTION	BIT								
			7	6	5	4	3	2	1	0	
IN	40H	LINE BUTTONS	LINE	8	7	6	5	4	3	2	1
			IC PIN #	37	38	39	40	1	2	3	4
			J4 PIN #	20	19	18	17	16	15	14	13
IN	41H	LINE BUTTONS	LINE	15	14	13	12	11	10	—	9
			IC PIN #	25	24	23	22	21	20	19	18
			J4 PIN #	28	27	26	25	24	23	22	21
IN	42H	OFF, HOLD AUX BUTTONS	BUTTON	OFF-B	OFF-A	—	HLD-B	HLD-A	AUX -3	AUX-2	AUX-1
			IC PIN #	10	11	12	13	17	16	15	14
			J4 PIN #	36	35	34	33	32	31	30	29

## U12 - 8255

PORT TYPE	PORT ADDRESS	PORT FUNCTION	BIT								
			7	6	5	4	3	2	1	0	
IN	50H	LAMP DETECT	LINE	8	7	6	5	4	3	2	1
			IC PIN #	37	38	39	40	1	2	3	4
			J4 PIN #	44	43	42	41	40	39	38	37
IN	51H	LAMP DETECT	LINE	15	14	13	12	11	10	—	9
			IC PIN #	25	24	23	22	21	20	19	18
			J4 PIN #	52	51	50	49	48	47	46	45
IN	52H	EXT IN	EXT	AUX-B	AUX-A	6	5	4	3	2	1
			IC PIN #	10	11	12	13	17	16	15	14
			J4 PIN #	60	59	58	57	56	55	54	53



NOTES:  
 1. UNLESS OTHERWISE SPECIFIED:  
 A. RES. ARE IN OHMS.  
 B. FIXED RES. ARE 1/4WATT 5% TOL.  
 C. CAPS. ARE 1U MICROFARADS.  
 D. VOLTAGES ARE D.C.  
 2. C14 - C18 +C20 - C26 ARE 1.

THIS DOCUMENT CONTAINS NO TECHNICAL INFORMATION OF A NATURE WHICH IS UNCLASSIFIED OR WHICH IS NOT SUBJECT TO RESTRICTIONS ON REPRODUCTION OR DISTRIBUTION.

**GENTNER**  
 MICROELECTRONIC TECHNOLOGY, INC.

TELEMIX ELECT. SCHEM. TELEMIX CPU BRD.

DATE: 2/22/73  
 DRAWN BY: J. J. JONES  
 CHECKED BY: J. J. JONES  
 SCALE: AS SHOWN  
 SHEET NO. 004-01-06  
 OF 1

DO NOT SCALE PWT.  
 UNLESS OTHERWISE SPECIFIED IN DRAWING.  
 UNLESS OTHERWISE SPECIFIED IN DRAWING.  
 UNLESS OTHERWISE SPECIFIED IN DRAWING.  
 UNLESS OTHERWISE SPECIFIED IN DRAWING.

TO SHT. 2  
 ADD-AD7  
 A12-A15  
 RD  
 RST  
 US-(16)  
 (U10-6)  
 (U11-6)

KEY 4  
 A12  
 A13  
 A14  
 A15

KEY 4  
 A12  
 A13  
 A14  
 A15

KEY 4  
 A12  
 A13  
 A14  
 A15

KEY 4  
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 A15

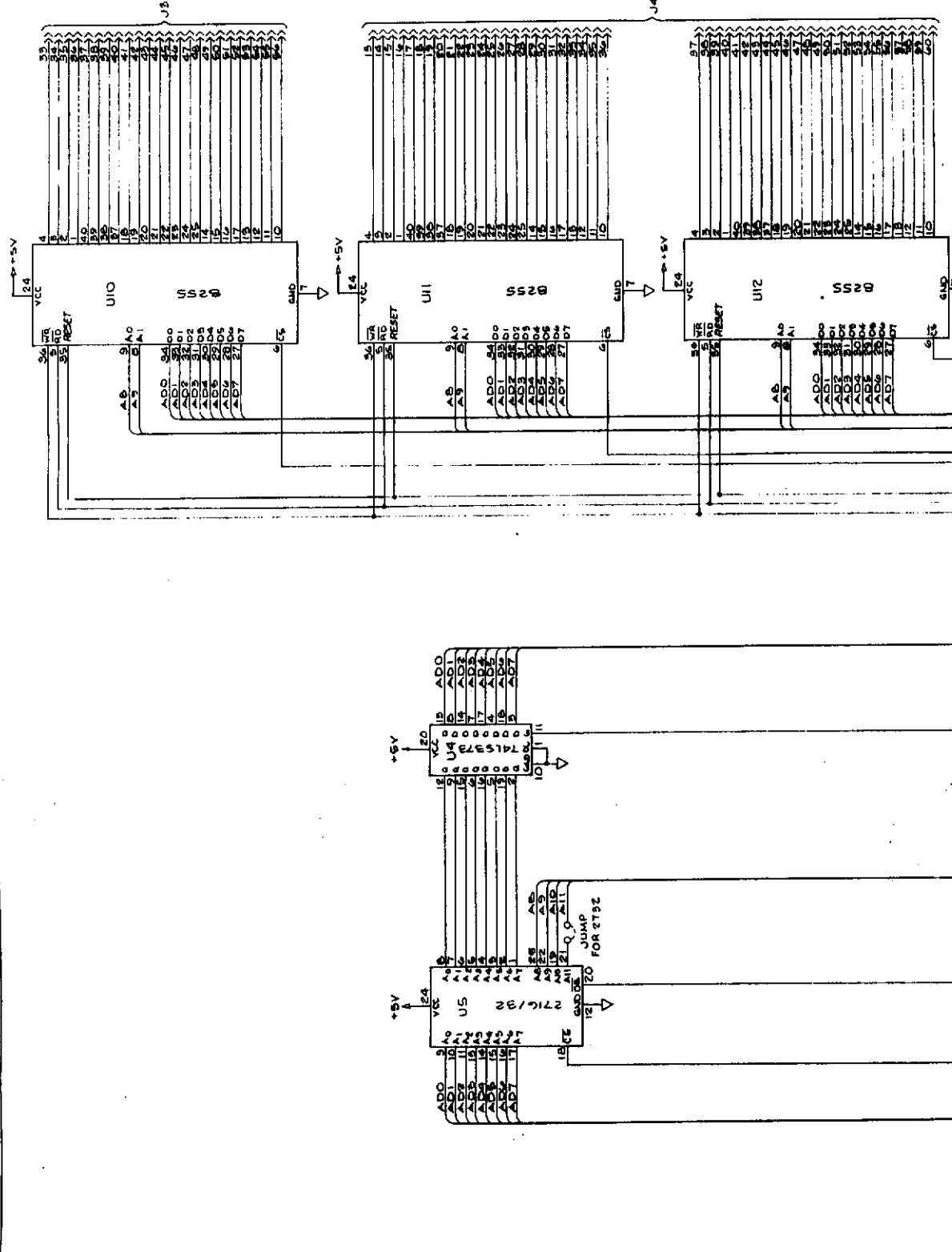
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KEY 4  
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KEY 4  
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KEY 4  
 A12  
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 A15

KEY 4  
 A12  
 A13  
 A14  
 A15



**GENTNER**  
PROGRAMMING CORPORATION

**TELEMIX ELECT. SCHEM. CPU BRD.**

NO NET SCALE BAR.  
WIRELESS CONNECTIONS  
SPECIFIED OTHERWISE  
RESISTOR VALUES  
IN OHMS UNLESS NOTED  
DIMENSIONS IN INCHES  
TOLERANCES UNLESS NOTED  
AS SHOWN ON DRAWING

DATE: 004-01-06  
REV. NO.: 001  
PAGE: 2 OF 2

DESIGNED BY: [Signature]  
CHECKED BY: [Signature]  
DRAWN BY: [Signature]

REV.	BY	DATE	DESCRIPTION
1	...	...	...
2	...	...	...
3	...	...	...
4	...	...	...
5	...	...	...
6	...	...	...
7	...	...	...
8	...	...	...
9	...	...	...
10	...	...	...

NOTES:  
 1. RESISTORS ARE 1/4 WATT.  
 2. RESISTANCE VALUES ARE IN OHMS ± 5% TOL.  
 3. CAPACITANCE VALUES ARE IN MICROFARADS.  
 4. UNLESS OTHERWISE SPECIFIED, ALL COMPONENTS ARE MIL-SPEC.  
 5. ALL DIMENSIONS ARE IN INCHES.

BY THE DESIGNER: [Signature]  
 CHECKED APPROVED: [Signature]  
 DATE: 11/17/67  
 TITLE: TELETYPE MATRNER (M U)  
 NO. 004-01-01

U1A U1N 2009 (7 PLCS)  
 U1B U1N 2009 (7 PLCS)  
 U1C U1N 2009 (7 PLCS)  
 U1D U1N 2009 (7 PLCS)  
 U1E U1N 2009 (7 PLCS)  
 U1F U1N 2009 (7 PLCS)

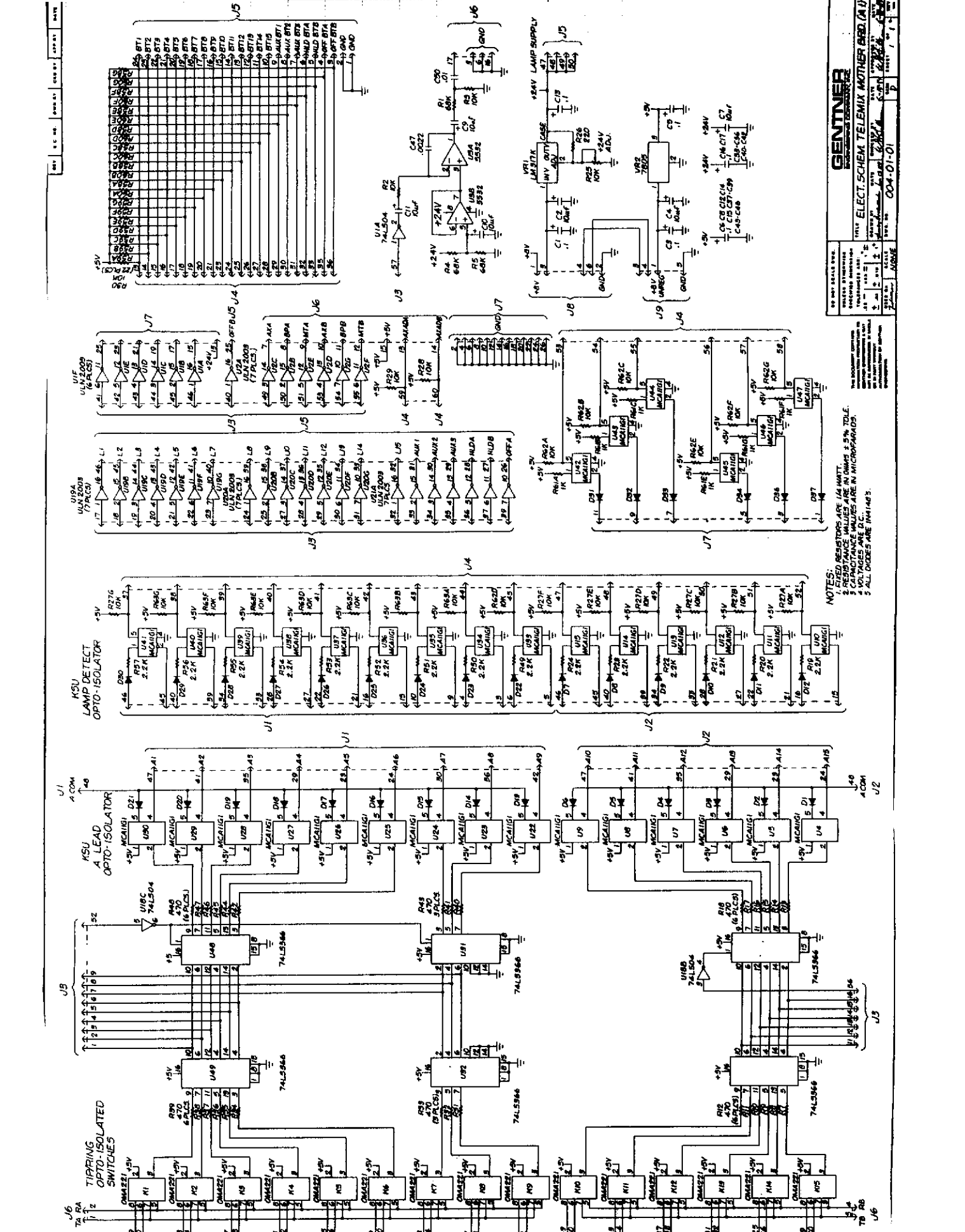
U2A U2N 2009 (7 PLCS)  
 U2B U2N 2009 (7 PLCS)  
 U2C U2N 2009 (7 PLCS)  
 U2D U2N 2009 (7 PLCS)  
 U2E U2N 2009 (7 PLCS)  
 U2F U2N 2009 (7 PLCS)

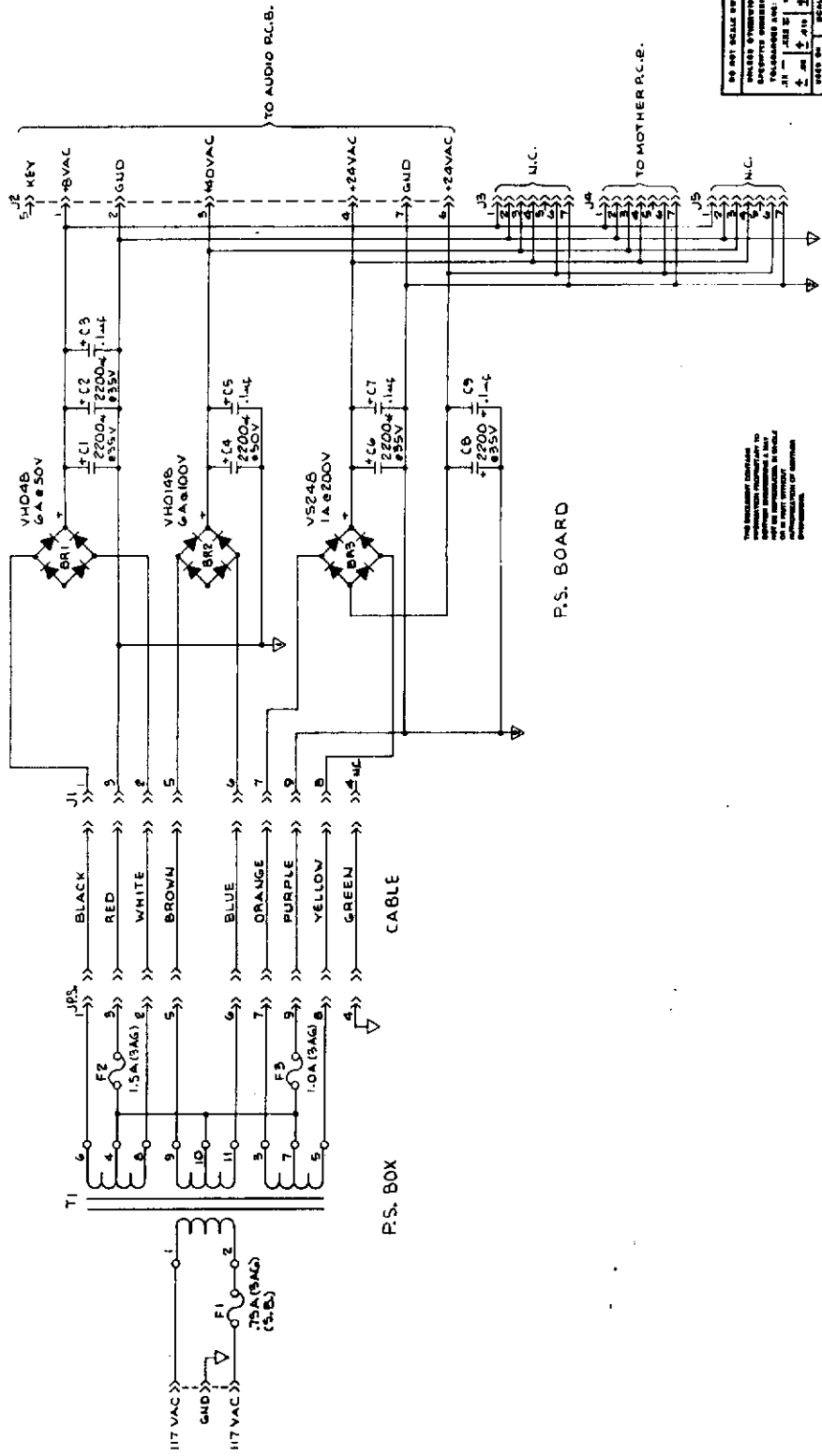
U3A U3N 2009 (7 PLCS)  
 U3B U3N 2009 (7 PLCS)  
 U3C U3N 2009 (7 PLCS)  
 U3D U3N 2009 (7 PLCS)  
 U3E U3N 2009 (7 PLCS)  
 U3F U3N 2009 (7 PLCS)

U4A U4N 2009 (7 PLCS)  
 U4B U4N 2009 (7 PLCS)  
 U4C U4N 2009 (7 PLCS)  
 U4D U4N 2009 (7 PLCS)  
 U4E U4N 2009 (7 PLCS)  
 U4F U4N 2009 (7 PLCS)

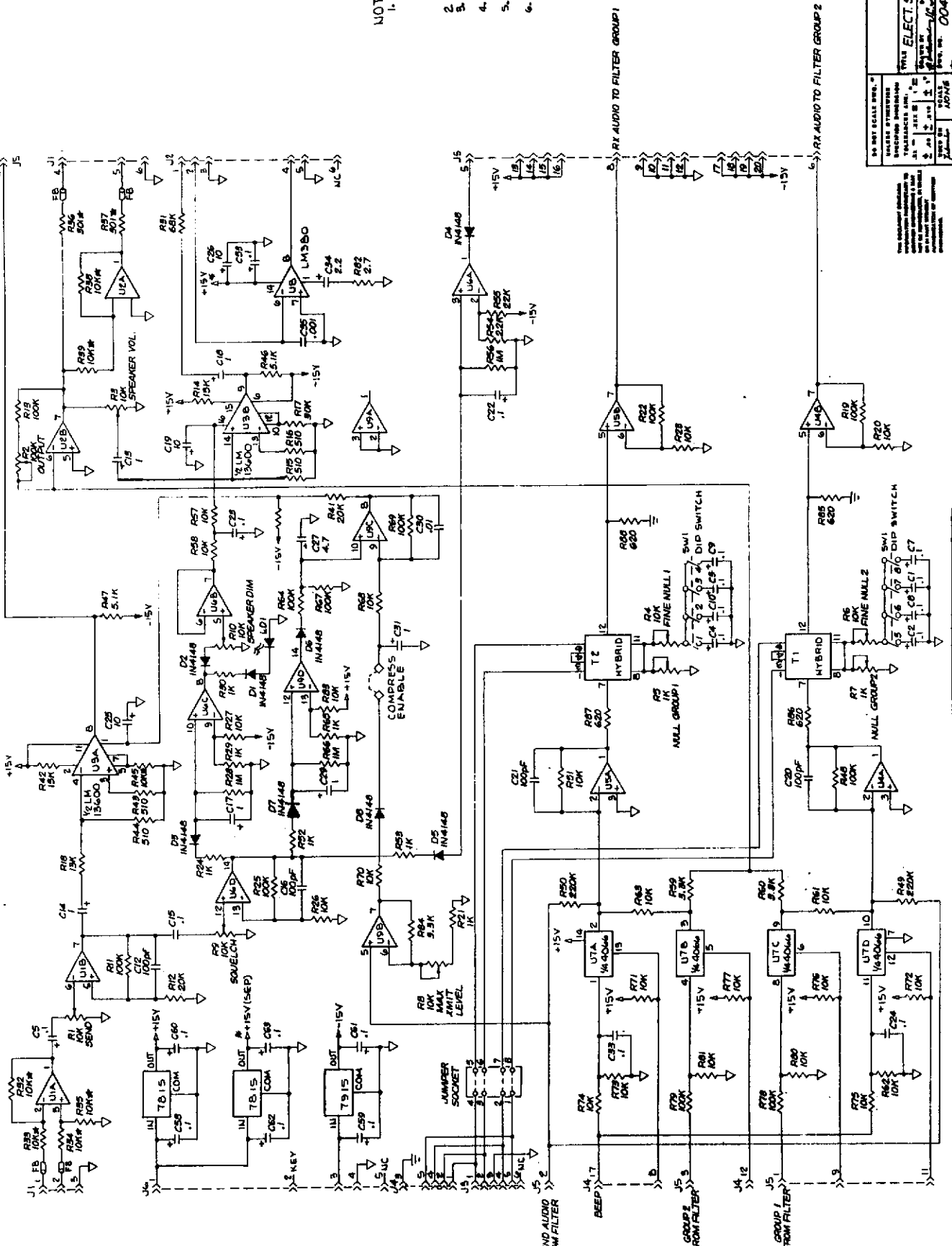
U5A U5N 2009 (7 PLCS)  
 U5B U5N 2009 (7 PLCS)  
 U5C U5N 2009 (7 PLCS)  
 U5D U5N 2009 (7 PLCS)  
 U5E U5N 2009 (7 PLCS)  
 U5F U5N 2009 (7 PLCS)

U6A U6N 2009 (7 PLCS)  
 U6B U6N 2009 (7 PLCS)  
 U6C U6N 2009 (7 PLCS)  
 U6D U6N 2009 (7 PLCS)  
 U6E U6N 2009 (7 PLCS)  
 U6F U6N 2009 (7 PLCS)





<b>GENTNER</b> ELECTRONIC EQUIPMENT CO.	
TITLE: <b>ELECT. SCHEM. TELEMUX PWR SUP BRD</b>	
DESIGNED BY: <b>W.H.</b>	CHECKED BY: <b>W.H.</b>
DRAWN BY: <b>W.H.</b>	DATE: <b>11/22/51</b>
PART NO: <b>004-01-02</b>	SHEET: <b>1</b> OF <b>1</b>



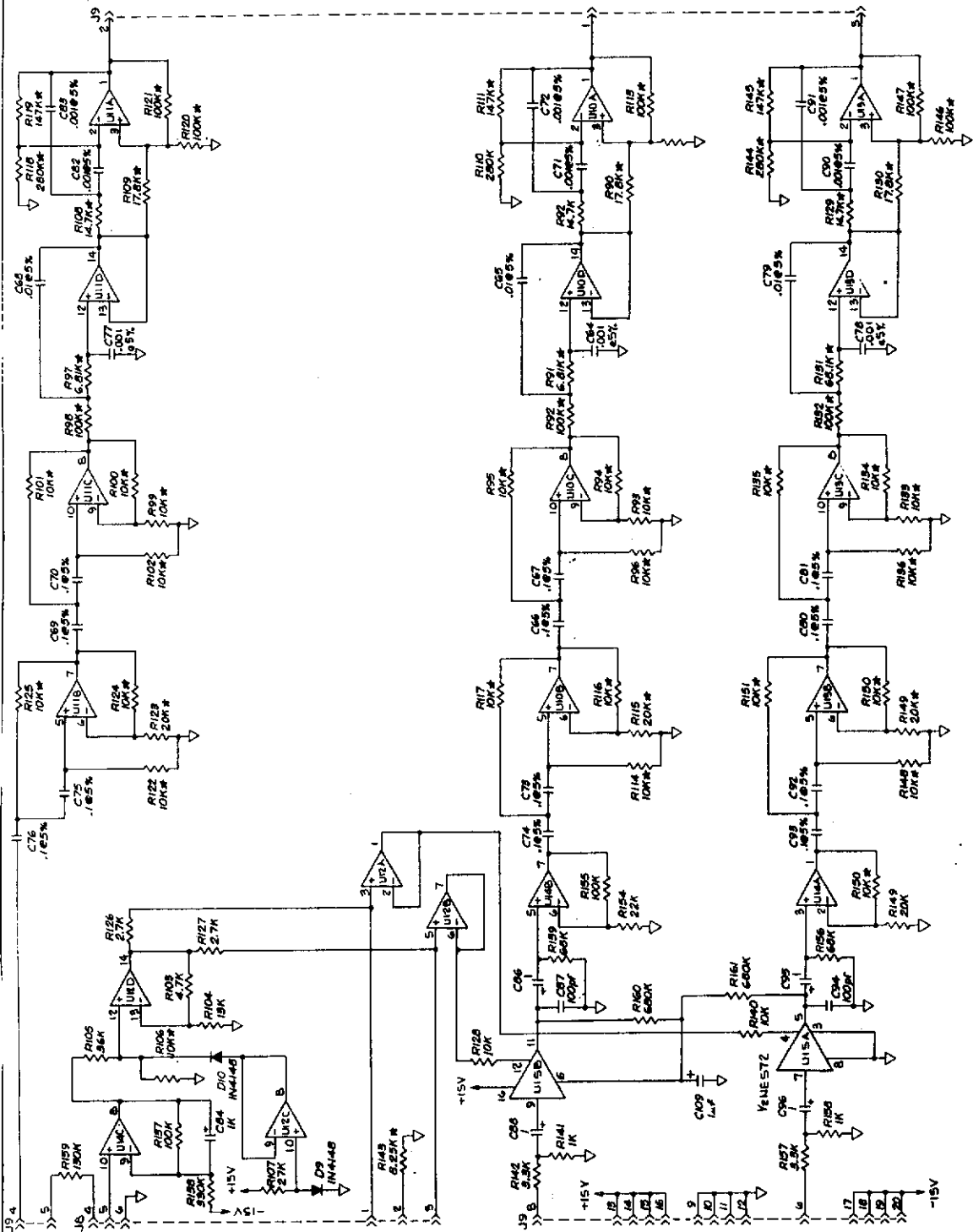
NOTES:

1. UNLESS OTHERWISE SPECIFIED:
  - a. ALL RES. ARE IN OHMS.
  - b. FIXED RES. ARE 1/4 WATT, 5% TOL.
  - c. ALL CAPS. ARE MICROFARAD.
  - d. VOLTAGES ARE AC.
2. \* INDICATES 1/2 TOL.
3. U1 ALSO HAS GND TO PINS 2, 3, 4, 5, 9, 10, 11, 12.
4. U1, U2, U4, U5 ARE NE5532's
5. W/PIN 5 TO +15V, PIN 4 TO -15V.
6. U6, U9 THRU U14 ARE LF347's.
7. W/PIN 4 TO +15V, PIN 11 TO -15V.
8. CAPS. NOT SHOWN SCHEMATICALLY ARE FILTER CAPS.

**GENTNER**  
 ELECTRONIC COMPONENTS, INC.  
 1000 W. 10th St., Suite 100  
 Denver, CO 80202  
 TEL: 303-733-2200  
 FAX: 303-733-2201  
 WWW: www.gentner.com

THIS ELECT. SCHEM. TELEMIX LG AUDIO BRD. (AS)  
 DRAWN BY: J. J. J. DATE: 10/1/95  
 REV. NO.: 004-01-05

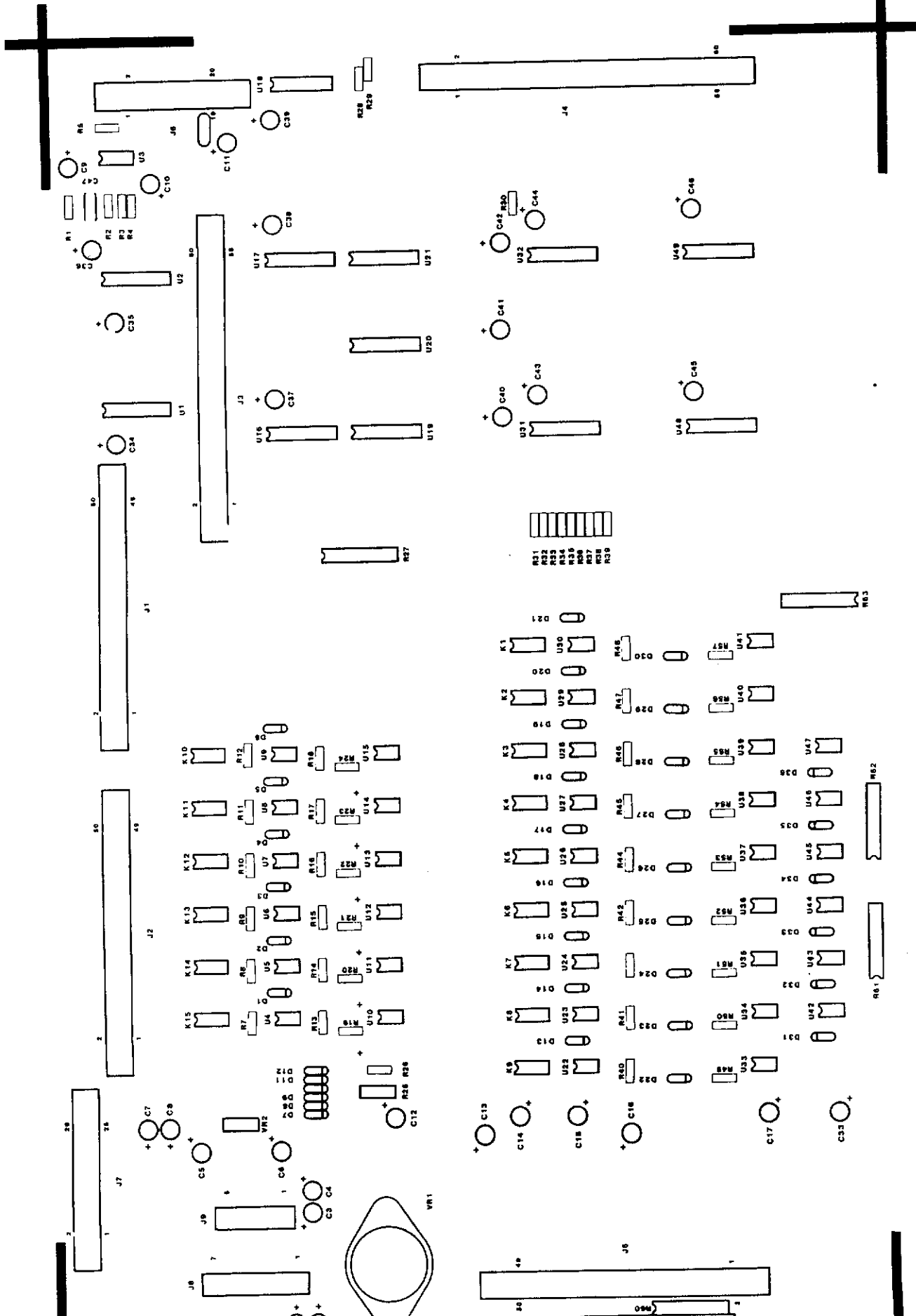
DO NOT SCALE DRAWING  
 UNLESS OTHERWISE  
 SPECIFIED  
 ALL DIMENSIONS ARE IN INCHES  
 UNLESS OTHERWISE SPECIFIED  
 DIMENSIONS ARE IN MILLIMETERS  
 UNLESS OTHERWISE SPECIFIED



NOTES:  
 1. UNLESS OTHERWISE SPECIFIED:  
 A. RESISTANCE VALUES ARE IN OHMS & IN TOL.  
 B. CAPACITANCE VALUES ARE IN MICROGRAMS.  
 C. FIXED RESISTORS ARE 1/4WATT.  
 D. VOLTAGES ARE D.C.  
 2. \* INDICATES 1% TOLERANCE.  
 3. CAPACITORS NOT SHOWN ARE BYPASS CAPS.

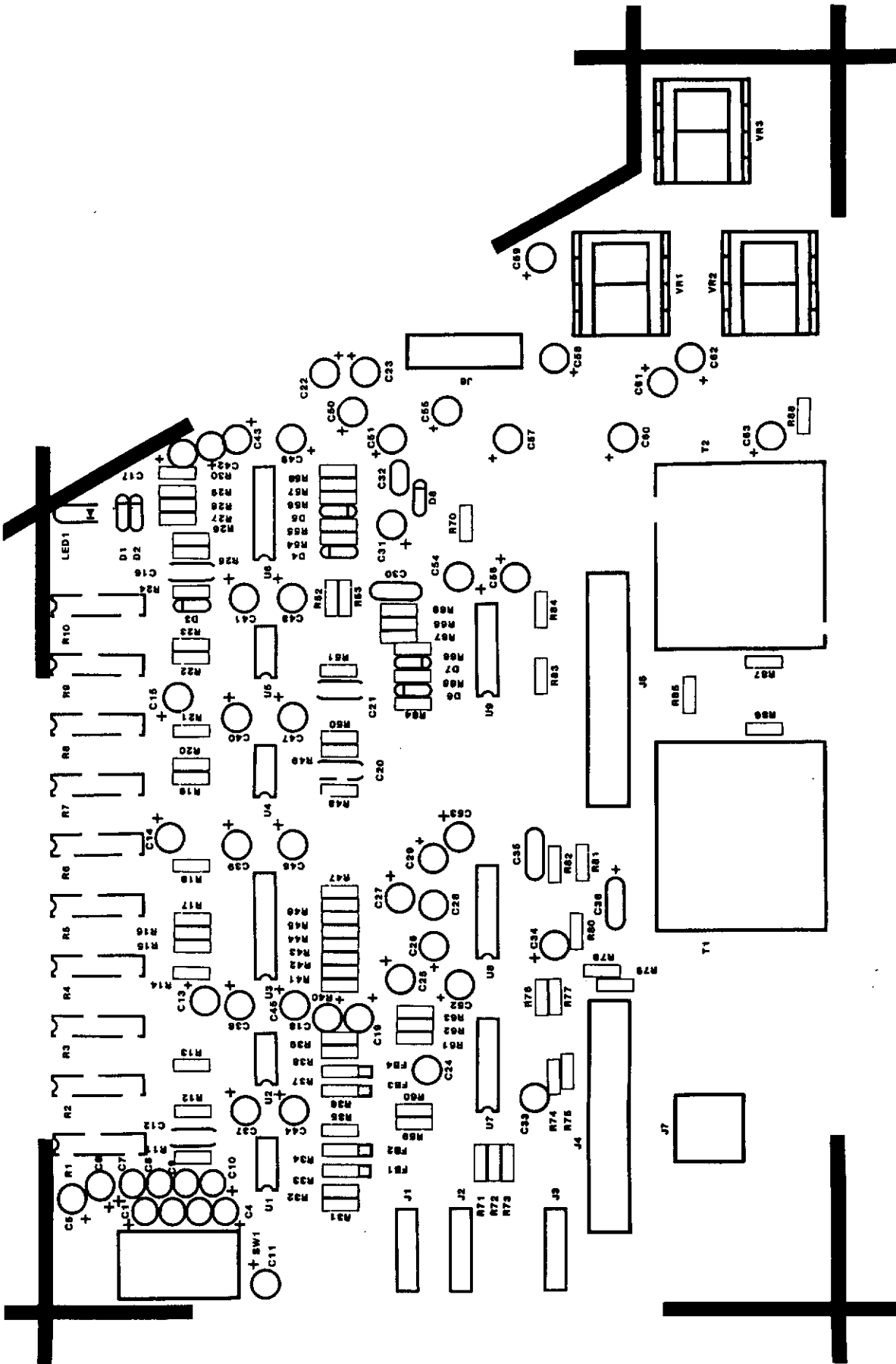
GENTNER		ELECT. SCHEM. TELEMIX 5M. AUDIO BROAD	
REV. 1.0	DATE 11/1/71	DESIGNED BY J. J. J.	APP'D BY J. J. J.
SCALE	NAME	C004-01-04	

FOR INFORMATION REFER TO THE REVISIONS LIST ATTACHED TO THIS SCHEMATIC. THE REVISIONS LIST IS THE ONLY AUTHORITY FOR THE CORRECTED SCHEMATIC.



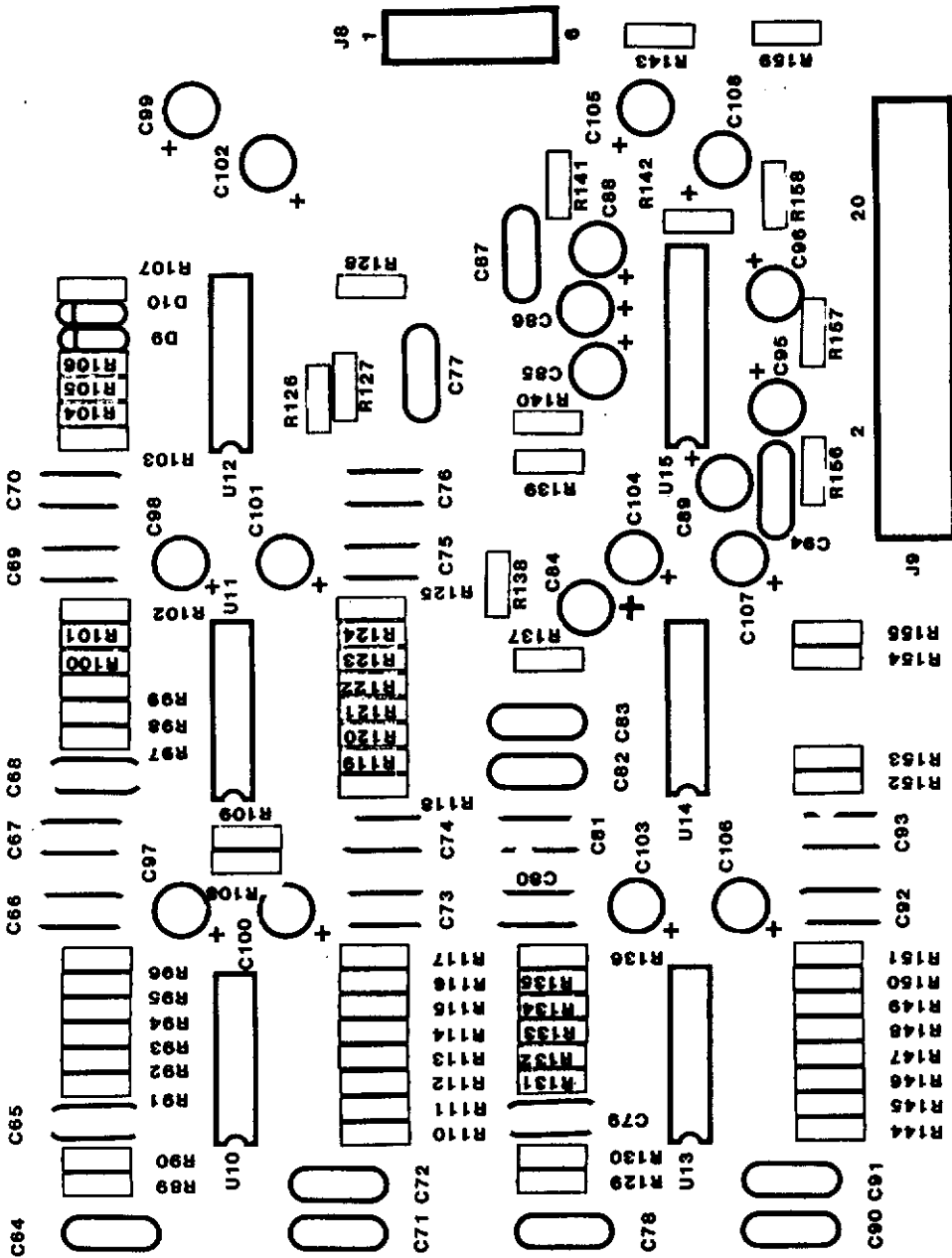
SILKSCREEN





SILKSCREEN

LG AUDIO BRD.  
004-00-04



SM AUDIO BRD.  
004-00-03

CPU BRD.  
M4-00-06

REV. 000001

